

*Prepared for:*

**County of Kaua'i Solid Waste Division**

4444 Rice Street

Mo'ikeha Building, Suite 295

Lihue, HI 96766

**REPORT OF  
CONSTRUCTION QUALITY ASSURANCE  
CELL 1 (1A THROUGH 1D)**

**Phase II Lateral Expansion, Cell 1 Base Liner Construction  
Kekaha Sanitary Landfill  
Kaua'i, Hawai'i**



*Prepared by:*

**Geosyntec**<sup>®</sup>  
consultants

475 14<sup>th</sup> Street, Suite 400  
Oakland, California 94612  
(510) 836-3034

Project Number: WG1298  
18 October 2010

OCT 20 2010

*Prepared for:*

**County of Kaua'i Solid Waste Division**  
4444 Rice Street  
Mo'ikeha Building, Suite 295  
Lihue, HI 96766

## **REPORT OF CONSTRUCTION QUALITY ASSURANCE**

### **CELL 1 (CELLS 1A THROUGH 1D)**

**Phase II Lateral Expansion, Cell 1 Base Liner Construction  
Kekaha Sanitary Landfill  
Kaua'i, Hawai'i**

*Prepared by:*

**Geosyntec**<sup>®</sup>  
consultants

475 14<sup>th</sup> Street, Suite 400  
Oakland, California 94612  
(510) 836-3034

Project Number: WG1298  
18 October 2010

## TABLE OF CONTENTS

	Page
<b>1. INTRODUCTION</b> .....	1-1
<b>1.1 Terms of Reference</b> .....	1-1
<b>1.2 Organization of Report</b> .....	1-1
<b>1.3 Responsible Parties</b> .....	1-3
<b>2. PROJECT DESCRIPTION</b> .....	2-1
<b>2.1 Background</b> .....	2-1
<b>2.2 Reference Documents</b> .....	2-2
<b>2.3 Description of Work</b> .....	2-3
<b>2.4 Design Modifications</b> .....	2-4
2.4.1 Introduction.....	2-4
2.4.2 Western Limits of Cell 1 (Drawing 4).....	2-5
2.4.3 Phased Construction of Cell 1 (Drawings 6, 7, and 17).....	2-5
2.4.4 Subbase Preparation (RFI #2).....	2-5
2.4.5 Interface Shear Strength (RFIs #5 and #24).....	2-5
2.4.6 Perimeter Berm Anchor Trench (RFI #4).....	2-6
2.4.7 Granular Drainage Layer (RFI #6).....	2-7
2.4.8 Existing Leachate Forcemain Piping (RFI #7).....	2-7
2.4.9 Pipe Penetration Assembly Air Tests (RFI #10).....	2-7
2.4.10 HDPE Cleanout Flange and Fasteners (RFI #15).....	2-8
2.4.11 Heat Bonding of Nonwoven Cushion Geotextile (RFI #16).....	2-8
2.4.12 Backfill Behind Pipe Penetration Assemblies (RFI #19).....	2-8
2.4.13 Operations Layer (RFI #20).....	2-9

2.4.14	Separator Geotextile Anchoring (RFI #22).....	2-9
2.4.15	Temporary Cell Termination (RFI #23).....	2-10
2.4.16	SDR of Dual Containment Forcemain Pipe (RFI #25).....	2-10
2.4.17	New Leachate Forcemain Valve Box (RFI #26).....	2-10
2.4.18	Wet Well #3 (RFI #27) .....	2-11
2.4.19	Compacted Fill (Offsite Soils) (RFI #28) .....	2-11
2.4.20	Final Subbase Compacted Fill Lift (RFI #30).....	2-11
2.4.21	Leachate Transfer Pipe Backfill (RFI #31).....	2-12
2.4.22	Cell 1A Tie-in to Phase II (RFI #33) .....	2-12
2.4.23	As-Built Grades for Cells 1A & 1B Penetrations (RFI #34) .....	2-12
2.4.24	Point 66 Subgrade Elevation (RFI #35).....	2-12
2.4.25	Infiltration Basin Grades (RFI #36).....	2-13
2.4.26	Systems Demonstrations .....	2-13
<b>3.</b>	<b>CONSTRUCTION QUALITY ASSURANCE (CQA) PROGRAM .....</b>	<b>3-1</b>
3.1	Scope .....	3-1
3.1.1	Introduction .....	3-1
3.1.2	Construction Quality Assurance .....	3-1
3.1.3	Report Preparation .....	3-3
3.2	Personnel .....	3-3
3.2.1	Project Technical Personnel.....	3-3
3.2.2	On-Site CQA Monitoring Personnel Schedules.....	3-5
<b>4.</b>	<b>EARTHWORK QUALITY ASSURANCE .....</b>	<b>4-1</b>
4.1	Soil Excavation.....	4-1
4.2	Subbase Preparation and Compacted Fill Placement.....	4-1
4.3	Granular Drainage Layer .....	4-2

4.4	Operations Layer .....	4-3
5.	<b>GEOSYNTHETIC CLAY LINER (GCL) QUALITY ASSURANCE</b> .....	5-1
5.1	Introduction.....	5-1
5.2	Manufacturer’s Certifications .....	5-1
5.3	Conformance Sampling and Testing.....	5-1
5.4	Monitoring of Operations .....	5-2
5.4.1	Delivery and On-Site Storage .....	5-2
5.4.2	Deployment.....	5-2
5.4.3	Seams and Overlaps .....	5-3
5.4.4	Repairs.....	5-3
6.	<b>GEOMEMBRANE QUALITY ASSURANCE</b> .....	6-1
6.1	Introduction.....	6-1
6.2	Manufacturer’s Certifications .....	6-1
6.3	Conformance Sampling and Testing.....	6-2
6.4	Monitoring of Operations .....	6-3
6.4.1	Delivery and On-Site Storage .....	6-3
6.4.2	Deployment .....	6-3
6.4.3	Trial Seams.....	6-4
6.4.4	Seaming Operations .....	6-5
6.4.5	Repairs.....	6-5
6.5	Non-Destructive Seam Testing .....	6-6
6.6	Destructive Seam Testing.....	6-6
6.6.1	Introduction .....	6-6
6.6.2	Sampling Procedure .....	6-7
6.6.3	Laboratory Testing .....	6-7

6.6.4	Destructive Test Results.....	6-8
<b>7.</b>	<b>GEOTEXTILE QUALITY ASSURANCE.....</b>	<b>7-1</b>
<b>7.1</b>	<b>Introduction.....</b>	<b>7-1</b>
<b>7.2</b>	<b>Manufacturer’s Certifications.....</b>	<b>7-1</b>
<b>7.3</b>	<b>Monitoring of Operations.....</b>	<b>7-2</b>
7.3.1	Delivery and On-Site Storage.....	7-2
7.3.2	Deployment.....	7-2
7.3.3	Seaming Operations.....	7-2
<b>8.</b>	<b>HDPE PIPES AND ASSEMBLIES QUALITY ASSURANCE.....</b>	<b>8-1</b>
<b>8.1</b>	<b>Introduction.....</b>	<b>8-1</b>
<b>8.2</b>	<b>Piping.....</b>	<b>8-1</b>
<b>8.3</b>	<b>Prefabricated Assemblies.....</b>	<b>8-2</b>
<b>8.4</b>	<b>Existing Leachate Cleanout Riser Modifications.....</b>	<b>8-2</b>
<b>9.</b>	<b>LCRS START-UP TEST AND SYSTEMS DEMONSTRATIONS.....</b>	<b>9-1</b>
<b>10.</b>	<b>GAS MONITORING PROBES.....</b>	<b>10-1</b>
<b>11.</b>	<b>MATERIAL DROP OFF FACILITY MODIFICATIONS.....</b>	<b>11-1</b>
<b>12.</b>	<b>SUMMARY AND CONCLUSIONS.....</b>	<b>12-1</b>
<b>13.</b>	<b>CERTIFICATION.....</b>	<b>13-1</b>
<b>14.</b>	<b>REFERENCES.....</b>	<b>14-1</b>
<b>15.</b>	<b>LIMITATIONS.....</b>	<b>15-1</b>

**LIST OF APPENDICES**

- Appendix A Photographic Documentation
- Appendix B Project Correspondence
- Appendix C Contractor Submittals

- Appendix D Requests For Information
- Appendix E Daily Field Reports
- Appendix F Soil Conformance Testing: Laboratory Test Results
  - Appendix F-1 Compacted Fill Materials Test Results
  - Appendix F-2 Granular Drainage Layer Test Results
  - Appendix F-3 Operations Layer Test Results
  - Appendix F-4 CLSM and Concrete Test Results
  - Appendix F-5 Base Course (MDOF Area) Test Results
- Appendix G Nuclear Density and Moisture Test Results
  - Appendix G-1 Cell 1 Test Results
  - Appendix G-2 12" CMP Backfill Test Results
  - Appendix G-3 MDOF Area Test Results
- Appendix H Geosynthetic Conformance Testing: Laboratory Test Results
  - Appendix H-1 GCL
  - Appendix H-2 60 mil Double-sided Textured Geomembrane
  - Appendix H-3 80 mil Double-sided Textured Geomembrane
  - Appendix H-4 Interface Shear Test Results
- Appendix I Geosynthetic Field Logs
  - Appendix I-1 Subgrade Acceptance Forms
  - Appendix I-2 Geomembrane Trial Seam Logs
  - Appendix I-3 Geomembrane Production Seam Logs
  - Appendix I-4 Geomembrane Panel Placement and Repair Summary Logs
  - Appendix I-5 Geomembrane Destructive Sample Logs
- Appendix J Geomembrane Destructive Sample Test Results
- Appendix K Manufacturer's Roll Certificates and Roll Inventory
- Appendix L HDPE Pipe and Assembly Pressure Test Results
- Appendix M Gas Monitoring Probe Installation
- Appendix N Systems Demonstrations
- Appendix O Report of Findings, Former Leachate Evaporation Pond Sub-Surface Soils
- Appendix P Red-lined Construction Drawings

Appendix Q Record Drawings  
Appendix R Geosynthetic Samples



## 1. INTRODUCTION

### 1.1 Terms of Reference

This report summarizes the construction quality assurance (CQA) performed by Geosyntec Consultants, Inc. (Geosyntec) for the construction of Cell 1 (Cells 1A through 1D), at the Kekaha Sanitary Landfill (Kekaha Landfill) in Kaua'i, Hawai'i. Cell 1 was constructed as part of the Phase II Lateral Expansion, Cell 1 Base Liner Construction. This report has been prepared for the County of Kaua'i Solid Waste Division to satisfy the requirements of the Hawai'i Department of Health (HDOH). The CQA activities were performed in accordance with the CQA Manual for the project [Geosyntec, 2010a].

This report was prepared by Kim Huyuh and Michael J. Minch, and was reviewed by Hari D. Sharma, Ph.D., P.E., all of Geosyntec, in accordance with the internal review policy of the firm.

### 1.2 Organization of Report

The remainder of this report is organized as follows:

- a description of the project including a summary of changes to the original design is presented in Section 2;
- the CQA program is summarized in Section 3;
- details of the CQA program during earthwork are presented in Section 4;
- details of the CQA program for the geosynthetic clay liner (GCL) are presented in Section 5;

- details of the CQA program for the geomembranes are presented in Section 6;
- details of the CQA program for the geotextiles are presented in Section 7;
- details of the CQA program for the high density polyethylene (HDPE) pipes and assemblies, are presented in Section 8;
- details of the LCRS startup test and systems demonstrations are presented in Section 9;
- details of the gas monitoring probe installation are presented in Section 10;
- details of the material drop off facility (MDOF) modifications are presented in Section 11;
- the summary and conclusions from the CQA work are presented in Section 12;
- certification is presented in Section 13;
- references are included in Section 14; and
- limitations on the application of information presented in this report are described in Section 15.

Photographic documentation related to the CQA activities is presented in Appendix A. Project correspondence, contractor submittals, and Requests for Information (RFIs) are included in Appendices B, C and D, respectively. CQA documentation, including laboratory test results, field test results, field logs, etc. are included in Appendices E through L. Documentation for the gas monitoring probe installation, systems demonstrations, and former leachate pond sub-surface soils evaluation are provided in Appendices M, N, and O, respectively. Red-lined construction drawings, documenting changes during construction, are provided in Appendix P. The as-built record drawings,

including the geomembrane panel layout drawings, are presented in Appendix Q. Samples of the geosynthetic materials used in the construction are provided in Appendix R.

For ease of reference during construction, a local site orientation was adopted that was based on the surrounding topography. For documentation purposes within this report, the mauka (mountain) side of the project is referred to as "north" and the makai (ocean) side of the project is referred to as "south."<sup>1</sup> These terms were used in various construction documents (e.g., dailies, geosynthetic logs, etc.) as well as in this report to describe portions of the construction.

Throughout the construction of Cell 1, other construction activities were underway for the rest of the Phase II expansion project. Therefore, the field documentation in the appendices of this report also refers to work on these other components (new leachate evaporation pond [NLEP], the new infiltration basin [NIB], and existing utilities).

### 1.3 Responsible Parties

The responsible parties involved in the Cell 1 construction included the Owner, the Design Engineer, the Construction Manager, the General Contractor, the Geosynthetics Installer, and the CQA Consultant (including CQA laboratories). The technical personnel for each company, who were key participants in the construction, are listed in Section 3.2.1 of this report.

The County of Kaua'i (County) is the owner of the site, and was responsible for funding and project management.

Waste Management of Hawai'i (WMI) is the operator of the site, and was responsible for site access and construction management.

AECOM was the Design Engineer, and prepared the Cell 1 construction drawings and technical specifications. As the Design Engineer, AECOM was responsible during

---

<sup>1</sup> These do not represent actual north and south directions.

construction for interpreting and answering design questions, approving design modifications and addressing material submittals if they did not meet the requirements of the technical specifications.

The General Contractor for the project was Goodfellow Brothers, Inc. (GBI). GBI was responsible for all construction associated with earthwork, granular drainage layer, leachate collection and removal system (LCRS), operations layer, HDPE pipes, leachate pump stations, surface water control features, and perimeter access roads.

The Geosynthetics Installer was Northwest Linings & Geotextile Products, Inc. (Northwest Linings) of Kent, Washington. Northwest Linings was responsible for deploying and installing the GCL, geomembranes, and cushion and separator geotextiles.

The Surveyor was Esaki Surveying and Mapping, Inc. (Esaki) of Lihue, Hawai'i. Esaki was responsible for staking construction limits and grades, performing surveys for various constructed layers (such final subbase and top of operations layer), and providing final record drawings.

CQA services were provided by Geosyntec. Geosyntec's responsibilities included preparing the CQA Manual, reviewing contractor submittals, sampling and testing of materials for conformance with technical specifications, observing and testing of contractor's work, documenting conformance with technical specifications, and preparing this report confirming that construction was completed in accordance with the construction documents.

CQA laboratory testing was performed by Texas Research International/Environmental, Inc. (TRI) laboratory of Austin, Texas for geosynthetics testing, Precision Geosynthetic Laboratories (Precision) of Anaheim, California, for both interface shear strength and some geotechnical soils testing, and Hirata & Associates, Inc. (Hirata) of Aiea, Hawai'i, for concrete and geotechnical soils testing. All results from the CQA laboratories were reviewed by Geosyntec as part of the CQA work.

## 2. PROJECT DESCRIPTION

### 2.1 Background

Kekaha Sanitary Landfill is a municipal solid waste disposal facility owned by the County, and operated by WMH. The landfill is located on the southwest side of the Island of Kaua'i, approximately 1.3 miles northwest of the town of Kekaha. The disposal facility comprises two distinct disposal units, Phase I (roughly 33 acres) and Phase II (roughly 32 acres), a former 1.9-acre leachate evaporation pond, and administration and maintenance facilities. The Phase II landfill has undergone an approximate 6.3-acre lateral expansion along its western boundary. As part of the Phase II Lateral Expansion, Cell 1 Base Liner Construction, the former leachate evaporation pond, which was located within the Cells 1A and 1B (Cells 1A/1B) footprint, was demolished and the NLEP was constructed<sup>2</sup>. The demolition of the former leachate pond and evaluation of the pond sub-surface soils are documented in Appendix O<sup>3</sup>.

Cell 1 is approximately 6.3 acres (plan) and includes Cells 1A through 1D. Cell 1 was constructed in two phases: Cells 1C and 1D (Cells 1C/1D) were completed on 8 June 2010; and Cells 1A/1B were completed on 14 September 2010. Previously, a CQA report was submitted to HDOH for the construction of Cells 1C/1D [Geosyntec, 2010c], and the information from that report is repeated in this Cell 1 (1A through 1D) CQA report for completeness.

Cell 1 incorporates the following containment system (from bottom to top):

---

<sup>2</sup> A CQA report for the NLEP containment system was submitted to HDOH on 27 May 2010 [Geosyntec, 2010b]. The CQA report was submitted prior to completion of ancillary structures for the NLEP, including the aerators. Approval to temporarily operate the NLEP without aerators was granted by HDOH in a letter dated 4 June 2010 (Appendix B).

<sup>3</sup> Approval to construct above the former leachate pond subgrade was granted by HDOH in an email dated 1 July 2010 (Appendix B). HDOH approval was given based on results of analytical tests of the sub-surface soils.

- prepared subbase which includes 6-inch (in) thick final subbase compacted fill;
- composite liner system consisting of (from subbase and up):
  - subbase 60-mil thick double-sided textured HDPE geomembrane (panels immediately adjacent to the sump pipe penetrations are 80-mil thick double-sided textured HDPE geomembrane)
  - geosynthetic clay liner (GCL); and
  - primary 60-mil thick double-sided textured HDPE geomembrane (panels immediately adjacent to the sump pipe penetrations are 80-mil thick double sided textured HDPE geomembrane);
- 16 oz/yd<sup>2</sup> non-woven cushion geotextile;
- 12-in thick granular drainage layer;
- 6 oz/yd<sup>2</sup> non-woven separator geotextile; and
- 24-in thick operations layer.

Cell 1 is equipped with a blanket-type LCRS which drains at approximate 2.8% slopes to 8-in diameter perforated HDPE collection pipes. Within each of the four cells (i.e., Cells 1A through 1D), an LCRS collection pipe drains at approximate 2% slopes into an LCRS sump. The pipes penetrate the containment systems at the sumps, and become dual containment conveyance pipes that gravity drain either to the new leachate pump station Wet Well #3 (from Cells 1A, 1B, and 1C) or to the existing manhole LCM-14 (from Cell 1D).

Leachate from Wet Well #3 and LCM-14 is routed to the NLEP through the existing forcemain along the northwest edge of Phase II.

## 2.2 Reference Documents

The following list of references includes the applicable design and construction documents related to the construction of the overall project:

- *Construction Drawings, Phase II Lateral Expansion, Cell 1 Base Liner Construction, Kekaha Sanitary Landfill, Kauai, Hawaii*, prepared by

AECOM, April 2009, Revised January 2010, February 2010, March 2010, April 2010, and June 2010.

- *Project Specifications and Drawings for Phase II Lateral Expansion, Cell 1 Base Liner Construction, Kekaha Sanitary Landfill, County of Kauai, HI, prepared by AECOM, July 2009, Revised February 2010.*
- *Construction Quality Assurance Manual, Phase II Lateral Expansion, Cell 1 Base Liner Construction, Kekaha Sanitary Landfill, Kekaha, Hawaii, prepared by Geosyntec Consultants, Inc., 9 February 2010, Revised 12 April 2010.*

### 2.3 Description of Work

The Cell 1 construction included the following primary activities:

- surveying;
- excavating soils from the Cell 1, NLEP, and NIB areas and the existing sand stockpile;
- site grading and preparing final subbase;
- controlling storm water and erosion;
- exposing the existing termination along the western boundary of the existing Phase II landfill for tie-in with Cell 1;
- constructing the Cell 1 containment system;
- installing LCRS piping, granular drainage materials, cushion and filter geotextiles, LCRS sumps and penetrations, and riser pipes;
- installing the new leachate pump station Wet Well #3;

- modifying the leachate conveyance system to flow to the NLEP;
- installing two new landfill gas probes for monitoring subsurface landfill gas migration (not monitored by Geosyntec);
- decommissioning an existing landfill gas monitoring probe (not monitored by Geosyntec);
- modifying the existing leachate cleanout risers;
- constructing an infiltration basin and ditch (not monitored by Geosyntec); and
- installing other ancillary structures, such as the perimeter berm access roads, the MDOF improvements, and control panels.

## 2.4 Design Modifications

### 2.4.1 Introduction

Several changes to the design were made during the construction of Cell 1. These changes were made either to improve the performance of the project, to simplify its construction, or to adjust for field conditions. Each change was reviewed and approved by AECOM, the Design Engineer, prior to implementation. The changes were either documented in the RFI process<sup>4</sup> (Appendix D) or revised construction drawings (Appendix P). The following subsections describe the amendments and modifications along with the reasons for each change.

---

<sup>4</sup> The RFI process included clarifications and responses from the Design Engineer which may or may not impact the design. Therefore, the RFIs described in Section 2.4 do not necessarily include all RFIs included in Appendix D.



#### 2.4.2 Western Limits of Cell 1 (Drawing 4)

At the start of construction, the property line was found to be located incorrectly on the Construction Drawing due to survey error. The Cell 1 subbase grades were revised and reissued with the correct location of the property line. Drawing 4 (Appendix P) reflects the revised grades and correct location of the property line.

#### 2.4.3 Phased Construction of Cell 1 (Drawings 6, 7, and 17)

As described in Section 2.1, Cell 1 was constructed in two separate phases. Based on the urgent need for airspace capacity, the County directed the Cell 1 construction to be completed in phases because the proposed construction schedule for the entire Cell 1 would not meet the site's immediate capacity needs. Therefore, Cells 1C/1D were constructed first with a temporary southern berm and a temporary wet well to route leachate to the NLEP. Drawings 6, 7, and 17 (Appendix P) were revised to include these modifications.

#### 2.4.4 Subbase Preparation (RFI #2)

Section 02330, Part 3.01C of the Project Specifications required the subbase to be proof-rolled with a minimum 20-ton roller to identify potential soft areas. The equipment available during construction included a 10-ton vibratory roller for compaction and proof rolling. This reduction in roller weight was approved conditionally by the Design Engineer, provided the minimum compaction requirements are met and no pumping or soft areas are visually observed. During construction of the subbase and Cell 1 berms, the compaction effort was field verified to meet the project requirements and the area was visually confirmed to be firm and unyielding.

#### 2.4.5 Interface Shear Strength (RFIs #5 and #24)

Interface direct shear tests (ASTM D5321, ASTM D6243) were performed for the various geosynthetic and soil interfaces in accordance with Section 02072 of the Project Specifications. A total of 16 three-point interface direct shear tests were performed for Cell 1. Appendix H-4 provides a summary of the tests performed as well as the laboratory test results.

All interface shear test results met the project requirements, with exception of the following four interfaces:

Interface	Normal Stress (psi)	Specified Peak Friction Angle (degrees)	Laboratory Peak Friction Angle (degrees)
Nonwoven separator geotextile versus granular drainage material	30, 40, 50	25	22.1
Granular drainage material versus nonwoven cushion geotextile versus 60 mil HDPE geomembrane	30, 40, 50	25	21.0
Granular drainage material versus nonwoven cushion geotextile versus 80 mil HDPE geomembrane	30, 40, 50	25	19.2
GCL (non-scrim) versus 80 mil HDPE geomembrane	30, 40, 50	23	15.0

Based on the re-evaluation of the design calculations, and in some cases consideration of the measured adhesion values, the Design Engineer accepted the test results for these interfaces as described in the responses to RFIs #5 and #24.

#### 2.4.6 Perimeter Berm Anchor Trench (RFI #4)

The original design for the perimeter berm anchor trench included a 2-ft by 2-ft square anchor trench with the containment system geosynthetics buried against the vertical wall and floor of the trench. The backfill was to be compacted to a minimum of 95% relative compaction (ASTM D1557). This design was modified to a minimum 2-ft deep V trench configuration (Drawing 15 in Appendix P) based on concerns regarding construction of vertical walls within a sand backfill material. As described in AECOM's response to RFI #4, the anchor trench backfill compaction was also revised to be a minimum of 90% relative compaction per ASTM D1557. The V trench configuration was constructed only for Cells 1C/1D. The 2-ft by 2-ft square

configuration was constructed for Cells 1A/1B as it was found to be stable during construction.

#### 2.4.7 Granular Drainage Layer (RFI #6)

The original Section 02062 of the Project Specifications required the granular drainage layer to have a maximum particle size of 1.5 inches, an average particle size (D50) of 1 inch, and less than 5% passing the #200 sieve. The Design Engineer revised Section 02062 (provided with the response to RFI #6) during construction to allow a range for the D50 particle size. The revised specifications for the granular drainage layer requires a maximum particle size of 1.5 inches, D85 particle size of 1 inch or larger, D50 particle size between 1 inch to 0.6 inches, and less than 5% passing the #200 sieve. The minimum permeability of  $3 \times 10^{-1}$  cm/sec remained unchanged.

#### 2.4.8 Existing Leachate Forcemain Piping (RFI #7)

The existing leachate forcemain piping from Forcemain Valve Box #2 to the existing leachate evaporation pond (Drawing 2) was to be removed and backfilled during cell construction. However, since the NLEP was constructed concurrently with Cells 1C/1D, this piping was proposed to remain in place and active below Cells 1C/1D to allow the existing pond to remain active during cell construction (and prior to approval of the NLEP). This design was reviewed and approved by the Design Engineer prior to abandonment. The existing pipe was capped and abandoned in place on 10 June 2010 in accordance with RFI #7. During the abandonment, residual liquid remaining in the pipe was pumped out using a vacuum truck.

#### 2.4.9 Pipe Penetration Assembly Air Tests (RFI #10)

The pipe penetration assemblies were factory-welded and air tested by Northwest Linings prior to shipment to the site. During the factory air testing, the assemblies were observed to bulge outwards approximately 6 inches under the required 3 psig pressure (Drawing 18 of the Construction Drawings). At GBI's request, the Design Engineer revised the field test requirement to be performed under 1.5 psig instead of 3 psig since the purpose of the field test is to verify weld integrity and liquid tightness.

#### 2.4.10 HDPE Cleanout Flange and Fasteners (RFI #15)

The leachate cleanout riser pipes were required to have 150 lb carbon steel or convoluted epoxy coated ductile iron backup flanges and cadmium plated carbon steel nuts and bolts, per Section 15019 of the Project Specifications. Due to material availability, the Design Engineer approved galvanized back-up flanges and stainless steel fasteners as substitutions in the response to RFI #15.

#### 2.4.11 Heat Bonding of Nonwoven Cushion Geotextile (RFI #16)

Section 02075, Parts 3.02C and 3.03A of the Project Specifications required all geotextile seams and patches to be sewn, and thermal bonding of patches to be approved by the Engineer. Approval of thermal bonding was granted in the Design Engineer's response to RFI #16 for repair patches and for the tie-in to Phase II landfill (Detail 4, Drawing 15 of the Construction Drawings). Thermal bonding of the nonwoven geotextile was visually observed, and no burnouts or holes were detected.

#### 2.4.12 Backfill Behind Pipe Penetration Assemblies (RFI #19)

After the pipe penetration assemblies were installed at the Cells 1C/1D sumps and the penetrations were connected to the dual containment conveyance pipes, it was observed that a void space had been created between the trench bottoms and the penetration assemblies which could not be backfilled with compacted soil due to limited access. The Design Engineer approved a controlled low-strength material (CLSM) slurry as a substitute to compacted soil provided the following conditions were met:

- the slurry mix shall be stiff enough so as to not flow under the installed penetration assemblies and into the sump;
- the seven-day compressive strength shall be 500 psi minimum; and
- a layer of 16 oz/sy nonwoven cushion geotextile shall be installed on the backside of the penetration assembly flatstock, and shall extend past the flatstock 5 ft minimum on the sideslope and 2 ft minimum on the sump bottom.

These conditions were verified during construction with exception of the seven-day compressive strength. Strength tests of the Cells 1C/1D CLSM slurry performed by Hirata showed the seven-day compressive to be 216 psi, and the 28-day compressive strength to be 529 psi minimum. The 28-day compressive strength for Cells 1C/1D was approved by the Design Engineer in the response to RFI #19. The minimum 28-day compressive strength for Cells 1A/1B CLSM slurry, tested later, was 539 psi minimum, which also met the approved minimum specified in the response to RFI #19. The CLSM test results are provided in Appendix F-4.

#### 2.4.13 Operations Layer (RFI #20)

The 24-inch thick operations layer is required to meet gradation and permeability requirements (Section 02062, Part 2.02). Several attempts to produce the material at the Kauai Aggregate Quarry yielded a material which met the minimum permeability of  $6 \times 10^{-3}$  cm/sec, but had a small fraction of coarse particles above the maximum allowed 3/8-inch particle size. The Design Engineer approved this material given the passing permeability results and the lack of particle size restrictions in the site permit and the design calculations.

The Design Engineer's response to RFI #20 states that all testing of the operations layer should show 100% passing the 1/2-inch sieve, minimum 93% passing the 3/8-inch sieve, less than 5% passing the #200 sieve, and acceptable interface results. The minimum permeability requirement of  $6 \times 10^{-3}$  cm/sec remained unchanged. These requirements were met during conformance testing of the operations layer (Appendices F-3 and H-4).

#### 2.4.14 Separator Geotextile Anchoring (RFI #22)

Drawing 15 of the Construction Drawings shows the 6 oz/sy nonwoven separator geotextile anchored within the perimeter berm anchor trench, 6 inches from the Cell 1 containment system geosynthetics. Prior to the separator geotextile installation, the perimeter berm anchor trench was fully backfilled in order to support the containment system geosynthetics during the granular drainage layer placement.

To avoid digging into the backfilled anchor trench and risking damage to the installed geosynthetics, the Design Engineer approved an alternate method to anchor the

separator geotextile in the response to RFI #22. The 6 oz/sy nonwoven separator geotextile was extended flat across the top of the perimeter berm to 1 ft minimum past the perimeter access road geotextile, and buried under the perimeter berm road fill (i.e., 1 ft of general fill soils and 9 inches of crushed aggregate).

#### 2.4.15 Temporary Cell Termination (RFI #23)

The Cell 1C southern temporary termination was designed with a 20-ft overbuild of the containment system geosynthetics and a temporary cell separation berm along the Cell 1B/1C boundary (Drawing 17 of the Construction Drawings). The termination as designed required sequencing several intricate construction steps. To simplify the construction, an alternate configuration was proposed in RFI #23 and was approved by the Design Engineer. The alternate configuration maintained the 20-ft liner overbuild, but relocated the separation berm and rain flap to within Cell 1C. During construction of Cells 1A/1B, the rain flap was cut off to connect the LCRS and complete the tie-in to Cell 1B.

#### 2.4.16 SDR of Dual Containment Forcemain Pipe (RFI #25)

Details 3 and 5 of Drawing 17 of the Construction Drawings, show the dual containment forcemain pipe, which runs from Wet Well #3 to LCM-14, as having a 4-inch diameter SDR-17 HDPE carrier pipe inside an 8-inch diameter SDR-11 HDPE containment pipe. These details conflict with Drawing 7, which show a 4-inch SDR-11 pipe inside an 8-inch SDR-17 pipe. The Design Engineer resolved this discrepancy in the response to RFI #25, and reissued Drawing 17 to be consistent with Drawing 7. As shown in the revised drawing (found in the response to RFI #25 and Appendix P), the correct forcemain pipe configuration has a 4-inch SDR-11 HDPE carrier pipe inside the 8-inch SDR-17 HDPE containment pipe. The forcemain pipe was installed in accordance with the revised Drawing 17.

#### 2.4.17 New Leachate Forcemain Valve Box (RFI #26)

A new leachate forcemain valve box was installed where the existing forcemain pipe connects with the new 6-inch diameter forcemain piping discharging to the NLEP. Detail 5 on Drawing 19 of the Construction Drawings specifies a prefabricated 6-ft

diameter HDPE manhole to be installed as the valve box. Due to the alignment of the piping, the valve box encroaches into the roadway about 18 to 24 inches. A 6-ft diameter traffic-rated concrete vault was proposed and approved by the Design Engineer. Details of the approval with additional criteria are presented in AECOM's responses dated 27 August 2010 and 2 September 2010 (Appendix D).

#### 2.4.18 Wet Well #3 (RFI #27)

The prefabricated Wet Well #3 was constructed with incorrect stub-out orientations per Detail 3 on Drawing 17 of the Construction Drawings. The Design Engineer approved the modified wet well structure to be used, provided design pipe slopes and invert elevations were met.

#### 2.4.19 Compacted Fill (Offsite Soils) (RFI #28)

A rock dust material from the Kauai Aggregates Quarry was proposed as a compacted fill (offsite soil) to construct the subbase grades for Cells 1A/1B. The Design Engineer approved this import material to be used to construct the Cells 1A/1B grades up to the final 6-inch subbase compacted fill lift. Due to the amount of oversize particles (i.e. larger than #4 US sieve), the rock dust material was not approved for use to construct the final 6-inch subbase layer.

#### 2.4.20 Final Subbase Compacted Fill Lift (RFI #30)

A quarry fines material from the Kauai Aggregates Quarry was proposed for use to construct the 6-inch thick final subbase compacted fill lift within Cells 1A/1B. The material met the grain size requirements (Section 02330, Part 2.01C) and the interface shear strength requirements (Section 02072, Part 2.04E), but did not meet the USCS soil classification requirements of a poorly-graded sand (SP) or poorly-graded sand with silt (SP-SM). The proposed material was classified as a well-graded sand with silt (SW-SM). The Design Engineer approved the quarry fines material to be used to construct the 6-inch thick final subbase compacted fill lift.

#### 2.4.21 Leachate Transfer Pipe Backfill (RFI #31)

Detail 4 on Drawing 17 of the Construction Drawings specifies a gravel backfill above the leachate transfer pipe (8-inch diameter HDPE carrier pipe inside 12-inch diameter HDPE containment pipe). The onsite sand material was approved to be used in place of the gravel backfill. Additionally, a backfill warning tape was also approved to be placed one foot above the top of the leachate transfer pipe.

#### 2.4.22 Cell 1A Tie-in to Phase II (RFI #33)

The southeast corner of the Cell 1 tie-in to the existing Phase II landfill required a field adjustment of the liner limit. The design liner limit presented on Drawing 2 shows the Cell 1A liner terminating at the Phase II limit near an existing leachate cleanout riser and the newly installed gas monitoring probe GP-II-6. Due to the locations of the riser and gas probe, the original design of the new perimeter access road south of the liner limit would have restricted future access along the road at this junction. A revised liner limit alignment which terminates further west was proposed in RFI #33 to improve access was approved by the Design Engineer.

#### 2.4.23 As-Built Grades for Cells 1A & 1B Penetrations (RFI #34)

The as-built elevations for Points E and F within the Cells 1A/1B sumps (refer to the table of Subgrade Control Points on Drawing 18 of the Construction Drawings) were constructed 0.1 ft above the project grading tolerance. The Design Engineer approved this deviation for these specific sump points in the response to RFI #34.

#### 2.4.24 Point 66 Subgrade Elevation (RFI #35)

Subgrade Control Point 66, with design elevation 23.49 ft above mean sea level (ft MSL), was noted to be in error. In an email dated 30 July 2010, the Design Engineer corrected the Point 66 elevation to be 17.27 ft MSL.



#### 2.4.25 Infiltration Basin Grades (RFI #36)

The infiltration basin was deepened at the northwest corner to produce additional fill material for construction. The as-built basin grades therefore provide additional storage capacity, and were reviewed and approved by the Design Engineer.

#### 2.4.26 Systems Demonstrations

The systems demonstrations procedures described in Section 01814 of the project specifications were modified by the Design Engineer in an email dated 31 August 2010 (Appendix B). The system demonstrations were performed in accordance with the revised procedures.

### 3. CONSTRUCTION QUALITY ASSURANCE (CQA) PROGRAM

#### 3.1 Scope

##### 3.1.1 Introduction

Geosyntec's scope of work for the construction of Cell 1 included the following:

- construction quality assurance; and
- preparation of this report.

These activities are described in Sections 3.1.2 through 3.1.4.

##### 3.1.2 Construction Quality Assurance

Geosyntec's primary role during construction of Cell 1 was as the CQA Consultant. The services performed were consistent with the CQA Manual, prepared by Geosyntec [2010a] and reviewed by the County and Design Engineer, and included:

- visually classifying, collecting samples of, and evaluating test results (tests performed by others) for all borrow soils to assure suitability for construction;
- monitoring compaction and final fine grading for subbase preparation;
- coordinating with the geosynthetics laboratory to collect all necessary geosynthetic conformance samples (either at the manufacturing plant or in the field);
- inspecting delivered geomembrane, GCL, and geotextile prior to deployment;
- reviewing conformance test results of geomembrane and GCL prior to deployment;

- monitoring and documenting deployment of GCL panels;
- monitoring geomembrane trial welding prior to deployment;
- monitoring and documenting deployment, welding, and repair of geomembrane panels;
- monitoring non-destructive testing of geomembrane seams;
- collecting destructive geomembrane seam samples for third-party testing and reviewing results for conformance with the specifications;
- monitoring and documenting deployment of geotextile panels;
- collecting samples of and evaluating test results for granular drainage materials for conformance;
- monitoring placement of solid and perforated HDPE pipes;
- monitoring placement of granular drainage materials;
- visually classifying, collecting samples of, and evaluating test results for granular drainage layer and operations layer soils to verify specified properties;
- monitoring placement of granular drainage layer and operations layer soils;
- monitoring installation of the temporary leachate pump station wet well and the new leachate pump station Wet Well #3;
- monitoring installation of the sumps, pipe penetrations, and risers; and
- documenting construction activities.

### 3.1.3 Report Preparation

Included in this CQA report is a discussion of the findings and observations of Geosyntec's on-site CQA personnel and off-site laboratories for the tasks summarized in Section 3.1.2. Documentation of the construction activities, as well as laboratory and field testing associated with the construction, were completed by Geosyntec. This documentation is presented as appendices to this report.

Red-lined drawings, also provided in this report, present the design of the Cell 1 as revised and approved by the Design Engineer during construction. As-built record drawings showing the survey elevations of the various layers, anchor trench liner termination, and buried utilities were provided by Esaki. Northwest Linings produced record drawings of the geomembrane panel placement for each of the subbase and primary layers. All record drawings are included in Appendix Q.

## 3.2 Personnel

### 3.2.1 Project Technical Personnel

The key technical personnel involved in the construction of Cell 1 are listed below:

#### County of Kaua'i (Owner)

Donald M. Fujimoto - Project Manager

Troy Tanigawa - Engineer

#### AECOM (Design Engineer)

Kenneth J. Bergschultz, P.E. - Design Engineer of Record

Jeffery Impens - Project Manager

Waste Management of Hawai'i, Inc. (Operator/Construction Manager)

Richard T. Von Pein, P.E. - Project Manager

Jeff Kaohi - Project Sponsor/Site Manager

Jesse Frey - Construction Manager

Goodfellow Brothers, Inc. (General Contractor)

Keith Suga - Regional Manager/Project Manager

Jeff Griffin - Regional Manager

Jeff Orsatelli - Site Foreman

ITC Water Management Inc. (Pipe Installer)

Bill Hewetson - Project Manager

Northwest Linings & Geotextile Products, Inc. (Geosynthetics Installer)

Kirk Lilleskare - Project Manager

Joel Mondragon - Site Superintendent

Esaki Surveying & Mapping, Inc. (Surveyor)

Dennis M. Esaki - Surveyor-of-Record

Geosyntec Consultants, Inc. (CQA Consultant)

Hari D. Sharma, Ph.D., P.E. - CQA Officer

Michael J. Minch - Senior Project Engineer

Kim Huynh - Project Engineer

Chris Scott - Field Manager

Doug Hamilton - Field Monitor

Texas Research International/Environmental, Inc. (Geotechnical and Geosynthetics Laboratory Testing)

John Allen – Director of Geosynthetics Interaction Laboratory

Precision Geosynthetics Laboratories (Geotechnical and Geosynthetics Laboratory Testing)

Cora Queja - Vice President

Hirata & Associates, Inc. (Geotechnical Testing)

David M. Kitamura - Vice President

Tony Frey - Technician

### 3.2.2 On-Site CQA Monitoring Personnel Schedules

Construction work was monitored by Geosyntec personnel on an as-needed basis. Monitoring was coordinated with WMH, GBI, and Northwest Linings staff to ensure that construction was monitored in accordance with the CQA Manual [Geosyntec, 2010]. Geosyntec personnel were on site, generally full time, during construction according to the following schedule:

- Chris Scott                      12 January – 27 May 2010;  
    4 June – 18 June 2010; and  
    17 July – 7 August 2010
- Mike Minch                      1 July – 16 July 2010
- Doug Hamilton                29 July – 15 September 2010

When full time monitoring was not required (i.e., mobilization, site cleanup, etc.), Geosyntec personnel were not onsite but remained in communication with WMH, GBI, and Northwest Linings to verify when onsite monitoring would again be necessary.

## 4. EARTHWORK QUALITY ASSURANCE

### 4.1 Soil Excavation

Geosyntec CQA personnel monitored the excavation of soils as described in Section 2.3. The contractor excavated the soils from within Cell 1 footprint to be used to construct the Cell 1 floor and berm grades. Approximately 4,300 cubic yards (yd<sup>3</sup>) of soil were excavated from within the Cell 1 footprint.

### 4.2 Subbase Preparation and Compacted Fill Placement

Geosyntec personnel monitored the preparation of the subbase and placement of compacted fill as needed to bring the elevations to the lines and grades shown on the construction drawings [AECOM, 2009a]. The CQA activities performed during these phases of construction included:

- observing proof-rolling of the subbase;
- observing the placement and compaction procedures for compacted fills;
- in-situ moisture/density testing (ASTM D6938, and D2937) of the compacted fills;
- on-site and off-site laboratory testing of the compacted fills including oven moisture content (ASTM D2216) for moisture corrections and modified Proctor compaction tests (ASTM D1557) for density evaluation; and
- monitoring the final subbase compacted fill preparation.

Approximately 48,000 yd<sup>3</sup> of compacted fill (onsite soils), compacted fill (offsite soils), and final subbase compacted fill were placed in conformance with Section 02330 of the project specifications. The compacted fill (onsite soils), compacted fill (offsite soils),



and final subbase compacted fill were placed in a manner such that the maximum lift thickness was approximately 6 inches upon the completion of compactive effort. The fills were compacted to a minimum relative compaction of 95% as determined by ASTM D1557.

Areas that did not meet the required minimum dry density, based on relative compaction requirements, were reworked as necessary until field testing indicated that the areas met the specification. Daily field reports describing the construction and CQA activities were completed and are presented in Appendix E. Laboratory conformance test results are presented in Appendix F-1. The results of in-situ moisture/density tests are included in Appendix G-1.

The subbase surface upon which geosynthetics were placed was prepared by GBI in accordance with Sections 02330 and 02072 of the project specifications. GBI removed surface irregularities, rounded corners and any surface desiccation cracking as required. After certification of the grades by the surveyor, Northwest Linings and Geosyntec inspected the surface of each completed area. Record of the approval of the subgrade surface is included in the subgrade acceptance forms in Appendix I-1.

### 4.3 Granular Drainage Layer

Off-site soils were imported from the Kauai Aggregate Quarry to construct the 12-inch thick granular drainage layer for Cell 1. Approximately 9,100 yd<sup>3</sup> of granular drainage layer material were placed.

Four conformance samples of the 1.5-in granular drainage layer material were collected by Geosyntec and tested by Precision for grain-size distribution (ASTM D422) and hydraulic conductivity (ASTM D2434), representing a test frequency of one test per 2,275 yd<sup>3</sup>. The project specifications [AECOM, 2009b] and CQA Manual [Geosyntec, 2010a] required at least one sieve analysis and one permeability test per 3,000 yd<sup>3</sup>. Results of the tests indicate that the material conform to Section 02062 of the project specifications. Results of the granular drainage layer material laboratory testing are presented in Appendix F-2.

Geosyntec observed that the granular drainage layer material was placed in accordance with the requirements of the construction drawings and specifications. The thickness of the granular drainage layer was certified by Esaki in the record drawings presented in Appendix Q, and was visually observed to meet the project requirements.

#### 4.4 Operations Layer

Off-site soils were imported from the Kauai Aggregate Quarry to construct the 24-inch thick operations layer for Cell 1. Approximately 18,900 yd<sup>3</sup> of material were placed.

Eight conformance samples of the 3/8-in operations layer material were collected by Geosyntec and tested by Precision for grain-size distribution (ASTM D422) and hydraulic conductivity (ASTM D2434), representing a test frequency of one test per 2,363 yd<sup>3</sup>. The project specifications [AECOM, 2009b] and CQA Manual [Geosyntec, 2010a] required at least one sieve analysis and one permeability test per 3,000 yd<sup>3</sup>. Results of the tests indicate that the material conformed to Section 02062 of the project specifications and AECOM's guidance (response to RFI #20). Results of the operations layer material laboratory testing are presented in Appendix F-3.

Geosyntec observed that the operations layer material was placed in accordance with the requirements of the construction drawings and specifications. The thickness of the operations layer was certified by Esaki in the record drawings presented in Appendix Q.

## **5. GEOSYNTHETIC CLAY LINER (GCL) QUALITY ASSURANCE**

### **5.1 Introduction**

Geosyntec monitored the deployment and installation of the GCL for Cell 1. CQA activities included:

- GCL conformance testing; and
- monitoring site storage, deployment, and seaming operations.

These activities are summarized in the following sections.

### **5.2 Manufacturer's Certifications**

CETCO-manufactured Bentomat FLW scrim-reinforced GCL was used during the construction of the Cell 1 containment system. CETCO produced 239 rolls of GCL for the project. The total installed GCL area within Cell 1 was approximately 274,000 sf. A sample of this material is provided in Appendix R.

CETCO provided manufacturer quality control (MQC) certifications for all rolls of GCL and also for the bentonite clay and geotextile used to produce the GCL. This documentation was reviewed by Geosyntec, and all test results provided for the materials were found to comply with the requirements in Section 02074 of the technical specifications. The GCL MQC certificates are included in Appendix K.

### **5.3 Conformance Sampling and Testing**

GCL conformance samples for the 239 rolls were collected at the manufacturer's plant by a representative from TRI. A total of six samples were collected and tested from the 239 rolls of GCL. This represents a test frequency of approximately one test per

89,625 ft<sup>2</sup> of GCL produced which meets the minimum frequency of one sample per 100,000 ft<sup>2</sup>, as required by the CQA Manual.

Geosyntec reviewed the conformance test results and compared them to the technical specifications. All conformance test results were found to meet Section 02074 of the technical specifications. The laboratory test results are presented in Appendix H-1.

In addition to material conformance, third-party laboratory testing was performed for the interface shear strength between the GCL and the 60 mil and 80 mil textured geomembranes. To represent actual field conditions, the higher asperity side, or "glossy" side, of the Microspike geomembrane was tested against the non-scrim side (white side) of the GCL, and the lower asperity side, or "matte" side, of the Microspike geomembrane was tested against the scrim (dark side) of the GCL. As required by the specifications, one test for each of the four interfaces was performed. All interface test results (Appendix H-4) met the minimum requirements of Section 02072 of the project specifications, or were approved as exceptions by the Design Engineer (refer to Section 2.4.3).

## 5.4 Monitoring of Operations

### 5.4.1 Delivery and On-Site Storage

Delivery of the GCL was observed by Geosyntec to verify that proper handling and storage procedures were used and on-site storage procedures provided for protection from ultraviolet light exposure, precipitation, mud, dirt, dust, and other conditions that could damage the material. Geosyntec observed that protective wrapping was maintained on the GCL rolls until placement operations began. Prior to deployment, all rolls were carefully checked and marked for repair, if necessary.

### 5.4.2 Deployment

GCL rolls were visually checked for the following:

- manufacturing defects;

- evidence of damage, which may have occurred during shipping, storage, or handling; and
- damage caused during installation activities (e.g., as a consequence of placement or weather).

Geosyntec monitored the deployment of the GCL to verify that field deployment was consistent with the interface test conditions (e.g., geomembrane “glossy” side against GCL white side), and that measures were taken to avoid the entrapment of stones, dust, or other objects in the GCL that could damage the material.

#### 5.4.3 Seams and Overlaps

GCL seaming and overlapping operations were monitored by Geosyntec personnel. Seams and overlaps were formed in accordance with Section 02074 of the project specifications and with the Design Engineer’s recommendations (23 December 2009 email correspondence, Appendix B). GCL was overlapped at a minimum of 6 in along the length (i.e., sides) and 12 in along the width (i.e., ends). Supplemental granular bentonite was placed within the width overlaps, and the “super groove” factory seam was provided along the length overlaps.

#### 5.4.4 Repairs

Defects or damaged areas detected by visual observation were repaired by Northwest Linings, and monitored by Geosyntec in accordance with Section 02074 of the project specifications and with the Design Engineer’s recommendations (AECOM response to RFI #16, Heat Bonding of 16 oz/sy Geotextile, Appendix B).

## 6. GEOMEMBRANE QUALITY ASSURANCE

### 6.1 Introduction

Geosyntec monitored installation of the 60-mil double-sided textured HDPE geomembrane liner and the 80-mil double-sided textured HDPE geomembrane liner for Cell 1. CQA activities included:

- geomembrane conformance testing;
- monitoring site storage, deployment, and seaming operations;
- monitoring the nondestructive seam test procedures;
- selecting locations for destructive geomembrane seam testing;
- coordinating laboratory testing of destructive samples; and
- monitoring geomembrane repairs.

These activities are summarized in the following sections.

### 6.2 Manufacturer's Certifications

Agru America (Agru) HDPE Microspike geomembrane was used during the construction of Cell 1. Agru provided 104 rolls of 60-mil double-sided textured HDPE Microspike geomembrane and 2 rolls of 80-mil double-sided textured HDPE Microspike geomembrane for the project. The total installed geomembrane area within the Cell 1 was approximately 548,000 sf. Samples of the both 60-mil and 80-mil Microspike geomembranes are provided in Appendix R.

Agru provided MQC certifications for all 106 rolls of Microspike HDPE geomembrane and for the resin used to produce the geomembranes. This documentation was reviewed by Geosyntec and the test results provided for the materials were found to comply with the requirements in Section 02072 of the technical specifications. MQC documentation for the Agru-manufactured materials were reviewed and approved. The geomembrane MQC certificates are included in Appendix K.

### 6.3 Conformance Sampling and Testing

Geomembrane conformance samples for the Agru-manufactured rolls were collected at the manufacturer's plant by a representative from TRI. A total of ten samples were collected and tested from the 104 rolls of 60 mil HDPE geomembrane, and one sample collected and tested from the two rolls of 80 mil HDPE geomembrane. These represent test frequencies of approximately one test per 98,072 ft<sup>2</sup> of 60 mil HDPE geomembrane produced and approximately one test per 15,088 ft<sup>2</sup> of 80 mil HDPE geomembrane produced. The test frequencies meet the minimum frequency of one sample per 100,000 ft<sup>2</sup> and one sample per lot as required by the CQA Manual.

Geosyntec reviewed the conformance test results and compared them to the project specifications. The conformance test results were found to meet Section 02072 of the project specifications. The laboratory test results are presented in appendices H-2 and H-3.

In addition to material conformance, Precision tested the interface shear strengths between the operations layer and the filter geotextile, the drainage gravel and the filter and cushion geotextiles, the textured geomembranes and the nonwoven cushion geotextile, the textured geomembranes and the GCL, and the textured geomembranes and the subbase soil. To represent actual field conditions, the following interfaces were tested:

- operations layer versus the 6 oz/sy nonwoven filter geotextile;
- granular drainage layer versus the 6 oz/sy nonwoven filter geotextile;

- granular drainage layer material versus the 16 oz/sy nonwoven cushion geotextile versus both 60 mil and 80 mil Microspike geomembranes higher asperity side (“glossy” side);
- 60 mil and 80 mil Microspike geomembranes higher asperity side (“glossy” side) versus GCL non-scrim side (white side);
- 60 mil and 80 mil Microspike geomembranes lower asperity side (“matte” side) versus GCL scrim (dark side); and
- 60 mil and 80 mil Microspike geomembranes lower asperity side (“matte” side) versus the subbase soils.

All interface test results (Appendix H-4) met the minimum requirements of Section 02072 of the project specifications or were approved as exceptions by the Design Engineer (refer to Section 2.4.3).

## 6.4 Monitoring of Operations

### 6.4.1 Delivery and On-Site Storage

Delivery of geomembrane was observed by Geosyntec to verify that proper handling and storage procedures were followed and that on-site storage procedures provided protection from mud, dirt, dust, and other conditions that could damage the material. All rolls were carefully checked and, if required, marked for repair prior to deployment.

### 6.4.2 Deployment

The general installation procedure consisted of placing 60 mil double-sided textured HDPE geomembrane panels over the subbase or GCL and welding adjacent panels together. The same procedure applied to the 80 mil double-sided textured HDPE geomembrane panels adjacent to the sump pipe penetration assemblies.

Geosyntec monitored the deployment of each panel of geomembrane and marked visible defects/damage for repair. Geomembrane panels and/or rolls were visually checked for the following:



- manufacturing defects;
- evidence of damage, which may have occurred during shipping, storage, or handling; and
- damage caused during installation activities (e.g., as a consequence of placement or seaming operations).

Damaged materials were either discarded or repaired. Geosyntec identified the repair locations and monitored the repair activities. Whenever possible, the cause(s) of the damage was ascertained and addressed.

#### 6.4.3 Trial Seams

Geomembrane trial seams were prepared daily prior to seaming operations by each operator, for each piece of seaming equipment, and for each field weld combination (i.e., smooth to smooth, smooth to textured, and textured to textured<sup>5</sup>) to be used. Additional trial seams were prepared for each piece of seaming equipment and each field weld combination every five hours during seaming operations. The trial seams were constructed in conformance with the project specifications and the procedures were observed by Geosyntec.

For the trial seam test program, six test coupons, measuring 1 in. wide by 6 in. long, were cut from the trial seam samples. Each test coupon was tested by the Geosynthetics Installer, under Geosyntec's observation, using a calibrated tensiometer. Three of the test coupons were tested in peel and the other three coupons were tested in shear. If any of the trial seam test coupons failed any of the tests (passing criteria for trial seams are specified in Section 02072 of the technical specifications), the seaming equipment was adjusted, a new trial seam was fabricated, and the test procedure was repeated.

---

<sup>5</sup> The Agro manufactures double-sided textured Microspike geomembrane with texturing throughout the body of the geomembrane sheet except the final 6 inches along the length edge. The smooth edges are provided for ease of welding, and constitute the smooth component of the trial welds.

Once a trial seam passed the tests described above, the technician proceeded with production seaming operations. A total of 84 trial seams were fabricated using fusion welders and 33 trial seams were fabricated using extrusion welders during the geomembrane liner installation. The trial seam logs are presented in Appendix I-2.

#### 6.4.4 Seaming Operations

Geomembrane seaming operations were monitored and documented by Geosyntec personnel. Seaming documentation included the date, time, seam and panel numbers, technician, and machine number. This information was recorded on Production Seaming Logs presented in Appendix I-3. In addition, geomembrane seams were visually examined for workmanship and continuity. Any portion of a seam found to be out of compliance with Section 02072 of the Project Specifications was marked by CQA personnel and subsequently repaired by Northwest Linings.

#### 6.4.5 Repairs

Northwest Linings repaired defects or damaged areas detected by visual observation, as well as non-destructive and destructive testing locations using extrusion or fusion welders to construct a patch or a cap strip, as appropriate. Repairs were performed in accordance with Project Specifications (Section 02072) and generally followed the procedures described below.

- Welding equipment used in the repair procedures had trial seams approved prior to use.
- Geomembrane surfaces were clean and dry at the time of the repair.
- Geomembrane surfaces were abraded no more than 15 minutes prior to the repair.
- Patches or caps extended at least 6 in. beyond the edge of the defect and the corners were rounded.
- Repairs were non-destructively tested.

Geosyntec personnel monitored the geomembrane repair work and documentation of the repairs is provided in the daily field reports (Appendix E). Repair locations are documented in Appendix I-4.

### 6.5 Non-Destructive Seam Testing

The geomembrane seams were non-destructively tested by Northwest Linings for continuity using air pressure test, vacuum test procedures, or "spark" testing. Double-track fusion seams were air pressure tested. The vacuum test method was used for seams constructed with extrusion welds. Spark tests were performed for the non-flat, extrusion-welded seams between the 80 mil HDPE geomembrane and the pipe penetration flatstock. The spark test involves applying a voltage to a weld with an embedded copper wire and generating a spark if a hole in the weld bead exists. Failed air pressure test seams were repaired in accordance with Section 02072 of the technical specifications. Extrusion welded seams failing vacuum testing or spark testing were repaired and re-tested. Northwest Linings conducted the non-destructive testing under the observation of Geosyntec.

Whenever non-destructive testing indicated that geomembrane seam repairs were necessary, the repairs were made and tested in accordance with Section 02072 of the project specifications. Geosyntec observed these procedures giving special attention to critical locations such as grade breaks and drainage swales. The non-destructive seam test results are presented in Appendix I-3 and I-4.

### 6.6 Destructive Seam Testing

#### 6.6.1 Introduction

Northwest Linings performed destructive seam testing of the geomembrane seams in the field and Geosyntec observed the testing. Independent off-site laboratory testing was performed by Precision. Geosyntec field personnel chose the seam sample locations for destructive testing and the samples were removed by Northwest Linings.

### 6.6.2 Sampling Procedure

At the locations selected by Geosyntec, test samples measuring approximately 12-in. wide by 44-in. long (along the seam) were removed by Northwest Linings for testing. Each test sample was then divided into segments and distributed as follows:

- several 1-in wide strips were collected from either end of the sample for initial field testing prior to shipping the CQA portion to the third-party laboratory;
- an approximately 12-in long sample for the Geosynthetic Installer's CQC technician to test in the field;
- an approximately 12-in long sample for the County archives; and
- an approximately 18-in long sample for off-site testing at the Precision laboratory.

The field testing was performed on site with a calibrated tensiometer for peel and shear strength by Northwest Linings, and Geosyntec personnel observed the testing. The field destructive test results are summarized in Appendix I-5. Sampled areas were repaired as described in Section 6.4.5 of this report.

### 6.6.3 Laboratory Testing

Independent laboratory testing of seam samples was performed by Precision in accordance with the project specifications. Ten 1-in. wide test coupons were removed with a punch press from each of the destructive seam samples. Each of the ten specimens was then tested per ASTM D6392 with a tensile-testing machine, five in peel and five in shear.

Per the project specifications, for a seam to be accepted, four out of five specimens had to achieve the minimum strength and five out of five had to be a film-tear-bond (FTB).

#### 6.6.4 Destructive Test Results

A total of 79 samples for destructive testing were identified, removed and tested as described above to verify the integrity of the production seams. Seventy-one samples were collected from 60-mil HDPE geomembrane seams, and eight samples were collected from the 80-mil HDPE geomembrane seams. Any failing laboratory tests were bracketed with two additional passing destructive samples per the specifications. Defective areas were repaired in accordance with the specifications. Results of the laboratory destructive testing program are presented in **Appendix J**.

## 7. GEOTEXTILE QUALITY ASSURANCE

### 7.1 Introduction

Geosyntec monitored the deployment and installation of the geotextiles used as filter/separation and cushion layers in Cells 1C/1D. CQA activities included:

- review of MQC data; and
- monitoring of site storage, deployment, and seaming operations.

Per Section 02075 of the specifications, third party conformance testing of the geotextiles was not required for this project.

### 7.2 Manufacturer's Certifications

TNS Advanced Technologies (TNS) manufactured non-woven needle-punched 16 oz/sy geotextile used to construct the cushion layer above the Cell 1 primary geomembrane. TNS provided 124 rolls of TNS E160 16 oz/yd<sup>2</sup> non-woven geotextile for the project. The total installed 16 oz/yd<sup>2</sup> geotextile area within Cell 1 was approximately 274,000 sf. A sample of the 16 oz/yd<sup>2</sup> geotextile is provided in Appendix R.

TNS also manufactured the non-woven needle-punched 6 oz/sy geotextile used to construct the separator layer above the Cell 1 granular drainage layer. TNS provided 84 rolls of TNS E060 6 oz/yd<sup>2</sup> non-woven geotextile for the project. The total installed 6 oz/yd<sup>2</sup> geotextile area within Cell 1 was approximately 274,000 sf. A sample of the 6 oz/yd<sup>2</sup> geotextile is provided in Appendix R.

TNS provided MQC certifications for the geotextile rolls supplied. This documentation was reviewed by Geosyntec and the test results provided for the materials were found to comply with the requirements in Section 02075 of the project specifications. The geotextile MQC certificates are included in Appendix K.

### 7.3 Monitoring of Operations

#### 7.3.1 Delivery and On-Site Storage

Deliveries of geotextiles were observed by Geosyntec to verify that proper handling and storage procedures were used and that on-site storage procedures provided for protection from ultraviolet light exposure, mud, dirt, dust, and other conditions that could damage the material. Geosyntec observed that protective wrapping was maintained on the geotextile rolls until placement operations began.

#### 7.3.2 Deployment

Geotextile rolls were visually checked for the following:

- manufacturing defects;
- evidence of damage, which may have occurred during shipping, storage, or handling; and
- damage caused during installation activities.

Damaged materials were either repaired (where possible) or removed and discarded. Geosyntec monitored the deployment of the geotextile to verify that under windy conditions the geotextile was weighed down with sandbags, and that measures were taken to avoid the entrapment of any objects and excessive ultraviolet exposure which could damage the geotextile.

#### 7.3.3 Seaming Operations

Geotextile seaming and overlapping operations were monitored by Geosyntec personnel. Seams and overlaps were formed in accordance with Section 02075 of the project specifications.

Geosyntec personnel visually checked geotextile connections to identify inadequate areas and brought them to the attention of Northwest Linings for repair. Holes and tears were similarly identified and damaged sections were cut out and patches were placed in accordance with the project specifications.

## 8. HDPE PIPES AND ASSEMBLIES QUALITY ASSURANCE

### 8.1 Introduction

HDPE piping and prefabricated HDPE pipe fittings and assemblies used in the LCRS and leachate conveyance for Cell 1 were manufactured by JM Eagle, Industrial Pipe Fittings, LLC, Improved Piping Products, Inc., FRIATEC, Spears Manufacturing Company, and Northwest Linings & Geotextile Products, Inc. The manufacturers submitted MQC documentation for the materials delivered to the site (Appendix C). The as-built surveys of the pipes and utilities are provided in Appendix Q. The as-built drawing shows the final locations of the completed HDPE piping.

### 8.2 Piping

An HDPE pipe welder from ITC Water Management (ITC) performed welding and air pressure testing of the HDPE pipes. Welding and placement of the pipes were observed by Geosyntec to ensure that the welding techniques met industry standards, and that no damage occurred during pipe handling and placement.

Geosyntec also observed the air pressure testing of welded pipe sections prior to installation and of installed pipes to verify conformance with the project requirements and the Design Engineer's recommendations<sup>6</sup>. Pressure tests were performed in

---

<sup>6</sup> Section 01457 of the project specifications requires final pressure testing of installed HDPE pipes. At the terminal ends of the solid dual containment leachate conveyance lines, where the pipes enter the leachate pump station wet wells, connect to perforated HDPE pipes, or connect to the existing operational forcemain system, pressure testing of the final welds were not possible. The Design Engineer clarified in the response to RFI #13 that all installed HDPE pipe segments shall be pressure tested, but that the whole system with the final connections does not need to be tested. All field testing of installed HDPE pipe segments, wet well interstitial spaces, and final weld connections of the conveyance pipes were visually observed and verified to conform to the project specifications and the Design Engineer's recommendations (response to RFI #13).



accordance with the Project Specifications, and test results for installed piping are provided in Appendix L.

The perforation size and spacing of the leachate collection pipes were visually observed to conform with the Construction Drawings.

### 8.3 Prefabricated Assemblies

Prefabricated assemblies for Cell 1 include the sump pipe penetrations, the temporary leachate pump station wet well structure (removed once Cells 1A/1B were constructed), new leachate pump station Wet Well #3, and the manhole extension for LCM-14. ITC pressure tested each assembly (except the manhole extension) prior to installation to verify the integrity of the factory welds. ITC also pressure tested the interstitial space of the wet well structures as specified by the Design Engineer in response to RFI #13. Geosyntec observed the pressure tests to verify conformance with the project requirements. Results of the pressure tests are provided in Appendix L.

Final connections of the leachate conveyance pipes to the assemblies were constructed either by electro-fusion couplers or mechanical connections. Final connections of containment pipes to manhole walls were completed by extrusion welding. Where extrusion welding was performed, a copper wire was embedded in the weld bead to facilitate spark testing of the weld.

### 8.4 Existing Leachate Cleanout Riser Modifications

In addition to the HDPE pipe installation for the Cell 1 containment system, work was also performed for the existing HDPE leachate cleanout risers in the Phase II landfill. A total of 14 cleanout risers were modified with new stubouts in accordance with the Construction Drawings. Geosyntec monitored the following activities during construction:

- excavation to expose the cleanout risers;

- cutting the riser pipes at the crest of the existing subgrade slope;
- connecting new HDPE stubouts with blind flanges to the riser pipes using an electro-fusion coupler; and
- backfilling around the cleanout riser to restore existing grade.

Geosyntec documented the construction activities at each cleanout riser location with photographs; typical photos documenting the construction are provided in Appendix A.

## 9. LCRS START-UP TEST AND SYSTEMS DEMONSTRATIONS

GBI performed a start-up test of the LCRS components including the power supply, pump controller, submersible pump, and discharge piping. To complete these tests, GBI partially filled the temporary wet well with non-potable water and then activated the LCRS pump. Water was passed through the system and upon conclusion of the testing, all components were found to function in accordance with the design intent. Findings of the start-up test are provided in Appendix N. Following the construction of Cells 1A/1B and the new leachate pump station Wet Well #3, the temporary wet well was removed.

GBI also performed the systems demonstration for Wet Well #3 on 22 September 2010. Geosyntec was not onsite at the time of the demonstration and did not observe the testing. WMH visually observed the demonstration of the leachate transfer system to verify that the demonstration was completed in accordance with the revised procedures outlined by the Design Engineer in an email dated 31 August 2010 (Appendix B). WMH confirmed that the pump floats functioned properly and that liquid transferred from Wet Well #3 to the LCM-14. Findings of the demonstration are provided in Appendix N.

## 10. GAS MONITORING PROBES

The existing gas monitoring probe GP-II-5, located at the Phase II western boundary, was abandoned during the Cells 1C/1D construction. Geosyntec personnel were not present during the abandonment, and we understand from GBI that the gas probe, casing, and concrete monument were removed and bentonite chips were tremied into the hole using the probe in accordance with the Construction Drawings (Note 5, Drawing 4).

Two new gas monitoring probes, GP-II-6 and GP-II-7 were installed by Valley Well Drilling, Inc. of Kapolei, HI. GP-II-6 is located south of the Cell 1A/Phase II tie-in corner and GP-II-7 is located southwest of the Cell 1C sump. Geosyntec personnel were not present during the construction of the new gas monitoring probes, and we understand that John Surigao of Valley Well Drilling supervised the construction of the gas monitoring probes, logged the soil from the drill cuttings, and prepared well completion logs. Valley Well Drilling's documentation of the installation of GP-II-6 and GP-II-7 is included in Appendix M. The surveyed locations of the two new probes are provided in Appendix Q.

## 11. MATERIAL DROP OFF FACILITY MODIFICATIONS

Geosyntec monitored the construction of Material Drop Off Facility (MDOF) modifications as shown on Drawing 25 of the Construction Drawings. The original pavement around the MDOF containers was removed, and new base course, asphalt paving and curbs were constructed.

Approximately 50 cy of base course material was obtained from the Kauai Aggregates Quarry. One sample of the base course material was collected and delivered to Hirata for grain-size distribution (ASTM D422) and modified Proctor compaction test (ASTM D1557) for density evaluation. The base course was compacted to a minimum of 95 percent of the maximum dry density (per ASTM D1557) in accordance with the project requirements. Laboratory test results and in-situ field compaction tests are provided in Appendices F-5 and G-3, respectively.

The asphalt paving used an HMA Mix IV asphalt in accordance with the project requirements. The asphalt mix design is provided in Appendix C.

## 12. SUMMARY AND CONCLUSIONS

The construction of Cell 1 at the Kekaha Sanitary Landfill in Kaua'i, Hawai'i, occurred during the periods of 28 December 2009 through 15 September 2010. Geosyntec provided qualified CQA personnel on site to monitor the construction activities as required by the CQA Manual. All significant construction of the Cell 1 containment system was completed by the Contractor and accepted by the Owner prior to issuance of this report. It is Geosyntec's understanding that work on other ancillary site components, including the infiltration ditch, are anticipated to continue through October 2010. This ancillary work is not part of this certification.

During construction, Geosyntec verified that the Cell 1 containment system was constructed in accordance with the contract documents, including the approved construction drawings and project specifications as revised by the Design Engineer during construction, and the CQA Manual. Geosyntec also verified that conditions or materials identified as non-conforming to the project specifications were rejected, resolved, or repaired and retested as described in this report.

Geosyntec observed the LCRS start-up test for the temporary wet well, which showed the LCRS components functioned in accordance with the design intent. WMH observed the system demonstration for Wet Well #3 and the leachate transfer system, and verified conformance with the design intent.

Valley Well Drilling supervised and performed the installation of the two new landfill gas monitoring probes. Geosyntec was not present to observe the probe installation.

### 13. CERTIFICATION

Based on the observations of Geosyntec Consultants, Inc. during construction, as well as on the data presented in the appendices of this report, the Cell 1 containment system at the Kekaha Sanitary Landfill in Kaua'i, Hawai'i, were constructed in accordance with the project specifications and construction drawings with revisions as stated in this report. Components of the construction monitored by Geosyntec Consultants, Inc., as outlined in this report, were completed in accordance with the project requirements.



*Hari D. Sharma*

Hari D. Sharma, Ph.D., P.E.

10694

CQA Officer

#### 14. REFERENCES

AECOM [2009a] *“Construction Drawings, Phase II Lateral Expansion, Cell 1 Base Liner Construction, Kekaha Sanitary Landfill, Kauai, Hawaii.”* April, Revised January 2010, February 2010, March 2010, April 2010, and June 2010.

AECOM [2009b] *“Project Specifications and Drawings for Phase II Lateral Expansion, Cell 1 Base Liner Construction, Kekaha Sanitary Landfill, County of Kauai, HI.”* July, Revised February 2010.

Geosyntec Consultants, Inc. [2010a] *“Construction Quality Assurance (CQA) Manual, Phase II Lateral Expansion, Cell 1 Base Liner Construction, Kekaha Sanitary Landfill, Kekaha, Hawaii.”* 9 February, Revision 1 12 April 2010.

Geosyntec Consultants, Inc. [2010b] *“Report of Construction Quality Assurance, New Leachate Evaporation Pond, Phase II Lateral Expansion, Cell 1 Base Liner Construction, Kekaha Sanitary Landfill, Kaua’i, Hawai’i.”* 25 May 2010.

Geosyntec Consultants, Inc. [2010c] *“Report of Construction Quality Assurance, Cells 1C and 1D, Phase II Lateral Expansion, Cell 1 Base Liner Construction, Kekaha Sanitary Landfill, Kaua’i, Hawai’i.”* 8 June 2010.

Geosyntec Consultants, Inc. [2010d] *“Report of Findings, Former Leachate Evaporation Pond Sub-Surface Soils, Phase II Lateral Expansion, Cell 1 Base Liner Construction, Kekaha Sanitary Landfill, Kekaha, Hawai’i.”* 24 September 2010.



## 15. LIMITATIONS

This report was prepared in general accordance with the accepted standard of practice, which existed in Hawai'i at the time this report was submitted to the County of Kaua'i. Geosyntec Consultants, Inc. has prepared this report for the exclusive use by the County of Kaua'i. No other representations, expressed or implied, and no warranty or guarantee is included or intended. No other party is authorized to use this report.

## **Appendix A**

### **Photographic Documentation**

For clarity of presentation, photos in this appendix are grouped by subject matter and are not necessarily presented in chronological order.

Photos 1-20 depict the mass grading of Cells 1A through 1D.

Photos 21-66 depict the leachate forcemain and LCRS pipe penetration construction.

Photos 67-70 depict the Phase II liner termination at the liner tie-in.

Photos 71-77 depict the preparation of the subgrade and excavation of anchor trenches.

Photos 78-81 depict the unloading and storage of the geosynthetic materials.

Photos 82-100 depict the installation of the subbase geomembrane.

Photos 101-106 depict the installation of the GCL.

Photos 107-113 depict the installation of the primary geomembrane.

Photos 114-118 depict the installation of the cushion geotextile.

Photos 119-120 depict backfill of the anchor trenches.

Photos 121-124 depict the LCRS collection pipes and granular drainage layer.

Photos 125-130 depict the installation of the separator geotextile and operations layer.

Photos 131-141 depict ancillary construction activities associated with Cell 1.

Photos 142-152 depict construction of the MDOF improvements



Photo 1. Former leachate evaporation pond and Cell 1 area prior to construction (looking northwest)



Photo 2. Cells 1A/1B existing subgrade, after demolition of the former leachate pond (looking southwest)



Photo 3. Cells 1C/1D prior to construction (looking northwest)



Photo 4. Proof-rolling the existing Cell 1 subbase using a 13-ton Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor (looking southeast)



Photo 5. A fully loaded Caterpillar (Cat.) 740 haul truck drives over the existing subbase to verify that the subbase is firm and non-yielding (looking north)



Photo 6. Compacted Fill (onsite soils) material is hauled from the existing sand stockpile and the new infiltration basin (NIB) to construct the Cell 1 subbase grades (looking northwest)



Photo 7. Onsite trimmings from the new leachate evaporation pond (NLEP) construction are also used to construct the Cell 1 subbase grades (looking west)

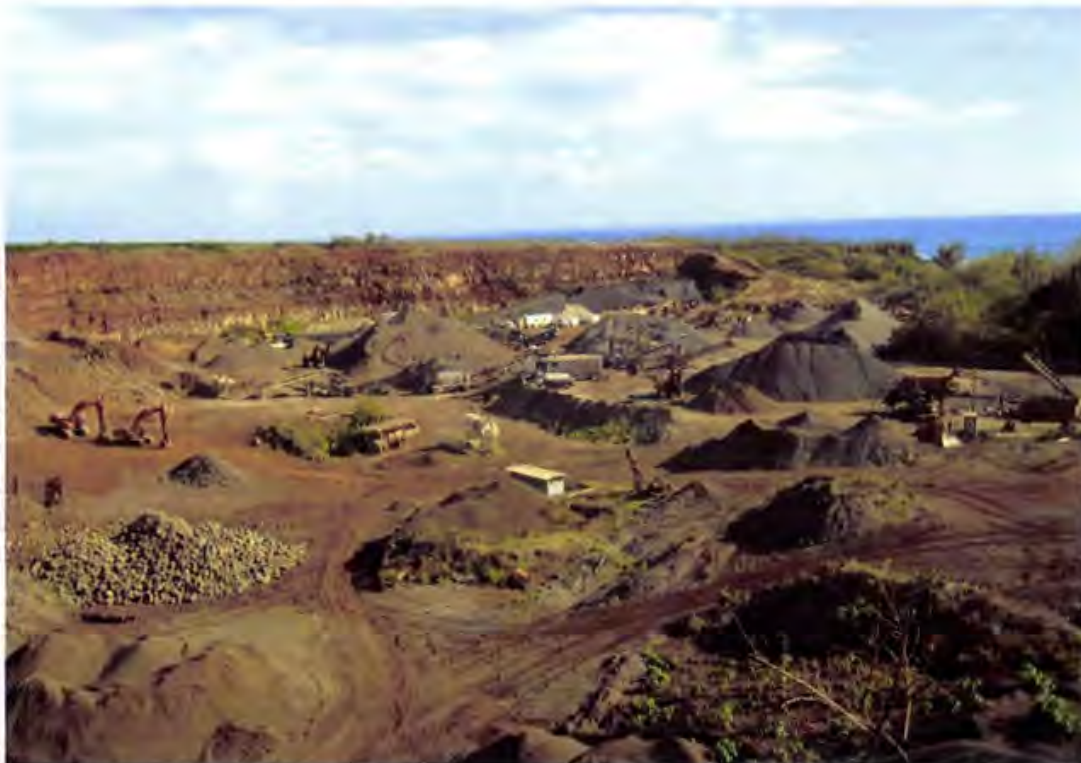


Photo 8. Compacted fill (offsite soils) material is imported from the local Kauai Aggregates quarry to construct the Cells 1A/1B subbase grades (looking west)



Photo 9. The compacted fill (onsite soils) materials are hauled to Cell 1 using Cat. articulated haul trucks, spread with a Cat. D6 LGP dozer, and then moisture conditioned with the water truck (looking west)



Photo 10. The compacted fill (offsite soils) materials are imported to Cells 1A/1B from the Kauai Aggregates quarry using end-dump trucks, spread with a Cat. D5 dozer, and moisture conditioned with the water truck (looking west)



Photo 11. An Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor and Bomag smooth drum vibratory roller applies compaction effort to the lifts (looking northwest)



Photo 12. Verifying compaction effort using a Troxler portable nuclear moisture density gauge (looking north)





Photo 13. Collecting thin-wall Shelby tube samples for moisture-density determination by the drive cylinder method (ASTM D2937)



Photo 14. Fine grading the Cell 1 floor subbase with a Cat. 140H motor grader (looking north)



Photo 15. Cells 1A/1B perimeter berm material being spread with a Cat. D5 dozer and compacted with smooth drum rollers (looking southwest)



Photo 16. Cat. articulated haul trucks place the fill material along the Cells 1C/1D perimeter berm (looking north)



Photo 17. A Cat D5 dozer with GPS control spreads the fill material to uniform 8- to 10-inch thick loose lifts across the berm width, a water truck moisture conditions the lifts, and the Ingersoll-Rand SD122DX vibratory compactor provides compactive effort (looking north)



Photo 18. A HAMM 2420 rubber tire smooth drum vibratory compactor assists to compact the perimeter berm (looking west)



Photo 19. A Cat. 140H motor grader and Cat. D5 dozer (both with GPS control) fine-grade Cells 1A/1B (looking west)



Photo 20. The Cat. 140H motor grader and Cat. D5 dozer (both with GPS control) fine grade Cells 1C/1D (looking west)



Photo 21. Existing forcemain cleanout located at the northeast end of Cell 1D (as shown on Drawing 2 of the Construction Drawings)



Photo 22. End section of existing cleanout is cut and capped using an HDPE cap with electro-fusion coupler (in accordance with RFI #7)



Photo 23. The existing cleanout is backfilled with hand-compacted sand fill (onsite soils) (looking north)



Photo 24. The existing forcemain pipe (from former leachate pond to existing valve box #2) cut at southwest end before Cell 1B (shown above) and at east end before valve box #2



Photo 25. Residual fluid from the existing forcemain pipe is pumped out using a vacuum truck (looking west at valve box #2)



Photo 26. Ends of the existing forcemain pipe are plugged with cement grout



Photo 27. New 6-inch  $\phi$  SDR 11 and 8-inch  $\phi$  SDR 9 HDPE pipe sections



Photo 28. New dual containment, 4-inch diameter SDR 11 inside 8-inch diameter SDR 17 (4"  $\phi$  x 8"  $\phi$ ), HDPE pipe sections





Photo 29. New dual containment, 8-inch diameter SDR 11 inside 12-inch diameter SDR 17 (8"  $\square$  x 12"  $\phi$ ), HDPE pipe sections



Photo 30. ITC Water Management production welds the various HDPE pipe sections



Photo 31. Fusion (butt) welding dual containment HDPE pipe sections



Photo 32. Melt bead along fusion weld of HDPE pipe sections



Photo 33. Air pressure tests were performed for all production welded HDPE pipe sections prior to installation



Photo 34. Air pressure tests were also performed for the prefabricated, factory-welded HDPE temporary wet well and Wet Well #3 assemblies prior to installation



Photo 35. Typical factory-welded HDPE pipe penetration assembly used for each of the Cells 1A through 1D sumps

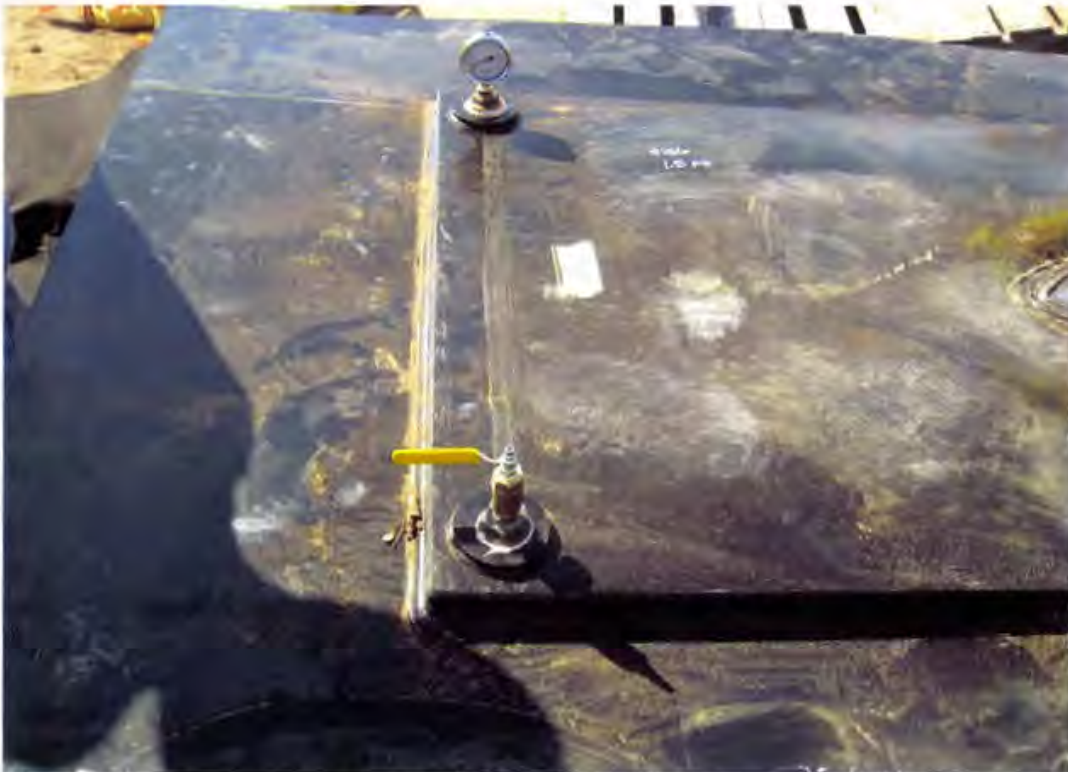


Photo 36. The 1-inch void between flatstock plates of the pipe penetration assemblies are air pressure tested to verify factory welds prior to installation



Photo 37. Air pressure of 1.5 psig is applied to the penetration assemblies and sustained for 1 hr minimum



Photo 38. Typical trenches cut at each of Cells 1A-1D sumps, through the sideslopes, for the leachate conveyance pipes



Photo 39. Typical installed pipe penetration assembly underlain by nonwoven geotextile and aligned with pipe trenches



Photo 40. During Cell 1A/1B construction, the temporary wet well (foreground well) was removed and the new Wet Well #3 (background well) was installed (looking south)



Photo 41. Dual containment (8"φ x 12"φ) HDPE conveyance pipe from the southern stubout (for future expansion) to Wet Well #3 (looking north)



Photo 42. Dual containment (8"φ x 12"φ) HDPE pipe from Wet Well #3 to connect to Cell 1B sump



Photo 43. Installing the dual containment (8"φ x 12"φ) HDPE conveyance pipe from Cell 1C sump penetration to new Wet Well #3 (looking east)



Photo 44. Installing the dual containment (8"φ x 12"φ) HDPE pipe from Cell 1D sump penetration to existing manhole LCM-14 (looking northwest)





Photo 45. Existing manhole LCM-14 is exposed for the pipe connections (looking east)



Photo 46. Cell ID dual containment (8"φ x 12"φ) connection to LCM-14. Outer pipe is extrusion welded to the manhole



Photo 47. The dual containment (8"φ x 12"φ) pipes are connected to the sump pipe penetration using electro-fusion couplers



Photo 48. All connected penetrating pipes are pressure tested prior to final connection to Wet Well #3 or LCM-14



Photo 49. The dual containment pipe trenches are backfilled with compacted fill (onsite soils) and marked with tape for future identification (looking south)



Photo 50. A controlled low-strength material (CLSM) slurry is used to backfill the void space below the pipe penetration assemblies (looking north at Cell 1D penetration)



Photo 51. The CLSM slurry is vibrated to remove voids and produce a more homogenous backfill



Photo 52. Typical completed CLSM backfill at the pipe penetration





Photo 53. Bentonite grout is used to fill the 1-inch void within the penetration assemblies



Photo 54. A layer of GCL is installed around the pipe penetration assemblies, below the subbase HDPE geomembrane for transition to pipe penetration flatstock (looking north)



Photo 55. Trench along Cells 1C/1D perimeter berm for the dual containment (4"φ x 8"φ) HDPE forcemain pipe from the new Wet Well #3 to LCM-14 (looking east along Cell 1D north berm)



Photo 56. Installed dual containment (4"φ x 8"φ) forcemain pipe (looking south)



Photo 57. The dual containment (4"φ x 8"φ) forcemain pipe penetrates LCM-14 above the Cell 1D dual containment (8"φ x 12"φ) pipe



Photo 58. Dual containment (4"φ x 8"φ) forcemain pipe connects to LCM-14. Outer pipe is extrusion welded to the manhole



Photo 59. A prefabricated manhole section is extrusion welded to LCM-14 to extend the manhole above design grades



Photo 60. Six inches of compacted fill (onsite soils) is backfilled over the forcemain pipe and compacted using a walk-behind vibratory compactor (looking west)





Photo 61. Two electrical conduits are installed above the buried forcemain pipe, and the trench is backfilled with compacted fill (onsite soils) and marked for future identification (looking west)



Photo 62. Modified piping near valve box #2 to direct leachate flow to NLEP and new forcemain valve box

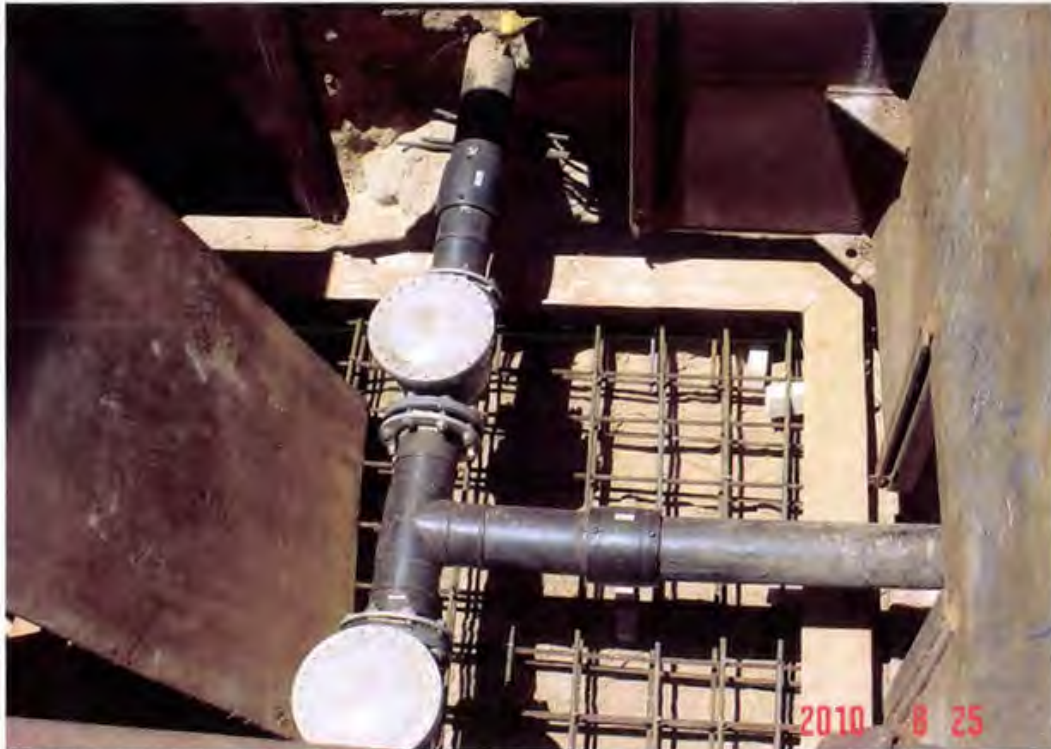


Photo 63. Floor of the new concrete valve box form work prior to concrete pour. Check valves on the forcemain direct flow through the tee and out to the NLEP



Photo 64. Installed concrete valve box completed with interior coating for waterproofing



Photo 65. End of discharge pipe in NLEP underlain by HDPE rubsheet weighed down with concrete blocks (looking west)



Photo 66. Wet Well #3 system demonstration was performed once the leachate conveyance system was completed



Photo 67. Exposing the existing Phase II containment system tie-in (looking north)



Photo 68. Existing Phase II containment system consists of 60 mil HDPE geomembrane overlying GCL (bentonite layer with geomembrane carrier, carrier side down)



Photo 69. West edge of existing Phase II containment system exposed for tie-in (looking south)



Photo 70. Northwest corner of existing Phase II containment system exposed for tie-in (looking north)



Photo 71. Cells 1A/1B prepared subgrade (looking south)



Photo 72. Cells 1C/1D prepared subbase (looking south)





Photo 73. Prepared subbase on side slopes (looking west along Cell 1D north sideslope)



Photo 74. Field adjusted subbase grades at far southeast corner of Cell 1A (looking west)



Photo 75. Field fitting subbase grades at far northeast corner of Cell 1D (looking northwest)



Photo 76. A Hitachi 450LC excavator constructs the 2'x2' square anchor trench along Cells 1A/1B perimeter berm (looking north)





Photo 77. V anchor trench along Cells 1C/1D perimeter berm (looking south)



Photo 78. GCL rolls stockpiled on pallets near the administrative office area



Photo 79. Unloading and stockpiling 16 oz/sy nonwoven geotextile rolls near the administrative office area



Photo 80. Unloading Agru 60 mil double-sided textured HDPE Microspike geomembrane rolls



Photo 81. Complete geosynthetic inventory stockpiled adjacent to the administrative office area



Photo 82. Deploying subbase 60 mil double-sided textured (DST) HDPE geomembrane using a Skytrac hi-lift fork lift over approved subbase (looking northwest)





Photo 83. Trial welds are prepared at the start of the day and at midday for each welding apparatus and material combination used that day (fusion welding textured-to-textured 60 mil HDPE geomembrane shown above)



Photo 84. Preparing an extrusion trial weld of textured-to-textured 60 mil HDPE geomembrane



Photo 85. Preparing an extrusion trial weld of textured 80 mil HDPE geomembrane to 1/2-inch thick HDPE flatstock



Photo 86. DemTech's Pro-Tester T-0100 tensiometer is used to field test the peel and shear of the trial welds



Photo 87. Field testing a trial seam for peel strength (textured geomembrane-to-flatstock extrusion trial weld shown above)



Photo 88. Production seaming subbase 60 mil HDPE geomembrane using a double-fusion wedge welder



Photo 89. A grinder is used to abrade the surface of the geomembrane prior to extrusion welding.



Photo 90. Extrusion welding the subbase 60 mil HDPE geomembrane to the existing Phase II geomembrane (looking southwest)



Photo 91. Subbase 80 mil HDPE geomembrane panels are extrusion welded, with an embedded copper wire (for spark testing), to the ½-inch thick HDPE flatstock of the pipe penetration assemblies



Photo 92. Non-destructive air pressure tests are performed for all double-fusion welded production seams (30 psi minimum held for 2 minutes)





Photo 93. Non-destructive vacuum box testing extrusion welded seams



Photo 94. Destructive seam sample location marked within production seam. Each seam sample consists of three parts: one part for the Installer, one part for CQA conformance testing, and one part for the Owner's archive



Photo 95. Destructive seam sample collected on the subbase tie-in to Phase II containment system



Photo 96. A repair patch is constructed over each destructive seam sample location once the sample is removed



Photo 97. Extrusion welding a repair patch on the existing Phase II geomembrane



Photo 98. Non-destructive vacuum box testing the extrusion seam of a repair patch





Photo 99. Completed subbase HDPE geomembrane (looking northwest)



Photo 100. Completed subbase HDPE geomembrane at Cell 1D northeast corner (looking northwest)



Photo 101. Deploying GCL above the approved subbase 60 mil HDPE geomembrane on the floor (looking east)



Photo 102. Deploying GCL above the approved subbase 60 mil HDPE geomembrane on the sideslopes (looking south)

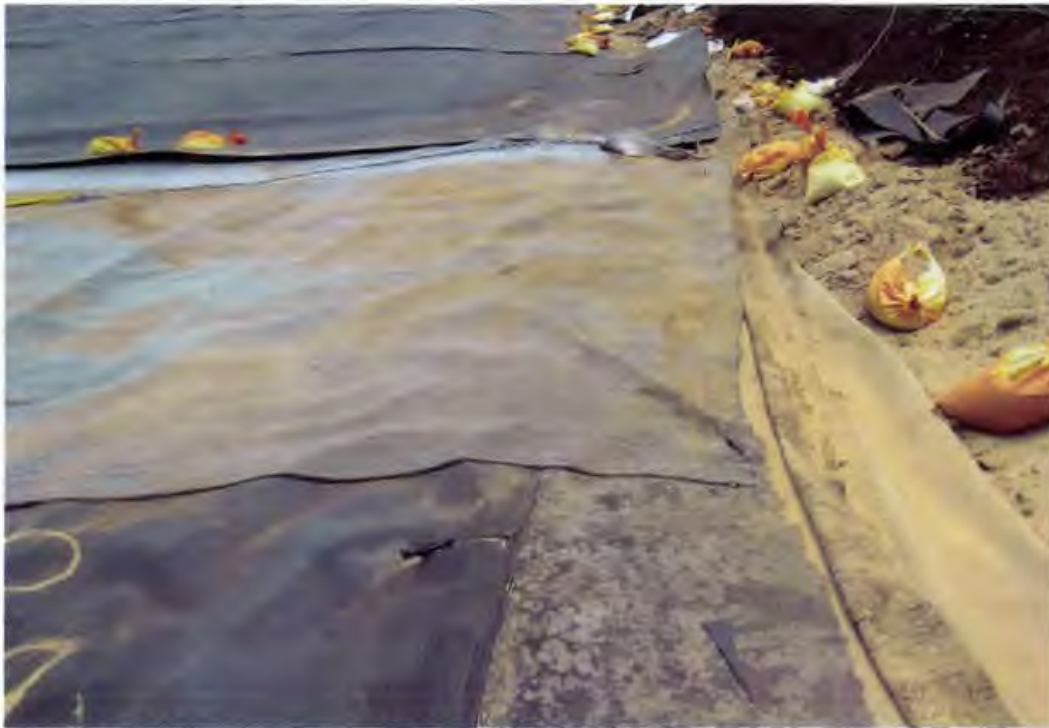


Photo 103. New GCL panels overlap a minimum 1 ft beyond the subbase tie-in to the existing Phase II containment system (looking north)



Photo 104. GCL panels are overlapped 12 inches minimum along the width and 6 inches minimum along the length. Granular bentonite is placed along the width (butt) seam, and a "super-groove" factory seam is along the length seam



Photo 105. Granular bentonite is placed along the edge of GCL around the pipe penetration assemblies (looking north at Cell 1D penetration)



Photo 106. GCL panels at Cell 1D northeast corner (looking northwest)



Photo 107. Primary 60 mil HDPE geomembrane is deployed over GCL panels



Photo 108. Production seaming primary 60 mil HDPE geomembrane using a double-track fusion wedge welder







Photo 109. Extrusion welding the primary 60 mil HDPE geomembrane to the existing Phase II geomembrane; the seam is abraded prior to applying the extrusion bead (looking south)



Photo 110. Primary 80 mil HDPE geomembrane panels are extrusion welded (with an embedded copper wire) to the ½-inch thick HDPE flatstock of the pipe penetration assemblies



Photo 111. The embedded copper wire provides a mean to spark test the weld to verify integrity



Photo 112. Non-destructive air pressure testing the fusion welded production seams of the primary geomembrane



Photo 113. Non-destructive vacuum box testing the extrusion seam of a repair patch for a destructive seam sample locations



Photo 114. Installing 16 oz/sy nonwoven cushion geotextile above the approved primary 60 mil HDPE geomembrane (looking west)



Photo 115. Sewing 16 oz/sy nonwoven cushion geotextile panels using single-prayer seams



Photo 116. 16 oz/sy nonwoven cushion geotextile panels seams sewn using single-prayer seams



Photo 117. 16 oz/sy nonwoven cushion geotextile heat bonded along existing Phase II tie-in (looking south)



Photo 118. 16 oz/sy nonwoven cushion geotextile around sump pipe penetration



Photo 119. The Cell 1 perimeter anchor trench is backfilled using with a sand fill (onsite soils) and compacted (looking south)



Photo 120. Verifying anchor trench backfill compaction effort using a nuclear moisture density gauge (looking north)



Photo 121. 8"φ perforated HDPE leachate collection and removal system (LCRS) pipes are installed with end caps above the 16 oz/sy nonwoven cushion geotextile



Photo 122. Perforations along the the LCRS pipe



Photo 123. Sump pipe penetrations are connected to the wye assemblies and cleanout risers using an electro-fusion coupler. Wye assemblies are fusion-welded to the perforated LCRS pipes



Photo 124. 1.5-inch minus granular drainage layer material (from Kauai Aggregate Quarry) is placed the floor, and is spread and graded using an LGP D6 dozer (looking northeast)





Photo 125. Installing 6 oz/sy nonwoven separator geotextile above the completed granular drainage layer (looking west)



Photo 126. 6 oz/sy nonwoven separator geotextile panels seams sewn using single-prayer seams



Photo 127. 3/8-inch minus operations layer material (from Kauai Aggregate Quarry) is placed directly onto the floor above the completed 6 oz/sy nonwoven separator geotextile (looking southeast)



Photo 128. An LGP D5 dozer spreads and grades the placed operations layer material to 2-ft thick (looking east)



Photo 129. Completed operations layer material (looking south)



Photo 130. Completed operations layer material (looking east along Cell 1D north berm)



Photo 131. General fill (onsite soils) is placed along the inner crest of the Cell 1 perimeter berm (looking southwest)



Photo 132. Separator geotextile for the perimeter access road is placed along the outer portion of the berm before placement of the crushed aggregate base course for the perimeter maintenance road (looking north)



Photo 133. Compacting 9-inch-thick crushed aggregate for perimeter access road using a HAMM smooth drum vibratory compactor (looking south)



Photo 134. The Cat. 140H motor grader fine grades the infiltration ditch (looking east)



Photo 135. Concrete and rip rap being installed near south end of the infiltration ditch (looking west)



Photo 136. Two new gas monitoring probes were installed (GP-II-6 and GP-II-7)



Photo 137. Completed gas monitoring probe with concrete pad and protection posts



Photo 138. Carefully exposing 14 existing cleanout risers along southern perimeter of Phase II landfill for modifications (typical)



Photo 139. Exposed existing Phase II cleanout riser (typical)



Photo 140. Existing cleanout modified with new HDPE end section connected using an electro-fusion coupler (typical)





Photo 141. Completed and backfilled modified cleanout riser (typical)



Photo 142. Sawcutting and demolition of existing concrete sidewalk and pavement at the Material Drop Off Facility (MDOF) (looking south)



Photo 143. Existing perimeter curb and gutter transition is over-excavated 18 inches, and existing subgrade is hand compacted (looking south)



Photo 144. The excavation is backfilled with compacted new aggregate base course



Photo 145. Field tests performed using a nuclear moisture density gauge verifies the compaction effort of 18" aggregate base course



Photo 146. Form work and reinforcing steel bars are constructed in preparation for new concrete



Photo 147. New concrete curb



Photo 148. Compacting new 18-inch aggregate base course using a HAMM 2420 smooth drum vibratory compactor for new pavement around MDOF and entrances/exits to administration area (looking south at MDOF)



Photo 149. HMA Mix IV AC pavement placed with a hot asphalt spreader and hand spread (looking north)



Photo 150. A smooth drum roller rolls the surface of the placed AC pavement (looking southeast)



Photo 151. New AC pavement and curb and gutter at MDOF



Photo 152. New AV pavement at west entrance/exit to administration building (looking southwest)

**Appendix B**  
**Project Correspondence**

## Mike Minch

---

**From:** Bergschultz, Ken [KEN.BERGSCHULTZ@aecom.com]  
**Sent:** Sunday, March 14, 2010 5:39 PM  
**To:** Mike Minch; JFrey@wm.com; Impens, Jeffrey  
**Subject:** Fw: GCL Seams

Here you go Mike

Kenny Bergschultz

---

**From:** Bergschultz, Ken  
**To:** Keith Suga <keiths@goodfellowbros.com>; Frey, Jesse <JFrey@wm.com>  
**Cc:** Christine Erorita <christinee@goodfellowbros.com>; Kirk Lilleskare <klilleskare@northwestlinings.com>; Jeff Griffin <jeffg@goodfellowbros.com>  
**Sent:** Wed Mar 10 14:36:58 2010  
**Subject:** FW: GCL Seams

Everyone,

As referenced in the response on GCL seams to Keith

Any questions, please let me know.

**Kenneth J. Bergschultz, PE**  
Office Manager, Midwest Region  
Environment  
D 920.451.2452 C 920.918.3299  
[ken.bergschultz@aecom.com](mailto:ken.bergschultz@aecom.com)

**AECOM**  
4135 Technology Parkway  
Sheboygan, WI 53083  
T 920.458.8711 F 920.458.0550  
[www.aecom.com](http://www.aecom.com)

---

**From:** Bergschultz, Ken  
**Sent:** Wednesday, December 23, 2009 4:58 PM  
**To:** Troy Tanigawa; Frey, Jesse  
**Cc:** Impens, Jeffrey  
**Subject:** GCL Seams

Troy and Jesse,

Something to keep an eye out on with the GCL for the project is the seams of the GCL. The GCL as specified is comprised of two nonwoven geotextiles. The resulting seam from the GCL overlap should be enhanced through typically bentonite powder or in some cases a "super-groove" seam design for some manufacturers. The nonwoven geotextile deters bentonite migration so in theory when this type of GCL is overlapped and hydrated, the seam could be a means for migration.

If you have any questions, please let Jeff Impens know at (808) 356-5396.

Have a good holiday.



Kim Huynh

---

From: Chris Scott  
Sent: Tuesday, April 13, 2010 9:24 PM  
To: Kim Huynh  
Subject: Fw: Pipe penetration grout

Fyi

----- Original Message -----

From: Bergschultz, Ken <KEN.BERGSCHULTZ@aecom.com>  
To: Keith Suga <keiths@goodfellowbros.com>; JFrey@wm.com <JFrey@wm.com>  
Cc: Chris Scott; Impens, Jeffrey <Jeffrey.Impens@aecom.com>  
Sent: Wed Apr 14 00:11:31 2010  
Subject: RE: Pipe penetration grout

A standard bentonite grout is acceptable.

Kenneth J. Bergschultz, PE  
Office Manager, Midwest Region  
Environment  
D 920.451.2452 C 920.918.3299  
[ken.bergschultz@aecom.com](mailto:ken.bergschultz@aecom.com)

AECOM  
4135 Technology Parkway  
Sheboygan, WI 53083  
T 920.458.8711 F 920.458.0550  
[www.aecom.com](http://www.aecom.com)

-----Original Message-----

From: Keith Suga [mailto:keiths@goodfellowbros.com]  
Sent: Tuesday, April 13, 2010 10:54 PM  
To: Bergschultz, Ken; 'JFrey@wm.com'  
Cc: 'CScott@Geosyntec.com'  
Subject: Pipe penetration grout

today we were able to air test and install pipe penetrations at 1C and 1D. We would like to perform the field grout tomorrow. Is any grout mixture ok as long as it meets the design intent? Last one for today. Sorry so late.

CONFIDENTIALITY NOTICE: If you have received this communication in error, please notify us immediately. This message is intended only for the use of the person, firm, or company it is addressed, and may contain information that is privileged, confidential and exempt from disclosure under applicable law. If the reader of this message is not the intended recipient, you are hereby notified that any dissemination, distribution or copying of this information is prohibited.

LINDA LINGLE  
DIRECTOR OF HEALTH



CHYRE L. KUKINO, M.D.  
DIRECTOR OF HEALTH

STATE OF HAWAII  
DEPARTMENT OF HEALTH  
ENVIRONMENTAL MANAGEMENT DIVISION  
SOLID AND HAZARDOUS WASTE BRANCH  
919 ALA MOANA BLVD., #212  
HONOLULU, HAWAII 96814

DR. CHYRE L. KUKINO, M.D.  
DIRECTOR OF HEALTH

June 4, 2010

S0617TM

**CERTIFIED MAIL NO. 7009 2250 0004 4923 0584  
RETURN RECEIPT REQUIRED**

Mr. Jeff Kaohi, District Manager  
Waste Management of Hawaii, Inc.  
Kekaha MSW Landfill  
6900-D Kaunualii Highway  
Kekaha, HI 96752

**CERTIFIED MAIL NO. 7009 2250 0004 4923 0577  
RETURN RECEIPT REQUIRED**

Mr. Donald Fujimoto  
County Engineer  
County of Kauai  
4444 Rice Street, Suite 275  
Lihue, HI 96766

Dear Messrs. Kaohi and Fujimoto:

**SUBJECT: CQA Report for New Evaporation Pond  
Phase II Landfill Expansion  
Kekaha MSW Landfill**

On June 1, 2010, the Department of Health, Solid and Hazardous Waste Branch received the *Report of Construction Quality Assurance (CQA) New Leachate Evaporation Pond*, dated May 25, 2010 and prepared by Geosyntec Consultants, Inc., as part of the Kekaha Municipal Solid Waste (MSW) Landfill Phase II lateral expansion under solid waste management (SWM) permit number LF-0053-09.

The CQA includes certification by Geosyntec Consultants, Inc. that all construction of the leachate pond containment system has been completed in accordance with the approved *Construction Drawings Phase II Lateral Expansion Cell 1 Base Liner Construction*, dated April 2009 and prepared by AECOM. Deviations from construction drawing requirements cited by the contractor or CQA consultant that are included in the


Mr. Jeff Kaohi  
Mr. Donald Fujimoto  
June 4, 2010  
Page 2

CQA report have been approved by the design engineer. The DOH has reviewed the CQA report and has no adverse comment on the adequacy of the work performed. The DOH understands that certain ancillary components shown on the construction drawings, including aerators and electrical power and control systems for the aerators, have not yet been completed, and, other than the aerators, the evaporation pond is fully operational.

Part II, Special Conditions, Section B, Item 14 of SWM permit LF-0053-09 states that the Evaporation Pond shall not be placed in operation until the CQA officer or manager certifies completion of construction in accordance with the approved construction drawings, and the DOH approves the CQA report. With the submission of Geosyntec's certification and CQA report, the DOH approves the construction of the Evaporation Pond containment system, and grants approval to temporarily operate the Evaporation Pond without the aerators if the aerators cannot be installed in time to support scheduled start of Evaporation Pond operation. Satisfactory installation of aerators shall be documented in a CQA report.

Should there be any questions regarding this letter, please contact Thomas Miyashiro of our Solid Waste Section at (808) 586-4226.

Sincerely,

  
STEVEN Y.K. CHANG, P.E., CHIEF  
Solid and Hazardous Waste Branch

c: Mr. Jesse Frey, Waste Management of Hawaii, Inc.



STATE OF HAWAII  
DEPARTMENT OF HEALTH  
ENVIRONMENTAL MANAGEMENT DIVISION  
SOLID AND HAZARDOUS WASTE BRANCH  
119 ALAMOGADO BLVD., #212  
HONOLULU, HAWAII 96814

June 24, 2010

S0661TM

Mr. Donald Fujimoto, County Engineer  
Department of Public Works  
County of Kauai  
4444 Rice Street, Suite 275  
Lihue, Hawaii 96786

Mr. Jeffrey K. Kaohi, District Manager  
Waste Management of Hawaii  
6900-D Kaunualii Highway  
Kekaha, Hawaii 96752

Dear Messrs. Fujimoto and Kaohi:

**SUBJECT:** Kekaha MSW Landfill Phase II Lateral Expansion  
Report of Construction Quality Assurance, Cells 1C and 1D

On June 9, 2010, the Department of Health, Solid and Hazardous Waste Branch (DOH) received the subject CQA report for the construction of Cells 1C and 1D. This report, dated June 8, 2010 and prepared by Geosyntec Consultants, Inc., covers the construction of the containment systems for Cells 1C and 1D, and interim facilities to enable operation of Cells 1C and 1D while Cells 1A and 1B are being constructed. This phased construction to enable earlier waste placement was proposed by the County of Kauai and concurred by DOH due to the limited space available in the existing Phase II landfill. The scope of work accomplished is indicated by annotations in red on the construction drawings for the Phase II lateral expansion. Exactly what portions of the construction work has not been completed is not clear.

It should be noted that the "red-lined" drawings included in the CQA report do not constitute the complete set of construction drawings. Some sheets are missing, presumably because they do not contain relevant information on the construction work performed. These drawings have been signed and sealed, and dated April 30, 2010, by the Design Engineer. These drawings include at least one design change not previously discussed with the DOH, namely the addition of a temporary wet well. One of the annotations in red on Drawing No. 2 indicates that the new leachate transfer piping connection to the new evaporation pond has not been installed. In a discussion with Mr. Jesse Frey, WMH project engineer, on June 22, 2010, Mr. Frey said the new evaporation pond could not be put into operation until the CQA for the pond construction was approved by DOH. The DOH approval was issued about the same time that the subject CQA report was prepared. The connection to the new

Mr. Donald Fujimoto  
Mr. Jeffrey K. Kaohi  
June 24, 2010  
Page 2

pond has since been installed, and the system is delivering leachate from the existing Phase II cells to the new pond. It is our understanding that portions of the new leachate collection and transfer piping for Cells 1C and 1D, including the temporary wet well, are complete and operational. Section 2.1 of the subject CQA, page 2-2, also noted that leachate from the temporary wet well and LCM-14 will be routed to the new evaporation pond, that construction of this portion of the leachate conveyance system was in progress at the time of the writing of this report, and that documentation of the final connection to the new evaporation pond will be submitted in a follow-up letter upon completion of the work.

At this time, the DOH has no adverse comments on the subject CQA report. The DOH acknowledges the certification of the construction work completed for Cells 1C and 1D containment systems by the CQA Officer. The DOH also acknowledges the fact that the DOH was not apprised of design changes made subsequent to permit issuance, and has not received the updated final drawings. The DOH will reserve further comment until a complete set of final drawings and the final CQA report for the remainder of the Phase II expansion work are received.

Part II, Special Conditions, Section B, Item 14 of the solid waste management permit for the landfill expansion, permit number LF-0053-09, states that no solid waste shall be disposed into the new cell until the CQA Officer certifies completion of construction in accordance with the approved construction drawings, and the DOH approves the CQA report. With the submission of Geosyntec's certification and partial CQA report, the DOH accepts the submitted CQA report, and the permittee may commence with select waste placement in Cells 1C and 1D in accordance with your solid waste management permit, Part II, Special Conditions, Section B, Item 8. However, as mentioned in the previous paragraph, the DOH reserves further comment on the construction of the expansion cells, including Cells 1C and 1D, until a complete set of final drawings and the final CQA report for the remainder of the Phase II expansion work are received.

If you have any questions regarding this letter, please contact Mr. Thomas Miyashiro of the Office of Solid Waste Management at (808) 586-4226.

Sincerely,

  
STEVEN K. CHANG, P.E., CHIEF  
Solid and Hazardous Waste Branch

c: Mr. Jesse Frey, Waste Management of Hawaii  
Mr. Jeff Impens, AECOM  
Mr. Troy Tanigawa, County of Kauai

Kim Huynh

---

**From:** Bergschultz, Ken (KEN.BERGSCHULTZ@aecom.com)  
**Sent:** Tuesday, August 31, 2010 3:27 PM  
**To:** Frey, Jesse; Kaohi, Jeffrey; Keith Suga  
**Cc:** Chris Scott; Mike Minch; Cioffi, Frank; Kim Huynh  
**Subject:** Specification Section 01814 - Verification

Jeff and Keith,

In response to the question in today's construction meeting regarding Section 01814 Systems Demonstrations I have the following response:

1. Article 1.01.A.1 is not applicable as the design no longer has an extraction riser located in the sumps.
2. Article 1.01.A.2 refers to Wet Well #3.
3. Article 1.01.A.3 as noted is aerators for the new evaporation pond.

The question is really on how to complete the time period for demonstration in Article 3.02.A, which is 8 hours per system. The resolution is as follows:

As noted above System 1 does not exist and does not apply

For System 2 (Wet Well #3) verify the operation of the floats manually for high and low levels. Test with water the pump on and pump off floats. The pump floats should be tested for a minimum of 30 minutes and visual verification of liquid arriving at LCM-14.

For System 3 (Aerators). As discussed the actual operation of the aerators is dependent upon the amount of liquid in pond. We do not want to introduce liquid to the pond needed to operate the aerators, the performance of the aerators will need to be completed under actual operation. GBI will need to understand that there will be a potential for repair/adjustments/replacement at a later date and at no cost to the County if satisfactory operation is obtained.

If you have any questions or need further verification, please let us know.

**Kenneth J. Bergschultz, PE**  
Office Manager, Midwest Region  
Environment  
D 920.451.2452 C 920.918.3299  
[ken.bergschultz@aecom.com](mailto:ken.bergschultz@aecom.com)

**AECOM**  
4135 Technology Parkway  
Sheboygan, WI 53083  
T 920.458.8711 F 920.458.0550  
[www.aecom.com](http://www.aecom.com)

**Appendix C**  
**Contractor Submittals**



**Hirata & Associates**  
 Geotechnical  
 Engineering

Hirata & Associates, Inc.  
 99-1433 Kalia Pl  
 Aiea, HI 96701  
 tel 808.485.0287  
 faxes 486.0870

GFB-6  
**RECEIVED**

JAN 14 2010

Goodfellow Bros. Inc.  
 Kauai Office

cc: Keith  
 Scott

**FAX MEMORANDUM**

January 13, 2010  
 W.O. 09-4854

**TO:** Mr. Keith Suga  
 Goodfellow Brothers, Inc.  
 Fax: (808) 241-4605

**FROM:** David M. Kitamura *DMK*

**RE:** Laboratory Test Results - Mana Refuse Station Stockpile  
 Waimea Water Main Replacement  
 Waimea, Kauai, Hawaii

As requested, laboratory testing was performed on the import material from a stockpile near the Mana Refuse Station, at Barking Sands. Bulk soil samples were obtained by our field technician for laboratory testing, consisting of sieve analysis, as well as maximum density (modified Proctor) tests.

Visually, the material from the stockpile consisted of tan silty sand with few coral fragments (Bag #6). The sieve analysis indicated about 96.7% passing the 3/8" sieve, about 7.4% passing the #100 sieve, and less than 3% passing the #200 sieve. Our laboratory test results indicated that the material is classified as poorly graded sand (SP). This classification is based on the Unified Soil Classification System. The following is a summary of our laboratory testing results:

Sieve Analysis

Sieve Size	Percent Passing
1/2"	96.9
3/8"	96.7
#16	92.3
#100	7.4
#200	2.6

Maximum Density (modified Proctor)

Maximum density: 103 PCF  
 Optimum Moisture Content: 14.5%

Should you have any questions concerning this memo, please call on us.

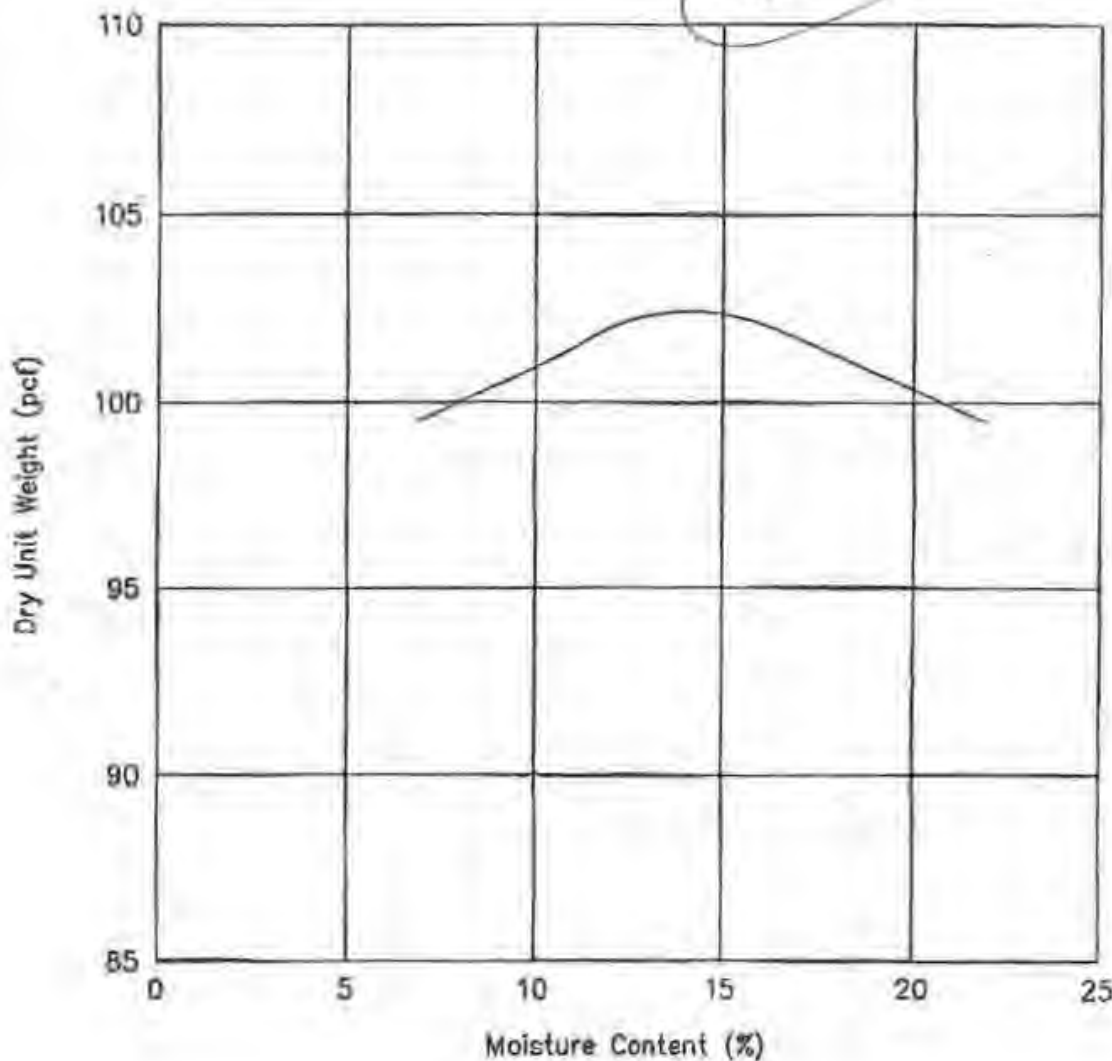
DMK:4854xrn.003

enc: Modified Proctor Curve (Bag #6)

No. of pages transmitted: 2  
 If this transmission is not complete,  
 please call us at (808) 486-0787.



GFB-6



Soil Data

Bag No.: 6  
 Location: Mana Refuse Station  
 Description: Tan silty sand

Test Results

Maximum Dry Density: 103.0  
 Optimum Moisture Content: 14.5

W.O. 09-4854.0	Waimea Main Replacement
Ernest K. Hirata & Associates, Inc.	<b>MODIFIED PROCTOR CURVE</b> Plate A1

Submitted by  
G.B. 2/3/2010

3/8" Material Sieve Analysis

100%	3/8"	✓
70%	#4	
40%	#8	
25%	16	
19%	30	
15%	50	
13%	100	
8.5%	200	X TOO HIGH

→ PERM BY MASA OK ✓

REJECTED

1 1/2" Material Sieve Analysis → PERM BY MASA OK ✓

100%	1 1/2"	✓
68%	1"	OK ( $D_{85} \geq 1"$ )
60%	3/4"	OK ( $D_{50} = 1" + 0.06"$ )
5%	3/8"	
2.5%	200	✓

ACCEPTED - RFI #6

Performed for: Goodfellow Bros  
 Project: Kekaha Landfill  
 Sample: 1-1/2" minus  
 Performed by: BT  
 wt of mold = 10.45 lbs.  
 wt of mold+soil = 13.35 lbs.

Location: Kauai  
 Job No.:  
 Constant Head Test  
 Date of test: 01.29.10

diameter = 4 inches → 10.16 cm  
 area = 81.07 sq. cm  
 length = 4.563 inches → 11.59 cm  
 volume = 939.64 cu. cm  
 mass soil = 2.90 lbs. → 1315.42 g  
 sq. cm  
 % Void 35.00 Dry Density → 1.40 g/cu. cm  
 % over 3/4" removed 0.00

Trial Number	1	2	3	4	5	6
elapsed time (sec)	5	10	15	20	30	45
Water Volume (mL)	186	294	506	703	975	1510
Δh of water (cm)	96.52	96.52	96.52	96.52	96.52	96.52
temp (deg C)	25	25	25	25	25	25
unit wt. of water	0.9970	0.9970	0.9970	0.9970	0.9970	0.9970
viscosity of water	9.045	9.045	9.045	9.045	9.045	9.045
coefficient of permeability	3.306E+00	2.613E+00	2.998E+00	3.124E+00	2.888E+00	2.982E+00

average 2.99E+00 cm/s

MASA FUJIOKA & ASSOCIATES  
 PERMEABILITY CONSTANT HEAD

Submitted by  
 1/29/2010

Performed for: Goodfellow Bros  
 Project: Kekaha Landfill  
 Sample: 3/8" minus  
 Performed by: BT  
 wt of mold = 10.45 lbs.  
 wt of mold+soil = 13.75 lbs.

Location: Kauai  
 Job No.:  
 Constant Head Test  
 Date of test: 01.29.10

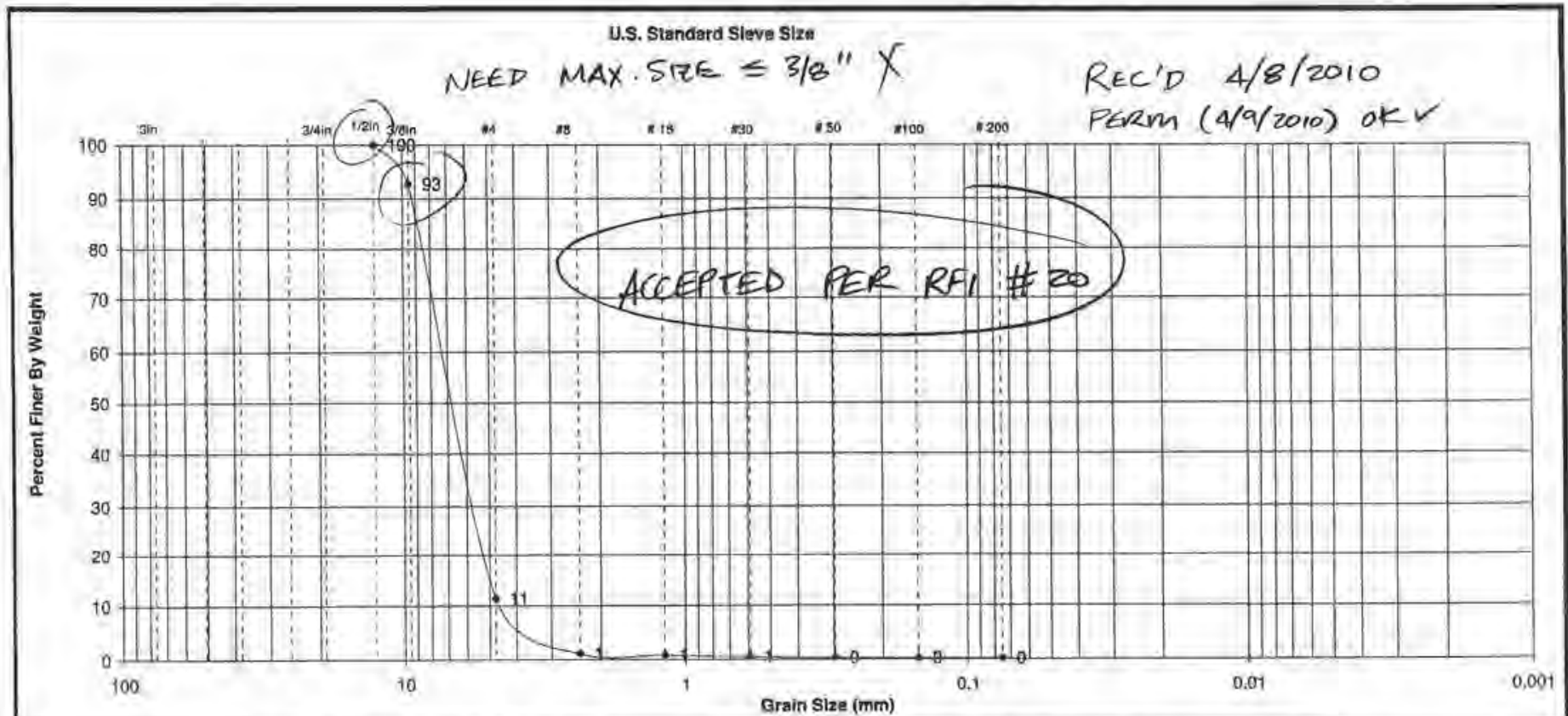
diameter = 4 inches → 10.16 cm  
 area = 81.07 sq. cm  
 length = 4.563 inches → 11.59 cm  
 volume = 939.64 cu. cm  
 mass soil = 3.30 lbs. → 1496.85 g  
 sq. cm  
 % Void 35.00 Dry Density → 1.59 g/cu. cm  
 % over 3/4" removed 0.00

Trial Number	1	2	3	4	5	6
elapsed time (sec)	5	10	15	30	45	60
Water Volume (mL)	78	767	244	484	725	955
Δh of water (cm)	96.52	96.52	96.52	96.52	96.52	96.52
temp (deg C)	25	25	25	25	25	25
unit wt. of water	0.9970	0.9970	0.9970	0.9970	0.9970	0.9970
viscosity of water	9.045	9.045	9.045	9.045	9.045	9.045
coefficient of permeability	1.386E+00	6.816E+00	1.446E+00	1.434E+00	1.432E+00	1.414E+00

average 2.32E+00 cm/s ✓

MASA FUJIOKA & ASSOCIATES  
 PERMEABILITY CONSTANT HEAD

Calculated by  
 M/F 2/5/10



Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	Test Moist. (%)	Permeability, K (cm/sec)	LL	PL	PI	Unified Soil Class.	Description
3/8" minus quarry sand										

## CONSTANT-HEAD PRESSURE PERMEABILITY TESTS ASTM D 2434

PROJECT Precision Lab # G100274

Date 4/12/2010

Job No 2001-068

By LD

Sample 3/8" minus quarry sand			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k (cm/sec)
6815.3	Tare			11:20:00		11:20:10	1800	4.1E-01
10040	Init. Wet wt			11:22:00		11:22:10	1821	4.1E-01
	Sat. Wt.	10140		11:23:00		11:23:10	1855	4.2E-01
	Trimmed Wt.	10140		11:24:00		11:24:10	1834	4.2E-01
1	% water	4.1						
94.0	Dry Density pcf	94.0						
			PSI	0.4	Total (Ave.)		7310	4.1E-01

✓ OK

Sample 3/4" minus quarry gravel			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k (cm/sec)
6760	Tare			15:00:00		15:00:10	2450	5.5E-01
9820	Init. Wet wt			15:03:00		15:03:10	2472	5.6E-01
	Sat. Wt.	9960		15:10:00		15:10:10	2449	5.5E-01
	Trimmed Wt.	9960		15:45:00		15:45:10	2480	5.6E-01
0.3	% water	4.9						
89.8	Dry Density pcf	89.8						
			PSI	0.4	Total (Ave.)		9851	5.6E-01

✓ OK

Sample			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k
	Tare							
	Init. Wet wt							
	Sat. Wt.							
	Trimmed Wt.							
	% water							
	Dry Density							
			PSI		Total (Ave.)			

K = coefficient of permeability (cm/sec)

L = sample height = 11.633 cm

A = area of sample = 182.322 cm<sup>2</sup>

H = Hydrostatic head (cm of H<sub>2</sub>O) 1 psi = 70.43 cm

$$K = QL / AhT$$

# POLYETHYLENE WATER & SEWER

SUBMITTAL AND DATA SHEET

PDF FILE : JMEAGLE PE F

FORCE MAIN MOD'S  
PERF PIPE  
CLEANOUTS

HDPE (IRON PIPE SIZE (I.P.S.) PRESSURE PIPE

ANSI/NSF-61, 14 LISTED

PE 4710		DR 7 (335 psi)			DR 9 (250 psi)			DR 11 (200 psi)		
PE 3408/3608		DR 7 (265 psi)			DR 9 (200 psi)			DR 11 (160 psi)		
PIPE SIZE	AVG. O.D.	MIN. T.	AVG. I.D.	WEIGHT LB/FT	MIN. T.	AVG. I.D.	WEIGHT LB/FT	MIN. T.	AVG. I.D.	WEIGHT LB/FT
1/2	0.840	0.120	0.586	0.12	0.093	0.643	0.10	0.076	0.679	0.08
3/4	1.050	0.150	0.732	0.18	0.117	0.802	0.15	0.095	0.849	0.12
1	1.315	0.188	0.916	0.29	0.146	1.005	0.23	0.120	1.061	0.20
1-1/4	1.660	0.237	1.158	0.46	0.184	1.270	0.37	0.151	1.340	0.31
1-1/2	1.900	0.271	1.325	0.60	0.211	1.453	0.49	0.173	1.533	0.41
2	2.375	0.339	1.656	0.94	0.264	1.815	0.76	0.216	1.917	0.64
3	3.500	0.500	2.440	2.05	0.369	2.675	1.66	0.318	2.826	1.39
4	4.500	0.643	3.137	3.39	0.500	3.440	2.74	0.409	3.633	2.29
5-3/8	5.375	0.768	3.747	3.75	0.597	4.109	4.11	0.489	4.338	4.34
5	5.563	0.795	3.878	5.17	0.618	4.253	4.18	0.506	4.490	3.51
6	6.625	0.946	4.619	7.33	0.736	5.065	5.93	0.602	5.349	4.97
7	7.125	0.976	5.056	8.20	0.792	5.446	6.86	0.648	5.751	5.75
8	8.625	1.232	6.013	12.43	0.850	6.594	10.05	0.784	6.963	8.43
10	10.750	1.536	7.494	19.32	1.194	8.219	15.61	0.977	8.679	13.09
12	12.750	1.821	8.889	27.16	1.417	9.746	21.97	1.159	10.293	18.41
14	14.000	2.000	9.760	32.76	1.556	10.107	26.50	1.273	11.301	22.20
16	16.000	2.286	11.154	42.79	1.778	12.231	34.60	1.455	12.915	29.00
18	18.000	2.571	12.549	54.14	2.000	13.760	43.79	1.636	14.532	36.69
20	20.000	2.857	13.943	66.85	2.222	15.289	54.05	1.818	16.146	45.30
22	22.000	3.143	15.337	80.89	2.444	16.819	65.40	2.000	17.76	54.82
24	24.000	3.429	16.732	96.27	2.667	18.346	77.85	2.182	19.374	65.24
26	26.000	—	—	—	2.889	19.875	91.36	2.364	20.988	76.57
28	28.000	—	—	—	3.111	21.405	105.95	2.545	22.605	88.78
30	30.000	—	—	—	3.333	22.934	121.62	2.727	24.219	101.92
32	32.000	—	—	—	—	—	—	2.909	25.833	115.97
34	34.000	—	—	—	—	—	—	3.091	27.447	130.93
36	36.000	—	—	—	—	—	—	3.273	29.061	146.80

I.D. : Inside Diameter  
O.D. : Outside Diameter  
T. : Wall Thickness

For data, sizes, or classes not reflected in these charts, please contact JM Eagle™ for assistance.



HDPE IRON PIPE SIZE (I.P.S.) PRESSURE PIPE (continued)

ANSI/NSF-61, 14 LISTED

PE 4710		DR 13.5 (160 psi)			DR 17 (125 psi)			DR 19 (112 psi)		
PE 3408/3608		DR 13.5 (128 psi)			DR 17 (100 psi)			DR 19 (90 psi)		
PIPE SIZE	AVG. O.D.	MIN. T.	AVG. I.D.	WEIGHT LB/FT	MIN. T.	AVG. I.D.	WEIGHT LB/FT	MIN. T.	AVG. I.D.	WEIGHT LB/FT
1/2	0.840	—	—	—	—	—	—	—	—	—
3/4	1.050	0.078	0.885	0.10	—	—	—	—	—	—
1	1.315	0.097	1.109	0.16	—	—	—	—	—	—
1-1/4	1.660	0.123	1.399	0.26	—	—	—	—	—	—
1-1/2	1.900	0.141	1.601	0.34	—	—	—	—	—	—
2	2.375	0.176	2.002	0.53	0.140	2.078	0.43	—	—	—
3	3.500	0.259	2.951	1.15	0.206	3.063	0.93	0.184	3.110	0.84
4	4.500	0.333	3.794	1.90	0.265	3.938	1.54	0.237	3.998	1.39
5-3/8	5.375	0.398	4.531	4.53	0.316	4.705	2.20	0.283	4.775	1.98
5	5.563	0.412	4.690	2.91	0.327	4.870	2.35	0.293	4.842	2.12
6	6.625	0.491	5.584	4.13	0.390	5.798	3.34	0.349	5.885	3.01
7	7.125	0.528	6.006	4.78	0.419	6.237	3.86	0.375	6.330	3.48
8	8.625	0.639	7.270	7.00	0.507	7.550	5.85	0.454	7.663	5.10
10	10.750	0.796	9.062	10.87	0.632	9.410	8.87	0.586	9.550	7.02
12	12.750	0.944	10.749	15.29	0.750	11.160	12.36	0.671	11.327	11.14
14	14.000	1.037	11.802	18.45	0.824	12.253	14.91	0.737	12.438	13.43
16	16.000	1.185	13.488	24.09	0.941	14.005	19.46	0.842	14.215	17.54
18	18.000	1.333	15.174	30.48	1.059	15.755	24.64	0.947	15.992	22.20
20	20.000	1.481	16.860	37.63	1.176	17.507	30.41	1.053	17.768	27.41
22	22.000	1.630	18.544	45.56	1.294	19.257	36.60	1.158	19.545	33.16
24	24.000	1.778	20.231	54.21	1.412	21.007	43.61	1.263	21.322	39.47
26	26.000	1.926	21.917	63.62	1.529	22.759	51.39	1.368	23.100	46.32
28	28.000	2.074	23.603	73.78	1.647	24.508	59.62	1.474	24.875	53.72
30	30.000	2.222	25.289	84.69	1.765	26.258	68.45	1.579	26.653	61.66
32	32.000	2.370	26.976	96.35	1.882	28.010	77.86	1.684	28.430	70.16
34	34.000	2.519	28.660	108.81	2.000	29.760	87.91	1.790	30.205	79.20
36	36.000	2.667	30.346	121.96	2.118	31.510	98.57	1.895	31.983	88.80
42	42.000	—	—	—	2.471	36.761	134.16	2.211	37.314	120.86
48	48.000	—	—	—	2.824	42.013	175.23	2.526	42.644	157.86
54	54.000	—	—	—	3.177	47.265	221.71	2.842	47.975	199.79
63	63.000	—	—	—	—	—	—	—	—	—

\* For data, sizes, or classes not reflected in these charts, please contact JM Eagle<sup>®</sup> for assistance.





HOPE IRON PIPE SIZE (I.P.S.) PRESSURE PIPE (continued)

ANSI/NSF-61, 14 LISTED

PE 4710		DR 21 (100 psi)			DR 26 (80 psi)			DR 32.5 (63 psi)		
PE 3408/3808		DR 21 (80 psi)			DR 26 (64 psi)			DR 32.5 (50 psi)		
PIPE SIZE	AVG. O.D.	MIN. T.	AVG. I.D.	WEIGHT LB/FT	MIN. T.	AVG. I.D.	WEIGHT LB/FT	MIN. T.	AVG. I.D.	WEIGHT LB/FT
3	3.500	0.187	3.146	0.77	0.135	3.214	0.63	0.108	3.271	0.50
4	4.500	0.214	4.046	1.26	0.173	4.133	1.03	0.138	4.207	0.83
5-3/8	5.375	0.256	4.832	1.80	0.207	4.936	1.47	0.165	5.025	1.18
5	5.563	0.265	5.001	1.93	0.214	5.109	1.57	0.171	5.200	1.27
6	6.625	0.315	5.957	2.73	0.255	6.084	2.23	0.204	6.193	1.80
7	7.125	0.338	6.406	3.16	0.274	6.544	2.58	0.219	6.661	2.08
8	8.625	0.411	7.754	4.64	0.332	7.921	3.79	0.265	8.063	3.05
10	10.750	0.512	9.665	7.21	0.413	9.674	5.87	0.331	10.048	4.75
12	12.750	0.607	11.463	10.13	0.490	11.711	8.26	0.392	11.919	6.67
14	14.000	0.667	12.586	12.22	0.538	12.859	9.96	0.431	13.086	8.05
16	16.000	0.762	14.385	15.96	0.615	14.696	13.01	0.492	14.957	10.50
18	18.000	0.857	16.183	20.20	0.692	16.533	16.47	0.554	16.826	13.30
20	20.000	0.952	17.982	24.93	0.769	18.370	20.34	0.615	18.696	16.41
22	22.000	1.048	19.778	30.18	0.846	20.206	24.61	0.677	20.565	19.86
24	24.000	1.143	21.577	35.19	0.923	22.043	29.30	0.738	22.435	23.62
26	26.000	1.238	23.375	42.14	1.000	23.880	34.39	0.800	24.304	27.74
28	28.000	1.333	25.174	48.86	1.077	25.717	39.88	0.862	26.173	32.19
30	30.000	1.428	26.971	56.12	1.154	27.554	45.79	0.923	28.043	36.93
32	32.000	1.542	28.730	63.84	1.231	29.390	52.10	0.985	29.912	42.04
34	34.000	1.619	30.568	72.06	1.308	31.227	58.81	1.046	31.782	47.43
36	36.000	1.714	32.366	80.78	1.385	33.064	65.94	1.108	33.651	53.20
42	42.000	2.000	37.760	109.97	1.615	38.576	89.71	1.292	39.261	72.37
48	48.000	2.286	43.154	143.65	1.846	44.086	117.18	1.477	44.869	94.66
54	54.000	2.571	48.548	181.75	2.077	49.597	148.33	1.662	50.477	119.70
63	63.000	3.000	56.640	247.42	2.423	57.863	201.88	1.938	58.891	162.84

\* For custom DR, perforated pipe, please contact JM Eagle® PE sales at (800) 621-4404 for availability.

\* All dimensions are in inches unless noted otherwise.

I.D. : Inside Diameter  
 O.D. : Outside Diameter  
 T : Wall Thickness





**JM EAGLE™ HDPE DUCTILE IRON PIPE SIZE (DIPS) PRESSURE PIPE (continued)**

ANSI/NSF-61, 14 LISTED

PE 4710		DR 21 (100 psi)			DR 26 (80 psi)			DR 32.5 (63 psi)		
PE 3408/3608		DR 21 (80 psi)			DR 26 (64 psi)			DR 32.5 (50 psi)		
PIPE SIZE	AVG. O.D.	MIN. T.	AVG. I.D.	WEIGHT LB/FT	MIN. T.	AVG. I.D.	WEIGHT LB/FT	MIN. T.	AVG. I.D.	WEIGHT LB/FT
4	4.800	0.229	4.315	1.44	0.185	4.408	1.17	0.148	4.486	0.95
6	6.900	0.329	6.203	2.97	0.265	6.338	2.42	0.212	6.451	1.95
8	9.050	0.431	8.136	5.11	0.348	8.312	4.17	0.278	8.461	3.36
10	11.100	0.529	9.979	7.69	0.427	10.195	6.27	0.342	10.375	5.06
12	13.200	0.629	11.867	10.87	0.508	12.123	8.87	0.406	12.339	7.15
14	15.300	0.729	13.755	14.60	0.588	14.053	11.90	0.471	14.301	9.61
16	17.400	0.829	15.643	18.88	0.669	15.982	15.39	0.536	16.264	12.44
18	19.500	0.929	17.531	23.71	0.750	17.910	19.34	0.600	18.228	15.60
20	21.600	1.029	19.419	29.10	0.831	19.838	23.74	0.665	20.190	19.16
24	25.800	1.229	23.195	41.51	0.992	23.697	33.85	0.794	24.117	27.32
30	32.000	1.524	28.769	63.84	1.231	29.390	52.10	0.985	29.912	42.04
36	38.300	1.824	34.433	91.45	1.473	35.177	74.61	1.179	35.801	60.18
42	44.500	2.119	40.008	123.44	1.712	40.871	100.75	1.370	41.596	81.25
48	50.800	2.419	45.672	160.87	1.954	46.658	131.28	1.563	47.486	105.90
54	57.100	2.719	51.338	203.25	2.196	52.444	165.83	1.757	53.375	133.81

\* For custom DR, perforated pipe, please contact JM Eagle™ PE sales at (800) 621-4404 for availability.

\* All dimensions are in inches unless noted otherwise.

**COPPER TUBING SIZES (C.T.S.) PRESSURE PIPE ASTM D2737**

ANSI/NSF-61, 14 LISTED

PE 4710		DR 7 (335 psi)			DR 9 (250 psi)			DR 11 (200 psi)		
PE 3408/3608		DR 7 (265 psi)			DR 9 (200 psi)			DR 11 (160 psi)		
PIPE SIZE	AVG. O.D.	MIN. T.	AVG. I.D.	WEIGHT LB/FT	MIN. T.	AVG. I.D.	WEIGHT LB/FT	MIN. T.	AVG. I.D.	WEIGHT LB/FT
1/2	0.625	0.090	0.434	0.07	0.069	0.479	0.05	0.062	0.494	0.05
3/4	0.875	0.125	0.610	0.13	0.097	0.669	0.10	0.080	0.705	0.09
1	1.125	0.160	0.786	0.21	0.125	0.860	0.17	0.102	0.909	0.14
1-1/4	1.375	0.196	0.959	0.32	0.153	1.051	0.26	0.125	1.110	0.21
1-1/2	1.625	0.232	1.133	0.44	0.181	1.241	0.36	0.148	1.311	0.30
2	2.125	0.304	1.481	0.76	0.236	1.625	0.61	0.193	1.716	0.51

# POLYETHYLENE WATER & SEWER

## SUBMITTAL AND DATA SHEET

S.I.D.R. PRESSURE PIPE ASTM D2239

ANSI/NSF-61, 14 LISTED

PE 4710		DR 7 (335 psi)			DR 9 (250 psi)			DR 11.5 (190 psi)		
PE 3408/3608		DR 7 (200 psi)			DR 9 (160 psi)			DR 11.5 (125 psi)		
PIPE SIZE	AVG. I.D.	MIN. T.	AVG. O.D.	WEIGHT LB/FT	MIN. T.	AVG. O.D.	WEIGHT LB/FT	MIN. T.	AVG. I.D.	WEIGHT LB/FT
½	0.622	0.089	0.800	0.09	0.069	0.760	0.07	0.060	0.742	0.06
¾	0.824	0.118	1.060	0.15	0.092	1.008	0.12	0.072	0.968	0.09
1	1.049	0.150	1.349	0.25	0.117	1.283	0.19	0.091	1.231	0.14
1¼	1.380	0.197	1.774	0.43	0.153	1.686	0.33	0.120	1.620	0.25
1½	1.610	0.230	2.070	0.59	0.179	1.968	0.44	0.140	1.890	0.34
2	2.067	0.295	2.657	0.97	0.230	2.527	0.73	0.180	2.427	0.56
2½	2.469	—	—	—	—	—	—	0.215	2.899	0.80
3	3.068	—	—	—	—	—	—	0.267	3.602	1.23
4	4.026	—	—	—	—	—	—	0.350	4.726	2.12
6	6.065	—	—	—	—	—	—	0.527	7.119	4.81

PE 4710		DR 15 (144 psi)			DR 19 (112 psi)		
PE 3408/3608		DR 15 (100 psi)			DR 19 (80 psi)		
PIPE SIZE	AVG. I.D.	MIN. T.	AVG. O.D.	WEIGHT LB/FT	MIN. T.	AVG. O.D.	WEIGHT LB/FT
½	0.622	0.060	0.742	0.06	0.060	0.742	0.06
¾	0.824	0.060	0.944	0.07	0.060	0.944	0.07
1	1.049	0.070	1.189	0.11	0.060	1.169	0.09
1¼	1.380	0.092	1.564	0.19	0.073	1.526	0.16
1½	1.610	0.107	1.824	0.25	0.085	1.780	0.20
2	2.067	0.138	2.343	0.42	0.109	2.285	0.33
2½	2.469	0.165	2.799	0.60	0.130	2.729	0.47
3	3.068	0.205	3.478	0.93	0.161	3.390	0.72
4	4.026	0.268	4.562	1.59	0.212	4.450	1.24
6	6.065	0.404	6.873	3.62	0.319	6.703	2.82

I.D. : Inside Diameter  
O.D. : Outside Diameter  
T. : Wall Thickness

\* For data, sizes, or classes not reflected in these charts, please contact JM Eagle™ for assistance.



# POLYETHYLENE WATER & SEWER

## SUBMITTAL AND DATA SHEET

### GEO-FLO HDPE GEOTHERMAL PIPE AND TUBING

Geo-flo HDPE Geothermal Pipe and tubing is produced to ASTM D3035 for smaller diameters and ASTM F714 for sizes 3" through 12".

ANSI/NSF-61, 14 LISTED

NOMINAL PIPE SIZE (IN)	AVERAGE O.D. (IN)	APPROX. I.D. (IN)	MIN. WALL THICKNESS (IN)	APPROX. WEIGHT (LBS/FT)
<b>HDPE SDR 7 - P.R. 265 psi</b>				
¾	1.050	0.730	0.150	0.18
1	1.315	0.910	0.188	0.28
1¼	1.660	1.150	0.237	0.45
1½	1.900	1.320	0.271	0.59
2	2.375	1.650	0.339	0.82
<b>HDPE SDR 9 - P.R. 200 psi</b>				
¾	1.050	0.800	0.117	0.15
1	1.315	1.000	0.146	0.23
1¼	1.660	1.270	0.184	0.36
1½	1.900	1.450	0.211	0.48
2	2.375	1.810	0.264	0.75
3	3.500	2.670	0.389	1.62
4	4.500	3.450	0.500	2.67
6	6.625	5.030	0.738	5.79
8	8.625	6.593	0.958	10.05
10	10.750	8.218	1.194	15.61
12	12.760	9.747	1.417	21.97
<b>HDPE SDR 11 - P.R. 160 psi</b>				
¾	1.050	0.850	0.095	0.12
1	1.315	1.060	0.120	0.19
1¼	1.660	1.340	0.151	0.30
1½	1.900	1.530	0.173	0.40
2	2.375	1.910	0.216	0.62
3	3.500	2.820	0.318	1.35
4	4.500	3.640	0.409	2.24
6	6.625	5.360	0.602	4.85
8	8.625	6.960	0.784	8.42
10	10.750	8.680	0.977	13.09
12	12.750	10.290	1.159	18.41

# POLYETHYLENE WATER & SEWER

## SUBMITTAL AND DATA SHEET

### REFERENCE STANDARDS

ASTM D638	Standard Test Method for Tensile Properties of Plastics
ASTM D746	Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact
ASTM D790	Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulation Materials
ASTM D1238	Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer
ASTM D1505	Standard Test Method for Density of Plastics by the Density-Gradient Technique
ASTM D2239	Standard Specification for Polyethylene (PE) Plastic Pipe (S.I.D.R.-PR) Based on Controlled Inside Diameter
ASTM D2657	Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings
ASTM D2737	Standard Specification for Polyethylene (PE) Plastic Tubing
ASTM D2774	Standard Practice for Underground Installation of Thermoplastic Pressure Piping
ASTM D2837	Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials
ASTM D3035	Standard Specifications for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter
<b>ASTM D3350</b>	Standard Specification for Polyethylene Plastic Pipe and Fittings Material
ASTM F412	Standard Terminology Relating to Plastic Piping Systems
ASTM F714	Standard Specification for Polyethylene (PE) Plastic Pipe (S.D.R.-PR) Based on Outside Diameter
ASTM F1473	Standard Test Method for Notch Tensile to Measure the Resistance to Slow Crack Growth of Polyethylene Pipes and Resins
AWWA C901	Polyethylene (PE) Pressure Pipe and Tubing, 1/2 in. Through 3 in. For Water Service
AWWA C906	Polyethylene (PE) Pressure Pipe and Fittings, 4 in. Through 63 in., For Water Distribution and Transmission
NSF Standard 014	Plastics Piping System Components and Related Materials
NSF Standard 061	Drinking Water System Components - Health Effects

## JMM HIGH DENSITY POLYETHYLENE (HDPE) PE3408/PE3608 PRODUCT SPECIFICATION

### Description:

JMM manufactures High Density Polyethylene (HDPE) water pressure pipes for municipal and industrial transmission systems. Our pressure pipe is used in many types of applications such as: potable water, sewer, drain, mining, irrigation, slip lining, and reclaimed water.

### Materials:

JMM HDPE pressure pipes are manufactured with premium, highly engineered PE3408/PE3608 resin that provides maximum performance benefits to service today's municipal and industrial water needs. The PE3408/PE3608 material conforms to ASTM D3350 with the cell classification of 345464C/E and is listed with the Plastic Pipe Institute's (PPI) TR4. It is formulated with carbon black and/or ultraviolet stabilizer for maximum protection against UV rays for added assurance.

Size	Type	DR	Standard (If Applicable)
4" - 63"	IPS / DIPS	7 - 41	ASTM F714, AWWA C906, NSF
½" - 3"	IPS	7 - 32.5	ASTM D3035, AWWA C901, NSF

### Quality Assurance:

JMM takes great pride in the quality and workmanship of all of our products. JMM quality control programs encompass three critical aspects of the manufacturing process: the incoming raw material, pipe production, and the finished goods. Incoming material is inspected and tested to ensure the material meets all applicable requirements for production. During production, the pipe will be examined and pipe samples will be collected for physical verification and testing for compliance. The finished product is subjected to further visual inspection to ensure it has met all the appropriate specifications and packaging requirements. Without exception, our pipes are constantly monitored throughout the entire manufacturing process to validate that they are in accordance with all applicable specifications. Certificates of Compliance are available upon request.

### Lengths & Bending Radius:

Standard laying lengths of HDPE pressure water pipe is 40/50 foot lengths. Pipe sizes under 6" may be coiled at continuous longer lengths upon request.

### Marking:

Our standard markings printed on JMM pipes generally consist of the JMM logo, nominal size and OE base, material code, dimension ratio, pressure class, current AWWA C906 (if applicable), ASTM F714 (if applicable), and production date (day, month, & year).



Website:

Please visit our website at [www.jmm.com](http://www.jmm.com) for more information.

Note: Information provided here is a general guideline of JMM PE products. JMM reserves the right to modify any information as necessary. For more detailed information, please contact your JMM sales representative. Always follow project specifications and adhere to local rules, codes and regulations.

HDPE IRON PIPE SIZE (IPS) PRESSURE PIPE PE3408/PE3608

Pipe Size	DR 7 (265 psi)				DR 7.3 (254 psi)				DR 9 (200 psi)				DR 9.3 (200 psi)				DR 11 (160 psi)				DR 13.5 (128 psi)			
	Avg OD	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft		
1/2	0.840	0.120	0.59	0.12	0.115	0.60	0.11	0.093	0.64	0.10	0.090	0.65	0.09	0.076	0.68	0.08	0.062	0.71	0.07					
3/4	1.050	0.150	0.73	0.19	0.144	0.75	0.18	0.117	0.80	0.15	0.113	0.81	0.15	0.095	0.85	0.12	0.078	0.88	0.10					
1	1.315	0.188	0.92	0.29	0.180	0.93	0.28	0.146	1.01	0.23	0.141	1.02	0.23	0.120	1.06	0.20	0.097	1.11	0.16					
2	2.375	0.339	1.66	0.95	0.325	1.69	0.91	0.264	1.82	0.77	0.255	1.83	0.74	0.216	1.92	0.64	0.176	2.00	0.53					
3	3.500	0.500	2.44	2.06	0.479	2.48	1.98	0.389	2.68	1.66	0.376	2.70	1.61	0.318	2.83	1.39	0.259	2.95	1.16					
4	4.500	0.643	3.14	3.40	0.616	3.19	3.28	0.500	3.44	2.75	0.484	3.47	2.67	0.409	3.63	2.30	0.333	3.79	1.91					
5 3/8	5.375	0.768	3.75	4.85	0.736	3.81	4.68	0.597	4.11	3.92	0.578	4.15	3.81	0.489	4.34	3.29	0.398	4.53	2.73					
5	5.563	0.795	3.88	5.20	0.762	3.95	5.02	0.618	4.25	4.20	0.598	4.29	4.08	0.506	4.49	3.52	0.412	4.69	2.92					
6	6.625	0.946	4.62	7.36	0.908	4.70	7.12	0.736	5.06	5.96	0.712	5.11	5.79	0.602	5.35	4.99	0.491	5.58	4.15					
7	7.125	0.976	5.06	8.23	0.976	5.06	8.23	0.792	5.45	6.89	0.766	5.50	6.70	0.648	5.75	5.78	0.528	6.01	5.03					
8	8.625	1.232	6.01	12.48	1.182	6.12	12.06	0.958	6.59	10.09	0.927	6.66	9.81	0.784	6.96	8.46	0.639	7.27	6.03					
10	10.750	1.536	7.49	19.40	1.473	7.63	18.74	1.194	8.22	15.88	1.156	8.30	15.24	0.977	8.68	13.14	0.796	9.08	10.93					
12	12.750	1.821	8.89	27.28	1.747	9.05	26.36	1.417	9.75	22.07	1.371	9.84	21.44	1.159	10.29	18.49	0.944	10.75	15.38					
14	14.000	2.090	9.76	32.90	1.918	9.93	31.78	1.556	10.70	26.61	1.505	10.81	25.85	1.273	11.30	22.30	1.037	11.80	18.57					
16	16.000	2.286	11.15	42.97	2.192	11.35	41.61	1.778	12.23	34.75	1.720	12.35	33.76	1.455	12.92	29.12	1.185	13.49	24.11					
18	18.000	2.571	12.55	54.37	2.466	12.77	52.53	2.000	13.76	43.97	1.935	13.90	42.73	1.636	14.53	36.84	1.333	15.17	30.63					
20	20.000	2.857	13.94	67.13	2.740	14.19	64.85	2.222	15.29	54.28	2.151	15.44	52.77	1.818	16.15	45.49	1.481	16.86	37.71					
24	24.000	3.429	16.73	96.68	3.288	17.03	93.39	2.667	18.35	78.18	2.581	18.53	75.98	2.182	19.37	65.52	1.778	20.23	54.4					
26	26.000							3.889	19.88	91.75	2.796	20.07	89.17	2.364	20.99	76.89	1.926	21.92	63.8					
28	28.000							3.111	21.40	106.40	3.011	21.62	103.42	2.545	22.60	89.15	2.074	23.60	74.0					
30	30.000							3.333	22.93	122.13	3.226	23.18	118.72	2.727	24.22	102.35	2.222	25.29	85.0					
32	32.000													2.909	25.83	116.46	2.370	26.98	96.7					
34	34.000													3.091	27.45	131.48	2.519	28.66	109.0					
36	36.000													3.273	29.06	147.41	2.667	30.35	122.4					





Pipe Size	Avg OD	DR 15.5 (110 psi)			DR 17 (100 psi)			DR 19 (90 psi)			DR 21 (80 psi)			DR 26 (64 psi)			DR 32.5 (50 psi)		
		Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft
1/2	0.840	0.054	0.73	0.07	0.062	0.71	0.07	0.044	0.75	0.05	0.062	0.71	0.07	0.062	0.71	0.07	0.062	0.71	0.07
3/4	1.050	0.068	0.91	0.09	0.062	0.92	0.08	0.055	0.93	0.08	0.062	0.92	0.08	0.062	0.92	0.08	0.062	0.92	0.08
1	1.315	0.085	1.14	0.14	0.077	1.15	0.13	0.069	1.17	0.12	0.063	1.18	0.11	0.062	1.18	0.11	0.062	1.18	0.11
2	2.375	0.153	2.05	0.47	0.140	2.08	0.43	0.125	2.11	0.39	0.113	2.14	0.35	0.091	2.18	0.29	0.073	2.22	0.25
3	3.500	0.226	3.02	1.02	0.206	3.06	0.93	0.184	3.11	0.84	0.167	3.15	0.77	0.135	3.21	0.63	0.108	3.27	0.56
4	4.500	0.290	3.88	1.68	0.265	3.94	1.54	0.237	4.00	1.39	0.214	4.05	1.26	0.173	4.13	1.03	0.138	4.21	0.85
5 3/8	5.375	0.347	4.64	2.40	0.316	4.71	2.20	0.283	4.78	1.98	0.256	4.83	1.80	0.207	4.94	1.47	0.165	5.03	1.16
5	5.563	0.359	4.80	2.57	0.327	4.87	2.35	0.293	4.94	2.12	0.265	5.00	1.93	0.214	5.11	1.57	0.171	5.20	1.27
6	6.625	0.427	5.72	3.63	0.390	5.80	3.34	0.349	5.89	3.01	0.315	5.96	2.73	0.255	6.08	2.23	0.204	6.19	1.86
7	7.125	0.460	6.15	4.21	0.419	6.24	3.86	0.375	6.33	3.48	0.340	6.40	3.16	0.274	6.54	2.58	0.219	6.66	2.08
8	8.625	0.556	7.45	6.16	0.507	7.55	5.65	0.454	7.66	5.10	0.411	7.75	4.64	0.332	7.92	3.79	0.265	8.06	3.01
10	10.750	0.694	9.28	9.50	0.632	9.41	8.88	0.566	9.55	7.92	0.512	9.66	7.21	0.413	9.87	5.83	0.331	10.05	4.71
12	12.750	0.823	11.01	13.48	0.750	11.16	12.36	0.673	11.35	11.14	0.607	11.46	10.13	0.490	11.71	8.26	0.392	11.92	6.67
14	14.000	0.903	12.09	16.24	0.824	12.25	14.91	0.737	12.44	13.43	0.667	12.59	12.22	0.538	12.86	9.96	0.433	13.09	8.01
16	16.000	1.032	13.81	21.21	0.941	14.01	19.46	0.842	14.21	17.54	0.762	14.38	15.96	0.615	14.70	13.01	0.492	14.96	10.5
18	18.000	1.161	15.54	26.84	1.059	15.75	24.64	0.947	15.99	22.20	0.857	16.18	20.20	0.692	16.53	16.47	0.554	16.83	13.3
20	20.000	1.290	17.26	33.14	1.176	17.51	30.41	1.053	17.77	27.41	0.952	17.98	24.93	0.769	18.37	20.34	0.615	18.70	16.4
24	24.000	1.548	20.72	47.72	1.412	21.01	43.81	1.263	21.32	39.47	1.143	21.58	35.91	0.923	22.04	29.30	0.738	22.44	23.6
26	26.000	1.677	22.44	56.00	1.529	22.76	51.39	1.368	23.10	46.32	1.238	23.38	42.14	1.000	23.88	34.39	0.800	24.30	27.7
28	28.000	1.806	24.17	64.95	1.647	24.51	59.62	1.474	24.88	53.72	1.333	25.17	48.86	1.077	25.72	39.88	0.862	26.17	32.1
30	30.000	1.935	25.90	74.58	1.765	26.26	68.45	1.579	26.65	61.66	1.429	26.97	56.12	1.154	27.55	45.79	0.923	28.04	36.9
32	32.000	2.065	27.62	84.87	1.882	28.01	77.86	1.684	28.43	70.16	1.542	28.73	63.84	1.231	29.39	52.10	0.985	29.91	42.0
34	34.000	2.194	29.35	95.81	2.000	29.76	87.91	1.790	30.21	79.20	1.619	30.57	72.06	1.308	31.23	58.81	1.046	31.78	47.4
36	36.000	2.323	31.08	107.41	2.118	31.51	98.57	1.895	31.98	88.80	1.714	32.37	80.76	1.385	33.06	65.94	1.108	33.65	53.2

HDPE IRON PIPE SIZE (IPS) PRESSURE PIPE PE3408/PE3608

Pipe Size	Avg OD	DR 17 (100 psi)			DR 19 (90 psi)			DR 21 (80 psi)			DR 26 (64 psi)			DR 32.5 (50 psi)			DR 41 (40 psi)		
		Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft
36	36.000	2.118	31.510	98.57	1.895	31.983	88.80	1.714	32.366	80.78	1.385	33.064	65.94	1.108	33.651	53.20	0.876	34.139	42.41
42	42.000	2.471	36.761	134.16	2.211	37.314	120.86	2.000	37.760	109.97	1.615	38.576	89.71	1.292	39.261	72.37	1.024	39.830	57.74
48	48.000	2.824	42.013	175.23	2.526	42.644	157.86	2.286	43.154	143.65	1.846	44.086	117.18	1.477	44.869	94.56	1.171	45.517	75.49
54	54.000	3.177	47.265	221.71	2.842	47.975	199.79	2.571	48.349	181.75	2.077	49.597	148.33	1.622	50.477	119.70	1.317	51.208	95.51
63	63.000							3.000	56.640	247.42	2.423	57.863	201.88	1.938	58.891	162.84	1.537	59.742	130.0

HDPE DUCTILE IRON PIPE SIZE (DIPS) PRESSURE PIPE PE3408/PE3608

J-M Manufacturing Company, Inc.

10000 J-M Drive, Houston, TX 77036



Pipe Size	DR 7 (265 psi)				DR 9 (200 psi)				DR 11 (160 psi)				DR 13.5 (128 psi)				DR 17 (128 psi)			
	Avg OD	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	
4	4.800	0.686	3.346	3.85	0.533	3.670	3.11	0.436	3.876	2.61	0.356	4.045	2.17	0.282	4.202	1.75				
6	6.900	0.946	4.894	7.96	0.767	5.274	6.43	0.627	5.571	5.39	0.511	5.817	4.48	0.406	6.039	3.62				
8	9.050	1.293	6.309	13.69	1.026	6.917	11.07	0.823	7.305	9.28	0.670	7.630	7.70	0.532	7.922	6.22				
10	11.100	1.586	7.738	20.59	1.233	8.486	16.65	1.009	8.961	13.95	0.822	9.357	11.59	0.653	9.716	9.37				
12	13.200	1.886	9.202	29.12	1.467	10.090	23.55	1.200	10.656	19.73	0.978	11.127	16.40	0.776	11.555	13.24				
14	15.300	2.186	10.666	39.12	1.700	11.696	31.64	1.391	12.351	26.51	1.133	12.898	23.02	0.900	13.392	17.80				
16	17.400	2.486	12.130	50.60	1.933	13.302	40.92	1.582	14.046	34.29	1.289	14.667	28.49	1.024	15.229	23.03				
18	19.500	2.786	13.594	63.55	2.167	14.906	51.39	1.773	15.741	43.07	1.444	16.439	35.77	1.147	17.068	28.91				
20	21.600				2.400	16.512	63.05	1.964	17.436	52.85	1.600	18.208	43.91	1.271	18.905	35.49				
24	25.800				2.867	19.722	89.96	2.345	20.829	75.38	1.911	21.749	62.64	1.518	22.582	50.63				
30	32.000							2.909	25.838	115.97	2.370	26.976	96.35	1.880	28.014	77.86				
36	38.300										2.837	32.286	138.04	2.253	33.524	111.55				
42	44.500													2.618	38.950	150.60				
48	50.800													2.988	44.465	196.21				

Pipe Size	DR 19 (90 psi)				DR 21 (80 psi)				DR 26 (64 psi)				DR 32.5 (50 psi)			
	Avg OD	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft
4	4.800	0.253	4.264	1.58	0.229	4.315	1.44	0.185	4.408	1.17	0.148	4.486	0.95			
6	6.900	0.363	6.130	3.26	0.329	6.203	2.97	0.265	6.338	2.42	0.212	6.451	1.95			
8	9.050	0.476	8.041	5.61	0.431	8.136	5.11	0.348	8.312	4.17	0.278	8.461	3.36			
10	11.100	0.584	9.862	8.44	0.529	9.979	7.69	0.427	10.195	6.27	0.342	10.375	5.06			
12	13.200	0.695	11.727	11.94	0.629	11.867	10.87	0.508	12.123	8.87	0.406	12.339	7.15			
14	15.300	0.805	13.593	16.04	0.729	13.755	14.60	0.588	14.053	11.90	0.471	14.301	9.61			
16	17.400	0.916	15.458	20.74	0.829	15.643	18.88	0.669	15.982	15.39	0.536	16.264	12.44			
18	19.500	1.026	17.325	26.05	0.929	17.531	23.71	0.750	17.910	19.34	0.600	18.228	15.60			
20	21.600	1.137	19.190	31.97	1.029	19.419	29.10	0.831	19.838	23.74	0.665	20.190	19.16			
24	25.800	1.358	22.921	45.61	1.229	23.195	41.51	0.992	23.697	33.85	0.794	24.117	27.32			
30	32.000	1.684	28.430	70.16	1.521	28.769	63.84	1.231	29.390	52.10	0.985	29.912	42.04			
36	38.300	2.016	34.026	100.50	1.824	34.433	91.45	1.473	35.177	74.61	1.179	35.801	60.18			
42	44.500	2.342	39.535	135.88	2.119	40.008	123.44	1.712	40.871	100.75	1.370	41.596	81.25			
48	50.800	2.674	45.131	176.81	2.419	45.672	160.87	1.954	46.658	131.28	1.563	47.486	105.90			



## PE 3408/PE 3608 JMM HDPE Typical Primary Properties

Property	Unit	Test Procedure	Typical Value
Material Designation	—	PPI-TR4	PE 3408/PE3608
Cell Classification	—	ASTM D3350	** 345464C
Density [3]	g/cm <sup>3</sup>	ASTM D1505	0.955
Melt Index [4]	g/10 minutes	ASTM D1238	<0.15
Flexural Modulus [5]	psi	ASTM D790	110,000 to <160,000
Tensile Strength [4]	psi	ASTM D638	3,000 – 3,500
SCG (PENT) [6]	Hours	ASTM F1473	>100
HDB @ 73.4°F (23°C)[4]	psi	ASTM D2837	1600
HDB @ 140°F (60°C)	psi	ASTM D2837	800
Color, UV Stabilize [C]	—	—	Black with minimum 2% carbon black
Brittleness Temperature	°F	ASTM D746	<130
Hardness	Shore D	ASTM D2240	> 60

\*\* Note: Cell Classification is 345464E for all Blue / Green / Gray Polyethylene Pipes.

# TigermagEP

## Technical Specifications

### FM656 Obstructionless Electromagnetic Flowmeter

PDF FILE : FLOW METER PDS656

REVISED 2/4/10



#### DESCRIPTION

The Model 656 is a microprocessor-based electromagnetic flowmeter designed to measure the flow of conductive liquids in full pipes. The sensor and the transmitter are integral and enclosed in a NEMA-7 explosion-proof housing. The sensor housing is made of steel.

A wide variety of liners and electrodes are available to allow you to tailor the meter to your process.

The Model 656's nonvolatile EPROM memory and circuitry eliminates the need for a microprocessor backup battery. It is not necessary to reprogram if the electronic module is replaced or exchanged with electronics from another size flowmeter.

#### APPLICATIONS

The Model 656's high signal frequency makes it ideally suited to applications with high levels of inherent noise including: Process Chemicals, Heavy Sludges, Pulp & Paper Stock, Mining Slurries, Polymers, Acids, Alkalies, Sewage, Cooling Water. Nearly any conductive liquid can be measured.

#### CERTIFIED ACCURACY

Each TigermagEP™ is wet-flow calibrated in Sparling's Primary Flow Lab traceable to the National Institute of Standards and Technology. A certificate of accuracy is furnished with each meter.

#### PRINCIPLE OF OPERATION

The Model 656 magnetic flowmeter is based on Faraday's Law which states that the voltage induced in a conductor moving through a magnetic field is proportional to the velocity of that conductor. The magnetic flowmeter will measure liquids with conductivities greater than 5 micromhos.

#### STANDARD FEATURES

- Sampling frequency up to 100 Hz for accurate measurement of fluids with high levels of inherent noise
- Forward, reverse and net totalization
- Programmable high and low flow alarms
- Nonvolatile EPROM memory
- Universal electronics module compatibility
- 2-line, 16 character backlit display
- Programming made easy with Mag-Command™
- User-selectable damping & low flow cutoff
- NEMA-4X & NEMA-7 explosion proof enclosure
- Approvals include: FM, CSA (std.)
- Rotatable modular display
- Empty pipe detection
- PZR - Positive Zero Return
- Standard 0.5% accuracy
- Sizes available from 0.5" - 72"



# SPARLING



### EASY TO READ BACKLIT ROTATABLE DISPLAY

The 16 character, 2 line backlit transmitter display is rotatable 360° in 90° increments ensuring easy reading in any orientation.

### INSTALLATION

The meter must be mounted at a point in the line in which the pipe is always full of the process liquid under flowing conditions.

The meter may be equipped with ANSI 150 or 300 lb., AWWA, DIN, PN10 or 16, JIS 10K or 20K, or British Standard flanges.

Only three diameters of straight pipe length are required from the center of the meter to normal obstructions to obtain specified accuracies. In the smaller sizes all of the necessary straight pipe is contained within the meter itself.

### E<sup>2</sup>PROM NONVOLATILE MEMORY

A backup battery is not required and there is no need to reprogram if the electronics module is replaced or exchanged. Meter identification (tube ID, serial number, K, offset, etc.) is stored on an E<sup>2</sup>PROM chip independent of transmitter electronics. The E<sup>2</sup>PROM chip has lifetime data retention.

### EMPTY PIPE DETECTION - Standard

The Sparling TigermagEP™ is designed to detect absence or inadequate volume of process fluid in the pipe and will hold the output signal to 4 mA or zero. This feature does not require any hard wiring as it is a software selection. One of the most important values of this feature is that it prevents false totalization possible with other meters under partially filled pipe conditions.

### EASE OF COMMUNICATIONS

The TigermagEP™ is programmable with Mag-Command or HART Protocol. 4-20 mA, RS-232 or RS-485 outputs give you flexibility when interfacing with your distributed control system.

### REMOTE MOUNTED TRANSMITTER

Remote mounting of the transmitter is required when pipe vibration is excessive, when flooding is possible or where high temperature conditions exist (over 212°F / 100°C).

The TigermagEP™ remote transmitter is housed in a NEMA-4X enclosure and features a larger sized (8mm) 16 digit 2-line backlit display. All power, coil and electrode connections are made within the transmitter enclosure and junction box. The meter is programmed using Mag-Command. HART-effect switches which are energized from outside the enclosure. The enclosure can be wall mounted. An optional bracket for pipe mounting is available.

### HI-Z CIRCUITRY

The Sparling TigermagEP™ provides superior performance in liquids which tend to deposit nonconductive coatings. HI-Z™ circuitry produces a high input impedance to the transmitter's preamplifier (10<sup>11</sup> ohms). The impedance of the coating is negligible as compared to the impedance of the receiving instrument. The voltage drop across the electrode coating is also negligible eliminating the need for electrode cleaners.

### TWO FLOW ALARMS

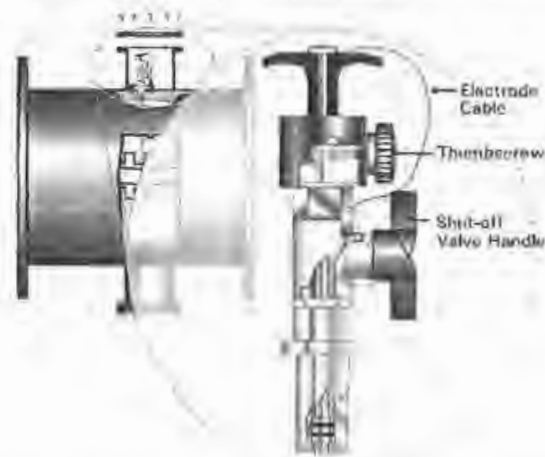
Fault alarms can be configured with alarm set points between 0-99% of flow for each alarm. Open collector output turns on above programmed set point.

### PZR - Positive Zero Return

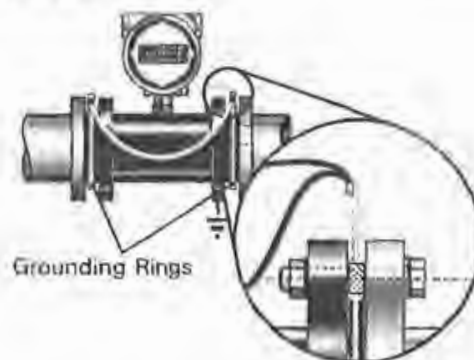
An electronic circuit is activated by an external contact closure when lines go empty or when a pump or valve is shut down, indicating to the meter that it should drive the output signal to 4 mA or zero.

### REMOVABLE ELECTRODES (optional)

Two configurations of removable electrodes are available in sizes 6" or greater for all FM656 meters. The first configuration allows removal of the electrode after the line has been depressurized and drained. Removal is performed with an 11/32" nut driver and a 3/4" socket wrench.



The second is the 'roll lap' electrode which allows electrode replacement while the system is still under pressure without disturbing the process flow. Removal can be easily performed with a phillips screwdriver and a crescent wrench. Special locking catches were designed to prevent high pressure accidents during electrode removal. The shut-off valve must be closed before the electrode may be removed.



### GROUNDING

The use of grounding rings is recommended to ensure accuracy. Grounding rings are required if adjacent piping is lined or nonconductive. Pump noise or excessive RF should be minimized to achieve highest accuracy.

# / RATES & DIMENSIONS

## A 1 - Flow & Dimensions

Line & Flange Size (Inches)	Dimensions								Flowrates - GPM - Full Scale		
	A		B		C		D		1 ips.	3 ips.	33 ips.
	150lb.	300lb.	150lb.	300lb.	150lb.	300lb.	150lb.	300lb.			
0.5	4.00	4.00	3.50	3.75	9.50	9.62	9.25	9.37	0.6	1.7	10
1	4.00	4.00	4.35	4.88	10.19	10.50	9.94	10.25	2	6	86
1.5	4.00	4.00	5.00	5.12	10.88	11.44	10.63	11.19	5	16	174
2	4.00	4.00	6.00	6.50	11.69	12.89	11.44	11.84	9	27	303
3	6.00	6.00	7.50	8.25	13.00	13.40	12.75	13.15	20	60	684
4	6.00	6.00	9.00	10.00	14.30	14.88	14.13	14.63	35	107	1162
6	13.28	14.88	11.00	12.50	17.00	17.75	16.75	17.50	85	254	2800
8	13.28	15.40	13.50	14.25	18.40	19.70	18.35	19.53	145	436	4800
10	18.15	20.55	16.00	17.50	22.56	23.37	22.31	23.06	236	709	7800
12	19.40	21.78	18.00	20.50	25.00	25.75	24.75	25.50	333	1000	11000
14	21.38	23.75	21.00	23.00	26.67	27.67	26.42	27.42	409	1227	13500
16	23.38	25.88	23.50	25.50	28.37	29.37	28.72	29.72	545	1636	18000
18	27.25	29.88	25.00	28.00	31.14	32.64	30.88	32.39	667	2000	22000
20	27.60	30.40	27.50	30.50	33.39	34.89	33.14	34.64	879	2636	29000
24	32.75	35.75	32.00	36.00	37.44	39.44	37.19	39.19	1273	3818	42000
30	43.50	46.63	38.75	43.00	40.72	45.85	43.47	45.60	1909	5727	63000
36	47.75	50.85	46.00	50.00	50.20	52.20	49.95	51.95	2925	8775	96525
42	51.75	55.12	53.00	57.00	56.90	59.90	56.65	58.65	4040	12120	133320
48	51.75	55.38	59.50	65.00	63.05	66.60	62.80	66.55	5322	15966	175626
54	53.50	*	66.25	*	69.88	*	69.63	*	7144	21433	235000
60	65.50	*	73.00	*	76.75	*	76.60	*	8500	25500	280500
66	65.50	*	80.00	*	83.75	*	83.50	*	10300	31000	341000
72	72.75	*	86.50	*	90.00	*	89.75	*	12700	38100	419100

Dimensions for flanges: Allow 1/8" to 1/4" for lining thickness / Dimensions C & D ± 0.125"

### HOW TO ORDER A TIGERMAG EP MODEL 656

Base Model Number

FM-656 - Tigermag EP

Size

00 = 0.50, 0F = 1", 0G = 1.5", 02 = 2", 03 = 3", 04 = 4", 06 = 6", 08 = 8", etc.

Table 3 - Liner Material

1 Hard Rubber (6"-72")	3 Tefzel® (0.5"-48")	6 Ceramic liner (0.5"-2")
2 Soft Rubber (6"-72")	4 Polyurethane (1"-48")	9 Neoprene (6"-72")

Table 4 - Electrode Material

1 316SS	4 Titanium	7 Platinum
2 Hastelloy C	5 Tantalum	8 Zirconium
3 316SS Buller-Nosed	6 Fused Platinum	9 Monel

Table 5 - Flange Rating

1 150 lb. flanges	4 PN 10 DIN	6 JIS 10K
3 300 lb. flanges	5 PN 16 DIN	7 JIS 20K

Table 6 - Transmitter and Mounting

0 Integral NEMA-4X/NEMA-7 enclosure
1 Remote NEMA-4X/NEMA-7 enclosure, 15' cable
2 Remote NEMA-4X/NEMA-7 enclosure, 15' cable, accidental submergence proof sensor
3 Remote NEMA-4X enclosure, 15' cable
4 Remote NEMA-4X encl., 15' cable, accidental submergence proof sensor
5 Remote NEMA-4X encl., 15' cable, permanent submergence proof sensor

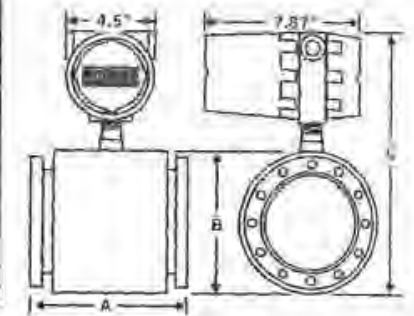
Table 7 - Power Supply\*

0 77-265 VAC Power	1 12-60 VDC Power
--------------------	-------------------

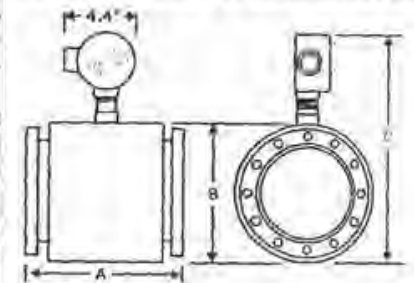
#### Special Notes for Construction

- Hart® protocol (KP802 programmer available)
- RS-485 Communications port
- High temperature coils - required for temperatures over 266 °F
- Requires remote mount option from Table 6
- Ceramic max temp 420 °F / Tefzel® max temp 300 °F @ 100 psi
- Hot Tap removable electrode design (6" & above only)
- Removable electrode design (6" - 72")
- Special cable length (over 15 feet) - Max 100 ft.
- Alarm with relay contacts (remote only)

### Integral Mount Transmitter

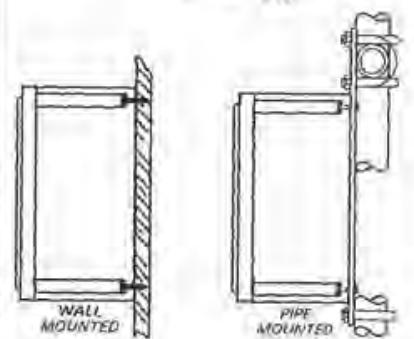
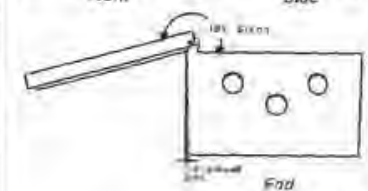
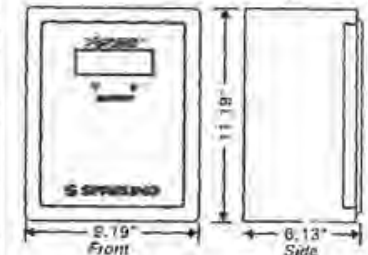


### Remote Mount Transmitter



A Sensor

V Transmitter Enclosure (NEMA-4X)



0653 100

\*FM approval in up to 120 volts

## B SPECIFICATIONS

Accuracy Output	1.0%-7.2% 0.5% of flow rate (1-100%)
	0.5% % of flow rate (1-100%)
Temperature Effect	±0.025% FS/°C
Full Scale Range	From 0-2100 to 30 flow
Repeatability	±0.1% full scale
Electrodes	Stainless steel standard (others available)
Lines	Ceramic (aluminum oxide 99.5%), Hard Rubber, Soft Rubber, Neoprene, Polyurethane or Teflon
Outputs	1) Isolated analog 4-20 mA dc into 800 ohms (std); 2) scaled pulse 24 Vdc with selectable 12.5/25/50/100 ms on time, max. freq. 60 Hz; 3) 0-1000 Hz freq. for 0-100% flow rate; 15 Vdc; 4) two flow alarms; 5) fault, with open collector; 6) RS232 communication; 7) flow direction with open collector; 8) Positive Zero Return (PZR) for external relay contacts. Outputs 2 & 3 can be open collector if required.
Mag. Command™	Selection and change of meter parameters by magnetic probe without opening the enclosure
Display	2-Line, 16-Digit alphanumeric backlit display (rate and total) Modular, rotatable 360° in 90° increments
Conductivity	Minimum 5 micromhos/cm
Minimum Velocity	0.3 fpm (0.1 mps)
Power Requirements	*77-265 Vac 50/60 Hz (±2.00 Vdc optional)
Power Consumption	Less than 20 Watts
Enclosures	Transmitter: Cast aluminum epoxy coated (integral (NEMA 7) or remote mounted (NEMA-4X)) Sensor Housing: Fabricated Metal, epoxy coated
Electrical Rating	FM Class I, Div. 2, Groups B, C, D; Class II, Div. 2, Groups E, F, G (150 psi integral mount); CSA Approved for Class I, Division 2
Preamp Impedance	10 <sup>11</sup> ohms minimum
Ambient Temp.	32° to 140° F (-20° to 60° C) Display data below 159° F (70° C)
End Connections	1/2" (bore) 3/8" O.D.
Sensor Tube	304 Stainless Steel
Process Temp.	<b>Integral Mount:</b> Hard Rubber, Soft Rubber, Neoprene, Polyurethane/Pood Grade Polyurethane ..... 441-100° F Teflon® Ceramic ..... 300-212° F <b>Remote Mount (opt)</b> Teflon® (to 200 psi), Ceramic ..... 40-266° F <b>High Temp Cells (opt)</b> Teflon® (to 100 psi) ..... 30-300° F Ceramic ..... 40-425° F
Selectable Damping	0-99 sec.
Low Flow Cutoff	Selectable 0-95% of FS
Options	<ul style="list-style-type: none"> <li>• Remote Mounted NEMA-4X Enclosure</li> <li>• Remote Two-Stage Switching Transmitter</li> <li>• Electrode Materials: Titanium, Hastelloy C, Monel, Zirconium, Tantalum, Platinum, Fixed Platinum (cerams only)</li> <li>• Process Temperature to 420° F (216° C) (cerams only)</li> <li>• 1-2-80 Vdc operation</li> <li>• Digital Communications (HART Protocol)</li> <li>• Accidental/Permanent Subrange/EP-Print Sensor (remote mount only)</li> <li>• Removable Electrodes (0-72" only)</li> <li>• Hot-Tap Removable Electrodes (0-72" only)</li> <li>• RS-485 Communication</li> <li>• Alarm with relay contacts (remote mount only)</li> </ul>

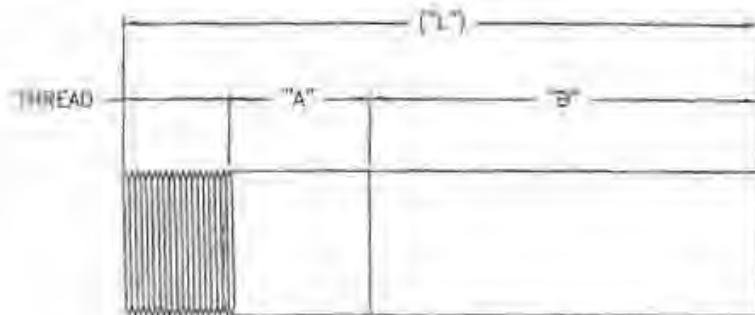
## MODEL FM-656 SPECIFICATIONS

- 1) The magnetic flowmeter shall be microprocessor-based and capable of both indicate, totalize, and transmit flow in full pipes.
- 2) The magnetic flowmeter shall utilize DC bipolar out-sold coil excitation (optional) at frequencies up to 100 Hz and automatically re-zeroing pulse every cycle.
- 3) The accuracy shall be at least 0.5% of flow rate over a 33:1 turndown in all flow rates above 1" flow. Accuracy shall be verified by calibration in a flow laboratory (acceptable to the U.S. National Institute of Standards and Technology).
- 4) The flow sensor(s) shall be Ceramic, Hard Rubber, Soft Rubber, Neoprene, Polyurethane or Teflon®. The housing shall be steel.
- 5) The integrally-mounted flow sensor and transmitter shall be FM approved for Class I, Division 2, Groups B, C, D and Class II, Division 1, Groups E, F, G environments without use of air purge. CSA Approved for Class I, Division 2.
- 6) The electronics shall be integrally or remote mounted.
- 7) When remote mounted, the flowmeter transmitter shall be furnished in a NEMA-4X enclosure box with a larger 3/8" character 2-line 16 digit backlit display and 15 feet of cable (standard). Batch controller option available.
- 8) The flowmeter shall be suitable for operation at temperatures from -40° F to 266° F and at pressures from full vacuum to 740 psi. Temperatures to 420° F (optional).
- 9) The flowmeter electrodes on ceramic liners shall be fused platinum and shall not require O-rings.
- 10) The meter shall incorporate Hi-Z circuitry. The preamplifier input impedance shall not be less than 10<sup>11</sup> ohms. External ultrasonic electrode cleaners shall not be acceptable.
- 11) Available outputs shall be 1) Isolated analog 4-20 mA dc into 800 ohms (standard); 2) scaled pulse 24 Vdc with selectable 12.5/25/50/100 ms on time, max. freq. 60 Hz; 3) 0-1000 Hz freq. for 0-100% flow rate; 15 Vdc; 4) two flow alarms; 5) fault, with open collector; 6) RS232 communication; 7) flow direction with open collector; 8) Positive Zero Return (PZR) for external relay contacts. Outputs 2 & 3 can be open collector if required.
- 12) Low flow cutoff shall be selectable from 0-9% of FS and there shall be two flow alarms selectable from 0-99% of span.
- 13) A 2-line, 16 character backlit alphanumeric display shall indicate user-defined flow units and total flow. All menu advice and commands shall be visible on this display. The display shall be modular and rotatable 360° in 90° increments. Characters shall be at least 0.125" high for ease of readability.
- 14) The flowmeter shall incorporate the MAG-COMMAND feature allowing menu selection and changes to be made from outside the housing via Hall-effect sensors. It shall not be necessary to remove covers, panels or fasteners to accomplish calibration or program changes.
- 15) The TigermagEP's unique diagnostic functions eliminate the need for a technician to carry test equipment or open the housing. Current ramp, complete coil check and true front-end input simulator may be activated in MAG-COMMAND without opening the enclosure.
- 16) The meter software shall incorporate a password feature preventing inadvertent program changes.
- 17) The meter shall feature nonvolatile EPROM memory and universal electronics module compatibility between all TigermagEP meters.
- 18) The flowmeter shall have a switching power supply having an operating range from 77-265 Vac 50/60 Hz (±2-60 Vdc). Power consumption shall not exceed 20 Watts.
- 19) All printed circuit boards shall be contained in a plug-in module and be interchangeable for any size without requiring test equipment.
- 20) The flowmeter manufacturer shall have meters of the DC pulse type in similar flowing mediums for a minimum of five years.
- 21) The flowmeter shall be warranted against defective workmanship or materials for a period of two years from date of shipment.
- 22) Totalized flow and programmed configuration shall be maintained in memory for the meters lifetime.
- 23) The flowmeter shall be MODEL 656 TigermagEP™ as manufactured by Spading Instruments, Inc.



4097 N. Temple City Blvd. • P.O. Box 5868 • El Monte, CA USA 91731  
 Ph (626) 444-0571 • Fx (626) 452-0733  
 Internet: <http://www.spadinginstruments.com> • Email: [sales@spadinginstruments.com](mailto:sales@spadinginstruments.com)





NOTES:

1. Threads per American National Standard Taper Pipe Threads, NPT (ANSI B1.20.1-1983).
2. "A" materials NSF approved brass or 316 SS. ✓
3. "B" materials J408 HDPE
4. "B" FM Class 150 is SDR 11 pipe, FM Class 200 is SDR 9 pipe
5. 2", 3", & 4" Class 150 & 200 are FM Tested.



SIZE	OVERALL LENGTH "L"	LENGTH "A"	LENGTH "B"	LENGTH "THREAD"
1"	6.5	2 1/2	4	0.9845
1 1/4"	7	3	4	1.0085
1 1/2"	7.5	3 5/8	3.875	1.0252
2"	9.5	4 1/8	5.375	1.0582
3"	9.5	4 5/8	4.875	1.6337
4"	9.5	4 5/8	4.875	1.7337
6"	10.5	5 1/8	5.375	1.9462
8"	11.5	6 1/8	5.375	2.1462
10"	14	8 1/8	5.875	2.3587
12"	14	8 1/8	5.875	2.5587
14"	16	10	6	2.6837
16"	16	10	6	2.8837
18"	19	13	6	3.0837
20"	21	15	6	3.2837
24"	21	15	6	3.6837
-	REF	+/- .062	+/- 0.05	+/- 0.05

PDF FILE: TF 718100 TRANS

LEACHATE FORCE MAIN #3

NOTES:

- 1.) ALL DIMENSIONS ARE IN INCHES.
- 2.) SEE TABLE FOR TOLERANCE.

NO PART OF THIS DOCUMENT MAY BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS, OR STORED IN A DATA BASE OR RETRIEVAL SYSTEM, WITHOUT THE PRIOR WRITTEN PERMISSION OF INDUSTRIAL PIPE FITTING, LLC.

REFERENCE DRAWING:

SS 90° SCALE DRAWING

**INDUSTRIAL PIPE FITTINGS**  
 8020 INDEPENDENT ST. HOUSTON, TEXAS 77061  
 Phone: 713-643-2555 Fax: 713-643-1725

1" - 24" STEEL TO HDPE  
 THREADED TRANSITION  
 STANDARD PRODUCT DRAWING

DRG. NO. TF 718100

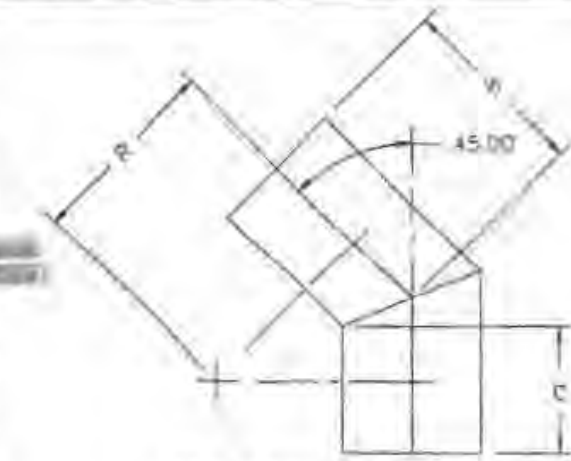
REV. 1 OF 1



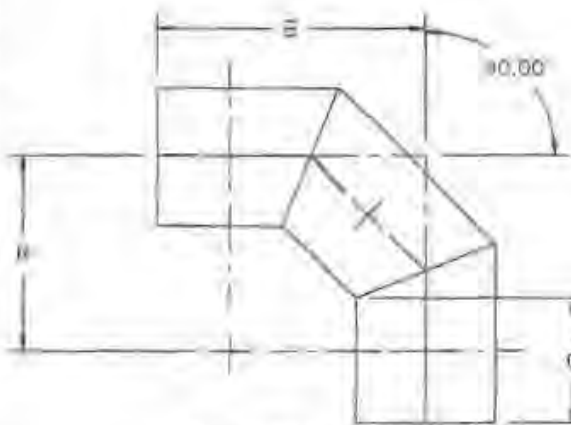
PDF FILE 45 AND 90 FAB ELL TO B 803 (SUBMITTAL MODEL)  
 FORCE MAIN MODIFICATIONS & CLEANOUTS

FOR SUBMITTAL PURPOSES ONLY

NOM IPS SIZE IN	R/D RATIO	RADIUS IN	END SEG INSIDE LENGTH "C"	CENTER TO FACE "E"	
				45 DEG	90 DEG
2	2.02	4 3/4	4	4 1/2	7 1/4
3	1.53	5 3/8	4	4 3/4	7 7/8
4	1.30	6 7/8	5	5 7/8	9 3/8
5	1.15	8 3/8	5	6 1/8	9 7/8
6	1.41	9 3/8	6	7 3/8	12 7/8
8	1.20	10 3/8	6 1/2	8 1/4	14 3/8
10	1.17	12 5/8	6 1/2	8 3/4	16 1/8
12	1.07	13 5/8	8	10 5/8	18 5/8
14	1.02	14 1/4	8	10 7/8	19 1/4
16	0.95	15 1/4	8	11 3/8	20 1/4
18	0.90	16 1/4	8	11 3/4	21 1/4
20	0.85	17 1/4	8	12 1/8	22 1/4
22	1.05	23 1/8	8	12 1/2	26 1/8
24	1.00	24	8	13	27
28	1.47	38 1/4	14	19 3/8	41 3/4
28	1.36	38 1/8	14	19 3/4	42 1/8
30	1.28	38 3/8	14	20 1/4	42 3/4
32	1.20	38 3/8	14	20 5/8	43 1/8
34	1.13	38 3/8	14	21	43 1/2
36	1.07	38 1/2	14	21 1/2	44
42	1.20	60 3/8	21	29 3/4	68 1/4
48	1.05	60 3/8	21	31	60 1/2
54	0.94	60 3/4	21	32 1/8	61 7/8
63	.80	65.75	21	34	67 1/4
TOL	REF	REF	REF	REF	REF



45.0 ELBOW - 2 SEGMENT



90.0 ELBOW - 3 SEGMENT

**FACTORY MUTUAL NOTES:**

1. APPLIES ONLY TO NOMINAL SIZES 2" THRU 18" FOR FACTORY MUTUAL
2. NOMINAL O.D.'S WALL THICKNESSES AND TOLERANCES MANUFACTURED ACCORDING TO ASTM D3261
3. ALL CLASS 150 FAB FITTINGS MADE FROM DR 9.0 FEEDSTOCK  
ALL CLASS 200 FAB FITTINGS MADE FROM DR 2.0 FEEDSTOCK
4. MACHINED ENDS OPTIONAL  
CLASS 150 ENDS ARE TO BE MACHINED TO SDR 11 WALL (SEE 700370)  
CLASS 200 ENDS ARE TO BE MACHINED TO SDR 8 WALL (SEE 700370)
5. FOR FEED O.D., WALL & END MACHINING SPEC. SEE PIPE 708907
6. MATERIAL- PE3608 AND/OR PE4710 ONLY.

**NOTES:**

1. ALL DIMENSIONS ARE IN INCHES.

NO PART OF THIS DOCUMENT MAY BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS, OR STORED IN A DATA BASE OR RETRIEVAL SYSTEM, WITHOUT THE PRIOR WRITTEN PERMISSION OF INDUSTRIAL PIPE FITTING, LLC.

**REFERENCE DRAWINGS:**

DO NOT SCALE DRAWING

**INDUSTRIAL PIPE FITTINGS**

8070 OSBORN ST HOUSTON, TEXAS 77033 Phone 713-645-1234 Fax 713-645-1758

2" - 18" IPS FABRICATED ELBOWS  
 SUBMITTAL DIMENSIONS - 22 1/2" JAWER  
 MATERIAL PE3408 AND/OR PE4710

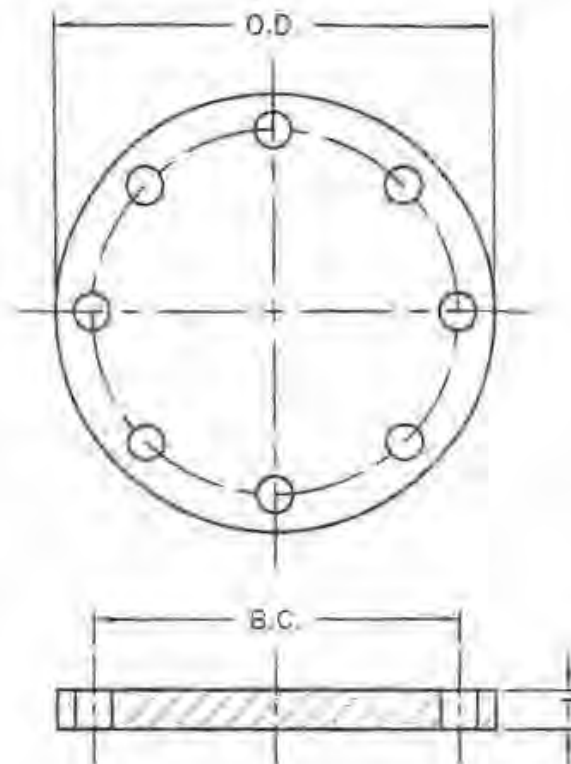
22.5 ELL 708803 1 7 10

DIMENSIONS (INCHES)

NOM. PIPE SIZE	O.D.	B.C.	NOM. THICKNESS T	NUMBER OF HOLES	DIAMETER OF HOLES	NOM. WEIGHT (LBS)
1	4 1/2	3 1/8	1	4	5/8	0.5
2	6	4 3/4	1	4	3/4	0.9
3	7 1/2	6	1	4	3/4	1.5
4	9	7 1/2	1	8	3/4	2.0
6	11	9 1/2	1	8	7/8	3.1
8	13 1/2	11 3/4	1	8	7/8	4.7
10	16	14 1/4	1	12	1	6.8
12	19	17	1	12	1	9.4
14	21	18 3/4	1	12	1 1/8	12
16	23 1/2	21 1/4	1	16	1 1/8	14
18	25	22 3/4	1	16	1 1/4	16
20	27 1/2	25	1	20	1 1/4	19
22	29 1/2	27 1/4	1	20	1 3/8	23
24	32	29 1/2	1	20	1 3/8	27
26	34 1/4	31 3/4	1-1/2	24	1 3/8	31
28	36 1/2	34	1-1/2	28	1 3/8	35
30	38 3/4	36	1-1/2	28	1 3/8	39
32	41 3/4	38 1/2	1-1/2	28	1 5/8	45
34	43 3/4	40 1/2	1-1/2	32	1 5/8	49
36	46	42 3/4	1-1/2	32	1 5/8	55
42	53	49 1/2	2	36	1 5/8	73
48	59 1/2	56	2	44	1 5/8	93
54	66 1/4	62 3/4	2	44	1 7/8	115
TOL:	±1/8	±1/16			±1/16	

NOTE:

- DIMENSIONS SAME AS ANSI B16.5 150 LB BOLT PATTERN TO BE USED AS A LINER ONLY. NOT FOR PRESSURE USE AS A BLIND FLANGE.



NOT PRESSURE RATED  
LINER SERVICE ONLY  
REQUIRES STEEL BLIND FLANGE

PDF FILE: BL FL 70BS77 HDPE  
BLIND FLANG ON SIDE SLOPE  
CLEAN OUT ASS'Y

NOTES:

- ALL DIMENSIONS ARE IN INCHES.
- TOLERANCE ± 1/4"

NO PART OF THIS DOCUMENT MAY BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS, OR STORED IN A DATA BASE OR RETRIEVAL SYSTEM, WITHOUT THE PRIOR WRITTEN PERMISSION OF INDUSTRIAL PIPE FITTING, LLC.

REFERENCE DRAWINGS

DO NOT SCALE DRAWING			


REV	12-12-06
DATE	
BY	
CHECKED	
DATE	
BY	
CHECKED	
DATE	
BY	
CHECKED	
DATE	

**INDUSTRIAL PIPE FITTINGS**  
 8020 OSBORN ST HOUSTON, TEXAS 77033  
 Phone: 713-940-2858 Fax: 713-945-1706

1" - 54" IPS PE BLIND FLANGE LINERS  
 NON-PRESSURE RATED  
 STANDARD PRODUCT DRAWING

SHEET 1 OF 1

# COUPLINGS

1/2" CTS through 28" IPS 

Our Couplings and Fittings deliver flexibility and reliability. No one offers a wider range of coupling sizes and every FRIATEC fitting is ASTM approved.

Short Designation MBI/UBI...0D

Field of Application Connections of PE Pipes 2406 and 3408/4710

Range of Application Gas up to 100 psi and water up to 160 psi

For higher pressure ranges, contact IPEX at 800-463-9572

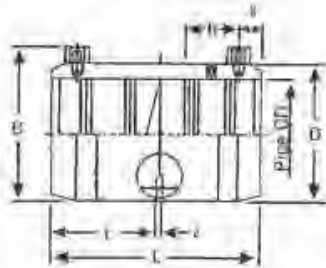


PDF FILE : IPEX ELECTROFUSE

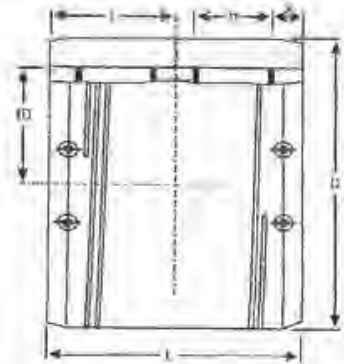
FOR ASS'Y OF ~~PE~~ CLEANOUT  
ASS'Y & DUAL WALL PIPE  
WITH FACTORY FABRICATED LINE  
BOOT IN CELLS AND INSTALLATION  
OF 6" SWING CHECKS & TEE

## ▲ 1/2" CTS through 28" IPS cont'd

1/2" - 6"



8" - 28"



Nominal Pipe	Product	ID	ID	D	E	F	G	H	I	J	K	X	Fusion	Cooling
OD CTS SDR	Code	min	max										Time/Sec @ 73°F	Time/Min **/+/***
1/2"	11	128031	0.622	0.634	1.102	1.732	2.283	1.142	0.079	0.591	0.23		27	05/08/10
1"	11	128027	1.122	1.134	1.654	2.244	3.071	1.535	0.079	0.787	0.31		28	05/08/10

Nominal Pipe	Product	ID	ID	D	E	F	G	H	I	J	K	X	Fusion	Cooling
OD IPS SDR	Code	min	max										Time/Sec @ 73°F	Time/Min **/+/***
3/4"	11	128026	1.047	1.059	1.575	2.165	2.598	1.260	0.079	0.728	0.27		28	05/08/10
1"	11	128024	1.311	1.323	1.850	2.460	3.071	1.496	0.079	0.787	0.31		28	05/08/10
1-1/4"	11	128025	1.654	1.679	2.244	2.835	3.346	1.634	0.079	0.945	0.39		34	10/15/25
1-1/2"	11	128033	1.902	1.917	2.480	3.130	3.858	1.870	0.079	1.060	0.46		34	10/15/25
2"	11	128028	2.374	2.390	3.142	3.657	4.449	2.205	0.079	1.205	0.51		54	10/15/25
3"	11	128029	3.496	3.516	4.606	4.980	5.472	2.717	0.079	1.417	0.59		100	10/30/40
4"	11	128030	4.492	4.516	5.827	6.173	6.260	3.110	0.079	1.689	0.67		151	10/30/40
6"	11	128032	6.610	6.634	8.543	8.740	7.992	3.976	0.079	2.295	0.79		440	20/60/75
8" <sup>max</sup>	11	128060	8.626	8.665	11.029	-	9.448	4.724	-	2.953	1.063		540	20/60/75
8" <sup>min</sup>	11	128023	8.626	8.665	11.022	-	9.448	4.724	-	2.953	1.063		554 ea side	20/60/75
10"	11	128061	10.748	10.787	13.975	-	11.811	5.275	-	3.149	1.063		500 ea side	30/75/100
12"	11	128062	12.748	12.787	15.746	-	11.219	5.610	-	2.679	1.142		550 ea side	30/75/100
14"	11	128064	13.976	14.016	17.716	-	11.811	5.905	-	3.500	1.260		580 ea side	30/75/100
16"	11	128063	15.969	16.008	19.685	-	12.598	6.299	-	3.748	1.260		870/730 ea side	45/95/120
18"	11	128065	17.969	18.008	22.047	-	13.386	6.693	-	3.346	1.260		870/870 ea side	45/95/120
20"	11	128176	19.961	20.016	24.803	-	14.173	7.086	-	3.622	1.260		870/720 ea side	45/95/120
22"	17	128066	21.961	22.016	24.803	-	14.566	7.283	-	3.291	1.260		870/720 ea side	45/95/120
24"	13.5	128067	24.000	24.039	27.952	-	15.748	7.874	-	4.095	1.420		870/850 ea side	45/95/120
28"	17	128068	27.992	28.031	31.496	-	15.748	7.874	-	6.062	1.614		850/850 ea side	60/80/120

FRIATEC Safety Fittings can be fused to all PE pipes within melt index groups 003-050 and pipe SDR range 9.33 through 17.6.

- Pipe can be moved after indicated cooling time (handling)
- \*\* Pipe can be pressurized after indicated cooling time (pressure <90 psi)
- \*\*\* Pipe can be pressurized after indicated cooling time (pressure >90 psi)
- + FM 200 psi, Short Designation: MBL...OD



**INDUSTRIAL PIPE FITTINGS, LLC**  
HOUSTON, TX / CORSICANA, TX / MISSOULA, MT



**Fabricated IPS 2-Segment 22.5 El.**  
ALL M&I ELBOWS 2" - 24" NOW PRODUCED TO  
AWWA C906-99  
PE 4710 AND PE 100 ON REQUEST

Nominal Size Actual Size	Pressure Class (psi)	End Stock	Dimensions R x C x D (in)	Std. Item	Weight per ft. (lbs.)
2"	100	100	15.00 x 2.4 x 4.4	Y	1
	125	100			1
	150	100			1
	200	100			1
3"	125	100	15.00 x 4.4 x 5.0	Y	1
	150	100			2
	200	100			2
	150	100			2
4"	125	100	14.00 x 6.4 x 7.0	Y	2
	150	100			3
	200	100			3
	175	100			3
6"	125	100	15.00 x 8.4 x 9.0	Y	6
	150	100			7
	200	100			8
	100	100			10
8"	125	100	16.00 x 10.4 x 11.0	N	10
	150	100			12
	200	100			15
	100	100			11
10"	100	100	17.00 x 12.4 x 13.0	N	17
	125	100			20
	150	100			24
	200	100			24
12"	80	100	17.00 x 14.4 x 15.0	Y	19
	100	100			26
	125	100			28
	150	100			28
14"	80	100	21.00 x 16.4 x 17.0	Y	29
	100	100			35
	125	100			35
	150	100			31

✓ \*

\* Dimensions are approximate and subject to change. All dimensions are in inches unless otherwise noted. AWWA C900 standard for pipe weight. Drawing No. IPF22EL

Industrial Pipe Fittings, LLC 10700 Chiles, Houston, TX 77036-1875 (713) 666-1100  
Web site: ipffittings.com

PDF FILE: IPF 22 EL  
CLEAN OUT



# IPF

## INDUSTRIAL PIPE FITTINGS

INDUSTRIAL PIPE FITTINGS, LLC | 6020 OSBORN STREET | HOUSTON, TX 77030

TOLL FREE: 800.241.4175 PHONE: 713.645.2858 FAX: 713.645.1754

Home

About Us

Products

Contact Us

### Products - Molded Fittings

#### Product List

#### Municipal/Industrial Fittings

- » Fabricated Municipal/Ind
- » Molded
- » Transition Fittings
- » Custom Fittings
- » Electrofusion

#### Factory Mutual Fittings

#### HDPE Pressure Pipe

- » Straight Lengths
- » Cells

#### Spirolite

- » Spirolite Pipe
- » Spirolite Manholes
- » Odor Control

#### Dual Containment

#### Fusion Equipment

#### Custom HDPE Fittings

#### Structures

#### Butt Fusion Fittings



45 Degree Elbow



3/4 - 6 IPS Sizes

SDR 11 Standard (Others on Request)

PE 3408 in Stock, PE 2406 on Request

Conforms to ASTM D2513

CSA Certified, ISO 9003-1987

PDF FILE! IPF 45EL

FORCE MAIN MODS INTO NEW POWD

Nom. Pipe Size	SDR	Stock	Dim. A	Dim. B	Box Qty	Box Weight	Part Number
3/4	9-11	✓	1.75	3.75	10	2	FS007FH4007EB
1	9-11	✓	1.75	3.75	10	2	FS010GH4010EB
1-1/4	9-11	✓	2.0	4.0	10	3	FS012FH4012EB

1-1/2	9-11	y	2.5	4.5	10	8	FS015FH4015EB
2	9-11	y	3.2	5.0	10	8	FS020FH4020EB
3	9-17	y	3.2	5.5	4	10	FS030FH4030EB
4	9-21	y	3	5	4	12	FS040GH4040EB
6	9-32.5	n	8	10	2	13.5	FS060FH4060EB

website designed by ShakeFX, LLC



**IPF**  
INDUSTRIAL PIPE FITTINGS

INDUSTRIAL PIPE FITTINGS, LLC | 6020 OSBORN STREET | HOUSTON, TX 7703

TOLL FREE: 800.241.4175 PHONE: 713.645.2858 FAX: 713.645.1756

Home About Us Products Contact Us

Products - Molded Fittings

Product List

Municipal/Industrial Fittings

- » Fabricated Municipal/Ind.
- » Molded
- » Transition Fittings
- » Custom Fittings
- » Electrofusion

Factory Mutual Fittings

HDPE Pressure Pipe

- » Straight Lengths
- » Coils

Spirolite

- » Spirolite Pipe
- » Spirolite Manholes
- » Order Control

Dual Containment

Fusion Equipment

Custom HDPE Fittings

Structures

Butt Fusion Fittings



45 Degree Elbow



3/4 - 6 IPS Sizes

SDR 11 Standard (Others on Request)

PE 3408 in Stock, PE 2406 on Request

Conforms to ASTM D2513

CSA Certified, ISO 9003-1987

PDF FILE: IPF 90EL  
FORCE MAIN MODIFICATION

Nom. Pipe Size	SDR	Stock	Dim. A	Dim. B	Box Qty	Box Weight	Part Number
3/4	9-11	y	1.75	3.25	10	2	FS007FH9007EB
1	9-11	y	2.50	3.80	10	2	FS010FH9010EB



1-1/4	9-11	v	2-1/2	4	10	2	FS012FH9012EB
1-1/2	9-11	v	2-7/8	4-1/2	10	3	FS015FH9015EB
2	9-11	v	2-1/2	4	10	3	FS020FH9020EB
3	9-17	v	3	5-1/2	4	3	FS030FH9030EB
4	9-27	v	3	3	3	15	FS040FH9040EB
6	9-32.5	v	4	3	2	12	FS060FH9060EB

website designed by ShakeFX, LLC



# IPF

## INDUSTRIAL PIPE FITTINGS

INDUSTRIAL PIPE FITTINGS, LLC | 6020 OSBORN STREET | HOUSTON, TX 7703

TOLL FREE: 800.241.4175 PHONE: 713.645.2859 FAX: 713.645.1758

[Home](#)

[About Us](#)

[Products](#)

[Contact Us](#)

### Products - Molded Fittings

#### Product List

#### Municipal/Industrial Fittings

- » Fabricated Municipal/Ind
- » Molded
- » Transition Fittings
- » Custom Fittings
- » Electrofusion

#### Factory Mutual Fittings

#### HDPE Pressure Pipe

- » Straight Lengths
- » Coils

#### Spirolite

- » Spirolite Pipe
- » Spirolite Manholes
- » Odor Control

#### Dual Containment

#### Fusion Equipment

#### Custom HDPE Fittings

#### Structures

#### Butt Fusion Fittings



End Caps



1-1/4 to 14 IPS Sizes

SDR 11 Standard (Others Available)

PE 3408 Standard, PE 2406 on Request

Conforms to ASTM D2513

CSA Certified, ISO 9003-1987

PDF FILE : IPFCAP CAP PERFORATED PIPE

Nom. Pipe Size	SDR	Box Qty	Stock	Dim. A	Dim.	Box Weight	Part Number
1-1/4	9-11	10	y	1-7/8	2-1/4	1.2	FS012FHP012EB
1-1/2	9-11	10	y	1-7/8	2-1/4	1.2	FS015FHP015EB
2	9-11	10	y	2-1/4	2-7/8	3	FS020FHP015EB
3	9-17	10	y	3	3-1/4	5	FS030FHP0
4	9-21	10	y	3	4	10	FS040FHP0
6	9-32.5	5	y	2-7/8	4-1/2	12	FS060FHP060EB
8	11-32.5	3	y	2-1/8	4-3/4	6.4	FS080FHP080EB
10	11	3	y	2-1/8	5	6.5	FS100FHP100EB
12	11	2	y	3	5	15.5	FS120FHP120EB
14	11	2	y	3	5	18.5	FS140FHP140EB



# Industrial Pipe Fittings, LLC

## Dual Containment Piping System

*Municipal & Industrial Dual Containment for  
Transporting Environmentally Hazardous Fluids  
Protection Against Environmental Contamination*

### Dual Containment Products

Municipal and industrial dual containment applications demand high quality, high performance and durability to protect the environment, minimize costs, reduce maintenance and provide long-term, trouble-free service. IPF DCS piping products are manufactured from engineered polyethylene materials that provide a balance of properties for strength, toughness, flexibility, wear resistance, chemical resistance and durability. IPF DCS products have excellent hydraulics for low resistance to fluid flows even at high flow velocities, and resilience for outstanding tolerance to pressure surge and water hammer. The preferred joining method for IPF DCS is by simultaneous butt fusion, where the carrier and containment pipe are butt fused at the same time. Properly made heat fusion joints provide leak-tight connections that are as strong as the pipe itself.

Municipal and industrial applications require dual containment to protect the environment when transporting hazardous chemicals to protect piping and fluids against contamination when piping must traverse contaminated areas. IPF DCS Dual Containment piping products are manufactured from polyethylene materials that are engineered to provide balanced properties for strength, toughness, flexibility, wear resistance, chemical resistance and durability to protect against contamination, minimize costs, reduce maintenance and provide long-term, trouble-free service.

IPF DCS provides excellent hydraulics, outstanding tolerance to pressure surge and water hammer, and heat fusion joints that provide zero-leak connections that are as strong as the pipe itself.

### Performance Characteristics

IPF DCS piping products are manufactured from engineered polyethylene piping materials.

- IPF DCS polyethylene materials are PPI Listed with HDPE ratings of 1600 psi at 73°F (11.03 MPa at 23°C) and 800 psi at 140°F (5.52 MPa at 60°C)
- IPF DCS polyethylene materials meet ASTM D 3350 with Cell Classifications 345464C (black) or 345464E (non-black & color).
- IPF DCS polyethylene materials are high-density, extra-high molecular weight

ASTM D 3350 classifies polyethylene pipe material physical properties according to cell values that identify nominal physical property value ranges for density, melt index, flexural modulus, tensile strength at yield, slow crack growth resistance, hydrostatic design basis at 73°F, and color and ultraviolet stabilizer.

#### ASTM D 3350 Cell Classification Descriptions

D-3350 Cell Classification Number	Property, ASTM Standard, units	Range of Typical Values Allowed per ASTM D 3350 Cell Classification Number	Typical Value for HDPE Material
3	Density, D 1505, g/cm <sup>3</sup>	0.941 – 0.955*	0.955 (black)† 0.946 (color)‡
4	Melt Index, D 1238, g/10 min	<0.15	0.1
5	Flexural Modulus, D 790, psi (MPa)	110,000 – 160,000 (758.45 – 1103.20)	133,000 (917.04)

**NOTICE** – this publication is intended for use as a guide to support the designer of piping systems. It is not intended to be used as installation instructions, and should not be used in place of the advice of a professional engineer. Industrial Pipe Fittings, LLC has made every reasonable effort to ensure the accuracy of this publication, but it may not provide all necessary information, particularly with respect to special or unusual applications. This publication may be changed from time to time without notice. Contact Industrial Pipe Fittings, LLC to determine if you have the most current edition.

# Industrial Pipe Fittings, LLC

## Dual Containment Piping System

<i>D 3350 Cell Classification Number</i>	<i>Property, ASTM Standard, Units</i>	<i>Range of Typical Values Allowed per ASTM D 3350 Cell Classification Number</i>	<i>Typical Value for HDPE Material</i>
4	Tensile Strength at Yield, D 638, psi (MPa)	3,000 – 3,500 (20.68 – 24.13)	3,200 (22.06)
5	Slow Crack Growth Resistance, F 1473 (PENT), hours	5 = >100 h PENT	>100 h PENT
4	Hydrostatic Design Basis, D 3350, psi (MPa)	1600 (11.03)	1600 (11.03)
C E	Color & UV Stabilizer, D 3350	C = Min 2% carbon black, E = Color with UV Stabilizer	C = 2-3% carbon Black E = Color with UV Stabilizer

**NOTICE** – This chart provides typical physical property information for polyethylene resins used to manufacture IPF polyethylene piping products. It is intended for comparing polyethylene piping resins. It is not a product specification, and it does not establish minimum or maximum values or manufacturing tolerances for resins or for piping products. These typical physical property values were determined using compression-molded plaques prepared from resin. Values obtained from tests of specimens taken from piping products can vary from these typical values. IPF has made every reasonable effort to ensure the accuracy of this chart, but this chart may not provide all necessary information, particularly with respect to special or unusual applications.

\* The ASTM D 3350 density cell classification is for unpigmented base resin.

† Black density includes carbon black pigmentation.

‡ Color density includes color pigmentation and UV stabilizer.

### SCG (ESCR) Resistance

IPF piping materials are engineered to provide exceptional resistance to cracking from long-term stress. In recent years, new tests have been developed to evaluate the resistance to long-term stress cracking. Preeminent among these new tests is ASTM F 1473, the "PENT" test. Research has shown that this stringent test is an excellent indicator of SCG performance, and further, that there may be an empirical correlation between PENT performance and long-term service. IPF pressure piping materials meet or exceed the highest ASTM D 3350 requirements for ASTM F 1473 slow crack growth resistance, and exceed the highest requirements for ASTM D 1693 ESCR.

### Color and UV Stabilizer

To resist ultraviolet degradation polyethylene materials are compounded with 2-3% carbon black (black) or sacrificial stabilizers (non-black and colors). Carbon black provides protection for extended unprotected outdoor storage and for long-term surface or above grade applications. Color and non-black products are temporarily protected to allow for up to 18 months of unprotected storage. Color and non-black products are intended for underground service, and should not be used for long-term applications on the surface or above grade.

### Chemical Resistance

Very few chemicals will have an effect on IPF DCS piping. Most chemicals, acids, salts and aggressive soils do not attack polyethylene pipe or cause it to degrade. IPF DCS piping does not rust, rot, corrode, or promote or support biological or bacteriological growth. General information on chemical effects is presented with pressure rating information in this bulletin.

Chemicals that may affect the pipe may physically attack and degrade the material (such as strong oxidizers) or may permeate or solvate the pipe wall (such as liquid hydrocarbons). Such chemicals may be unsuitable for transport, or may reduce the pressure rating. Chemical concentration and service temperature may be factors and typically higher concentrations and higher temperatures increase chemical effects.

In some cases, chemically saturated soils may be of concern if the chemicals can permeate the pipe wall and the purity of the fluid in the pipe must be maintained. Liquid hydrocarbon permeation may also reduce pressure rating and may affect future connections to the system.

# Industrial Pipe Fittings, LLC

## Dual Containment Piping System

### I P F DCS Piping Products

The I P F DCS system is a complete system of factory assembled dual-contained pipe and fittings, and components for detecting and monitoring the containment for leakage. System components are intended for field joining using simultaneous butt fusion, where carrier and containment are butt fused in a single joining operation. I P F DCS is a complete system of dual containment pipe, fittings and components. Compatibility with products from other manufacturers, even when those products are assembled using I P F components, cannot be assured. The user should consult with the product manufacturer to verify that products from other manufacturers are suitable for use and compatible with I P F DCS products.

#### Pipe and Fittings

I P F DCS pipe and fittings are factory assembled with the carrier pipe or fitting inside the containment pipe or fitting. Necessary supports are installed on the carrier component before assembly inside the containment, and centralizers are installed and welded in place to ensure that carrier and containment are concentric and locked together for simultaneous butt fusion joining. Supports and centralizers have openings to allow any leakage in the containment to flow to monitoring sites or detection equipment.

Various combinations of carrier and containment pipe sizes are available as shown in the table. Consult Industrial Pipe Fittings for special sizes and constructions.

#### I P F DCS Pipe – Standard Carrier x Containment Configurations

DCS Size	Carrier			Containment Size and Available DR's									
	IPS Size	DR Range	OD In.	IPS Size	OD In.	7.3	9	11	13.5	17	21	26	32.5
1 x 4	1	7.3 - 11	1.315	4	4.500	Y	Y	Y	Y	Y	Y	Y	Y
1-1/4 x 4	1-1/4	7.3 - 13.5	1.660	4	4.500	-	Y	Y	Y	Y	Y	Y	Y
1-1/2 x 4	1-1/2	7.3 - 13.5	1.800	4	4.500	-	-	Y	Y	Y	Y	Y	Y
2 x 4	2	7.3 - 17	2.375	4	4.500	-	-	-	-	Y	Y	Y	Y
2 x 6	2	7.3 - 17	2.375	6	6.625	Y	Y	Y	Y	Y	Y	Y	Y
3 x 6	3	7.3 - 17	3.500	6	6.625	-	-	Y	Y	Y	Y	Y	Y
3 x 8	3	7.3 - 17	3.500	8	8.625	Y	Y	Y	Y	Y	Y	Y	Y
4 x 8	4	7.3 - 21	4.500	8	8.625	-	Y	Y	Y	Y	Y	Y	Y
6 x 10	6	7.3 - 32.5	6.625	10	10.750	-	-	Y	Y	Y	Y	Y	Y
8 x 12	8	7.3 - 32.5	8.625	12	12.750	-	-	-	Y	Y	Y	Y	Y
8 x 14	8	7.3 - 32.5	8.625	14	14.000	-	Y	Y	Y	Y	Y	Y	Y
10 x 16	10	7.3 - 32.5	10.750	16	16.000	-	-	Y	Y	Y	Y	Y	Y
12 x 16	12	7.3 - 32.5	12.750	16	16.000	-	-	-	-	-	-	Y	Y
12 x 18	12	7.3 - 32.5	12.750	18	18.000	-	-	-	Y	Y	Y	Y	Y
14 x 18	14	7.3 - 32.5	14.000	18	18.000	-	-	-	-	-	Y	Y	Y
14 x 20	14	7.3 - 32.5	14.000	20	20.000	-	-	Y	Y	Y	Y	Y	Y
16 x 22	16	7.3 - 32.5	16.000	22	22.000	-	-	-	Y	Y	Y	Y	Y
18 x 24	18	7.3 - 32.5	18.000	24	24.000	-	-	-	Y	Y	Y	Y	Y
20 x 26	20	7.3 - 32.5	20.000	26	26.000	-	-	-	-	Y	Y	Y	Y
22 x 28	22	7.3 - 32.5	22.000	28	28.000	-	-	-	-	Y	Y	Y	Y
24 x 30	24	7.3 - 32.5	24.000	30	30.000	-	-	-	-	Y	Y	Y	Y

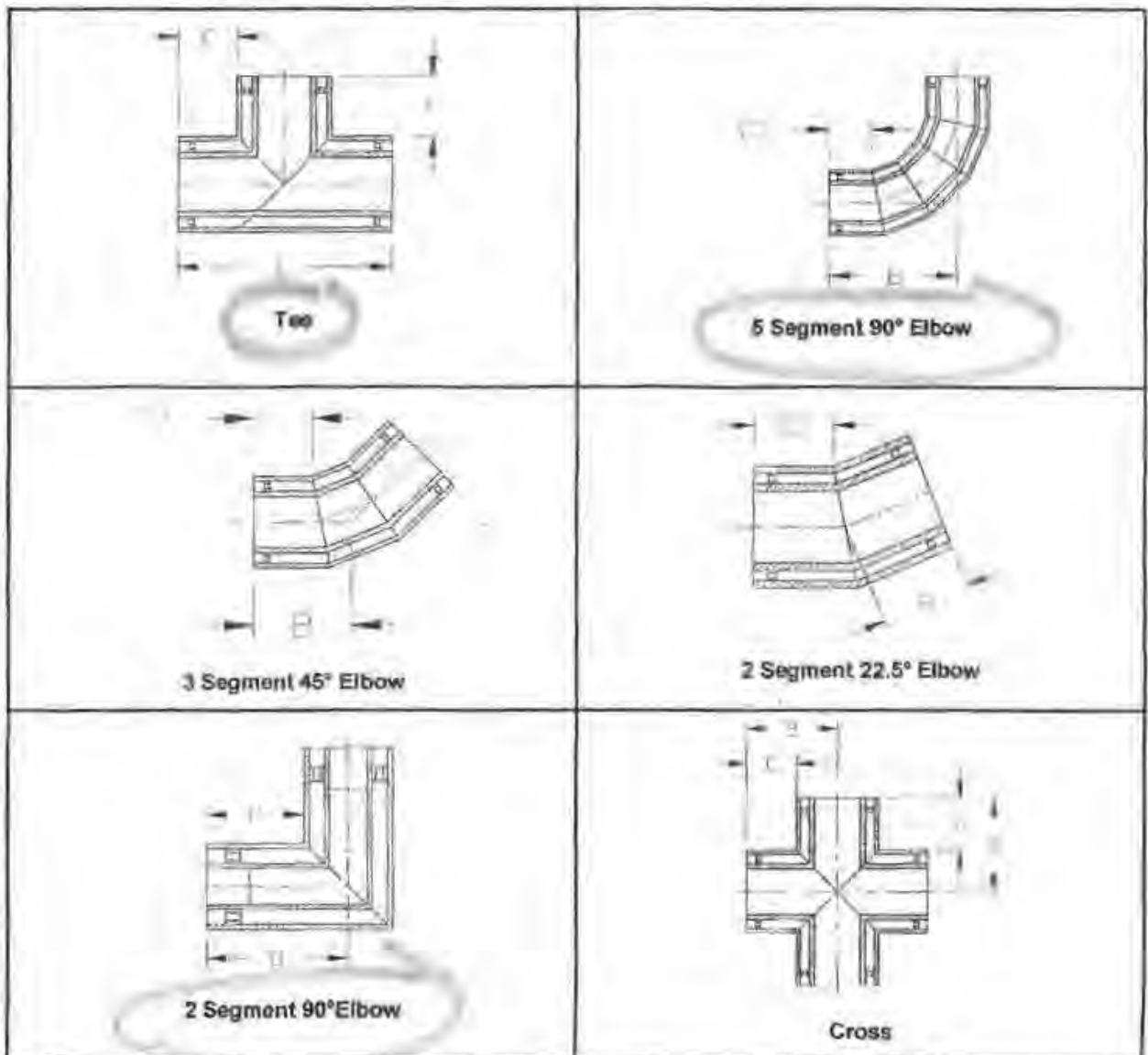
# Industrial Pipe Fittings, LLC

## Dual Containment Piping System

DCS Size	Carrier			Containment Size and Available DR's									
	IPS Size	DR Range	OD In.	IPS Size	OD In.	7.3	9	11	13.5	17	21	26	32.5
26 x 32	26	9 - 32.5	26.000	32	32.000	-	-	-	-	-	Y	Y	Y
28 x 34	28	9 - 32.5	28.000	34	34.000	-	-	-	-	-	Y	Y	Y
30 x 36	30	9 - 32.5	30.000	36	36.000	-	-	-	-	-	Y	Y	Y

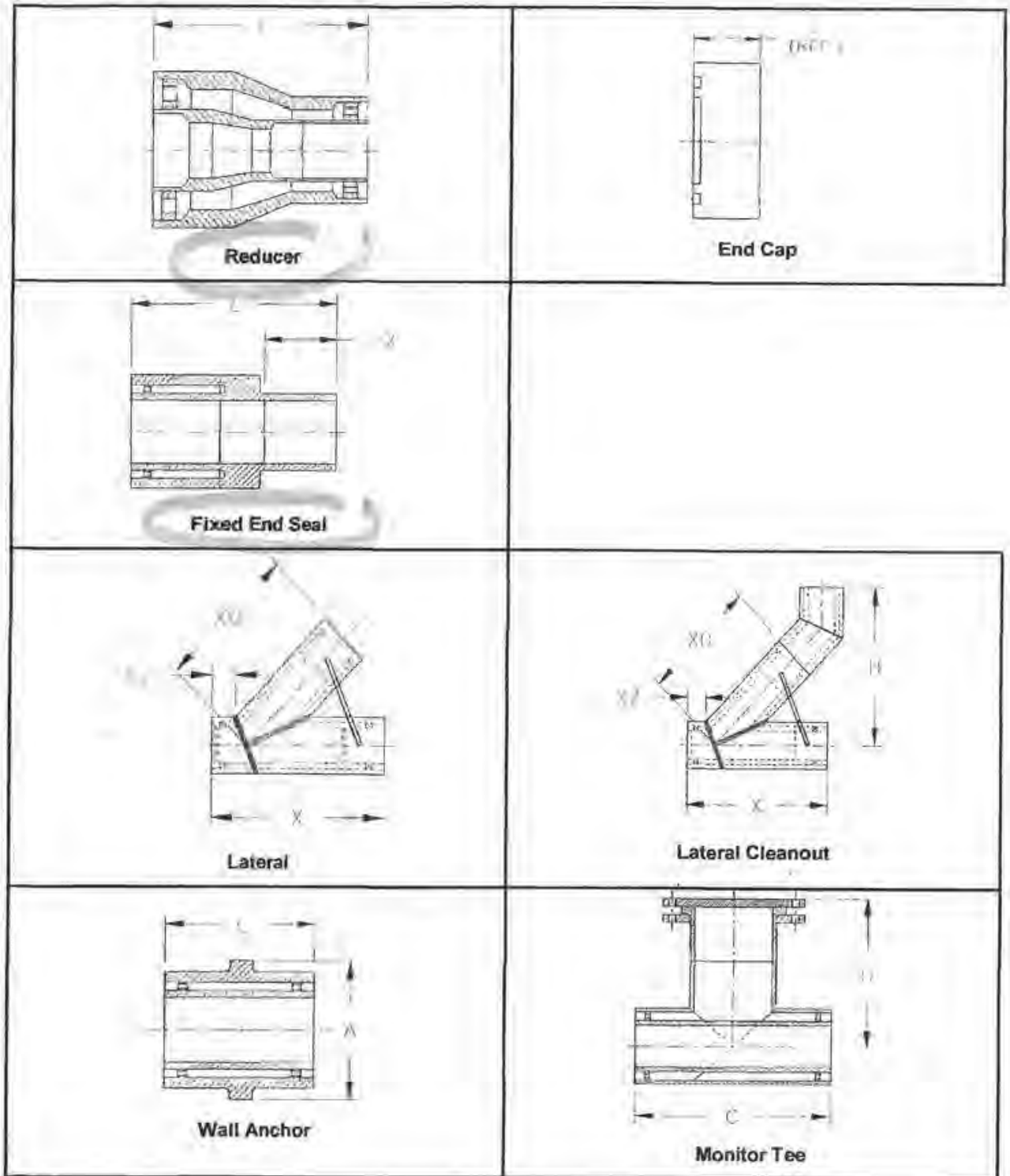
### I P F DCS Fitting, Containment Monitoring and Leak Detection Components

Individual product bulletins provide detailed information on I P F DCS components.



# Industrial Pipe Fittings, LLC

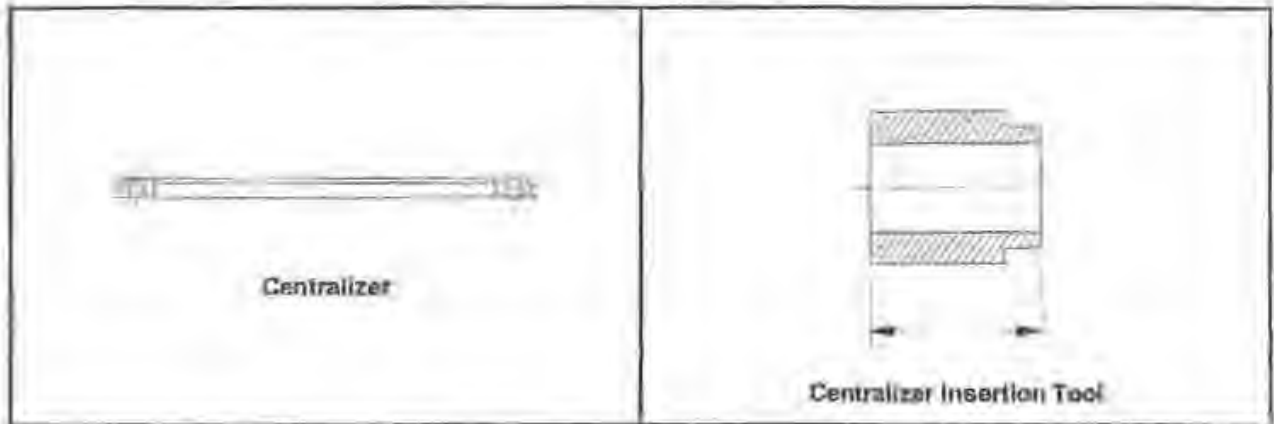
## Dual Containment Piping System





# Industrial Pipe Fittings, LLC

## Dual Containment Piping System



### IPF DCS Design Characteristics

#### *Service Pressure, Temperature and Application Ratings*

IPF DCS carrier and containment pressure service ratings are determined according to the dimension ratio (DR), the fluid being transported, the service temperature, and the surrounding environment.

- Carrier and containment pressure ratings are independent of each other.
- IPF DCS *system* pressure ratings are limited to the pressure rating of the lowest pressure rated component in the system. In many cases, fitting pressure ratings, especially fitting containment pressure ratings will determine system pressure ratings for carrier and containment.
- Carrier pipe pressure ratings are based on water service at 80°F (27°C) or lower using a 0.40 design factor for dual containment piping systems.
- Containment pipe pressure ratings are based on water service at 80°F (27°C) or lower using a 0.50 design factor.

To determine pressure ratings for temperatures above 80°F (27°C) and for applications other than water, multiply the carrier or containment pressure rating from Table A by the appropriate Service Temperature Multiplier from Table B and Service Application Multiplier from Table C. For special or unusual applications contact Industrial Pipe Fittings. Fitting pressure ratings may differ from pipe pressure ratings.

**Table A – IPF DCS Carrier and Containment Pipe Pressure Ratings\* for Water Service at 80°F (27°C)**

<i>Carrier</i>		<i>Containment</i>	
<i>DR</i>	<i>Rating, psi (MPa)</i>	<i>DR</i>	<i>Rating, psi (MPa)</i>
7.3	200 (1.38)	7.3	255 (1.76)
9.0	160 (1.10)	9.0	200 (1.38)
11.0	130 (0.90)	11.0	160 (1.10)
13.5	100 (0.69)	13.5	130 (0.90)
17.0	80 (0.55)	17.0	100 (0.69)
21.0	65 (0.45)	21.0	80 (0.55)
26.0	50 (0.34)	26.0	65 (0.45)
32.5	40 (0.28)	32.5	50 (0.34)

# Industrial Pipe Fittings, LLC

## Dual Containment Piping System

*\* The carrier and containment pressure ratings in this table are for I P F DCS pipe as a component of a dual containment system. System pressure ratings for carrier and containment may be less where pressure ratings for other components of the system are lower.*

**Table B – I P F DCS Carrier and Containment Pipe Service Temperature Multipliers**

80°F (27°C)	90°F (32°C)	100°F (38°C)	110°F (43°C)	120°F (49°C)	130°F (54°C)	140°F (60°C)†
1.00	0.90	0.78	0.75	0.63	0.60	0.50

*† For suitable pressure applications, the maximum carrier pipe service temperature is 140°F (60°C). For suitable non-pressure and gravity flow applications, service temperatures up to 180°F (82°C) are permissible.*

**Table C – I P F DCS Carrier and Containment Pipe Service Application Multipliers for Applications Other Than Water**

Service Application	Multiplier‡
Fluids such as potable and process water, benign chemicals, dry gas (that is not subject to federal regulations for pressure)*, brine, carbon dioxide*, hydrogen sulfide*, wastewater, sewage, glycol/anti-freeze solutions	1.00
Compressed air, oxygen or other oxidizing gases at 73°F (23°C) or lower temperature‡	0.64
Fluids such as solvating or permeating chemicals in pipe or soil (typically liquid hydrocarbons) in 2% or greater concentrations, natural or other fuel-gas liquid condensates, crude oil, fuel oil, gasoline, diesel, kerosene, hydrocarbon fuels.	0.50

‡ At the discretion of the design engineer, lower multipliers may be appropriate for some applications.  
 \* Compressed gas lines must be fully restrained, and protected against mechanical damage by burial or other mechanical means.  
 † For compressed air, oxygen and other oxidizing gases, service life may be reduced and service above 73°F (23°C) is not recommended.

### Pipe Surge Pressures

I P F DCS high-density polyethylene piping has exceptional tolerance for surge pressures such as water hammer. When there is a sudden increase or decrease in water system flow velocity, a pressure surge will occur. Recurrent pressure surges,  $P_{RS}$ , are repetitive surge events that occur frequently such as during pump start-stop operation. Occasional pressure surges,  $P_{OS}$ , are irregularly occurring surges such as a sudden flow change due to firefighting or check valve operation. Surge pressure magnitude corresponds directly to velocity change; greater velocity change produces greater surge pressure. Under all steady pressure conditions, Table A pressure ratings apply. When a surge event occurs, the maximum permissible internal pressure during the surge event is the Table A pressure rating plus the appropriate recurring or occasional surge allowance.

**Pressure Rating, Surge Allowance and Corresponding Sudden Velocity Change for Water at 80 °F (27°C) or Lower**

Pressure Rating, psi	Recurring Surge Events – $P_{RS}$		Occasional Surge Events – $P_{OS}$	
	Surge Allowance, $P_{RS}$ , lb/in <sup>2</sup>	Corresponding Sudden Velocity Change, ft/s	Surge Allowance, $P_{OS}$ , lb/in <sup>2</sup>	Corresponding Sudden Velocity Change, ft/s
80	40	4.0	80	8.0
100	50	4.4	100	8.9
130	65	5.0	130	10.0
160	80	5.6	160	11.1
200	100	6.2	200	12.4

# Industrial Pipe Fittings, LLC

## Dual Containment Piping System

### ***Subfreezing Temperatures***

Water can be frozen solid in polyethylene pipe without damaging the pipe, but an ice plug in the pipe will stop flow. *Do not apply pressure to a frozen line that has an ice plug. Allow ice plugging to thaw before applying pressure to the line. Severe water hammer (such as from an ice plug stopping suddenly at an obstruction) in a frozen, surface or above grade pipeline can shatter the pipeline and flying fragments can cause death, injury or property damage.*

### ***Thermal Expansion and Contraction***

When subjected to a temperature change, unrestrained (not buried) polyethylene pipe will expand or contract. A rule-of-thumb is 1/10/100 – allow about 1" for a 10°F change for each 100 feet of pipe.

Allow piping to stabilize to trench bottom or casing temperature before final tie-in or backfilling. Surface or aboveground installations should be snaked side to side to allow for thermal length change. Restraining anchors may be necessary to maintain the pipeline in the right-of-way.

### ***Flow Resistance***

I P F DCS piping has a hydraulically smooth, non-wetting inside surface. Higher flow capacity and reduced friction loss can result in lower operating costs from reduced pumping costs and reduced maintenance. I P F DCS piping does not rust, rot, corrode, or tuberculate. When combined with outstanding abrasion resistance, I P F DCS piping provides excellent flow properties throughout its service life. For pressure water and wastewater flows, a Hazen-Williams "C" factor of 150-155 is typically used. For gravity flows, a Manning "n" factor of 0.009 is typically used. See the *Industrial Pipe Fittings Engineering Manual* for additional information.

### ***Joining***

I P F DCS pipe and fittings are joined using simultaneous butt fusion and flange connections. Simultaneous butt fusion joins carrier to carrier and containment to containment in a single operation. When properly made, heat fusion joints are reliable, leak-free, and fully restrained. See PPI TR-33 for recommended butt fusion joining procedures. PPI Bulletin TR-33 is available on their website at [www.plasticpipe.org](http://www.plasticpipe.org).

When determining fusion joining pressure for hydraulic butt fusion equipment, use the equipment manufacturer's recommended procedure to determine fusion joining pressure for the carrier, and then for the containment, and then add the two pressures together.

## **Installation**

*Observe safe handling and construction practices at all times. Observe all applicable local, state, and federal codes and regulations, and all safety requirements specified by the owner, owner's representative or project engineer.*

I P F DCS piping products for M & I applications may be directly buried, directionally drilled, pulled-in, submerged, laid on the surface, or suspended. *Pull-in type installations (such as directional drilling) are limited to butt-fused I P F DCS pipes and the pulling force on the pipe should not be allowed to exceed the allowable tensile load (ATL) for the containment pipe. A weak link or break-away device at the pulling head is necessary whenever pulling equipment can generate pulling forces that exceed the ATL for the containment pipe. During the pull, both ends of the pull should be monitored for constant motion. For ATL information, see ASTM F 1804 Standard Practice for Determining Allowable Tensile Load for Polyethylene (PE) Gas Pipe During Pull-In Installation. Pulling heads should be designed for the type of pull-in installation. I P F does not offer pulling head products.*

### ***Direct Burial***

For subsurface installations, I P F DCS piping is installed using flexible pipe/soil system design practices. Flexible I P F pipe acts together with the embedment and the surrounding soil to support earthloads and live loads above the pipe, thus the selection of embedment soils and their placement around the pipe are very important. At

# Industrial Pipe Fittings, LLC

## Dual Containment Piping System

normal burial depths, installation and embedment for non-pressure containment should be in accordance with ASTM D 2321, *Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and other Gravity Flow Applications*; and in accordance with ASTM D 2774, *Standard Practice for Underground Installation of Thermoplastic Pressure Piping*, for pressure containment. Special burial design may be required for greater depths and in special or unusual soil conditions.

### Trench Construction and Terms



### Minimum Trench Width

Nominal Pipe OD, in	Minimum Trench Width, in	Clearance Between Parallel Pipes, in
< 3	12	4
3 – 16	Pipe OD + 12	6
> 16 – 34	Pipe OD + 18	9
> 34 – 63	Pipe OD + 24	12
> 63	Pipe OD + 36	18

IPFDCS pipes can be simultaneously butt fused on the surface into long lengths, thus narrow trench widths and minimal open trench length can be used to reduce installation costs.

The recommended cold bending radius for field installations is 100 times the containment pipe OD or greater. If adequate space is not available for the minimum bending radius, a fitting of the desired angle may be fused into the system to obtain the necessary change in direction. When the containment is 16" IPS and larger, IPFDCS fabricated fittings require special care during handling and installation to prevent breakage and damage.

### **Directional Drilling**

IPFDCS polyethylene piping is a material of choice for trenchless installation such as horizontal directional drilling. Flexibility, fused joints that are as strong as the pipe and excellent tensile strength make it well suited for HDD applications where it is necessary to install piping under obstacles such as rivers, lakes or highways.

Horizontal directional drilling is a subsurface installation technique that involves pulling the pipe into a prepared borehole. Horizontal directional drilling uses a surface-mounted rig, first to drill a guided hole along a shallow arc bore path, then to pull a string of pipe back into the borehole. Pullback is facilitated by a back-reamer that enlarges the hole. A drilling fluid (drilling mud) is injected into the borehole to stabilize the borehole and to lubricate the drill string and the pipe. Tracking equipment is used to guide and direct drilling. Horizontal directional drilling can be very cost effective for river, lake and reservoir crossings and where existing subsurface utilities and obstructions raise the cost of open-cut trenching. Existing subsurface obstructions must be accurately located before installation.

As the hole is bored, a steel drill string is extended behind a cutting head. Drilling mud is used to cool the cutter, to flush excavated soil from the borehole and to lubricate the borehole. At the end of the borepath, the drill string is angled upwards and through the surface. The cutting head is removed and a backreamer attached. The pipe string is attached to the backreamer. As the drill string is withdrawn to the drilling rig, the backreamer enlarges the borehole and the pipe string is drawn in. As with any pipe pulling technique, the movement of the drill string and the pipe string must be monitored, and the pulling load on the polyethylene pipe must not exceed the allowable tensile load, or safe pull strength, of the containment pipe. A weak-link device is necessary between the pipe and the pull string when pulling equipment can exceed the allowable tensile load (ATL) of the containment pipe.

# Industrial Pipe Fittings, LLC

## Dual Containment Piping System

Horizontal directional drilling is most often used where open cut installations are not feasible such as road and river crossings. For road or driveway crossings, this method can often be more economical than open cut because surface restoration is reduced and there is less traffic disruption.

### ***Submerged***

I P F DCS piping can be installed as a submerged line. Its flexibility, butt-fused joints and corrosion resistance make it an excellent choice for submerged installations. I P F piping is lightweight and requires anti-flotation ballast, weights or anchors. Submerged crossings with I P F piping can often be an economical alternative to traditional pipe materials or other installation methods.

### **Fluid Flows**

The inside surface of I P F DCS polyethylene pipe is both hydraulically smooth and non-wetting. To estimate gravity flows using the Manning equation, a Manning roughness coefficient of 0.009 is used.

Pressure flows of water and water-like fluids may be estimated with the Hazen-Williams formula. Values of the Hazen-Williams C-factor range from 150 to 160 for I P F polyethylene pipe with values from 150 to 155 being used for conservative flow estimates. For fluid flow estimates using Darcy-Weisbach, Colebrook and Moody methods, an absolute roughness of  $7 \times 10^{-5}$  ft is recommended.

### **Cautions and Notices**

Polyethylene piping has been safely used in thousands of applications. In addition to the general handling, installation, construction and operating safety precautions that should be observed when using any product including piping products, below are some precautions that should be observed when using I P F piping products. Local, state and federal codes and regulations may also apply.

#### ***Fusion***

During the heat fusion process the equipment and products can reach temperatures in excess of 450°F (231°C). Caution should be taken to prevent burns.

Do not bend pipes into alignment against open butt fusion machine clamps. The pipe may spring out and cause injury or damage.

#### ***Weight, Unloading and Handling***

Although polyethylene pipe is not as heavy as some other piping products, significant weight may be involved. Exercise care when handling and working around polyethylene pipe.

Polyethylene piping is a tough, robust material, but it is not immune to damage. Improper handling or abuse can damage piping and compromise system quality or performance or cause injury or damage.

***WARNING – Obtain and observe the pipe unloading instructions provided by the delivery driver.***

I P F DCS piping should be handled only with proper handling and lifting equipment that has been checked before use to ensure adequate capacity and safe condition. Use lifting equipment with spreader bars having fabric slings spaced 15-20 feet apart, or fork lift forks should be of sufficient depth, padded and spread 15-20 feet apart. Do not use chains or wire rope. Do not push, roll or drop pipe off the truck, or drag piping. Unload and store I P F DCS products on level terrain and so that the potential for mechanical damage is minimized. See the unloading instructions provided by the delivery driver.

While polyethylene piping has excellent impact resistance, striking the pipe with an instrument such as a hammer may result in uncontrolled rebound. Do not stand or walk on polyethylene pipe, especially when the pipe is damp.

#### ***Testing***

When testing is required, observe all safety measures, restrain pipe against movement in the event of catastrophic failure, and observe limitations of temperature, test pressure, test duration and making repair.

# Industrial Pipe Fittings, LLC

## Dual Containment Piping System

*The carrier pipe must be pressurized when testing the containment, and the containment test pressure must not exceed the internal pressure applied to the carrier or the containment pressure rating of the lowest pressure rated component containment, whichever is less.*

### **Protection Against Shear and Bending Loads**

Measures such as properly placed, compacted backfill, protective sleeves and structural supports are necessary to protect plastic pipe against shear and bending loads. Connections should be protected where an underground polyethylene branch or service pipe is joined to a branch fitting such as a service saddle, branch saddle or tapping tee on a main pipe, and where pipes enter or exit casings or walls. Properly placed, compacted backfill and a protective sleeve or a structural support are generally used together, but whether or not a protective sleeve or a structural support is installed, the area surrounding the connection must be embedded in properly placed, compacted backfill to protect the polyethylene pipe against shear and bending loads.

Information about protecting against shear and bending loads at service or branch connections and where PE pipe penetrates a structure or enters or exits a casing can be found in the PPI Handbook of Polyethylene Pipe and ASTM D 2774 *Underground Installation of Thermoplastic Pressure Piping*.

### **Liquid Hydrocarbon Permeation**

When present, liquid hydrocarbons may permeate (solvate) polyethylene pipe. Liquid hydrocarbon permeation may occur when liquid hydrocarbons are present in the pipe, or where soil surrounding the pipe is contaminated with liquid hydrocarbons. All types of liquid hydrocarbons (aromatic, paraffinic, etc.) have a similar effect, and the relative effect on different polyethylene pipe resins is essentially the same. Heat fusion joining to liquid hydrocarbon permeated pipes may result in a low strength joint.

*CAUTION — Once polyethylene pipe has been permeated with liquid hydrocarbons, heat fusion or electrofusion joining is not recommended because liquid hydrocarbons can leach out during heating and contaminate the joint. Liquid hydrocarbon permeated polyethylene pipe should be joined using suitable mechanical connection methods.*

Liquid hydrocarbon contamination is indicated by a rough, sandpaper-like, bubbly, or pockmarked surface when a fusion heating iron is removed from the pipe surface, and may be indicated by discoloration or by a hydrocarbon fuel odor.

*Mechanical fittings must be installed in accordance with the fitting manufacturer's instructions. Obtain these instructions from the fitting manufacturer.*

### **Locating**

Most polyethylene materials are not detectable with standard magnetic locating equipment. To aid in the detection of underground PE piping, measures such as tracer wires, identification and detection tapes, line markers, electronic marker systems, acoustic pipe tracing, and "call before you dig" line location measures may be used. When installing PE piping, the method or methods for future pipeline detection should be considered. Where posted signs are used, the signs should indicate that the pipeline is polyethylene to alert locating personnel that the pipeline may not be detectable with standard locating equipment. Utilities in the area should always be contacted before the start of any underground installation work such as excavation, trenching, directional boring, etc.

# IPF

## INDUSTRIAL PIPE FITTINGS

INDUSTRIAL PIPE FITTINGS, LLC | 6020 OSBORN STREET | HOUSTON, TX 77030

TOLL FREE: 800.241.4175 PHONE: 713.645.2858 FAX: 713.645.1758

Home

About Us

Products

Contact Us

### Products - Molded Fittings

#### Product List

##### Municipal/Industrial Fittings

- » Fabricated Municipal/Ind
- » Molded
- » Transition Fittings
- » Custom Fittings
- » Electrofusion

##### Factory Mutual Fittings

##### HDPE Pressure Pipe

- » Straight Lengths
- » Coils

##### Spirolite

- » Spirolite Pipe
- » Spirolite Manholes
- » Odor Control

##### Dual Containment

##### Fusion Equipment

##### Custom HDPE Fittings

##### Structures

#### Butt Fusion Fittings



Tee



3/4 - 6 IPS Sizes

SDR 11 Standard (Others on Request)

PE 3408 in Stock, PE 2406 on Request

Conforms to ASTM D2513

CSA Certified, ISO 9003-1987

PDF! FILE : IPF TEE SWING CHECK  
FORCED MAIN MODIFICATION

Nom. Pipe Size	SDR	Stock	Dim. A	Dim. B	Dim. L	Box Qty	Box Weight	Part Number
3/4	9-11	y	DOR	DOR	DOR	10	DOR	FS007FHT007EB
1	9-11	y	DOR	DOR	DOR	10	DOR	FS010FHT010EB
1-1/4	9-11	y	2-1/2	4	8	10	5	FS012FHT012EB
1-1/2	9-11	y	2-7/8	4	8-1/2	10	6.2	FS015FHT015EB

2	9-11	v	2-1/2	4-1/4	8-1/2	10	10	FS020FHT020EB
3	9-17	v	3	5-3/4	11-3/8	4	8.8	FS030FHT030EB
4	9-21	v	5	6-1/4	12-1/4	4	15.2	FS040FHT040EB
6	9-32.5	n	6	8-1/4	16-1/4	4	10	FS060FHT060EB

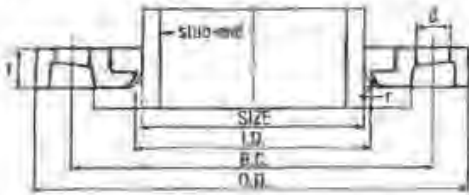


website designed by ShakeFX, LLC



## BUP-SDR

### Convolute Flange/Backup Ring



- **Description** Utilizes the patented IPP Deltaflex® flange cross section.
- **Utilization** HDPE and PP thermoplastic piping systems.
- **Materials** Ductile iron, ASTM A536-84. ✓
- **Dimensions** Mate with all 150 lb flanges, ANSI B16.5, B16.47, B16.1 AWWA C207. ✓
- **Finish** Red oxide primed, hot dip galvanized, epoxy coated. ✓

Pipe Diameter	IPP Product Code	Outside Dia. O.D.	Flange Thickness T	Inside Dia. I.D.	Bolt Count N	Dia. Bolt Hole B.D.	Bolt Circle B.C.	Radius r	Weight lbs/pc	Operating <sup>1</sup> Pressure
1/2"	BUP-SDR7-0050C	3.50	0.50	0.90	4	0.63	2.36	0.13	1.0	267
3/4"	BUP-SDR7-0075C	3.88	0.50	1.11	4	0.63	2.75	0.13	1.0	267
1"	BUP-SDR7-01C	4.25	0.56	1.36	4	0.63	3.13	0.13	1.0	267
1 1/4"	BUP-SDR7-0125C	4.63	0.63	1.72	4	0.63	3.50	0.19	2.0	267
1 1/2"	BUP-SDR7-0150C	5.00	0.69	1.97	4	0.63	3.88	0.25	2.0	267
2"	BUP-SDR7-02C	6.00	0.75	2.46	4	0.75	4.75	0.31	3.0	267
2"	BUP-SDR11-02B	6.00	0.50	2.63	4	0.75	4.75	0.20	1.5	160
2 1/2"	BUP-SDR7-0250C	7.00	0.88	2.97	4	0.75	5.50	0.31	4.0	267
3"	BUP-SDR7-03C	7.50	0.94	3.60	4	0.75	6.00	0.40	4.0	267
3"	BUP-SDR11-03B	7.50	0.53	3.75	4	0.75	6.00	0.28	2.5	160
4"	BUP-SDR7-04C	9.00	0.94	4.60	8	0.75	7.50	0.40	5.5	267
4"	BUP-SDR11-04B	9.00	0.55	4.75	8	0.75	7.50	0.28	3.5	160
5"	BUP-SDR7-05C	10.00	0.94	5.68	8	0.88	8.50	0.44	6.0	267
6"	BUP-SDR7-06C	11.00	1.00	6.75	8	0.88	9.50	0.40	7.0	267
6"	BUP-SDR11-06B	11.00	0.63	6.88	8	0.88	9.50	0.28	4.5	160
8"	BUP-SDR7-08C	13.50	1.12	8.75	8	0.88	11.75	0.40	11.0	267
8"	BUP-SDR11-08B	13.50	0.65	8.68	8	0.88	11.75	0.28	8.0	160
10"	BUP-SDR7-10C	16.00	1.19	10.92	12	1.00	14.25	0.40	16.0	267
10"	BUP-SDR11-10B	16.00	0.98	11.00	12	1.00	14.25	0.31	12.0	160
12"	BUP-SDR7-12C	19.00	1.50	12.92	12	1.00	17.00	0.40	23.0	267
12"	BUP-SDR9.3-12B	19.00	1.25	13.13	12	1.00	17.00	0.31	22.0	192
12"	BUP-SDR11-12B	19.00	1.25	13.13	12	1.00	17.00	0.28	20.0	160
14"	BUP-SDR7-14C	21.00	1.63	14.18	12	1.13	18.75	0.40	37.0	267
14"	BUP-SDR11-14B	21.00	1.38	14.38	12	1.13	18.75	0.31	30.0	160
16"	BUP-SDR7-16C	23.50	1.88	16.19	16	1.13	21.25	0.40	49.0	267

<sup>1</sup> Operating pressure on an HDPE slub-end with a safety factor of 2.  
Continued for sizes 16" through 55" on pg. 12

PDF FILE: IPP BACK UP RING

FORCE SWING CHECKS ASS'Y

FORCE MAIN MOD'S  
CLEAN OUT ASS'Y



## High Density Polyethylene Flange Adapters

Property	Test Method	Unit	Nominal Value
Density	ASTM D 1505	Gm/cm <sup>3</sup>	.955
Melt Index	ASTM D 1238 (Condition E)	Gm/10min	.11
ESCR	ASTM D 1693	F <sub>O<sub>2</sub></sub> Hours	>5000
Flexural Modulus	ASTM D 790	Psi	135,000
Tensile Strength	ASTM D 638	Psi	3,200
HDB@73.4° F	ASTM D 2837	Psi	1,600
UV Stabilizer	ASTM D 1603	%C	>2
Hardness	ASTM D 2240	Shore "D"	65
Tensile Strength @ Yield (Type IV Spec.)	ASTM D 638 (2"/min)	Psi	3,200
Tensile Strength @ Break (Type IV Spec.)	ASTM D 638	Psi	5,000
Elongation @ Break	ASTM D 638	%, minimum	750
Modulus of Elasticity	ASTM D 638	Psi	130,000
Linear Thermal Expansion Coefficient	ASTM D 696	In/in/° F	1.2x10 <sup>-4</sup>
Thermal Conductivity	ASTM D 177	BTU-IN/ft <sup>2</sup> /hrs/° F	2.7
Brittleness Temperature	ASTM D 746	° F	<-180
Heat Fusion Condition	-	Psi@° F	75@400°

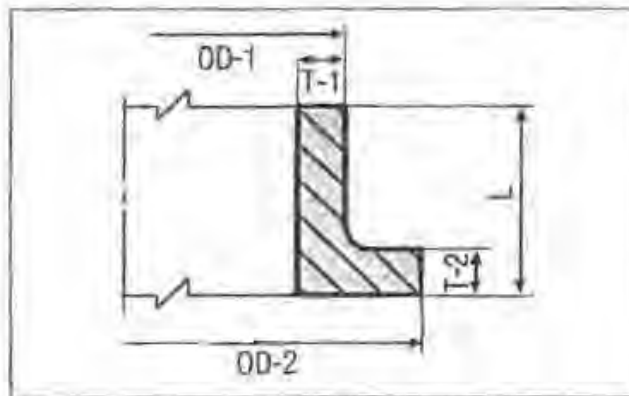
Specifications		
Material Designation	PPI	PE3408 ✓
Cell Classification	ASTM D 3350	345434C ✓

PDF FILE : IPP FLANGE ADAPTER

FORCE MAIN MOD'S  
CLEAN OUT ASS'Y

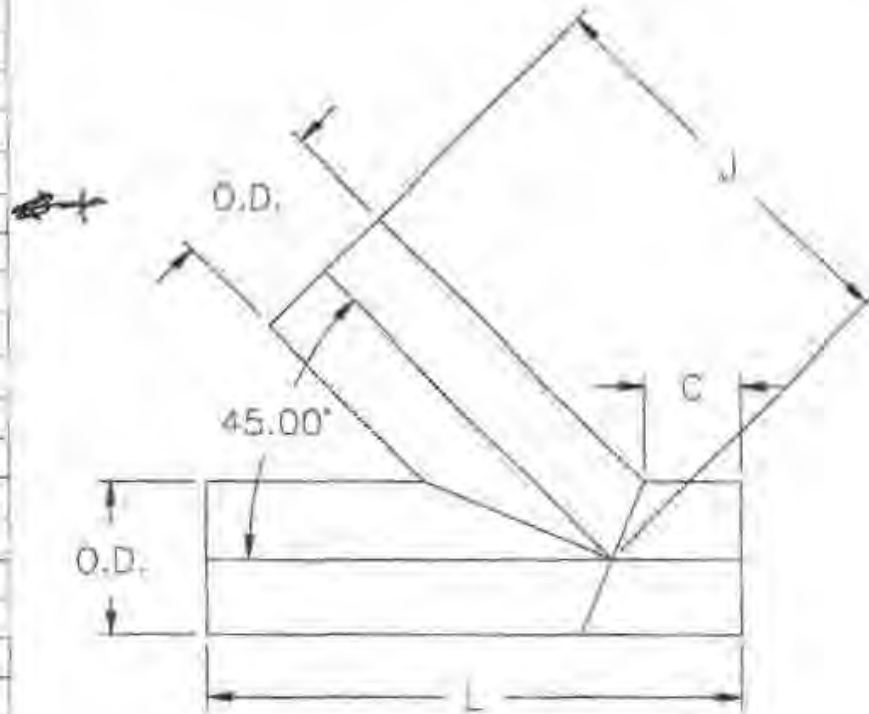
Dimensions (inches) for High Density Polyethylene Flange Adaptors

Pipe Size (Inch)	SDR	Product Code	OD-1	T-1	L	OD-2	T-2	Weight (Lbs)
2"	11	PESE-SDR11-02	2.37	0.22	5.98	4.00	0.40	0.5
2"	17	PESE-SDR17-02	2.37	0.14	5.98	4.00	0.40	0.5
3"	11	PESE-SDR11-03	3.50	0.32	5.98	5.00	0.60	1.0
3"	17	PESE-SDR17-03	3.50	0.20	5.98	5.00	0.60	1.0
4"	11	PESE-SDR11-04	4.50	0.41	5.98	6.60	0.80	2.0
4"	17	PESE-SDR17-04	4.50	0.26	5.98	6.60	0.80	1.0
6"	11	PESE-SDR11-06	6.63	0.60	7.99	8.50	0.80	4.0
6"	17	PESE-SDR17-06	6.63	0.39	7.99	8.50	0.80	3.0
8"	11	PESE-SDR11-08	8.63	0.76	9.02	10.60	0.80	7.0
8"	17	PESE-SDR17-08	8.63	0.51	9.02	10.60	0.80	5.0
10"	11	PESE-SDR11-10	10.75	0.98	9.02	12.80	1.30	11.0
10"	17	PESE-SDR17-10	10.75	0.63	9.02	12.80	0.90	8.0
12"	11	PESE-SDR11-12	12.75	1.16	10.79	15.00	1.50	19.0
12"	17	PESE-SDR17-12	12.75	0.75	10.79	15.00	1.00	12.0
14"	11	PESE-SDR11-14	14.00	1.27	11.00	17.50	1.70	25.0
14"	17	PESE-SDR17-14	14.00	0.82	11.00	17.50	1.10	16.0
16"	11	PESE-SDR11-16	16.00	1.45	12.00	20.00	1.90	35.0
16"	17	PESE-SDR17-16	16.00	0.94	12.00	20.00	1.20	23.0
18"	11	PESE-SDR11-18	18.00	1.64	12.00	21.10	2.10	42.0
18"	17	PESE-SDR17-18	18.00	1.06	12.00	21.10	1.40	28.0
20"	11	PESE-SDR11-20	20.00	1.82	12.00	23.50	2.30	53.0
20"	17	PESE-SDR17-20	20.00	1.18	12.00	23.50	1.50	36.0
22"	11	PESE-SDR11-22	22.00	2.00	12.00	25.60	2.50	65.0
22"	17	PESE-SDR17-22	22.00	1.29	12.00	25.60	1.60	43.0
24"	11	PESE-SDR11-24	24.00	2.18	14.00	27.90	2.90	90.0
24"	17	PESE-SDR17-24	24.00	1.41	14.00	27.90	1.80	59.0



**DIMENSIONS (INCHES)**

IPS SIZE	OD	C	L	J
2	2 3/8	4	21 3/8	16 7/8
3	3 1/2	4	23	18 1/4
4	4 1/2	4	24 3/8	19 3/8
6	6 5/8	6	31 3/8	24
8	8 5/8	8	36 1/4	26 3/8
10	10 3/4	8	41 1/4	31
12	12 3/4	8	44	33 3/8
14	14	8	54 3/4	43 7/8
16	16	10 1/2	61 5/8	47 7/8
18	18	10 1/2	63 1/2	49 1/4
20	20	12	70 1/4	54 1/8
22	22	12	72 1/8	55 1/2
24	24	12	70	53
26	26	18	96 3/4	73 3/8
28	28	18	98 5/8	74 3/4
30	30	18	100 3/8	76 1/4
32	32	18	102 1/4	77 5/8
34	34	18	104 1/8	79
36	36	30	129 7/8	92 1/2



**NOTES:**

1.) ALL DIMENSIONS ARE IN INCHES.

NO PART OF THIS DOCUMENT MAY BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS, OR STORED IN A DATA BASE OR RETRIEVAL SYSTEM, WITHOUT THE PRIOR WRITTEN PERMISSION OF INDUSTRIAL PIPE FITTING, LLC.

**REFERENCE DRAWINGS**

NO.	DESCRIPTION	DATE

**INDUSTRIAL PIPE FITTINGS**

DESIGNED BY: HOUSTON, TEXAS 77033  
 PHONE: 713-645-2600  
 FAX: 713-645-1752

2" - 36" IPS  
 DR 11 - DR 32.5  
 BUTT FABRICATED 45° MATERIALS  
 SUBMITTAL PRODUCT DRAWING

DWG. NO. LAT 708847

PDF FILE: LAT 708847 SUBMITTAL-MODEL  
 CLEAN OUT ASS'Y  
 DR 11

# INDUSTRIAL SWING CHECK VALVES



## Sample Engineering Specification

All thermoplastic check valves shall be flanged Swing Check type constructed from PVC Type I, ASTM D 1784 Cell Classification 12454 or CPVC Type IV, ASTM D 1784 Cell Classification 23447, or Polypropylene, ASTM D 4101. All O-rings shall be EPDM or Viton<sup>®</sup>. All valves components shall be replaceable. All valves shall have top-entry access with O-ring sealed drain plug for in-line servicing. All valves shall have optional external Arrow Position Indicator or optional external Counter Balance. All 3/4"-4" valves shall be pressure rated to 150 psi, all 6" valves to 100 psi, and all 8" valves to 70 psi for water at 73°F, as manufactured by Spears<sup>®</sup> Manufacturing Company.

## Quick-View Valve Selection Chart

Valve Size	O-ring Material	Part Number <sup>1,2,3</sup>	Pressure Rating
3/4"	EPDM	4423-007	150 psi Non-Shock Water @ 73°F
	Viton <sup>®</sup>	4433-007	
1"	EPDM	4423-010	
	Viton <sup>®</sup>	4433-010	
1-1/4"	EPDM	4423-012	
	Viton <sup>®</sup>	4433-012	
1-1/2"	EPDM	4423-015	
	Viton <sup>®</sup>	4433-015	
2"	EPDM	4423-020	
	Viton <sup>®</sup>	4433-020	
2-1/2"	EPDM	4423-025	
	Viton <sup>®</sup>	4433-025	
3"	EPDM	4423-030	
	Viton <sup>®</sup>	4433-030	
4"	EPDM	4423-040	
	Viton <sup>®</sup>	4433-040	
6"	EPDM	4423-080	100 psi @ 73°F
	Viton <sup>®</sup>	4433-080	
8"	EPDM	4423-080	70 psi @ 73°F
	Viton <sup>®</sup>	4433-080	



- For CPVC valves, add the letter "C" to part numbers listed (e.g. 4423-025C).
- For valves with Arrow Position Indicator, add the letter "I" before the dash separator (e.g. 4433-025I).
- For Polypropylene valves, add the letter "P" to the part number (e.g. 4423-025P).

## Features – PVC, CPVC & PP

Designed for optimum flow, quick response and positive shutoff with minimum turbulence, this industrial grade Swing Check Valve is used in a variety of industrial and chemical processing applications where high volume fluid transfer is required. Suitable for horizontal or up-flow vertical applications. Available in PVC, CPVC and Glass Filled Polypropylene, IPS 3/4" - 8" with Flanged Body.

Engineered for Quick Response, Full-Flow Fluid Transfer

- Heavy Bodied All-Plastic Interior Construction
- Top Access & O-ring Sealed Drain Plug for In-line Servicing
- Standard O-ring type Seat & Seals in EPDM or Viton<sup>®</sup>
- Sizes 3/4" - 4" Pressure Rated to 150 psi @ 73°F, 6" Pressure Rated to 100 psi and 8" to 70 psi @ 73°F
- Stainless Steel External Hardware
- Fully Serviceable, Replaceable Components
- Suitable for Vacuum Service
- Assembled with Silicone-Free, Water Soluble Lubricants

## Options & Accessories

- External Arrow Position Indicator<sup>1</sup>
- External Counter Balance<sup>1</sup>
- Natural Polypropylene Body

<sup>1</sup> Available as dependent option or kit for inline valve.

**General Installation Information:** Industrial Swing check valves are designed for horizontal installations, but may be installed in up-flow only vertical position. Check valves **MUST** be installed with the valves FLOW arrow pointing in the direction of flow. Do not install valve upside down. Normal flange-bolt assembly in top holes of the valve flange requires bolt insertion through the companion flange with nuts secured on Swing Check flange side. Certain system configurations involving direct connection of a Swing Check Valve to other flanged equipment may require consideration of this bolt clearance.

PDF FILE: SPEARS-INDUSTRIAL SWING CHECK VALVE

SUBSTITUTE FOR  
ASHI SWING  
CHECK

# INDUSTRIAL SWING CHECK VALVES



## Temperature Pressure Rating

System Operating Temperature: °F (°C)		100 (38)	110 (43)	120 (49)	130 (54)	140 (60)	150 (66)	160 (71)	170 (77)	180 (82)	190 (88)	200 (93)	210 (99)	
Valve Pressure Rating psi (MPa)	3/4" - 4"	PVC	150 (.03)	135 (.93)	110 (.76)	75 (.52)	50 (.34)	0	0	0	0	0	0	0
		CPVC	150 (.03)	140 (.97)	130 (.90)	120 (.83)	110 (.76)	100 (.70)	90 (.62)	80 (.55)	70 (.48)	60 (.41)	50 (.34)	0
		PP	150 (.03)	105 (.72)	90 (.62)	80 (.55)	75 (.52)	65 (.45)	55 (.39)	50 (.34)	45 (.31)	0	0	0
	6"	PVC	100 (.70)	90 (.62)	80 (.55)	65 (.45)	50 (.34)	0	0	0	0	0	0	0
		CPVC	100 (.70)	90 (.62)	80 (.55)	65 (.45)	50 (.34)	75 (.52)	70 (.48)	65 (.45)	60 (.41)	55 (.38)	50 (.34)	0
		PP	100 (.70)	90 (.62)	85 (.59)	75 (.52)	70 (.48)	60 (.41)	55 (.38)	50 (.34)	45 (.31)	0	0	0
	8"	PVC	70 (.48)	65 (.45)	60 (.41)	50 (.34)	45 (.31)	0	0	0	0	0	0	0
		CPVC	70 (.48)	65 (.45)	62 (.43)	60 (.41)	57 (.39)	55 (.38)	52 (.36)	50 (.34)	45 (.31)	42 (.29)	40 (.28)	0
		PP	70 (.48)	60 (.41)	57 (.39)	55 (.38)	52 (.36)	50 (.34)	47 (.32)	45 (.31)	40 (.28)	0	0	0

## Arrow Position Indicator Kit

Spears® Swing Check Valve Indicator Kit is designed for field installation of external indicator Arrow in Spears® Swing Check Valves. This kit can be installed through the bonnet assembly and removal of valve from line is not required.

### Kit Includes:

- 1 - Extended Shaft
- 2 - Shaft Cup Seats
- 1 - Shaft Nut
- 1 - Indicator Arrow
- 1 - Retaining clip

Valve Size	Part Numbers		
	PVC KIT	CPVC KIT	PP KIT
3/4	I3K-007	I3K-007C	I3K-007P
1	I3K-010	I3K-010C	I3K-010P
1-1/4 & 1-1/2	I3K-015	I3K-015C	I3K-015P
2	I3K-020	I3K-020C	I3K-020P
2-1/2 & 3	I3K-030	I3K-030C	I3K-030P
4	I3K-040	I3K-040C	I3K-040P
6	I3K-060	I3K-060C	I3K-060P
8	I3K-080	I3K-080C	I3K-080P

## Application of Counter Balance

Swing Check Valves operate in response to a fluid stream flow opening a swinging disc. As the fluid stream slows and reverses, the disc responds by swinging to the closed position. Sudden reversal of flow direction can result in "slamming" condition as the disc closes. The function of the Counter Balance mechanism is to start the disc closing earlier as the fluid stream begins to slow so that it is almost closed when flow reversal takes place, thereby eliminating slamming of the disc. Available as installed unit with valve or as a kit for adaptation of installed valves.

## Counter Balance Kits

Spears® Swing Check Valve Counter Balance Kit is designed for field installation of counter balance mechanism in Spears® Swing Check Valves. This kit can be installed through the bonnet assembly and removal of valve from line is not required.

### Kit Includes:

- 1 - Extended Shaft
- 2 - Shaft Cup Seats
- 1 - Shaft Nut
- 1 - Counter Balance
- 1 - Retaining Bolt
- 1 - Flat Washer
- 1 - Extra Weight Plates (1-small & 1-large)
- 1 - Plate Mounting Bolt
- 2 - long & 2 short

Valve Size	Part Numbers		
	PVC KIT	CPVC KIT	PP KIT
3/4	CB3K-007	CB3K-007C	CB3K-007P
1	CB3K-010	CB3K-010C	CB3K-010P
1-1/4 & 1-1/2	CB3K-015	CB3K-015C	CB3K-015P
2	CB3K-020	CB3K-020C	CB3K-020P
2-1/2 & 3	CB3K-030	CB3K-030C	CB3K-030P
4	CB3K-040	CB3K-040C	CB3K-040P
6	CB3K-060	CB3K-060C	CB3K-060P
8	CB3K-080	CB3K-080C	CB3K-080P



**BENTOMAT® FLW CERTIFIED PROPERTIES**  
**KEKAHA SANITARY LANDFILL PHASE II EXPANSION**  
**JANUARY 2010**

MATERIAL PROPERTY	TEST METHOD	TEST FREQUENCY ft <sup>2</sup>	REQUIRED VALUES
Bentonite Swell Index <sup>1</sup>	ASTM D 5890	1 per 50 tonnes	24 mL/2g min. ✓
Bentonite Fluid Loss <sup>1</sup>	ASTM D 5891	1 per 50 tonnes	18 mL max. ✓
Cap Geotextile Mass/Area <sup>2</sup> (nonwoven)	ASTM D 5261	200,000 ft <sup>2</sup>	5.8 oz/yd <sup>2</sup> MARV ✓
Carrier Geotextile Mass/Area <sup>2</sup> (scrim-reinforced nonwoven)	ASTM D 5261	200,000 ft <sup>2</sup>	5.9 oz/yd <sup>2</sup> MARV ✓
GCL Mass/Area <sup>3</sup>	ASTM D 5993	40,000 ft <sup>2</sup>	0.82 lb/ft <sup>2</sup> min ✓
Bentonite Mass/Area <sup>3</sup>	ASTM D 5993	40,000 ft <sup>2</sup>	0.75 lb/ft <sup>2</sup> min ✓
GCL Tensile Strength <sup>4</sup>	ASTM D 6768	200,000 ft <sup>2</sup>	45 lbs/in MARV ✓
GCL Peel Strength <sup>4</sup>	ASTM D 6496	40,000 ft <sup>2</sup>	3.5 lbs/inch min ✓
GCL Index Flux <sup>5</sup>	ASTM D 5887	270,000 ft <sup>2</sup>	1 x 10 <sup>-6</sup> m <sup>3</sup> /m <sup>2</sup> /sec max
GCL Hydraulic Conductivity <sup>5</sup>	ASTM D 5887	270,000 ft <sup>2</sup>	5 x 10 <sup>-6</sup> cm/sec max ✓
GCL Hydrated Internal Shear Strength <sup>6</sup>	ASTM D 5321 ASTM D 6243	Periodic	500 psf (24 kPa) typ.

**Bentomat FLW is a reinforced GCL consisting of a layer of sodium bentonite between a scrim-reinforced nonwoven geotextile and a nonwoven geotextile, which are needlepunched together.**

**Notes**

- <sup>1</sup> Bentonite property tests performed at a bentonite processing facility before shipment to CETCO's GCL production facilities.
- <sup>2</sup> Geotextile property tests performed on the geotextile components before they are incorporated into the finished GCL product.
- <sup>3</sup> Bentonite mass/area reported at 0 percent moisture content.
- <sup>4</sup> All tensile strength testing is performed in the machine direction using ASTM D 6768. All peel strength testing is performed using ASTM D 6496. Upon request, tensile and peel results can be reported per modified ASTM D 4632 using 4 inch grips.
- <sup>5</sup> Index flux and permeability testing with deaired distilled/deionized water at 80 psi (551kPa) cell pressure, 77 psi (531 kPa) headwater pressure and 75 psi (517 kPa) tailwater pressure. Reported value is equivalent to 925 gal/acre/day. This flux value is equivalent to a permeability of 5x10<sup>-6</sup> cm/sec for typical GCL thickness. Actual flux values vary with field condition pressures. The last 20 weekly values prior the end of the production date of the supplied GCL may be provided.
- <sup>6</sup> Peak values measured at 200 psf (10 kPa) normal stress for a specimen hydrated for 48 hours. Site-specific materials, GCL products, and test conditions must be used to verify internal and interface strength of the proposed design.

TR 401-BMFLW-KEKAHA LP  
Revised 01/10

800.527.9948 Fax 847.577.5560

For the most up-to-date product information, please visit our website, [www.cetco.com](http://www.cetco.com).

A wholly owned subsidiary of AMCOL International Corporation. The information and data contained herein are believed to be accurate and reliable. CETCO makes no warranty of any kind and accepts no responsibility for the results obtained through application of this information.

# High Density Polyethylene Micro Spike® Liner



## Product Data

Property	Test Method	Values				
Thickness, nominal (mm)		30 (.75)	40 (1.0)	60 (1.5)	80 (2.0)	100 (2.5)
Thickness (min. ave.), mil (mm)	ASTM D5994*	29 (.71)	38 (.95)	57 (1.43)	76 (1.90)	95 (2.38)
Thickness (lowest indiv. for 5 of 10 spec.), mil (mm)	ASTM D5994*	27 (.68)	36 (.90)	54 (1.35)	72 (1.80)	90 (2.25)
Thickness (lowest indiv. for 1 of 10 spec.), mil (mm)	ASTM D5994*	26 (.64)	34 (.85)	51 (1.28)	68 (1.70)	85 (2.13)
*The thickness values may be changed due to project specifications (i.e., absolute minimum thickness)						
Asperity Height (min. ave.), mil (mm)	GRI GM12	16 (.41)	16 (.41)	16 (.41)	16 (.41)	16 (.41)
Density, g/cc, minimum	ASTM D792, Method B	0.94	0.94	0.94	0.94	0.94
Tensile Properties (ave. both directions)	ASTM D6693, Type IV					
Strength @ Yield (min. ave.), lb/in width (N/mm)	2 in./minute	66 (11.0)	88 (15.4)	132 (23.1)	176 (30.8)	220 (38.5)
Elongation @ Yield (min. ave.), % (GL=1.3in)	5 specimens in each direction	13	13	13	13	13
Strength @ Break (min. ave.), lb/in width (N/mm)		66 (11.6)	88 (15.4)	132 (23.1)	176 (30.8)	220 (38.5)
Elongation @ Break (min. ave.), % (GL=2.0in)		350	350	350	350	350
Tear Resistance (min. ave.), lbs (N)	ASTM D1004	23 (102)	30 (133)	45 (200)	60 (267)	72 (320)
Puncture Resistance (min. ave.), lbs (N)	ASTM D4833	60 (267)	80 (400)	120 (534)	150 (667)	180 (801)
Carbon Black Content (range in %)	ASTM D4218	2-3	2-3	2-3	2-3	2-3
Carbon Black Dispersion (Category)	ASTM D5596	Only near spherical agglomerates for 10 views: 9 views in Cat. 1 or 2, and 1 view in Cat. 3				
Stress Crack Resistance (Single Point NCTL), hours	ASTM D5397, Appendix	300	300	300	300	300
Oxidative Induction Time, minutes	ASTM D3985, 200°C, 1 atm O <sub>2</sub>	≥100	≥100	≥100	≥100	≥100
Melt Flow Index, g/10 minutes	ASTM D1238, 190°C, 2.16kg	≤1.0	≤1.0	≤1.0	≤1.0	≤1.0
Oven Aging	ASTM D5721	60	80	80	80	80
with HP DIT, (% retained after 90 days)	ASTM D5885, 150°C, 500psi O <sub>2</sub>					
UV Resistance	GRI GM11	20hr. Cycle @ 75°C/4 hr. dark condensation @ 60°C				
with HP DIT, (% retained after 1600 hours)	ASTM D5885, 150°C, 500psi O <sub>2</sub>	50	50	50	50	50

\*These product specifications meet or exceed GRI's GM13

## Supply Information (Standard Roll Dimensions)

Thickness		Width		Length		Area (approx.)		Weight (average)	
mil	mm	ft	m	ft	m	ft <sup>2</sup>	m <sup>2</sup>	lbs	kg
30	.75	23	7	600.1	192.9	13,782	1,280	3,325	1,510
40	1.0	23	7	600.1	182.9	13,782	1,280	3,325	1,510
60	1.5	23	7	410.1	125	9,419	875	3,366	1,522
80	2.0	23	7	328.1	100	7,535	700	3,306	1,500
100	2.5	23	7	246.1	75	5,651	525	3,167	1,436

### Notes:

All rolls are supplied with two slings. All rolls are wound on a 6 inch core. Special roll lengths are available on request.

All information, recommendations and suggestions appearing in this literature concerning the use of our products are based upon tests and data believed to be reliable; however, it is the user's responsibility to determine the suitability for their own use of the products described herein. Since the actual use by others is beyond our control, no guarantee or warranty of any kind, expressed or implied, is made by AGRU/America as to the effects of such use or the results to be obtained, nor does AGRU/America assume any liability in connection herewith. Any statement made herein may not be absolutely complete since additional information may be necessary or desirable when particular or exceptional conditions or circumstances exist or because of applicable laws or government regulations. Nothing herein is to be construed as permission or as a recommendation to infringe any patent.

500 Garrison Road, Georgetown, South Carolina 29440

843-546-0600

800-373-7478

Fax: 843-527-2718

e-mail: salesmk@agruamerica.com

www.agruamerica.com





**Kekaha Sanitary Landfill Phase 2**  
**Kekaha, HI**

Agru America, Inc. will confirm that the material shall be first quality new polyethylene resin containing no more than 2 % clean recycled polymer by weight.

A handwritten signature in cursive script that reads "Paul W. Barker" followed by a circled "P" or similar mark.

---

Paul W. Barker  
Technical Director

Date: November 3, 2009

For more information and technical  
assistive contact:

Chevron Phillips Chemical Company LP  
P.O. Box 4910  
The Woodlands, TX 77387-4910  
300.251.1212



PREMIUM EXTRUSION AND RIGID PACKAGING RESIN

## Marlex® K307

MEDIUM DENSITY POLYETHYLENE

This medium density, high molecular weight hexene copolymer is tailored for geomembrane applications that require:

- Outstanding ESCR
- Broad fusion range
- Excellent melt strength
- Good processability

Typical geomembrane applications for K307 include:

- Landfill liners
- Gasoline and chemical tank containment liners
- Tunnel moisture barriers
- Mine tailing collection projects

This resin meets these specifications:

- ASTM D4976 - PE 225
- GRI-GM13 except carbon black requirements
- FDA 21 CFR 177.1520(c) 3.1a, use conditions C through G per 21 CFR 176.170(c). Volume of food contacting article must be equal to or greater than 6 gallons.

NOMINAL PHYSICAL PROPERTIES <sup>1</sup>	English	SI	Method
Density	—	0.937 g/cm <sup>3</sup>	ASTM D1505
Flow Rate (HLM, 130/21.5)	—	21.0 g/10 min	ASTM D1238
Tensile Strength at Yield, 2 in/min, Type IV bar	2,900 psi	20 MPa	ASTM D638
Elongation at Break, 2 in/min, Type IV bar	800%	800%	ASTM D638
Flexural Modulus, Tangent - 18:1 span/depth, 0.5 in/min	120,000 psi	830 MPa	ASTM D790
ESCR, Condition B (10% Igepl), F <sub>50</sub>	>1,500 h	>1,500 h	ASTM D1693
ESCR, Condition C (100% Igepl), F <sub>50</sub>	>1,500 h	>1,500 h	ASTM D1693
SP-NCTL	>900 h	>900 h	ASTM D6397 (Appendix)
Durometer Hardness, Type D (Shore D)	57	57	ASTM D2240
Vicat Softening Temperature, Loading 1, Rate A	221°F	105°C	ASTM D1525
Heat Deflection Temperature, 66 psi, Method A	137°F	58°C	ASTM D648
Brittleness Temperature, Type A, Type I specimen	<-403°F	<-75°C	ASTM D745
Tensile Impact, Type S bar	190 ft-lb/in <sup>2</sup>	400 kJ/m <sup>2</sup>	ASTM D1822

1. The nominal properties reported herein are typical of the product, but do not reflect normal testing variance and therefore should not be used for specification purposes. Values are rounded. The physical properties were determined on compression molded specimens that were prepared in accordance with Procedure C of ASTM D4703, Annex A1.

MSDS #240370

Revision Date July, 2004

Another quality product from



Before using this product, the user is advised and cautioned to make its own determination and assessment of the safety and suitability of the product for the specific use in question and is further advised against relying on the information contained herein as it may relate to any specific use or application. It is the ultimate responsibility of the user to ensure that the product is suited and the information is applicable to the user's specific application. Chevron Phillips Chemical Company LP does not make, and expressly disclaims, all warranties, including warranties of merchantability or fitness for a particular purpose, regardless of whether oral or written, express or implied, or allegedly arising from any usage of any trade or from any course of dealing in connection with the use of the information contained herein or the product itself. The user expressly assumes all risk and liability, whether based in contract, tort or otherwise, in connection with the use of the information contained herein or the product itself. Further, information contained herein is given without reference to any intellectual property issues, as well as federal, state or local laws which may be encountered in the use thereof. Such questions should be investigated by the user.

## TNS Advanced Technologies

681 DeYoung Road  
Greenville, SC 29651

(864) 968-0592 Tel  
(864) 879-4639 Fax

11/5/2009

REF: TNS E160  
Kekaha Sanitary Landfill

Northwest Linings & Geotextile Products, Inc.

Dear Sir/Madam:

This is to certify that TNS E160 is a polypropylene, nonwoven, needle-punched fabric. The fabric is comprised of 98% Polypropylene, and 2% Carbon Black and other additives. TNS E160 is resistant to degradation due to ultraviolet exposure and resists commonly encountered soil chemicals, insects, mildew, and is non-biodegradable. TNS E160 has been continuously inspected for needles and found to be needle free. Polypropylene is stable within a pH range of 2 to 13. TNS E160 conforms to the physical properties listed in the following table:

<u>FABRIC PROPERTY</u>	<u>TEST METHOD</u>	<u>UNITS</u>	<u>M.A.R.V</u>
Weight	ASTM D 5261	oz/sqyd	16.0 ✓
Grab Tensile	ASTM D 4632	lbs	370 ✓
Grab Tensile Elongation	ASTM D 4632	%	50 ✓
Trap Tear	ASTM D 4533	lbs	145 ✓
Puncture	ASTM D 4833	lbs	170 ✓
UV Resistance(500 hrs)	ASTM D 4355	% retained	70 ✓

*Marshall O. Gaddy*

Marshall O. Gaddy  
Quality Control Manager



881 DeYoung Rd.  
Greer, SC 29651  
(864)968-0582

Geotextile Product Description Sheet

**Style TNS E160**  
**Kekaha Sanitary Landfill**

TNS E160 is a nonwoven geotextile produced by needlepunching 100% polypropylene staple fibers in a random network to form a high strength dimensionally stable fabric. The polypropylene fibers are specially formulated to resist ultraviolet light deterioration, and are inert to commonly encountered soil chemicals. The fabric will not rot or mildew, is non-biodegradable, and is resistant to damage from insects and rodents. Polypropylene is stable within a pH range of 2 to 12. TNS E160 conforms to the physical property values listed below:

Fabric Property	Test Method	Units	Minimum Average Roll Value
Weight	ASTM D 5261	oz/sq. yd.	16.0 ✓
Grab Tensile	ASTM D 4632	lbs.	370 ✓
Grab Elongation	ASTM D 4632	%	50 ✓
Trap Tear	ASTM D 4533	lbs.	145 ✓
Puncture	ASTM D 4833	lbs. -	170 ✓
UV Resistance after 500 hrs.	ASTM D 4355	% Strength Retained	70 ✓
<b>Packaging</b>			
Roll Dimensions-Feet	15 x 360		
Square Yards Per Roll	600		
Estimated Roll Weight-Lbs.	820		

\* At time of manufacturing, handling may change these properties.

\*\* Modified

To the best of our knowledge, the information contained herein is accurate. However, TNS Advanced Technologies cannot anticipate all conditions under which TNS product information and our products, or the products of other manufacturers in combination with our products, may be used. We accept no responsibility for results obtained by the application of this information or the safety or suitability of our products either alone or in combination with other products. Final determination of the suitability of any information or material for the use contemplated, of its manner of use, and whether the suggested use infringes any patents is the sole responsibility of the user.

# TNS Advanced Technologies

681 DeYoung Road  
Greenville, SC 29651

(864) 968-0592 Tel  
(864) 879-4639 Fax

12/16/2009

REF: TNS E060  
Kekaha Sanitary Landfill

Northwest Linings & Geotextile Products, Inc.

Dear Sir/Madam:

This is to certify that TNS E060 is a polypropylene, nonwoven, needle-punched fabric. The fabric is comprised of 98% Polypropylene, and 2% Carbon Black and other additives. TNS E060 is resistant to degradation due to ultraviolet exposure and resists commonly encountered soil chemicals, insects, mildew, and is non-biodegradable. TNS E060 has been continuously inspected for needles and found to be needle free. Polypropylene is stable within a pH range of 2 to 13. TNS E060 conforms to the physical properties listed in the following table:

<u>FABRIC PROPERTY</u>	<u>TEST METHOD</u>	<u>UNITS</u>	<u>M.A.R.V</u>
Weight	ASTM D 5261	oz/sqyd	6.0 ✓
A.O.S.	ASTM D 4751	U.S. Sieve	70 ✓
Permittivity	ASTM D 4491	1/sec	1.5 ✓
Permeability	ASTM D 4491	cm/sec	.30 ✓

*Marshall O. Gaddy*

Marshall O. Gaddy  
Quality Control Manager



681 DeYoung Rd.  
Greer, SC 29651  
(864)968-0592

Geotextile Product Description Sheet

**Style TNS E060**  
**Kekaha Sanitary Landfill**

TNS E060 is a nonwoven geotextile produced by needlepunching synthetic staple fibers in a random network to form a high strength dimensionally stable fabric. The polypropylene fibers are specially formulated to resist ultraviolet light deterioration, and are inert to commonly encountered soil chemicals. The fabric will not rot or mildew, is non-biodegradable, and is resistant to damage from insects and rodents. Polypropylene is stable within a pH range of 2 to 13. TNS E060 conforms to the physical property values listed below.

Fabric Property	Test Method	Units	Minimum Average Roll Value
Weight	ASTM D 5261	oz/sq. yd.	8.0 ✓
Permittivity*	ASTM D 4491	1/sec	1.5 ✓
AOS	ASTM D 4751	U.S. Sieve	70 ✓
Permeability*	ASTM D 4491	cm/sec	.30 ✓
<b>Packaging</b>			
Roll Dimensions-Feet			12.5 x360
Square Yards Per Roll			500
Estimated Roll Weight-Lbs.			220

\* At time of manufacturing, handling may change these properties.

\*\* Modified

To the best of our knowledge, the information contained herein is accurate. However, TNS Advanced Technologies cannot anticipate all conditions under which TNS product information and our products, or the products of other manufacturers in combination with our products, may be used. We accept no responsibility for results obtained by the application of this information or the safety or suitability of our products either alone or in combination with other products. Final determination of the suitability of any information or material for the use contemplated, of its manner of use, and whether the suggested use infringes any patents is the sole responsibility of the user.

**NORTHWEST LININGS & GEOTEXTILE PRODUCTS, INC.**

• 21000 77<sup>th</sup> Avenue South • Kent, WA 98032 •

Phone: (253) 872-0244 • Fax: (253) 872-0245

[www.northwestlinings.com](http://www.northwestlinings.com)

**LETTER OF TRANSMITTAL**

<b>TO</b>	<b>Goodfellow Brothers Inc.</b>
	P.O. Box 3029
	Lihue, HI 96766
	<a href="mailto:jeffg@goodfellowbros.com">jeffg@goodfellowbros.com</a>

<b>DATE:</b> January 29, 2010	<b>JOB NO.:</b> N09150
<b>ATTENTION:</b> Jeff Griffin	
<b>RE:</b> Kekaha Sanitary Landfill Phase II Expansion/Cell 1 liner-Geomembrane submittals	

WE ARE SENDING YOU:     Attached     Under Separate Cover via \_\_\_\_\_ the following items:

Shop Drawings     Prints     Plans     Specifications     Samples

Copy of Letter     Change Order     Submittals     Warranties     Other

Copies	Specification #	Description
1	Sec. 02072-1.02A.9	NWL's shop drawing of the Revised Proposed 60-mil Textured HDPE liner panel layout on Lateral Expansion Phase II/Cell 1 area of Sanitary Landfill

These are transmitted as checked below:

For Approval     Approved as submitted     Resubmit     Copies for Approval

For your use     Approved as noted     Submit     Copies for distribution

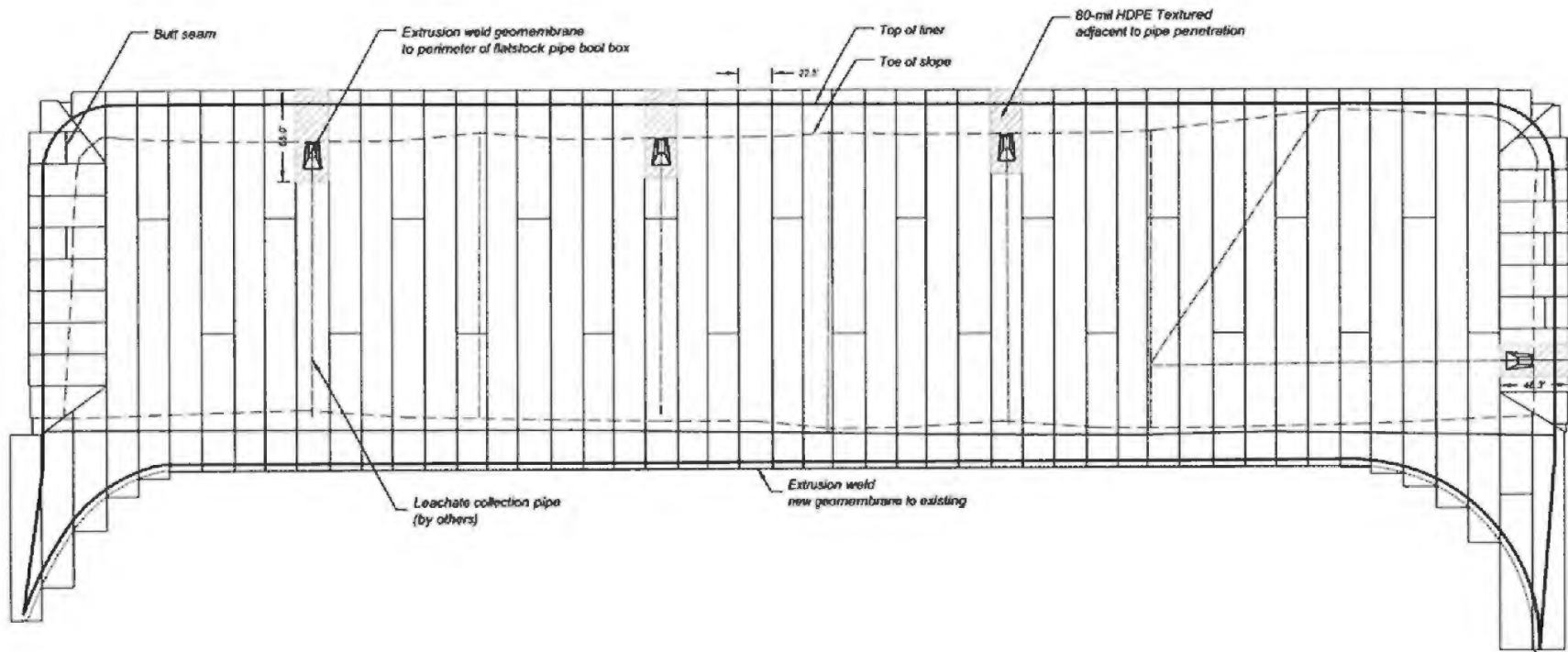
For review and comment     Returned for corrections     Return     Corrected Prints

For bids due \_\_\_\_\_     Other: \_\_\_\_\_

Prints returned after loan to us

REMARKS:

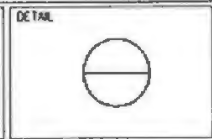
COPY TO: \_\_\_\_\_ SIGNED: S.G. Jr.



**Kekaha Sanitary Landfill Phase II Lateral Expansion - Cell 1**  
**Proposed 60-mil textured HDPE liner Panel Layout**

Note: exact number, position and sequence of panel installation will be determined in the field by the contractor.

SHL  
 1 of 1



**NORTHWEST LININGS &  
 GEOTEXTILE PRODUCTS, Inc.**  
 www.northwestlinings.com  
 2100 17TH AVE. SOUTH  
 KENT, WA 98032  
 (253) 872-0244 (253) 872-0245 FAX

JOB NAME:	Kekaha Sanitary Landfill		
JOB NO:	N 0 9 1 5 0		
DATE:	11 17 09	CHECKED:	SG
BY:	TS	SCALE:	AS SHOWN



**NORTHWEST LININGS & GEOTEXTILE PRODUCTS, INC.**

• 21000 77<sup>th</sup> Avenue South • Kent, WA 98032 •  
 Phone: (253) 872-0244 • Fax: (253) 872-0245  
www.northwestlinings.com

**LETTER OF TRANSMITTAL**

<b>TO</b>	<b>Goodfellow Brothers Inc.</b>	<b>DATE:</b> February 23, 2010	<b>JOB NO.:</b> N09150
	P.O. Box 3029	<b>ATTENTION:</b> Jeff Griffin	
	Lihue, HI 96766	<b>RE:</b> Kekaha Sanitary Landfill Phase II Expansion/Cell 1 liner- HDPE Flatstock submittals	
	jeffg@goodfellowbros.com		

WE ARE SENDING YOU:     Attached     Under Separate Cover via \_\_\_\_\_ the following items:

Shop Drawings     Prints     Plans     Specifications     Samples

Copy of Letter     Change Order     Submittals     Warranties     Other

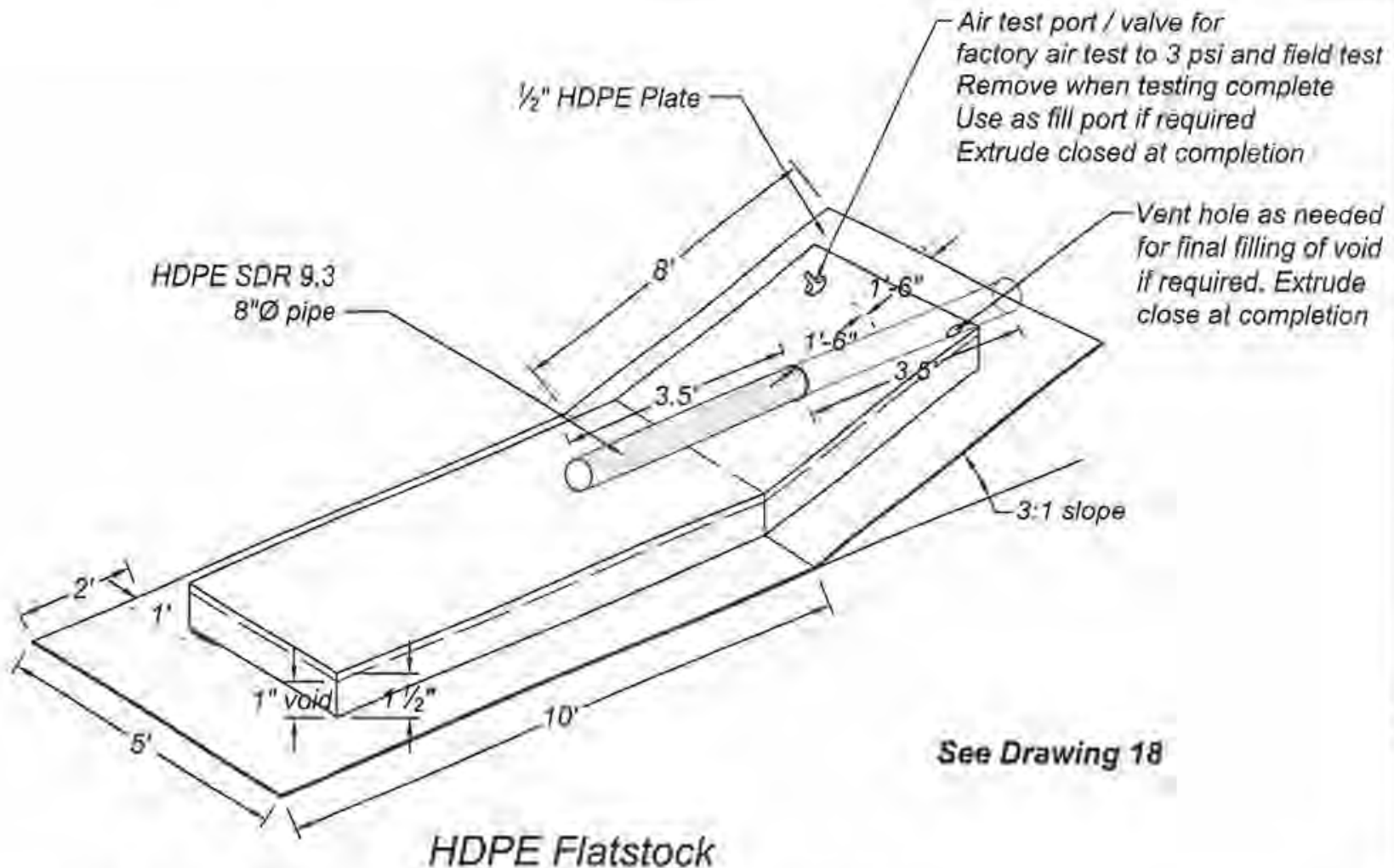
Copies	Specification #	Description
1		NWL Shop drawing of HDPE Flatstock
1		Vista Option's shop drawing of HDPE Flatstock
1		Vista Option's specification of HDPE plate
1		Blank PE Pipe Pressure Test Report
1		NWL General Sequence of Pipe Penetration/Pipe Structure Fabrication to install

These are transmitted as checked below:

- For Approval     Approved as submitted     Resubmit     Copies for Approval
- For your use     Approved as noted     Submit     Copies for distribution
- For review and comment     Returned for corrections     Return     Corrected Prints
- For bids due \_\_\_\_\_     Other \_\_\_\_\_
- Prints returned after loan to us

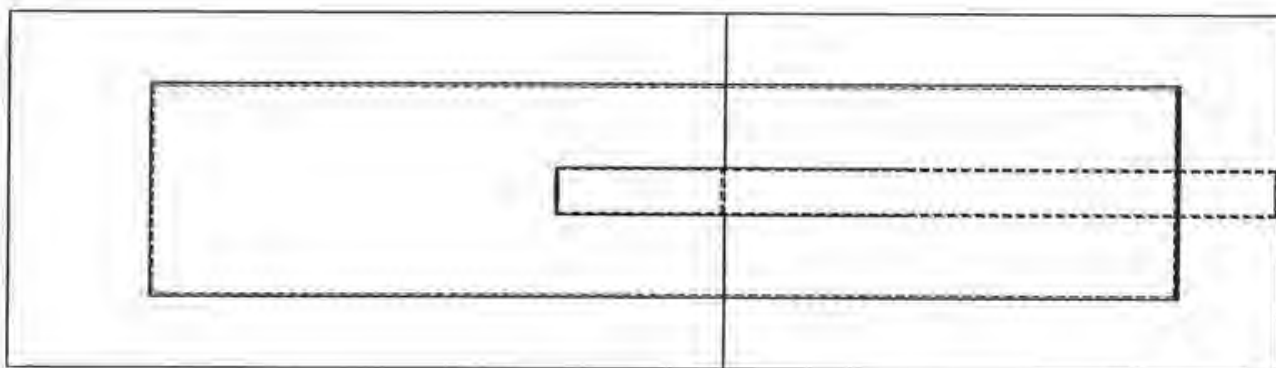
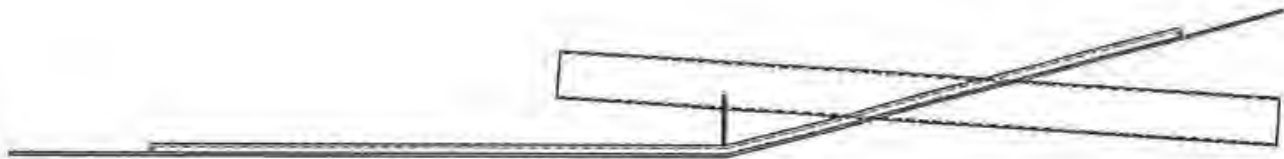
REMARKS:

COPY TO: \_\_\_\_\_ SIGNED: S.G. Jr.



Northwest Linings & Geotextile Products, Inc.(NWL) is not a licensed engineering firm and does not practice engineering or provide engineering services. NWL does not make any representation or warranties, express or implied, as to any drawings, or the suitability of any of the drawings for a particular use or purpose. Without limiting the foregoing, NWL makes no representation or warranty that the drawings are appropriate for any particular installation. Only a registered professional engineer who has specialized knowledge of a particular project and the needs and requirements of such project can determine what specific design, engineering or installation detail is best suited for each project.

SHEET NO.	DETAIL 	<b>NORTHWEST LININGS &amp; GEOTEXTILE PRODUCTS, Inc.</b> www.northwestlinings.com 21000 37TH AVE SOUTH SEINT, WA, 98072 (206) 475-0244 (206) 475-0219 FAX		JOB NAME: <i>Kekaha Sanitary Landfill - Phase II Lateral Expansion</i>	
				JOB NO. <b>N 0 9 1 5 0</b>	
				DATE: <b>2 23 10</b>	CHECKED: <b>KL</b>
				BY: <b>SG</b>	SCALE: <b>NTS</b>



Visual Options Incorporated  
 4320 S. Adams Julie C.  
 Tacoma, WA 98409

Phone: 253-472-1444  
 Fax: 253-472-1521  
[www.visualoptions.net](http://www.visualoptions.net)



PROPRIETARY AND CONFIDENTIAL

THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF VISUAL OPTIONS INCORPORATED. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF VISUAL OPTIONS INCORPORATED IS PROHIBITED.

DIMENSIONS ARE IN INCHES  
 TOLERANCES:  
 FRACTIONAL  $\pm 1/32$   
 ANGULAR  $\pm 1$  DEGREE  
 TWO PLACE DECIMAL  $\pm .03$   
 THREE PLACE DECIMAL  $\pm .032$

MATERIAL: HDPE  
 FINISH: Black

NAME	DATE
J.E.	1-8-10

COMMENTS:

DWG. NAME:

Kekaha

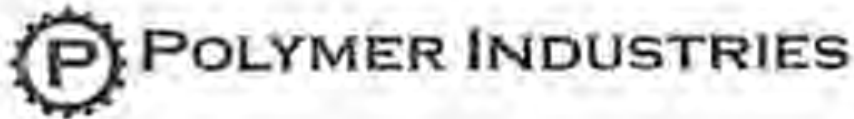
DWG. NO.

N/A

REV.

SCALE

SHEET 1 OF 1



**Densetec HDPE Pipe Grade:  
Typical Properties**

Property	Test Method	Typical Values	
		English Units	Metric Units
<b>Nominal Sheet Properties<sup>(1)</sup></b>			
Density	D1505	58.9 lbs/ft <sup>3</sup>	0.944 g/cc
Melt Flow Rate (HLMT), Condition 190 °C / 21.6 kg	D1238	—	11 g / 10 min
Polyethylene Classification	D4976	Group 2, Class 3, Grade 5	Group 2, Class 3, Grade 5
Polyethylene Plastic Pipe Classification	D3350	Meets Class 345464C & 345465C	Meets Class 345464C & 345465C
Polyethylene Plastic Pipe Classification	F412 & Plastic Pipe Institute	PE 3408	PE 3408
Potable Water Standards	NSF International	Meets Standards 14 & 61	Meets Standards 14 & 61
Tensile Strength @ Yield	D638	3,200 psi	22 MPa
Ultimate Elongation	D638	800%	800%
PENT Slow Crack Growth	F1473	> 100 hours	> 100 hours
Flexural Modulus	D790	140,000 psi	960 MPa
Brittleness Temperature	D746	< -103 °F	< -75 °C
<b>Nominal Pipe Properties<sup>(2)</sup></b>			
Hydrostatic Design Basis, 73 °F (23 °C)	D2837	1600 psi	11 MPa
Hydrostatic Design Basis, 140 °F (60 °C)	D2837	800 psi	5.5 MPa
Minimum Strength Required	ISO 9080	1160 psi	8 MPa

<sup>(1)</sup>The nominal properties reported herein are typical of the product but do not reflect normal testing variance and therefore should not be used for specification purposes.

<sup>(2)</sup>The nominal pipe properties were determined on pipe extruded from the same resin as is used to make the sheet.

4. Retest results.

ATTACHMENT I FORM PE PIPE PRESSURE TEST REPORT				
PROJECT NAME/NO:			TIME:	
CONTRACTOR:			DATE:	
PERSON PERFORMING TESTS:				
DESCRIPTION/LOCATION OF TEST SEGMENT (Pipe Diameter, Length, and SDRs):				
<p> <math>T_i</math> = Initial temperature in °C = _____ °C  <math>P_i</math> = Initial test pressure in psig = _____ psig  <math>P_c</math> = Initial pressure in psig corrected for temperature (<math>T_i</math>) at time 't'  <math>t</math> = Time in minutes from initiation of test  <math>T_t</math> = Temperature in °C at time 't'  <math>P_t</math> = Test pressure in psig at time 't'  <math>P_c</math> = <math>\frac{(P_t + 14.7)(T_i + 273)}{(T_t + 273)} - 14.7</math> </p> <p>                     Percent Pressure Drop = <math>\frac{(P_c - P_t) \times 100}{P_c}</math> </p>				
TIME (min.)	P <sub>c</sub> TEMP READING (°C)	T <sub>t</sub> GAUGE READING (psig)	P <sub>t</sub> CORRECTED PRESSURE (psig)	P <sub>c</sub> PRESSURE DROP (%)
0				
20				
30				
40				
50				
60				
PASS/FAILURE:			RETEST (yes/no):	
DESCRIPTION/NATURE OF LEAKS AND REPAIRS OF RETEST SEGMENT:				



## **NORTHWEST LININGS & GEOTEXTILE PRODUCTS, Inc.**

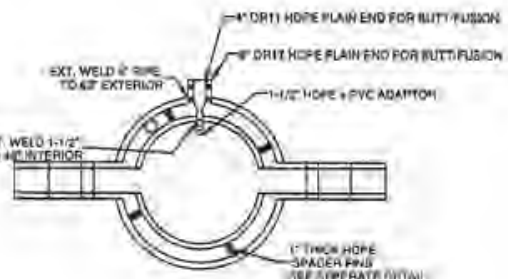
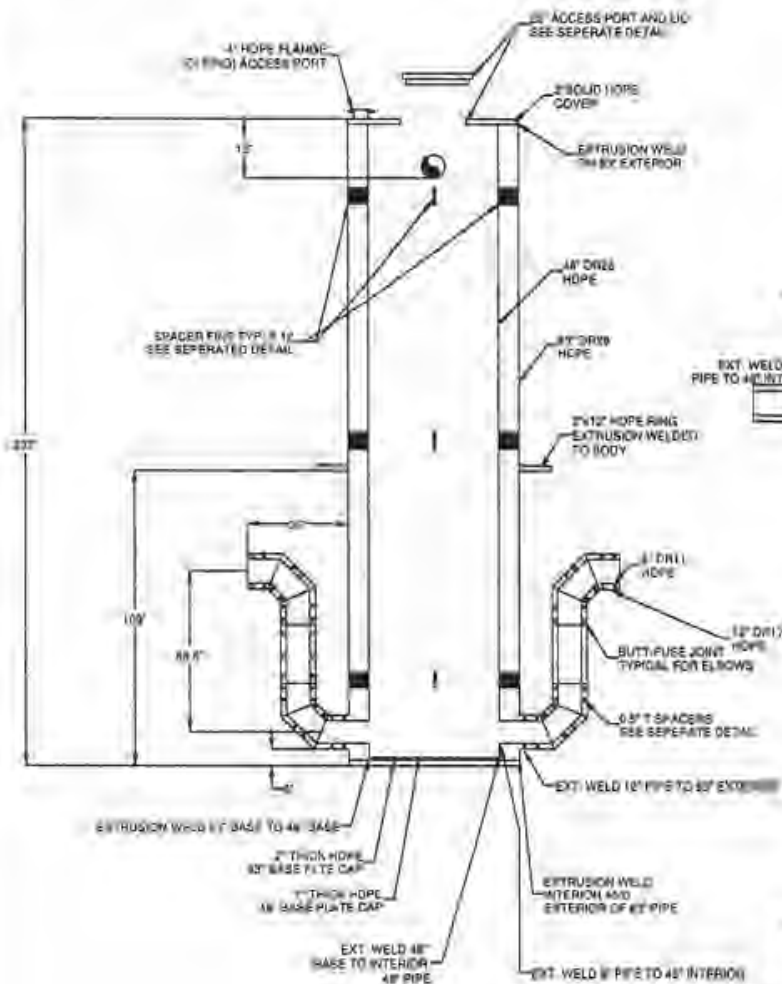
21000 77th AVE. SOUTH  
KENT, WA 98032  
253-872-0244  
FAX 253-872-0245  
800-729-6954 Toll Free  
E-Mail: [www.northwestlinings.com](http://www.northwestlinings.com)

### **GENERAL SEQUENCE OF PIPE PENETRATION/ PIPE STRUCTURE FABRICATION TO INSTALL**

1. 1/2" HD Flatstock and pipe (HD SDR 9.3 8" diameter pipe) to Visual Options fabrication facility.
2. Pipe penetration fabricated with air test port and gauge port.
3. 3 psi air test completed, recorded on PE PIPE Pressure Test Report form.
4. Pipe penetrations palleted, blocked and braced for shipment to site. Packing configuration may be 1 unit or 2 units together.
5. Deliver to site, unpack as near install area as possible. Contractor/HD pipe installer to place and fusion weld pipe in berm and careful backfill.
6. Air test unit in final location in grade.
7. Void filled with grout using air test port and vent port by contractor.
8. Extrusion weld ports closed, vacuum box test welds.
9. Extrusion weld HDPE geomembrane to structure during install of geosynthetics and perform QC.

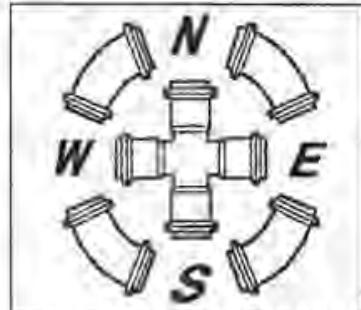
**THIS SIGNED DRAWING MUST ACCOMPANY PURCHASE ORDER OR DIMENSIONS OF FITTING DEPICTED WILL NOT BE GUARANTEED.**

SUBMITAL FOR  
LEACHATE WET WELL  
(19 FEB 2010)  
SEE RFI #27 FOR  
REVISIONS



**DISCLAIMER - PLEASE READ**

- 1) All dimensions approximate, subject to change without  
--Angle tolerance is +/- 2 degrees  
--All other dimensions to +/- 1"
- 2) This drawing only applicable if a copy of it is referenced  
--Without copy of drawing fitting construction
- 3) Subject to Specified Fittings Standard Terms and Conditions



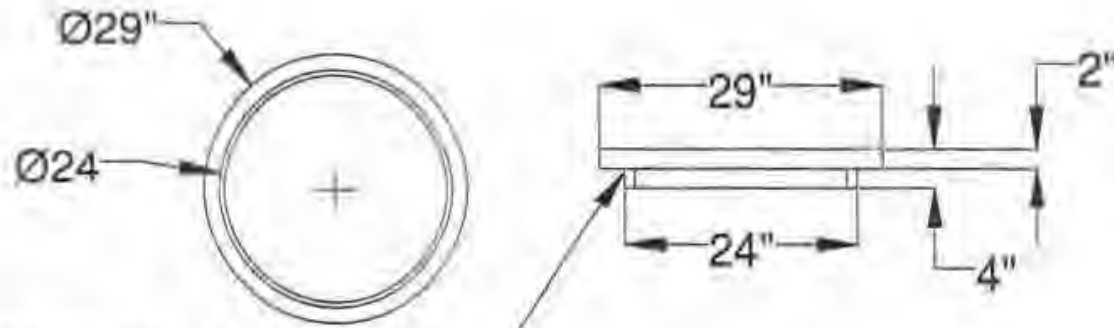
**SPECIFIED FITTINGS**

164 WEST SMITH ROAD  
BELLINGHAM WA 98226

TITLE			
CUSTOM HDPE DUAL CONTAINMENT MANHOLE STRUCTURE			
SIZE	CAGE CODE	DWG NO	REV
A4			
SCALE		SHEET	
NOT TO SCALE		1/1	



THIS SIGNED DRAWING MUST ACCOMPANY  
PURCHASE ORDER OR DIMENSIONS OF  
FITTING DEPICTED WILL NOT BE GUARANTEED.



24" OD HDPE RING-EXT. WELDED  
TO 29" HDPE DISC



**SPECIFIED FITTINGS**

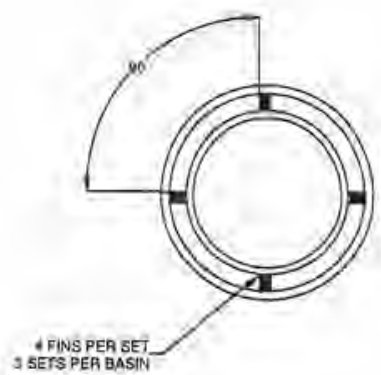
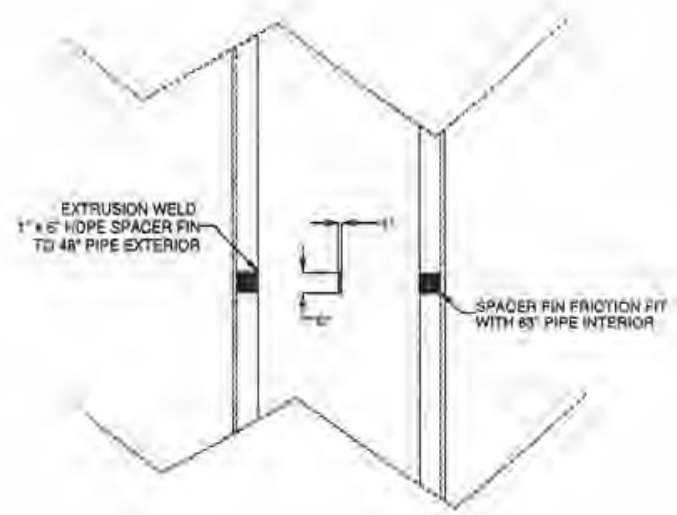
164 WEST SMITH ROAD  
BELLINGHAM WA 98226

TITLE			
MANHOLE ACCESS COVER DETAIL			
SIZE	CAGE CODE	DWG NO	REV

SIZE	A4	CAGE CODE		DWG NO		REV	
SCALE	NOT TO SCALE			SHEET	1/1		



**THIS SIGNED DRAWING MUST ACCOMPANY  
PURCHASE ORDER OR DIMENSIONS OF  
FITTING DEPICTED WILL NOT BE GUARANTEED.**



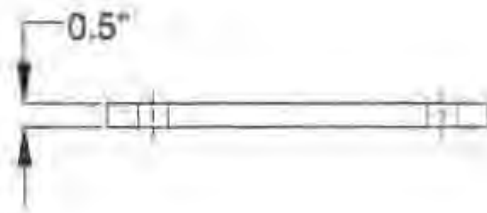
**SPECIFIED FITTINGS**

164 WEST SMITH ROAD  
BELLINGHAM WA 98226

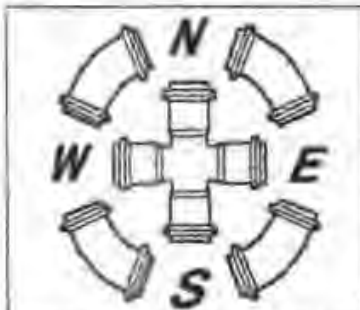
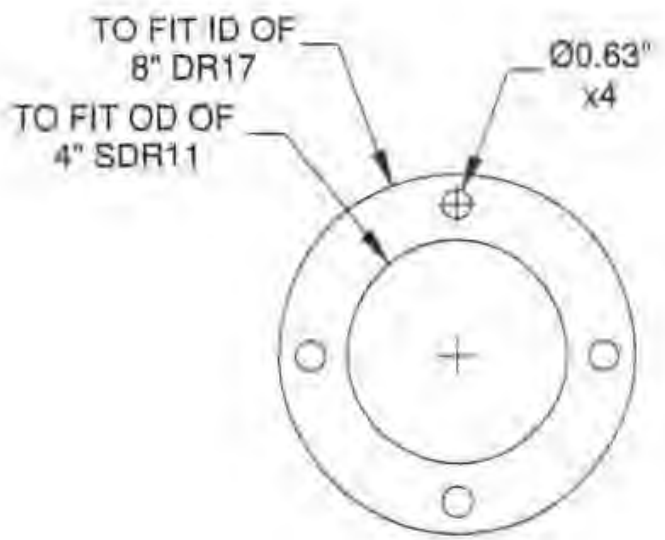
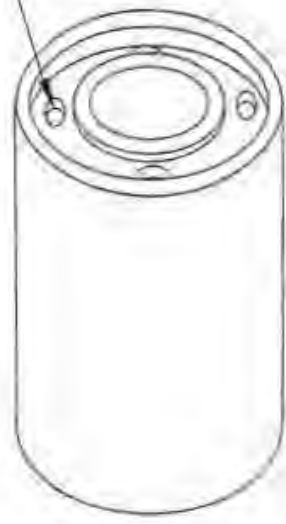
TITLE  
**63" DR26 x 48" DR26 HDPE DUAL-  
CONTAINMENT SPACER FIN DETAIL**

SIZE <b>A4</b>	CAGE CODE	DWG NO	REV
SCALE <b>NOT TO SCALE</b>		SHEET <b>1/1</b>	





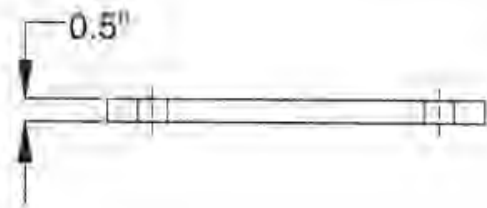
Ø0.5" HOLES ALLOW MONITORING



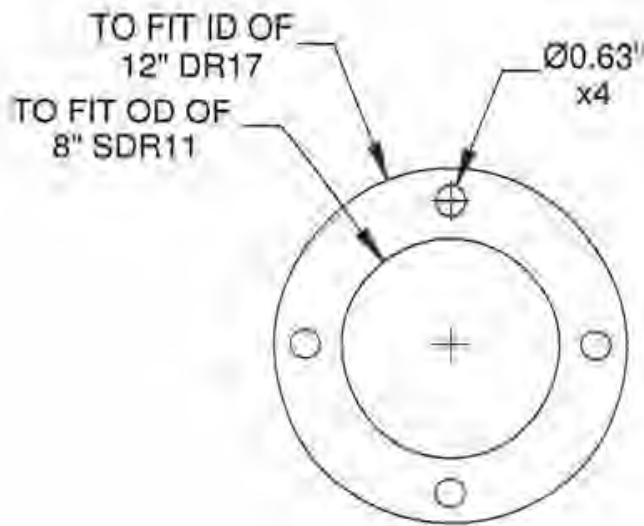
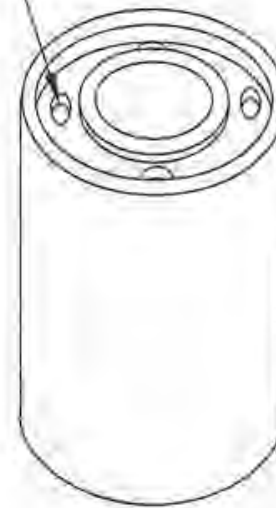
### SPECIFIED FITTINGS

164 WEST SMITH ROAD  
BELLINGHAM WA 98226

TITLE			
HDPE DUAL CONTAINMENT SPACERS 8" SDR17 HDPE x 4" SDR11 HDPE			
SIZE	CAGE CODE	DWG NO	REV
A4			
SCALE		SHEET	
NOT TO SCALE		1/1	



Ø0.5" HOLES ALLOW MONITORING



### SPECIFIED FITTINGS

164 WEST SMITH ROAD  
BELLINGHAM WA 98226

TITLE

HDPE DUAL CONTAINMENT SPACERS  
12" SDR17 HDPE x 8" SDR11 HDPE

SIZE

A4

CAGE CODE

DWG NO

REV

SCALE  
NOT TO SCALE

SHEET  
1/1


**TENCATE**  
**Mirafi**

*SUBMITTAL FOR  
ROAD GEOTEXTILE  
(24 MARCH 2010)*


**Mirafi<sup>®</sup> 170N**

Mirafi<sup>®</sup> 170N is a nonwoven geotextile composed of polypropylene fibers, which are formed into a stable network such that the fibers retain their relative position. Mirafi<sup>®</sup> 170N is inert to biological degradation and resists naturally encountered chemicals, alkalis, and acids.

Mechanical Properties	Test Method	Unit	Minimum Average Roll Value	
			MD	CD
Grab Tensile Strength	ASTM D 4632	N (lbs)	801 (180)	801 (180) ✓
Grab Tensile Elongation	ASTM D 4632	%	50	50
Trapezoid Tear Strength	ASTM D 4533	N (lbs)	334 (75)	334 (75) ✓
Mullen Burst Strength	ASTM D 3786	kPa (psi)	2273 (330)	
Puncture Strength <sup>1</sup>	ASTM D 4833	N (lbs)	467 (105) ✓	
CBR Puncture Strength	ASTM D 6241	N (lbs)	2003 (450)	
Apparent Opening Size (AOS) <sup>2</sup>	ASTM D 4751	mm (U.S. Sieve)	0.15 (100) ✓	
Permittivity	ASTM D 4491	sec <sup>-1</sup>	1.2 ✓	
Flow Rate	ASTM D 4491	l/min/m <sup>2</sup> (gal/min/ft <sup>2</sup> )	4278 (105)	
UV Resistance (at 500 hours)	ASTM D 4355	% strength retained	70 ✓	

<sup>1</sup> ASTM D 4833 has been replaced with ASTM D 6241

<sup>2</sup> ASTM D 4751: AOS is a Maximum Opening Diameter Value

Physical Properties	Test Method	Unit	Typical Value
Weight	ASTM D 5261	g/m <sup>2</sup> (oz/yd <sup>2</sup> )	251 (7.4)
Thickness	ASTM D 5199	mm (mils)	1.7 (67)
Roll Dimensions (width x length)	—	m (ft)	4.5 x 91 (15 x 300)
Roll Area	—	m <sup>2</sup> (yd <sup>2</sup> )	418 (500)
Estimated Roll Weight	—	kg (lb)	111 (245)

**Disclaimer:** TenCate assumes no liability for the accuracy or completeness of this information or for the ultimate use by the purchaser. TenCate disclaims any and all express, implied, or statutory standards, warranties or guarantees, including without limitation any implied warranty as to merchantability or fitness for a particular purpose or arising from a course of dealing or usage of trade as to any equipment, materials, or information furnished herewith. This document should not be construed as engineering advice.


**TENCATE**  
 materials that make a difference

RECEIVED

OCT 14 2008



Hirata & Associates

Geotechnical  
Engineering

Hirata & Associates, Inc.

99-1433 Koala Pl  
Aiea, HI 96701  
tel 808.486.0787  
fax 808.486.0870

October 8, 2008  
W.O. 08-4658

Mr. Keith Suga  
Goodfellow Brothers, Inc.  
P.O. Box 1090  
Koloa, Kauai, Hawaii 96756

*c.c. Keith Suga*  
*Jeff*

Dear Mr. Suga:

Re: Laboratory Testing Results  
for Base Course Material  
New Mill Crusher Stockpile  
Kalaheo, Kauai, Hawaii

COPY

SUBMITAL FOR  
BASE COURSE FOR  
PERMETER BERM  
ROAD (CELL 1)

(REC'D 4 MARCH 2010)

As requested, laboratory testing was performed on bulk soil samples of the base course material generated from Goodfellow Brothers, Inc. (GBI) New Mill Crusher facility in Kalaheo, Kauai. Earthmoving equipment was utilized to obtain samples from several areas inside the stockpile of base course. As discussed, current laboratory testing results for the base course material were requested by DOT personnel. As a result, a sieve analysis, sand equivalent, maximum density (modified Proctor) and laboratory CBR tests were performed on the granular sample. The L.A. Abrasion test was performed by Construction Engineering Labs (Conlabs), and the test results are enclosed with this letter.

Visually, the material consisted of reddish gray sandy gravel with silt, and was fairly well-graded with a sufficient amount of fine soils. The following is a summary of our laboratory test results. A gradation curve and (rock correction) modified Proctor curve are also attached with this letter.

Sieve Analysis

<u>Sieve Size</u>	<u>Percent Passing</u>
1-1/2"	100 ✓
3/4"	88.9
#4	45.1
#40	15.3
#200	7.5

Maximum Density (modified Proctor) w/rock correction

Maximum Density = 151.6 PCF  
Optimum Moisture Content = 6.8%

Hirata & Associates, Inc.

Laboratory CBR

CBR @ 0.1" = 178%

Swell = negligible

Sand Equivalent Test

S.E. value = 59% (State Spec. Min. <sup>35%</sup>~~30%~~) ✓


L.A. Abrasion Test

Lost = 21.4% (State Spec. Max. <sup>50%</sup>~~40%~~) ✓

If you have any questions concerning this letter, please call our office.

Sincerely,

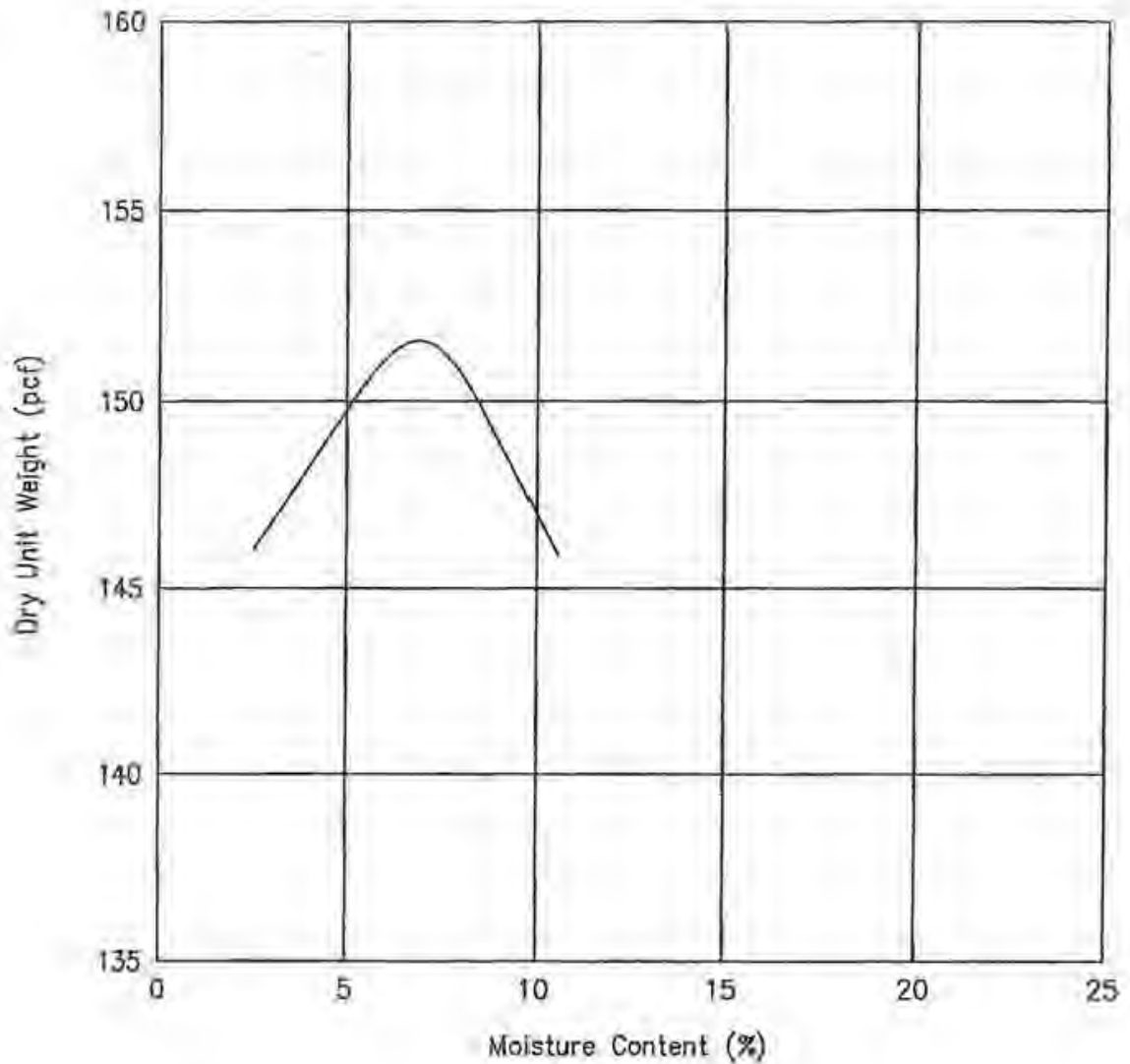
HIRATA & ASSOCIATES, INC.



David M. Kitamura, P.E.

DMK:4658LT.001

- enc. Modified Proctor Curve (Plate A1)
- Gradation Curve
- L.A. Abrasion Test Result from ConLabs



Soil Data

Bag No.: 1  
 Location: Stockpile at crusher site  
 Description: Reddish gray sandy gravel with silt - 3/4" base course

Test Results

Maximum Dry Density: 151.6 pcf  
 Optimum Moisture Content: 6.8 %

W.O. 08-4658.0

GBI Kalaheo Crusher

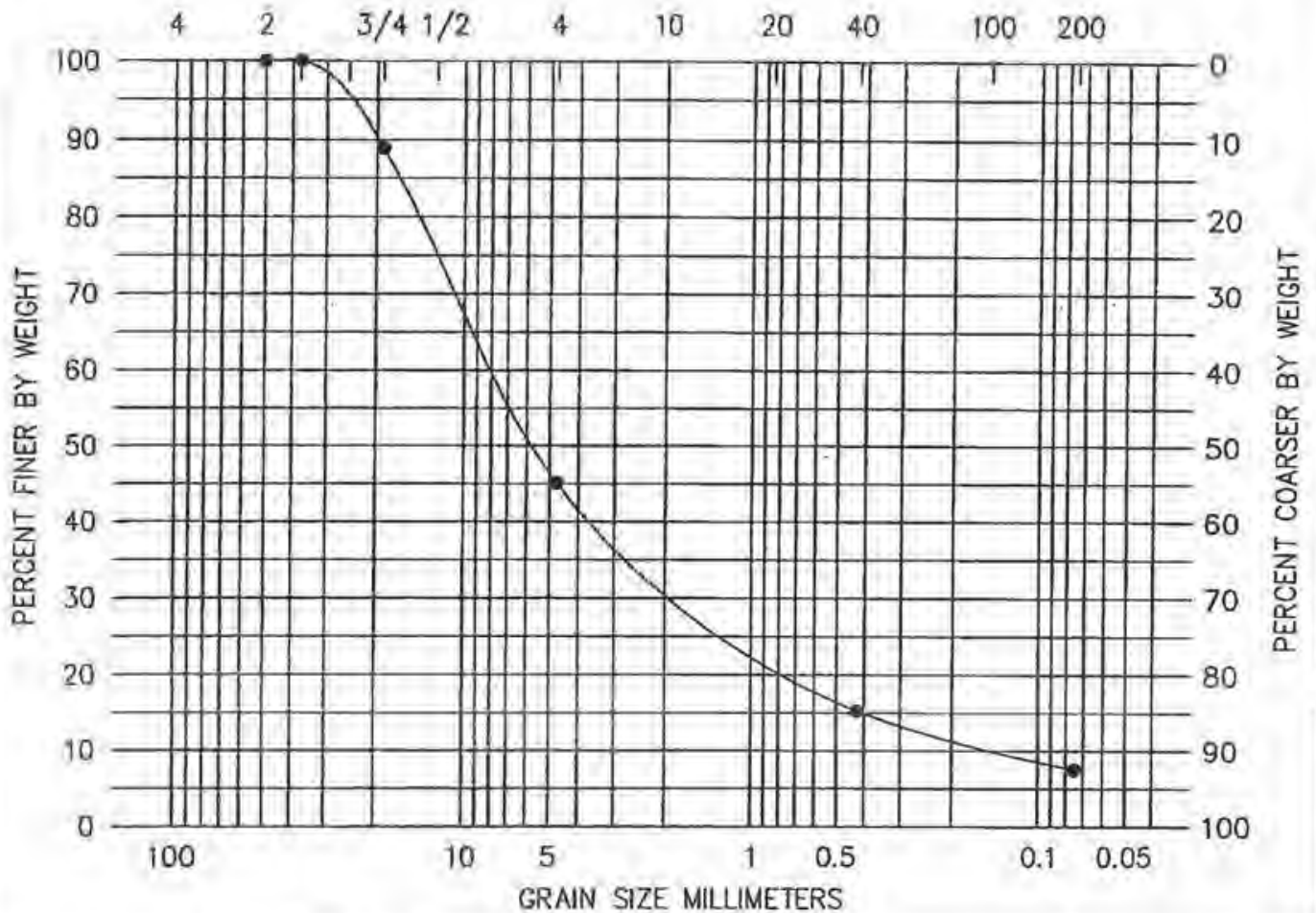
Hirata & Associates, Inc.

**MODIFIED PROCTOR CURVE**

Plate A1

U.S. STANDARD SIEVE OPENING  
IN INCHES

U.S. STANDARD SIEVE NUMBERS



COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

• Bag #11	Location: Stockpile
	Description: Reddish gray sandy gravel w/silt

W.O. 08-4658.0

GBI Kalaheo Crusher

Hirata & Associates, Inc.

# GRADATION CURVE





**Construction  
Engineering  
Labs**

96-1173 Waihona St., Unit B-7  
Pearl City, Hawaii 96782



Hirata & Associates, Inc  
99-1433 Koaha Pl.  
Aiea, Hawaii 96701

Date: 10/02/08  
Report #: 08473.001

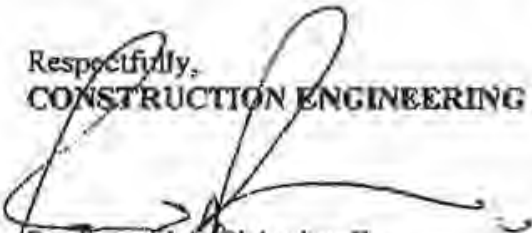
### TEST REPORT

Project: New Mill Crusher Kauai	W.O. No. 08473
Client: Hirata & Associates	Received: 9/11/08
Description of material: Base Course	Tech: WP
Source: GBI Crusher	Sample #: 9006
Depth: NA	Grading B

TEST	TEST RESULT LOSS (%)	SPECIFICATION
L A Abrasion ASTM C131	21.4	NA

Please contact our office if you have any questions.

Respectfully,  
**CONSTRUCTION ENGINEERING LABS, INC.**



By: Ronald A. Pickering II  
Its: Vice President Operations

10/2/08 10:00 AM 10/2/08 10:00 AM



**Appendix D**  
**Requests For Information**

**LIST OF REQUESTS FOR INFORMATION**  
**Phase II Lateral Expansion, Cell 1 Base Liner Construction**  
**Kekaha Sanitary Landfill**  
**October 18, 2010**

RFI NO.	SPECIFICATION/ DRAWING	TITLE	WASTE UNIT		
			NEW LEACHATE EVAPORATION POND	CELLS 1C & 1D	CELLS 1A & 1B
#1	02330	Sand Compaction	✓	✓	✓
#2	02330, Part 3.01	Subbase Proof Rolling with 20-ton Roller	✓	✓	✓
#3	02072, Part 2.04	Interface Shear Strength		✓	✓
#4	02058, Part 3.05, and Drawings 11 & 15	Perimeter Berm Anchor Trench	✓	✓	✓
#5	02072, Part 2.04	Interface Shear Strength		✓	✓
#6	02062, Parts 2.01 & 2.02	Granular Drainage Materials		✓	✓
#7	Drawing 2	Existing Forcemain to be Removed		✓	
#8	Drawing 3	NLEP As-Built Subgrade Survey	✓		
#9	Drawing 9	Headwall Structure for Infiltration Basin			✓
#10	Drawing 18	Pipe Penetration Air Test		✓	✓
#11	Drawing 22	Gas Monitoring Probe Construction		✓	✓
#12	02074, Part 3.02	Hydrated GCL	✓	✓	✓
#13	02074, Part 3.02	HDPE Pipe Pressure Tests		✓	✓
#14	Drawing 11	NLEP 2-inch Granular Protection Layer	✓		
#15	15019, Part 2.02D	HDPE Cleanout Flange and Fasteners		✓	✓
#16	02075, Part 3.03A	Heat Bonding of 16 oz/sy Geotextile	✓	✓	✓
#17	Drawing 13	2-inch HDPE Flatstock in NLEP	✓		
#18	Drawing 22	Gas Monitoring Protective Casing		✓	✓
#19	Drawing 18	Backfill of Void Below Pipe Penetration		✓	✓
#20	02062, Part 2.02B	3/8-inch Minus Operations & Protection Layers	✓	✓	✓
#21	Drawing 13	Batten Strip for Aerator Support Pad	✓		
#22	Drawing 15, Details 2 & 3	Cell Separator Geotextile Anchoring		✓	✓
#23	Drawing 17, Detail 6	Temporary Cell Termination		✓	✓
#24	02072, Part 2.04F	Interface Shear Strength		✓	✓
#25	Drawing 17, Detail 3	SDR for Dual Containment Forcemain Pipe		✓	✓
#26	Drawing 19, Detail 5	New Leachate Forcemain Valve Box			✓
#27	Drawing 17, Detail 3	Wet Well #3			✓
#28	02330, Part 2.01B	Compacted Fill (Offsite Soils)			✓
#29	Drawing 22, Detail 3	Flow Meter Vault			✓
#30	02330, Part 2.01C	Final Subbase Compacted Fill Lift			✓
#31	Drawing 17, Detail 4	Leachate Transfer Pipe Backfill			✓
#32	Drawing 11, Detail 2	Float Level Switch			✓
#33	Drawing 4	Cell 1A Tie-in to Phase II			✓
#34	Drawing 6 and 18	As-Built Grades for Cells 1A & 1B Penetrations			✓
#35	Drawing 4	Point 66 Subgrade Elevation			✓
#36	Drawings 2 & 9	Infiltration Basin and Ditch Grades			✓

GOODFELLOW BROS., INC.  
P.O. Box 3029 Lihue, Hawaii 96766  
(808) 241-4601 phone (808) 241-4605 fax

**REQUEST FOR INFORMATION**

*QBI RESCINDED*

TO: Waste Management of Hawaii RFI No.: 1  
ATTN: Jesse Frey Request submitted: January 6, 2010  
Respond requested by: Jeff Griffin  
Project: Kekaha Sanitary Landfill  
Phase II Lateral Expansion

Specification Reference: 02330 Plan Reference: \_\_\_\_\_

Subject:  Discrepancy  Clarification  Suggestion  Other

Request:

Approximately 38,000 cy of onsite native sand material will be embanked in the bottom of Cell 1. We believe the material may have a higher variance than the specified  $\pm 2\%$  of optimum moisture content due to its close proximity to the water table, please clarify if alternative methods of testing will be developed to measure compaction when near the existing water table.

Signed: Jeff M. Griffin

Date: January 6, 2010

Reply:

Signed: \_\_\_\_\_

Date: \_\_\_\_\_

Request VIA:  Telephone  Facsimile  Email  
Copies to:  File

GOODFELLOW BROS., INC.  
P.O. Box 3029 Lihue, Hawaii 96766  
(808) 241-4601 phone (808) 241-4605 fax

---

## REQUEST FOR INFORMATION

TO:	<u>Waste Management of Hawaii</u>	RFI No.:	<u>2</u>
ATTN:	<u>Jesse Frey</u>	Request submitted:	<u>January 7, 2010</u>
		Respond requested by:	<u>Keith Suga</u>
		Project:	<u>Kekaha Sanitary Landfill Phase II Lateral Expansion</u>

Specification Reference: 02330,3.01C Plan Reference: \_\_\_\_\_

Subject:  Discrepancy  Clarification  Suggestion  Other

---

Request:

Per the above referenced specification section a 20 ton roller is required to proof roll subbase to identify areas of soft material. We currently have a 10 ton vibratory roller on island that we would like to utilize for all of the projects proof rolling and compaction needs. Please advise if this is acceptable.

Signed: Keith Suga

Date: January 7, 2010

---

Reply:

Change in the above referenced specification is acceptable as long as compaction is still achieved as specified and that visual observation of prepared areas, when traversed by loaded vehicles, do not demonstrate pumping or soft areas. Repair and fix pumping or soft areas encountered as specified.

Signed: 

Date: 1/9/2010

Request VIA:  Telephone  Facsimile  Email  
Copies to:  File

Geosyntec Consultants, Inc.  
475 14<sup>th</sup> Street, Suite 400 Oakland, California 94612  
(510) 836-3034 phone (510) 836-3036 fax

## REQUEST FOR INFORMATION

TO: Waste Management of Hawaii RFI No.: 3  
ATTN: Jesse Frey Request submitted: January 26, 2010  
Respond requested by: Mike Minch, Geosyntec  
Project: Kekaha Sanitary Landfill  
Phase II Lateral Expansion

Specification Reference: 02072, Parts 2.04 F&G Plan Reference: \_\_\_\_\_

Subject:  Discrepancy  Clarification  Suggestion  Other


Requests: Section 02072 Part 2.04F lists minimum interface direct shear strengths for the various geosynthetic interfaces. Please clarify whether these minimum requirements refer to peak or post-peak strengths.

Section 02072 Part 2.04G states that Engineer approval is necessary in order to use the apparent adhesion results of lab interface testing as a basis of material approval. As such, attached interface 3A and 9 test results require Engineer review and approval. Please confirm whether attached interface 3A and 9 are passing.

Signed: /s/ Mike Minch  
Date: January 26, 2010

Reply: The interface direct shear strength values listed in Section 02072 Part 2.04.F define the minimum value for peak strength.

In review of the design calculations (buildout stability and drainage layer stability) and the shear strength results for interfaces 3A and 9 of the laboratory report, these test results are acceptable. The peak value for 3A exceeds the peak value specified. The value for interface 9 is 22.0 degrees. Based on the design calculations, the area affected most for this interface is the cell base sideslope during drainage layer placement and which equipment is used for that task. Based upon this calculation, interface 9 is acceptable as well. Please verify which piece of equipment will be used on the sideslope during placement in case this calculation needs to be revisited. The specified piece of equipment is a Caterpillar D6H LGP with surface pressure of less than 5 psi.

Signed:   
Date: 1/28/2010

Request VIA:  Telephone  Facsimile  Email  
Copies to:  File

INTERFACE SHEAR TEST TABLE for Kehaka LF 2010

MATERIALS		Spec (Conf)	Spec (Pond)	Lab Peak	Lab Post-Peak	PASS OR FAIL																			
Test No.	No. of runs per Config	Normal Stress (psi)	Operations Layer (S/F)	60s NW/GT	Drainage Gravel (1.5")	15 cc HW/GT	15 cc HW/GT	15 cc HW/GT	15 cc HW/GT	60s NW/GT	OC (white side)	OC (white side)	OC (black side)	OC (black side)	Subbase Sol 1	Subbase Sol 2	Subbase Sol 1	Subbase Sol 2	Subbase Sol 1	Subbase Sol 2	Spec (Conf)	Spec (Pond)	Lab Peak	Lab Post-Peak	PASS OR FAIL
1	3	30,40,50		60s NW/GT																	25				
2	3	30,40,50		60s NW/GT	Drainage Gravel (1.5")																25				
3A	3	30,40,50		60s NW/GT	Drainage Gravel (1.5")	15 cc HW/GT															25		79.1	13.5	
3B	3	30,40,50		60s NW/GT	Drainage Gravel (1.5")	15 cc HW/GT															25				
4A	3	30,40,50		60s NW/GT	Drainage Gravel (1.5")	15 cc HW/GT															21				
4B	3	30,40,50		60s NW/GT	Drainage Gravel (1.5")	15 cc HW/GT															21				
5A	3	30,40,50		60s NW/GT	Drainage Gravel (1.5")	15 cc HW/GT															21				
5B	3	30,40,50		60s NW/GT	Drainage Gravel (1.5")	15 cc HW/GT															21				
6A	3	30,40,50		60s NW/GT	Drainage Gravel (1.5")	15 cc HW/GT															21				
6B	3	30,40,50		60s NW/GT	Drainage Gravel (1.5")	15 cc HW/GT															21				
6C	3	30,40,50		60s NW/GT	Drainage Gravel (1.5")	15 cc HW/GT															21				
6D	3	30,40,50		60s NW/GT	Drainage Gravel (1.5")	15 cc HW/GT															21				
7	3	2.5,10	Operations Layer (S/F)	60s NW/GT	Drainage Gravel (1.5")																25				
8	3	2.5,10		60s NW/GT	Drainage Gravel (1.5")	15 cc HW/GT															25				
9	3	2.5,10		60s NW/GT	Drainage Gravel (1.5")	15 cc HW/GT															25				
10	3	2.5,10		60s NW/GT	Drainage Gravel (1.5")	15 cc HW/GT															25				
11	3	2.5,10		60s NW/GT	Drainage Gravel (1.5")	15 cc HW/GT															25				
12A	3	2.5,10		60s NW/GT	Drainage Gravel (1.5")	15 cc HW/GT															25				
12B	3	2.5,10		60s NW/GT	Drainage Gravel (1.5")	15 cc HW/GT															25				
12C	3	2.5,10		60s NW/GT	Drainage Gravel (1.5")	15 cc HW/GT															25				
Total	57																								
Total Configs where materials will be used			2	4	5	3	30	6	3	3															
No. of runs per material			6	12	18	6	30	18	6	6															
No. of runs/ Sockets of 60 lbs of materials needed			3	3	6	4	4	3	3	3															





GOODFELLOW BROS., INC.  
P.O. Box 3029 Lihue, Hawaii 96766  
(808) 241-4601 phone (808) 241-4605 fax

---

**REQUEST FOR INFORMATION**

TO:	<u>Waste Management of Hawaii</u>	RFI No.:	<u>4</u>
ATTN:	<u>Jesse Frey</u>	Request submitted:	<u>February 1, 2010</u>
		Respond requested by:	<u>Keith Suga</u>
		Project:	<u>Kekaha Sanitary Landfill Phase II Lateral Expansion</u>

Specification Reference: Section 02058, 3.05 Plan Reference: DWG 11

Subject:  Discrepancy  Clarification  Suggestion  Other

---

Request:

Per plan drawing no. 11 the anchor trench for the Leachate Pond is to be excavated at a depth of about 4' by 4' wide. Due to the physical nature of the onsite sand material we feel excavating the anchor trench vertical will be difficult to achieve and maintain. We also have concerns with the triangular area within the anchor trench that calls out "backfill and compact anchor trench prior to geocell installation. We would like clarification on how we are to compact onsite sand material on a one to one slope within a 4' wide anchor trench. We would like to recommend running out the liner and eliminating the anchor trench. This would address vertical trenches and compaction in the anchor trench prior to geocell installation. A similar situation occurs with the cell 1 anchor trench with the vertical walls. Please advise how to proceed with leachate pond and cell 1 anchor trench work.


Signed: Keith Suga

Date: February 1, 2010

---

GOODFELLOW BROS., INC.  
P.O. Box 3029 Lihue, Hawaii 96766  
(808) 241-4601 phone (808) 241-4605 fax

Reply: Based upon discussions with Presto and evaluating your concerns on the geometry of the anchor trench shown on Drawing 11 for the leachate evaporation pond, the anchor trench can be modified. The anchor trench is required for anchoring and protecting the end of the geosynthetics. The anchor trench can be modified to a "vee" shape which can be cut by a dozer or grader to a 1:1 slope. The dead man for the geoweb requires the overburden and proper compaction to perform as designed. The revised leachate evaporation pond anchor trench will remain to be 4 feet deep with a 1:1 slope along the pond side and shaped on the opposite side to fit construction needs. The geosynthetics of the pond will be required to be placed at least 4 feet into the anchor trench. The location of the dead man remains the same as shown on the drawing. The anchor trench will need to be compacted in 1 foot lifts with the final lift tested by nuclear density moisture gauge at an interval of 1 test per 100 lf of anchor trench. Compaction requirement is 90% maximum dry density of the Modified Proctor. A revised Drawing #11 will be provided. The anchor trench for Cell 1 along the perimeter berm can be cut in the same "vee" format to the design depth of 2 feet. A revised detail will be provided as well.

Signed: 

Date: 2/8/10

Request VIA:  Telephone  Facsimile  Email  
Copies to:  File

Geosyntec Consultants, Inc.  
475 14<sup>th</sup> Street, Suite 400 Oakland, California 94612  
(510) 836-3034 phone (510) 836-3036 fax

## REQUEST FOR INFORMATION

TO: Waste Management of Hawaii RFI No. 5  
ATTN: Jesse Frey Request submitted: February 2, 2010  
Respond requested by: Mike Minch, Geosyntec  
Project: Kekaha Sanitary Landfill  
Phase II Lateral Expansion

Specification Reference: 02072, Parts 2.04 F&G Plan Reference: \_\_\_\_\_

Subject:  Discrepancy  Clarification  Suggestion  Other

Requests: Section 02072 Part 2.04F lists minimum interface direct shear strengths for the various geosynthetic interfaces, and the response to RFI #3 clarified that these minimum requirements refer to peak strengths. Additionally, Section 02072 Part 2.04G states that Engineer approval is necessary in order to use the apparent adhesion results of lab interface testing as a basis of material approval.


Based on these criteria, please review the attached interface 3B, 4A and 4B test results, and confirm whether these results are passing or if any exceptions can be made to accept the material(s).

Signed: /s/ Mike Minch  
Date: February 2, 2010

Reply: In response to this RFI #5, interface 3B is acceptable, interface 4A approved, and interface 4B is not approved. 3B meets the design requirements for bulldoz stability and drainage layer stability. Interface 4A met project specifications as shown for peak values.

Interface 4B (80 mil (shiny) to GCL (white)) is not approved given the low friction angle and high adhesion. AECOM is requesting this interface to rerun as adhesion is quite variable and can not fully be depended upon for stability. Of note, in review of the test data provided to date, the interfaces involving 80-mil HDPE (shiny side) are over 9 degrees lower in friction angle than the same tests done with 60-mil HDPE (shiny side). Is there a noticeable difference in texturing?

Also note for installation, please verify with field installation crews and CQA observers of the orientation of the products installed in the field in comparison to lab tests completed.

Signed:   
Date: 2/5/2010

Request VIA:  Telephone  Facsimile  Email  
Copies to:  File

**INTERFACE SHEAR TEST TABLE for Kehaka LF 2010**

Test No.	No of runs per Config	Nominal Stress (psi)	MATERIALS							Spec Peak	Spec Peak	Lab Peak	Lab Post-Peak	PASS OR FAIL
										(C&G)	(NLEP)			
1	3	30,40,50	Operations Layer (-3/8")	6oz NW GT						25	---	30.1	15.6	Pass
2	3	30,40,50		6oz NW GT	Drainage Gravel (-1.5")					25	---	28.9	11.8	Pass
3A	3	30,40,50			Drainage Gravel (-1.5")	16 oz NW GT	60mil HDT (shiny side)			25	---	28.1	11.9	Pass
3B	3	30,40,50			Drainage Gravel (-1.5")	16 oz NW GT	60mil HDT (shiny side)	60mil HDT (shiny side)		25	---	19.3	11.4	Pass
4A	3	30,40,50					60mil HDT (shiny side)	GCL (white side)		23	---	24.4	13.2	Pass
4B	3	30,40,50					60mil HDT (shiny side)	GCL (white side)	60mil HDT (shiny side)	23	---	15.0	15.1	Pass
5A	3	30,40,50					60mil HDT (dull side)	GCL (black side)		23	---	23.1	11.7	Pass
5B	3	30,40,50					60mil HDT (dull side)	GCL (black side)	60mil HDT (dull side)	23	---	21.9	14.8	Pass
6A	3	30,40,50					60mil HDT (dull side)		Subbase Soil 1	25	---	30.1	26.0	Pass
6B	3	30,40,50					60mil HDT (dull side)		Subbase Soil 2	25	---	17.0	24.2	Pass
6C	3	30,40,50					60mil HDT (dull side)		Subbase Soil 2	---	---	---	---	---
6D	3	30,40,50					60mil HDT (dull side)		Subbase Soil 2	---	---	---	---	---
7	3	2,5,10	Operations Layer (-3/8")	6oz NW GT						23	---	40.8	39.4	Pass
8	3	2,5,10		6oz NW GT	Drainage Gravel (-1.5")					25	---	42.3	40.7	Pass
9	3	2,5,10			Drainage Gravel (-1.5")	16 oz NW GT	60mil HDT (shiny side)			25	15	22.0	14.7	Pass*
10	3	2,5,10					60mil HDT (shiny side)	GCL (white side)		23	15	30.8	20.7	Pass
11	3	2,5,10					60mil HDT (dull side)	GCL (black side)		23	15	17.9	17.1	Pass
12A	3	2,5,10					60mil HDT (dull side)		Subbase Soil 1	25	15	4.0	34.1	Pass
12B	3	2,5,10					60mil HDT (dull side)		Subbase Soil 2	---	---	---	---	---
<b>Total</b>	<b>57</b>													
<b>Total Configs where materials will be used</b>			<b>2</b>	<b>4</b>	<b>5</b>	<b>3</b>	<b>10</b>	<b>6</b>	<b>3</b>	<b>3</b>				
<b>No. of runs per material</b>			<b>6</b>	<b>12</b>	<b>15</b>	<b>9</b>	<b>30</b>	<b>18</b>	<b>9</b>	<b>9</b>	<b>15</b>			
<b>No. of rolls/ buckets of 60 lbs of materials needed</b>			<b>2</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>4</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>			

**Notes**

\* Interface 9 shear strength results approved by AECOM per response to RFI #1 (28 January 2010) provided that a CAT D6H (GP or lighter equipment) is used

Kim Huynh

---

**From:** Chris Scott  
**Sent:** Thursday, February 25, 2010 8:17 PM  
**Subject:** Fw: Kekaha LF Interface 4B

Fyi

---

**From:** Bergschultz, Ken <KEN.BERGSCHULTZ@aecom.com>  
**To:** Frey, Jesse <JFrey@wm.com>; Impens, Jeffrey <Jeffrey.Impens@aecom.com>  
**Cc:** Keith Suga <keiths@goodfellowbros.com>; Jeff Griffin <jeffg@goodfellowbros.com>; Mike Minch; Chris Scott  
**Sent:** Wed Feb 24 23:42:39 2010  
**Subject:** RE: Kekaha LF Interface 4B

Thanks Jesse.

AECOM evaluated the slope stability of the proposed 80-mil vs. GCL based upon the actual lab results (initial and retested) which resulted in high adhesion and low friction angles. Based upon the revisited calculation the 80-mil and GCL interface friction angle results are excepted as provided.

I will forward the final calculation after my review comments are incorporated into the calc.

Any questions, please let me know.

**Kenneth J. Bergschultz, PE**  
Office Manager, Midwest Region  
Environment  
P 920.451.2452 C 920.918.3290  
[k.bergschultz@aecom.com](mailto:k.bergschultz@aecom.com)

**AECOM**  
4135 Technology Parkway  
Sheboygan, WI 53083  
T 920.458.8711 F 920.458.0550  
[www.aecom.com](http://www.aecom.com)

---

**From:** Frey, Jesse [mailto:JFrey@wm.com]  
**Sent:** Tuesday, February 23, 2010 6:02 PM  
**To:** Bergschultz, Ken; Impens, Jeffrey  
**Cc:** Keith Suga; Jeff Griffin; MMinch@Geosyntec.com; CScott@Geosyntec.com  
**Subject:** FW: Kekaha LF Interface 4B

Kenny and Jeff,

Please take a look at the attached. Hopefully this helps you to address RFI#5.

Regards,

Jesse Frey  
Engineer  
Site Management of Hawaii  
100 Farrington Hwy  
Kapolei, HI 96707  
Ph: 808-250-0574

Fax: 808-668-1366

---

**From:** Kirk Lilleskare [mailto:killeskare@northwestlinings.com]  
**Sent:** Tuesday, February 23, 2010 12:50 PM  
**To:** Frey, Jesse  
**Subject:** FW: Kekaha LF Interface 4B

Jesse,

Mike is out of town and I wanted to discuss the attached interface to get the 80 mil rolls approved. See the note below and test result attached and give me a call. Thanks

KIRK LILLESKARE - VICE PRESIDENT CONSTRUCTION  
Northwest Linings & Geotextile Products, Inc.  
21000 77th Ave. South  
Kent, WA 98032  
Ph. 253-872-0244 x 109  
Fx. 253-872-6953

[kirk@northwestlinings.com](mailto:kirk@northwestlinings.com)

---

**From:** Kirk Lilleskare [mailto:killeskare@northwestlinings.com]  
**Sent:** Tuesday, February 23, 2010 12:52 PM  
**To:** 'rminch@geosyntec.com'  
**Subject:** Kekaha LF Interface 4B

Mike,

I attached the result from TRI. The peak friction angle is similar to that on the 2 previous tests but with higher shear stresses generated at each normal stress, the specification line was added to provide clarity regarding the individual points. The shear stresses are as high as the other interfaces.

Give me a call to discuss. Thanks

KIRK LILLESKARE - VICE PRESIDENT CONSTRUCTION  
Northwest Linings & Geotextile Products, Inc.  
21000 77th Ave. South  
Kent, WA 98032  
Ph. 253-872-0244 x 109  
Fx. 253-872-6953

[kirk@northwestlinings.com](mailto:kirk@northwestlinings.com)

---

**Waste Management recycles enough paper every year to save 41 million trees. By not printing this email, you can help save even more.**

INTERFACE SHEAR TEST TABLE for Kehaka LF 2010

Test No.	No of runs per Config.	Nominal Stress (psi)	Materials	Spec Peak (ksi)	Spec Peak (N/ft <sup>2</sup> )	Lab Peak	Lab Post-Peak	PASS OR FAIL
1	3	30,40,50	Operations Layer (3/8") - 60# NW GT	25	25	30.1	16.6	Pass
2	3	30,40,50	60# NW GT	25	25	29.9	22.8	Pass
3A	3	30,40,50	Drainage Gravel (1.5") - 16 oz NW GT	25	25	28.1	13.9	Pass
3B	3	30,40,50	Drainage Gravel (1.5") - 16 oz NW GT	25	25	19.1	12.4	Pass
4A	3	30,40,50	60#il HDT (blky side)	25	25	24.4	13.2	Pass
4B	3	30,40,50	60#il HDT (wht side)	25	25	25.0	14.5	Pass
5A	3	30,40,50	60#il HDT (blky side)	25	25	28.1	11.1	Pass
5B	3	30,40,50	60#il HDT (wht side)	25	25	33.9	14.3	Pass
6A	3	30,40,50	60#il HDT (blky side)	25	25	30.3	28.5	Pass
6B	3	30,40,50	60#il HDT (blky side)	25	25	37.0	28.2	Pass
7C	3	30,40,50	60#il HDT (blky side)	25	25	---	---	---
7D	3	30,40,50	60#il HDT (blky side)	25	25	---	---	---
7E	3	30,40,50	60#il HDT (blky side)	25	25	---	---	---
8	3	2,5,10	Operations Layer (3/8") - 16 oz NW GT	25	25	40.6	39.4	Pass
9	3	2,5,10	60#il HDT (blky side)	25	25	48.0	46.7	Pass
10	3	2,5,10	Drainage Gravel (1.5") - 16 oz NW GT	25	25	22.0	14.2	Pass
11	3	2,5,10	60#il HDT (blky side)	25	25	30.8	29.1	Pass
12A	3	2,5,10	60#il HDT (blky side)	25	25	37.9	17.1	Pass
12B	3	2,5,10	60#il HDT (blky side)	25	25	43.0	34.5	Pass
Total	52							
Total Configs where materials will be used								
No. of runs per material								
No. of runs/ buckets of 60 lbs of material needed								

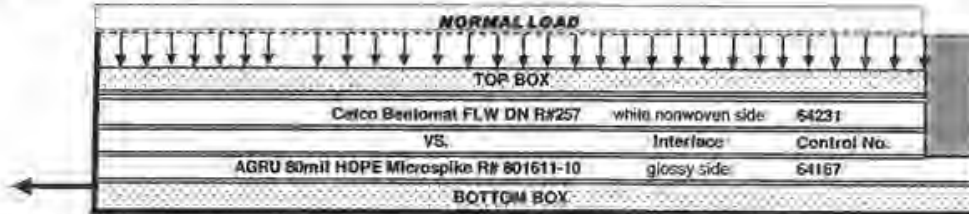
\*\*\* Interface 9 shear strength results approved by AECOM per response to RFI 43 (28 January 2010) provided that a CMT DSH-GCP or lighter equipment is used  
 \*\*\* Interface 3B shear strength results approved by AECOM per response to RFI 45 (5 February 2010)

Normal Stress (psi)	Initial Test Peak Shear Strength (psi)	Re-Test Peak Shear Strength (psi)
30	2247	2147
40	2312	2356
50	2776	2912

Reviewed L. [Signature]  
 Date: 01/29/10

INTERFACE SHEAR TEST RESULT (ASTM D6243)  
 PGL Job No. G10-0020

TEST CONFIGURATION: 4B



TEST CONDITIONS:

SAMPLE PREPARATION:

- Specimens were cut along machine direction to 14" x 17" for the upper box, and 14" x 19" for the lower box, with an effective test area of 12" x 12".
- Geosynthetic specimens were secured via flat bar clamping mechanisms complete with bolts and nuts (7/pair).

CONSOLIDATION:

- Each set of specimen was consolidated under flooded condition for 24 hrs @ normal load before shearing.
- Normal loads were applied using Bladder for all loads.

SHEAR TEST:

- Shear test was conducted @ 0.040 in/min.
- Sheared @ minimum 3.0 inch horizontal displacement.
- The test specimens were sheared at flooded condition.
- Test were performed in general accordance with ASTM D6243 using Brainard-Kilmer LG-112 Direct Shear machines with effective test area of 12 in X 12 in.

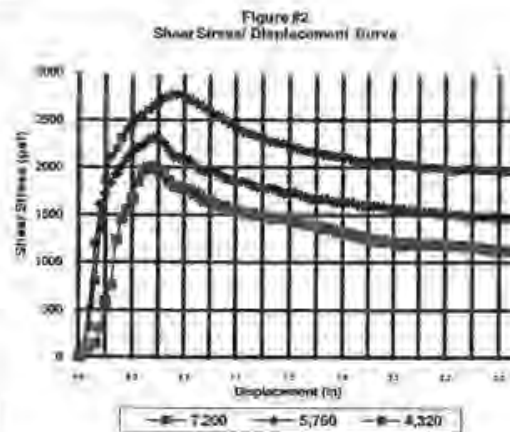
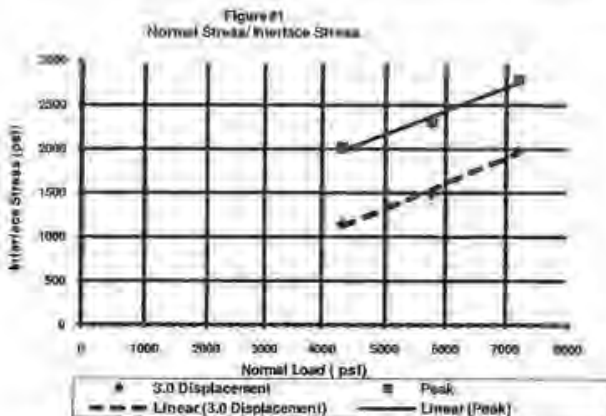
TEST RESULTS:

Normal Stresses Applied		GCL Moisture Content		Asperity Heights		PEAK STRENGTH		POST-PEAK STRENGTH AT 3.0 INCHES	
		Before	After	Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psf)	(psf)	(%)	(%)	(mils)	(mils)	(psf)	(degrees)	(psf)	(degrees)
30.00	4,320	22.2	65.9	32	29	2008	25	1147	15
46.00	5,760	22.2	61.0	31	27	2312	29	1477	14
50.00	7,200	22.2	52.8	31	24	2778	21	1978	15
Note:						COHESION (psf):		0	
						COEFFICIENT OF FRICTION:		0.27	
						FRICTION ANGLE (degrees):		15.0	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

OBSERVATIONS:

- No jilting of the system or any abnormalities observed during and after the test.
- Superficial abrasion on the geosynthetics interfacing sides (typical to all loads).
- Sliding occurred between the two interfacing surfaces.



By reviewing the data and results presented on this report, the Client agrees to waive the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims, on account, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.

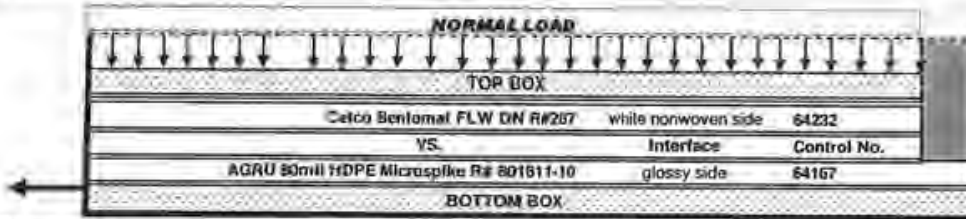


**RETEST**

**INTERFACE SHEAR TEST RESULT (ASTM D6243)**  
 PGL Job No. G10-0020

Reviewed By: \_\_\_\_\_  
 Date: 02/05/10

**TEST CONFIGURATION 4B1**



**TEST CONDITIONS:**

**SAMPLE PREPARATION:**

1. Specimens were cut along machine direction to 14" x 17" for the upper box, and 14" x 15" for the lower box, with an effective test area of 12" x 12".
2. Geosynthetic specimens were secured with full width clamping mechanisms complete with bolts and nuts (7-pairs).

**CONSOLIDATION:**

1. Each set of specimen was consolidated under flooded condition for 2 hours @ normal load before shearing.
2. Normal loads were applied using Bladder for all tests.

**SHEAR TEST:**

1. Shear test was conducted @ 0.040 in/min.
2. Sheared @ minimum 3.0 inch horizontal displacement.
3. The test specimens were sheared at flooded condition.
4. Test were performed in general accordance with ASTM D6243 using Brinard-Kilman LG-112 Direct Shear machine with effective test area of 12 in X 12 in.

**DRAFT**

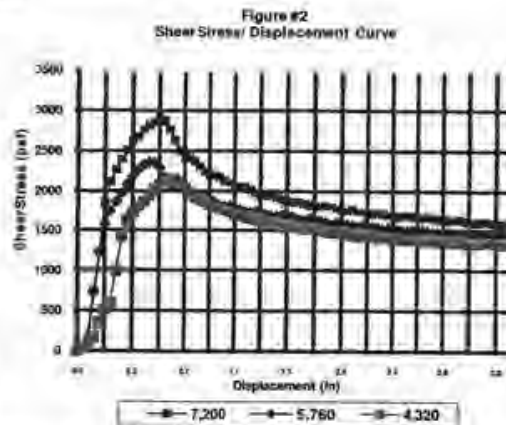
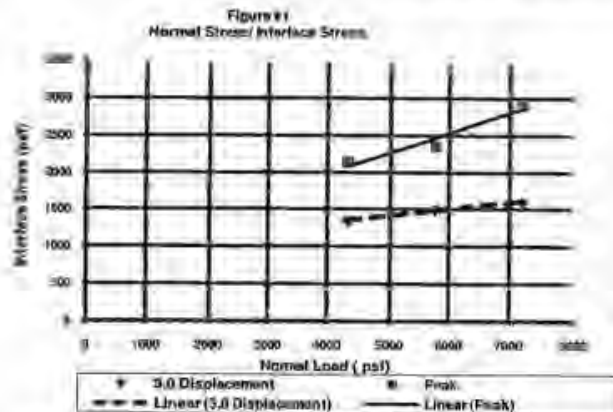
**TEST RESULTS:**

Normal Stresses Applied		GCL Moisture Content		Asperity Heights		PEAK STRENGTH		POST-PEAK STRENGTH AT 3.0 INCHES	
		Before	After	Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psf)	(psf)	(%)	(%)	(mils)	(mils)	(psf)	(degrees)	(psf)	(degrees)
30.00	4,920	22.2	75.6	29	26	2147	26	1338	17
40.00	5,760	22.2	88.5	30	26	2356	22	1481	15
50.00	7,200	22.2	84.7	30	26	2912	22	1591	12
Note:						COHESION (psf) :		942	
						COEFFICIENT OF FRICTION :		0.27	
						FRICTION ANGLE (degrees) :		14.9	
								967	
								0.09	
								5.0	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

**OBSERVATIONS:**

1. No tilting of the system or any abnormalities observed during and after the test.
2. Superficial abrasion on the geosynthetic interacting sides (typical to all loads).
3. Sliding occurred between the two interfacing surfaces.



By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims or lawsuits, due to the use of this data, to the extent for this specific tests presented in this report, and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories free and against all liabilities in excess of the aforementioned limit.



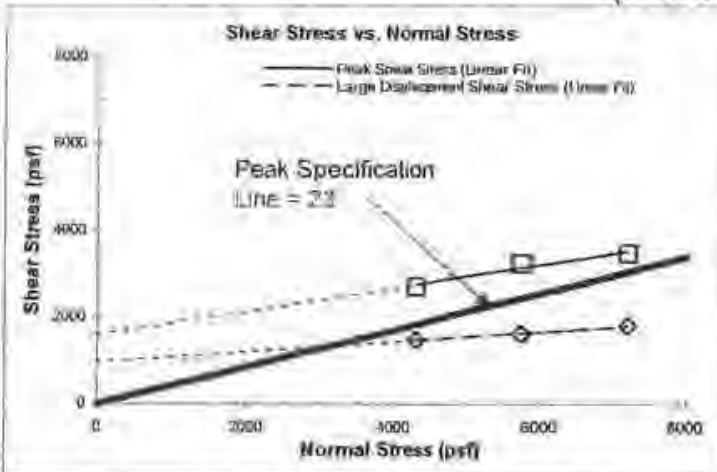
## Interface Friction Test Report

Client: Northwest Lining  
Project: Kekaha Landfill  
Test Date: 02/19/10-02/22/10

TRI Log#: E2337-17-04  
Test Method: ASTM D 6243

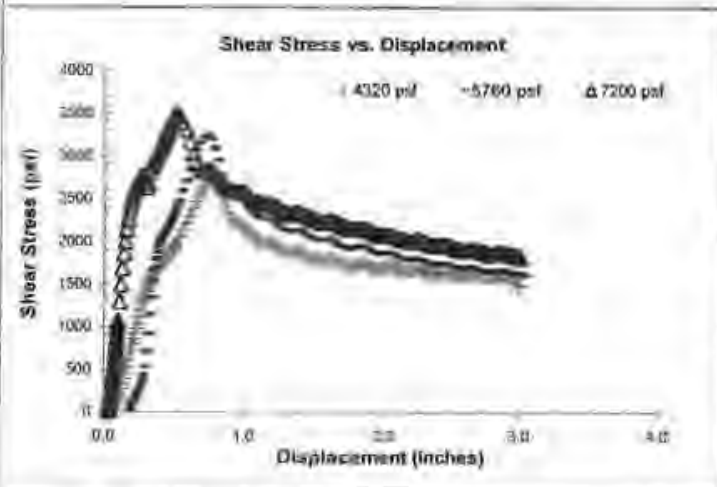
John M. Allen, P.E., 02/23/2010  
Quality Review/Date

**Tested Interface: Bentomat FLW DN GCL (259) vs. Agru 80 mil HDPE Microspike Geomembrane (801612-10)**



Test Results		
	Peak	Large Displacement (@ 3.0 in.)
Friction Angle (degrees):	15.0	6.7
Y-intercept or Adhesion (psf):	1595	961

Shearing occurred at the interface.

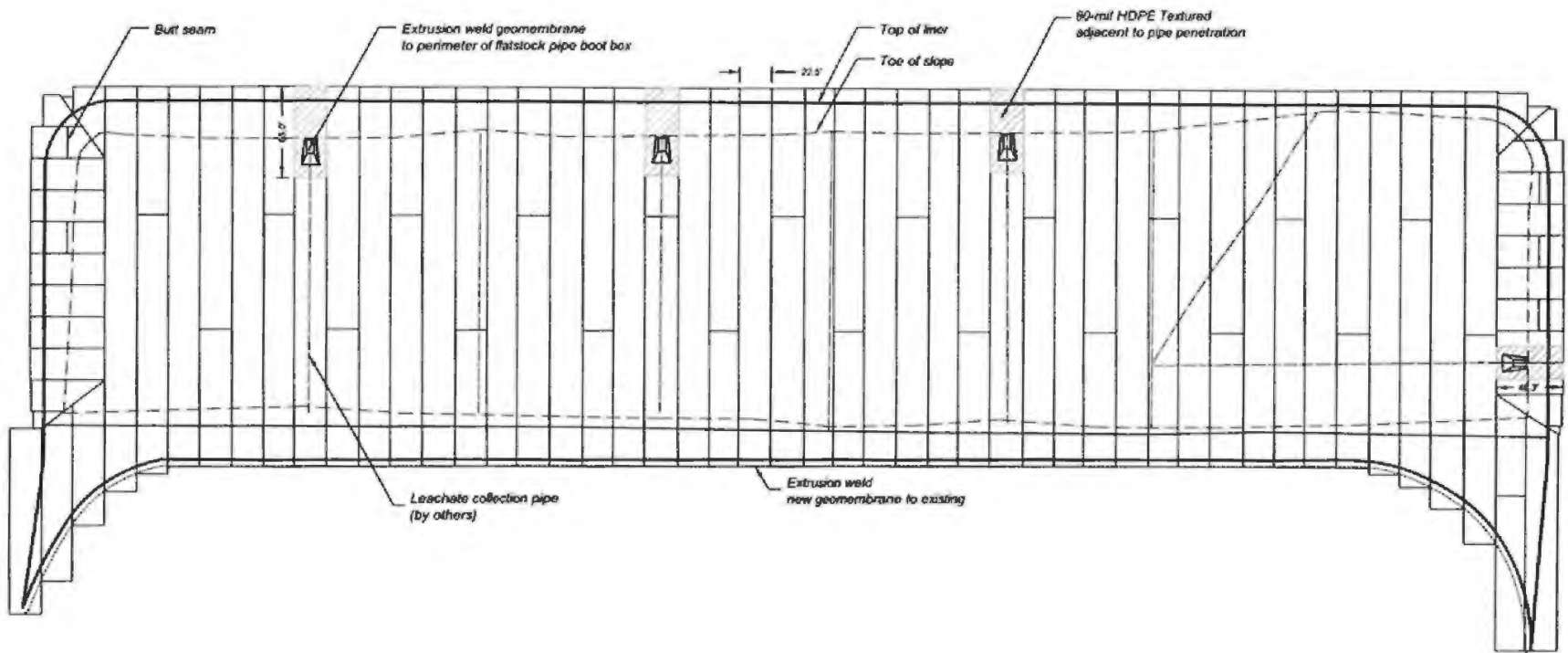


Test Conditions	
Upper Box &	Bentomat FLW DN GCL (white side)
Lower Box	Agru 80 mil HDPE Microspike geomembrane (shiny side)
Box Dimensions: 12"x12"x4"	
Interface Conditioning:	Interface soaked and loading applied for a minimum of 24 hours prior to shear.
Test Condition: Wet	
Shearing Rate: 0.04 inches/minute	

Test Data			
Specimen No.	1	2	3
Bearing Slide Resistance (lbs)	49	63	76
Normal Stress (psf)	4320	5760	7200
Corrected Peak Shear Stress (psf)	2706	3241	3479
Corrected Large Displacement Shear Stress (psf)	1479	1615	1817
Peak Secant Angle (degrees)	32.1	29.4	25.8
Large Displacement Secant Angle (degrees)	18.9	15.7	14.2
Asperity (mils)	30.2	31.8	31.4

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material.

TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



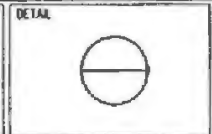
Field check number, position and completion of panel installation will be indicated in the field by the panel number.

**Kekaha Sanitary Landfill Phase II Lateral Expansion - Cell 1**  
**Proposed 60-mil textured HDPE liner Panel Layout**

**NORTHWEST LININGS &  
 GEOTEXTILE PRODUCTS, Inc.**

www.northwestlinings.com  
 21068 77TH AVE. SOUTH  
 KENT, WA 98032  
 (253) 872-0234 (253) 872-0235 FAX

S J  
**1 of 1**



JOB NAME:	Kekaha Sanitary Landfill		
JOB NO.:	N 0 1 1 5 0		
DATE:	11 17 09	CHECKED:	SC
BY:	JS	SCALE:	AS SHOWN

## Mike Minch

---

**From:** Bergschultz, Ken [KEN.BERGSCHULTZ@aecom.com]  
**nt:** Thursday, May 27, 2010 2:22 PM  
**To:** Frey, Jesse; Mike Minch  
**Cc:** Impens, Jeffrey  
**Subject:** Base Liner Stability - GCL Lab Results  
**Attachments:** Revised base\_slopestability\_equip 022410 reviewed 022610.pdf

Jesse and Mike,

Attached is the supporting calculation for the acceptance of the GCL/80-mil geomembrane test results for inclusion into the documentation report.

If you have any questions, please let me know.

**Kenneth J. Bergschultz, PE**  
Office Manager, Midwest Region  
Environment  
D 920.451.2452 C 920.918.3295  
[ken.bergschultz@aecom.com](mailto:ken.bergschultz@aecom.com)

**AECOM**  
4135 Technology Parkway  
Sheboygan, WI 53083  
T 920.458.8711 F 920.458.0550  
[www.aecom.com](http://www.aecom.com)

## CALCULATION SHEET

Page 1 Of 4Project No. 95561

Client	<u>County of Kaua'i</u>	Subject	<u>Drainage Layer</u>	Prepared By	<u>MZ</u>	Date	<u>2/24/10</u>
Project	<u>Kekaha Landfill</u>		<u>Stability Analysis with</u>	Reviewed By	<u>KJB</u>	Date	<u>2/26/10</u>
	<u>Phase II Lateral Expansion</u>		<u>Equipment Loading</u>	Approved By	<u>KJB</u>	Date	<u>2/26/10</u>

**DRAINAGE LAYER STABILITY ANALYSIS WITH EQUIPMENT LOADING****Objective**

Determine the stability during granular drainage layer placement and operations layer placement over the geosynthetic base liner on the sideslopes of Cell 1 where the Agru 80-mil textured HDPE geomembrane is proposed to be installed.

**Design Criteria and Assumptions**

1. The base liner system for Cell 1 is depicted in Figure 1 from Reference 1.
2. The drainage layer material is expected to be a sub-angular or angular gravel.
3. The placement of the granular drainage layer and the operations layer will be completed in two stages. The first stage would be placement of the 1-foot granular drainage layer and installation of the separator geotextile. After installation of the geotextile the 2-foot operations layer will be placed. This analysis will evaluate both conditions including placement of the operations layer in two 1-foot lifts as well. It is also assumed that the granular drainage layer or operations layer will be in place across the cell floor prior to placement on the sideslope.
4. This analysis will determine the minimum adhesion required for the varied side slope length where the Agru 80-mil textured HDPE geomembrane is proposed to be installed and at the lowest interface friction angle between the 80-mil textured HDPE geomembrane and the Cetco Bentomat GCL determined from the site specific lab testing. It is assumed that no tension is applied to the geotextile or geomembrane.
5. Based on the proposed panel layout for Cell 1 submitted by Northwest Linings & Geotextile Products, Inc. (Attachment 4), it is understood that the 80-mil textured HDPE geomembrane will be installed at four sump areas in Cell 1.
6. Slope length for granular drainage layer and operations layer placement is defined as the actual slope length, not a vertical or horizontal length.
7. Sideslopes are a maximum 3:1 (H:V) slope.
8. The dozer to be used for deployment of the drainage layer is expected to be a Caterpillar D6H LGP. This dozer has a ground pressure of less than 5 psi, typical for placement of soil material layers over geosynthetics. Model specifications are included as Attachment 1.
9. The dozer is operated from the bottom of the slope with no abrupt braking or change in direction during granular drainage layer placement.
10. Based on the drainage layer stability analysis performed for the subject site on December 22, 2008, it indicates that the critical placement period will be during the placement of the 1-foot granular drainage layer. As the lift thickness increases (the 1-foot drainage layer is then overlain by the operations layer) the critical interface requirement decreases as a result of the increased buttress effect at the toe of slope and distribution of the equipment loading through the granular soils. Therefore, the drainage layer stability was only analyzed for the placement of the 1-foot granular drainage layer in this analysis.

**Calculations****Caterpillar D6H LGP Dozer Properties (Attachment 1, Reference 5)**

Dozer track width:	36 inches
Track length on ground:	128.5 inches (10.7 ft)
Ground pressure:	4.88 psi (702.7 psf) < 5 psi

**CALCULATION SHEET**

Page 2 Of 4

Project No. 95561

<b>Client</b> <u>County of Kaua'i</u>	<b>Subject</b> <u>Drainage Layer</u>	<b>Prepared By</b> <u>MZ</u>	<b>Date</b> <u>2/24/10</u>
<b>Project</b> <u>Kekaha Landfill</u>	<b>Stability Analysis with</b>	<b>Reviewed By</b> <u>KJB</u>	<b>Date</b> <u>2/26/10</u>
<b>Phase II Lateral Expansion</b>	<b>Equipment Loading</b>	<b>Approved By</b> <u>KJB</u>	<b>Date</b> <u>2/26/10</u>

Drainage Layer Properties

Unit Weight: 130 pcf  
 Internal friction angle: \*34+ degrees

\*Table 3.31 of Reference 2 for SM, SP, SW, GM, GP, GW soils that could be used as drainage layer materials.

For conservatism, the internal friction angle used in the model and analysis is 33 degrees which is equal to the typical interface friction angle between sand/nonwoven geotextiles and gravel/nonwoven geotextile (Table 1, Reference 4). This will allow the model to evaluate a uniform layer thickness (granular drainage layer or with the added operations layer) with the separator geotextile included to determine the critical interface friction angle needed on the sideslope base liner system.

Maximum Slope Angle

3H:1V:  $\tan^{-1}(1/3) = 18.4 \text{ degrees}$

Minimum/Maximum Slope Length

Based upon visual observation of the base liner grades shown on Drawing 4 of Reference 1, the minimum side slope height for Cell 1 where the 80-mil textured HDPE geomembrane will be installed is 6.4 feet (vertical) at the sump area SE of Cell 1D. The resulting minimum slope length is determined to be:

$$(6.4) \left( \sqrt{3^2 + 1^2} \right) = 20.2 \text{ feet}$$

The maximum side slope height for Cell 1 where the 80-mil textured HDPE geomembrane will be installed is 10.82 feet (vertical, say 11 feet) at the sump area between Cell 1A and Cell 1B. The resulting maximum slope length is determined to be:

$$(11) \left( \sqrt{3^2 + 1^2} \right) = 34.8 \text{ feet or } 35 \text{ feet, say } \Rightarrow 40 \text{ feet}$$

Interface Shear Strength Parameters

The interface between the HDPE geomembrane and GCL is considered to be the critical interface in the proposed base liner system from a review of Reference 4 for typical peak interface friction angles and peak adhesion as shown in Table 1. Based on the site specific interface lab testing for the interface between Agru 80-mil textured HDPE geomembrane and Celco Bentomat GCL, the lowest interface friction angle at peak is 14.9 degrees. The adhesion at peak ranges from 826 psf to 942 psf. The lab testing reports are included in Attachment 3.

**CALCULATION SHEET**

Page 3 Of 4

Project No. 95561

Client	<u>Courty of Kauai</u>	Subject	<u>Drainage Layer</u>	Prepared By	<u>MZ</u>	Date	<u>2/24/10</u>
Project	<u>Kekaha Landfill</u>	Stability Analysis with		Reviewed By	<u>KJB</u>	Date	<u>2/26/10</u>
Phase II Lateral Expansion		Equipment Loading		Approved By	<u>KJB</u>	Date	<u>2/26/10</u>

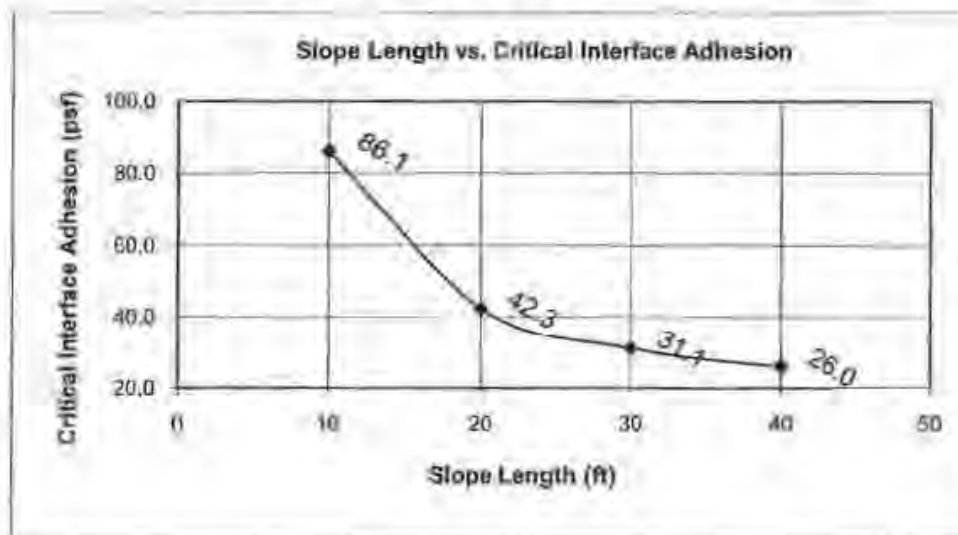
**Table 1  
Critical Base Liner Interfaces and Friction Angles**

Interface	Typical Interface Friction Test Results	
	Friction Angle (degrees)	Adhesion (kPa)
Nonwoven geotextile (separator and cushion) / granular drainage layer (gravel) or operations layer	33	0
Nonwoven geotextile (geocomposite and cushion) / textured HDPE geomembrane	25	8
Nonwoven geotextile (GCL) / textured HDPE geomembrane	23	8
Woven geotextile (GCL) / textured HDPE Geomembrane	18	11
Textured HDPE geomembrane to subbase (sand)	34	0
Needle-punched GCL (internal friction angle)	39.7	19.9

Method of Analysis

Attached as Figure 2, is a calibrated spreadsheet depicting the analysis presented by Koerner and Soong, 1998 (Reference 3). This spreadsheet depicts the driving and resisting forces experienced along the critical interface with the incorporation of equipment loading. A factor of safety of 1.1 was deemed as a qualifier for slope stability as equipment loading is a brief and temporary load condition.

**Table 2  
Slope Length vs. Critical Interface Adhesion**



By varying the slope length in Figure 2 and calculating the minimum critical interface adhesion for the specific slope length, the resulting Table 2 above was derived.

## CALCULATION SHEET

Page 4 Of 4Project No. 95581

Client	<u>County of Kauai</u>	Subject	<u>Drainage Layer</u>	Prepared By	<u>MZ</u>	Date	<u>2/24/10</u>
Project	<u>Kekaha Landfill</u>	Stability Analysis with		Reviewed By	<u>KJB</u>	Date	<u>2/26/10</u>
Phase II Lateral Expansion		Equipment Loading		Approved By	<u>KJB</u>	Date	<u>2/26/10</u>

**Conclusions**

As shown in Table 1 for the interface between textured HDPE geomembrane and nonwoven GCL, the adhesion at peak is 8 kPa (167 psf) and the interface friction angle at peak is 23 degrees. An interface friction angle of 14.9 degrees was used in the above analysis which results in a maximum adhesion of 26 psf required to keep the side slope stable at the maximum sideslope length where the 80-mil textured HDPE geomembrane will be installed. Because the required adhesion is well below the literature value, the proposed Agru 80-mil textured HDPE geomembrane and Cetco Bentomat GCL meet the interface shear strength requirements for sideslope stability at the locations where they are to be installed.

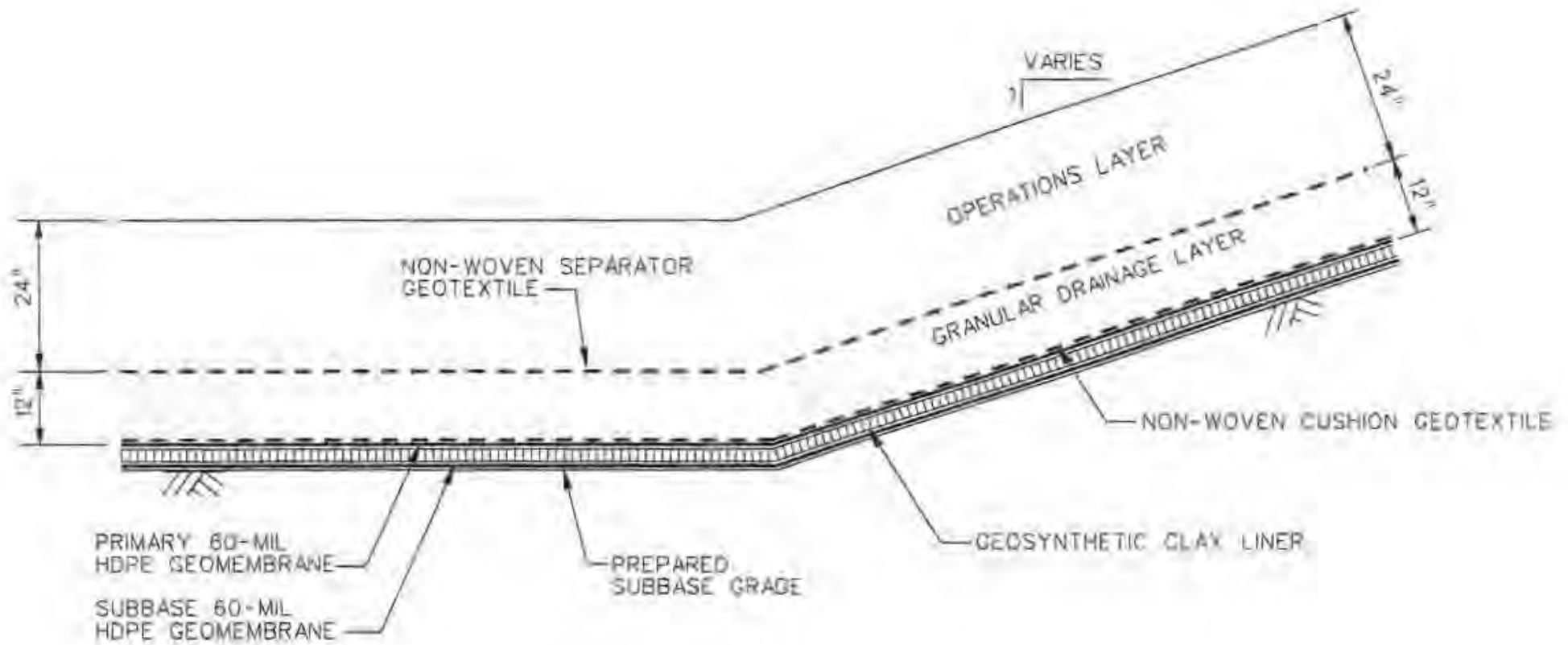
This calculation should be revisited if placement equipment is different or a change in the granular drainage layer. This calculation should also be revisited for the any change of the proposed base liner components.

**References**

1. Drawings entitled, "Engineering Report, Phase II Lateral Expansion, Kekaha Landfill", prepared by AECOM, dated January 2009.
2. Table 3.31, Hunt, Roy E., "Geotechnical Engineering Investigation Manual," 1984.
3. Koerner, R. M. and Soong, T.-Y. (1998), "Analysis and Design of Veneer Cover Soils" *Proc. 6th Int. Conf. on Geosynthetics, Atlanta, USA, IFAI*, pp. 1-23.
4. Koerner, George R. and Nejaro, Dhani, "Direct Shear Database of Geosynthetic-to-Geosynthetic and Geosynthetic-to-Soil Interfaces," Geosynthetic Research Institute, GRI Report #30, June 14, 2005.
5. "Caterpillar Performance Handbook," Edition 24, pages 1-8 and 1-21.



**FIGURE 1**  
**TYPICAL CELL 1 BASE LINER SYSTEM DETAILS**



## TYPICAL BASE LINER DETAIL - CELL 1

1

NTS

### NOTES:

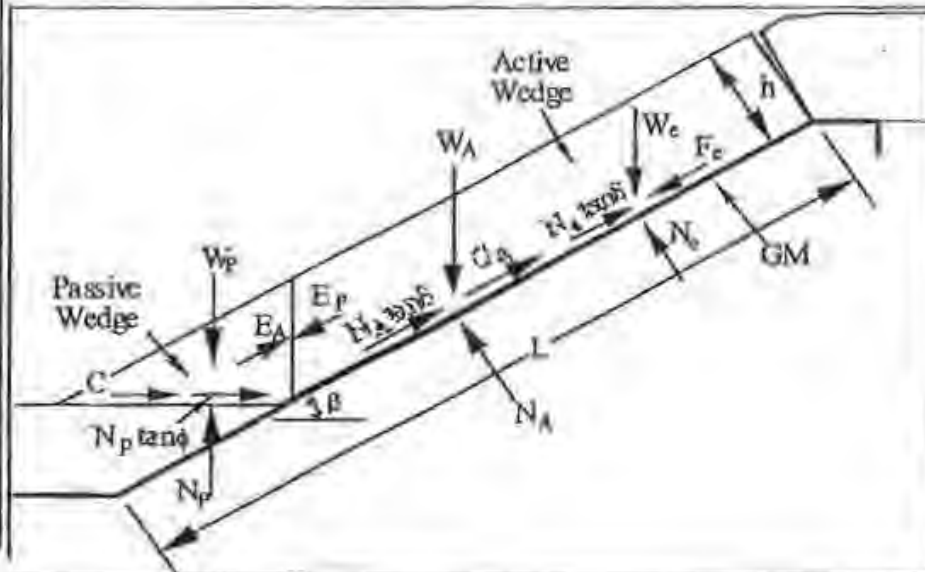
1. ALL GEOMEMBRANE IS TEXTURED ON BOTH SIDES.
2. WHEN DEPLOYING GCL OR GEOTEXTILES OVER TEXTURED GEOMEMBRANE OR WHEN DEPLOYING TEXTURED GEOMEMBRANE OVER GCL OR GEOTEXTILES, A RUBSHEET SHALL BE USED BETWEEN THE TWO MATERIALS AND REMOVED AFTER FINAL MATERIAL POSITIONING.

**FIGURE 2**

**DRAINAGE LAYER STABILITY CALCULATION WITH EQUIPMENT LOADING  
(MAXIMUM SLOPE LENGTH ONLY, 1-FOOT GRANULAR DRAINAGE LAYER)**

**Figure 2**

**Uniform Cover Soil Thickness with the Incorporation of Equipment Loads  
1-foot Thickness (1-foot Granular Drainage Layer Placed Only)**



**Calculation of FS**

**Active Wedge:**

$W_a = 4766.5$  k pounds  
 $N_a = 4522.8$  k pounds

**Passive Wedge:**

$W_p = 217.0$  k pounds

$$FS = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

$a = 3612.1$   
 $b = -4719$   
 $c = 820.5$

**FS = 1.10**

thickness of cover soil =  $h = 1.00$  ft  
 soil slope angle beneath the geomembrane =  $\beta = 18.4^\circ = 0.32$  (rad.)  
 finished cover soil slope angle =  $\omega = 18.4^\circ = 0.32$  (rad.)  
 length of slope measured along the geomembrane =  $L = 40.0$  ft  
 unit weight of the cover soil =  $\gamma = 130.0$  pcf  
 friction angle of the cover soil =  $\phi = 33.0^\circ = 0.58$  (rad.)  
 cohesion of the cover soil =  $c = 0.0$  psf  
 interface friction angle between cover soil and geomembrane =  $\delta = 14.9^\circ = 0.26$  (rad.)  
 adhesion between cover soil and geomembrane =  $c_a = 26.0$  psf

$C = 0$  k pounds  
 $C_a = 957.698931$  k pounds

thickness of cover soil =  $h = 1.00$  ft  
 equipment ground pressure (= wt. of equipment/(2wb)) =  $q = 702.7$  psf  
 length of each equipment track =  $w = 10.7$  ft  
 width of each equipment track =  $b = 3.0$  ft  
 influence factor\* at geomembrane interface =  $I = 0.97$   
 acceleration/deceleration of the bulldozer =  $a = 0.00$  g

$b/h = 3.0$   
 $W_n = q w I = 7293.9$   
 $N_c = W_c \cos \beta = 6920.5$   
 $F_c = W_c (a/g) = 0.0$

**Influence Factor Default Values**

Cover Soil Thickness	Equipment Track Width		
	Very Wide	Wide	Standard
<sup>2</sup> 300 mm	1.00	0.97	0.94
300-1000 mm	0.97	0.92	0.70
<sup>2</sup> 1000 mm	0.95	0.75	0.30

Note: numbers in boxes are input values  
 numbers in italics are calculated values

**ATTACHMENT 1**

**EQUIPMENT PROPERTIES FOR CATERPILLAR D6H LGP DOZER**

# Track-Type Tractors | Specifications



MODEL	D6H XR Series II		D6H LGP Series II		D7G		D7H Series II	
Flywheel Power	130 kW	175 hp	127 kW	170 hp	148 kW	200 hp	160 kW	215 hp
Operating Weight*	18 684 kg 41,192 lb		19 814 kg 43,590 lb		20 666 kg 45,560 lb		24 694 kg 54,401 lb	
(Power Shift)	18 684 kg 41,192 lb		19 989 kg 43,976 lb		20 510 kg 45,218 lb		24 694 kg 54,401 lb	
(Direct Drive)	18 799 kg 41,444 lb		—		—		24 693 kg 54,400 lb	
(Power Shift Differential Steer)	—		—		—		24 693 kg 54,400 lb	
Engine Model	3306		3306		3306		3306	
Rated Engine RPM	1900		1900		2000		2100	
No. of Cylinders	6		6		6		6	
Bore	121 mm	4.75"	121 mm	4.75"	121 mm	4.75"	121 mm	4.75"
Stroke	152 mm	6"	152 mm	6"	152 mm	6"	152 mm	6"
Displacement	10.5 L	638 in <sup>3</sup>	10.5 L	638 in <sup>3</sup>	10.5 L	638 in <sup>3</sup>	10.5 L	638 in <sup>3</sup>
Track Rollers (Each Side)	7		8		6		7	
Width of Standard Track Shoe	560 mm	22"	615 mm	24"	508 mm	20"	560 mm	22"
Length of Track on-Ground	2.77 m	9'1"	3.27 m	10'9.5"	2.70 m	8'11"	2.90 m	9'6"
Ground Contact Area (W/Std. Shoe)	3.11 m <sup>2</sup>	4815 in <sup>2</sup>	5.97 m <sup>2</sup>	9254 in <sup>2</sup>	2.76 m <sup>2</sup>	4280 in <sup>2</sup>	3.24 m <sup>2</sup>	5016 in <sup>2</sup>
Track Gauge	1.88 m	6'2"	2.23 m	7'3"	1.98 m	6'5"	1.98 m	6'5"
<b>GENERAL DIMENSIONS:</b>								
Height (Stripped Top)**	2.26 m	7'5"	2.82 m	7'7"	2.27 m	7'5"	2.44 m	8'0"
Height (To Top of ROPS)	3.12 m	10'3"	3.16 m	10'5"	3.20 m	10'6"	3.83 m	10'11"
Height (To Top of Cab ROPS)	3.12 m	10'3"	3.16 m	10'5"	—	—	3.42 m	11'3"
Height (To Top of ROPS Canopy)	—	—	3.16 m	10'5"	—	—	—	—
Overall Length (With P Blade)	—	—	5.18 m	17'0"	—	—	—	—
(Without Blade)	—	—	4.49 m	14'9"	—	—	—	—
Overall Length (With S Blade)	5.26 m	17'3"	—	—	5.26 m	17'4"	6.83 m	19'9"
(Without Blade)	4.21 m	13'10"	—	—	4.10 m	13'5"	4.73 m	15'6"
Width (Over Trunnion)	2.84 m	9'4"	3.43 m	11'3"	—	—	3.86 m	12'8"
Width (W/O Trunnion — Std. Shoe)	2.44 m	8'0"	3.14 m	10'3.5"	2.55 m	8'5"	2.54 m	8'4"
Ground Clearance	377 mm	14.8"	382 mm	15"	347 mm	13.7"	406 mm	16" (15.9")
<b>Blade Types and Widths:</b>								
Straight	3.36 m	11'0"	3.89 m	12'9"	3.66 m	12'0"	3.91 m	12'10"
Angle	—	—	—	—	4.27 m	14'0"	—	—
Angle Straight	4.16 m	13'8"	—	—	—	—	4.49 m	14'9"
Full Angle	3.76 m	12'5"	—	—	—	—	4.08 m	13'5"
Universal	—	—	—	—	3.81 m	12'6"	3.98 m	13'1"
Semi-U	3.26 m	10'8"	—	—	—	—	3.68 m	12'1"
Fuel Tank Refill Capacity	397 L	105 U.S. gal	337 L	89 U.S. gal	435 L	115 U.S. gal	479 L	127 U.S. gal

\*Operating Weight includes ROPS canopy, operator, lubricants, coolant, full fuel tank, hydraulic controls and fluid, straight dozer with full horn, back-up alarm, retrieval hitch and front pull hook.  
 — D7G includes end track guiding guards.  
 \*\*Height (stripped top) — without ROPS canopy, exhaust, seat back or other easily removed encumbrances.



**GROUND PRESSURES**

Pressures computed from operating weights given earlier in this section in the specifications tables.

MODEL	SHOE WIDTH		CONTACT AREA		GROUND PRESSURE	
	mm	in	m <sup>2</sup>	in <sup>2</sup>	kPa	psi
D3C Series II	356	14	1.35	2097	52	7.2
	406	16	1.54	2394	44	6.45
D3C LGP Series II	635	25	2.61	4045	29	4.2
D3C LGP-S Series II	890	39	4.85	7524	17	2.52
D4C Series II	406	16	1.67	2589	44	6.44
D4C LGP Series II	635	25	2.61	4045	30	4.3
D5C	457	18	1.92	3038	42.3	6.14
D5C LGP	680	26	2.83	4389	31.0	4.51
D4H Series II	360	14	1.59	2464	64	9.1
	410	16	1.82	2826	56	8.0
	460	18	2.05	3168	50	7.1
D4H XL Series III	510	20	2.45	3799	47	6.73
	560	22	2.69	4172	44	6.17
D4H LGP Series III	610	24	3.20	4953	38	5.34
	760	30	4.03	6252	31	4.39
	770	30	3.98	6170	31	4.41
D5E	406	16	1.77	2745	62	9.0
	457	18	1.99	3085	55	7.98
	508	20	2.21	3426	49.8	7.22
	560	22	2.44	3784	45	6.53
D5H Series II	460	18	2.11	3276	50.9	7.29
	510	20	2.35	3648	44.4	6.39
D5H XL Series II	560	22	2.78	4309	50	7.10
	600	24	3.63	4689	47	6.67
D5H LGP Series II	710	28	4.43	6866	36	5.15
	860	34	5.37	8321	30	4.24
	865	34	5.40	8369	29	4.17
D6E	457	18	2.17	3364	65	9.42
	508	20	2.41	3738	59	8.56
	560	22	2.65	4108	53	7.68
	610	24	2.89	4480	48	7.10
D6E	457	18	2.43	3766	60	8.70
	508	20	2.71	4200	54	7.83
	560	22	2.98	4618	49	7.10
	610	24	3.25	5040	45	6.54
D6H Series II	508	20	2.67	4140	65.0	9.44
	560	22	2.94	4664	59.0	8.56
	610	24	3.21	4971	64.2	9.26

←Standard Shoe

MODEL	SHOE WIDTH		CONTACT AREA		GROUND PRESSURE	
	mm	in	m <sup>2</sup>	in <sup>2</sup>	kPa	psi
D6H XL Series II	510	20	2.89	4484	66	9.42
	560	22	3.18	4923	60	8.49
	610	24	3.46	5363	55	7.96
D6H XR Series II	508	20	2.83	4388	67	9.48
	560	22	3.11	4815	60	8.55
	610	24	3.38	5246	56	7.93
D6H LGP Series II	760	30	4.96	7296	40	5.74
	915	36	5.97	9261	34	4.88
	1000	39	6.53	10,122	32	4.48
D7G	508	20	2.76	4280	73	10.6
	559	22	3.04	4708	68	9.8
	610	24	3.31	5136	60	8.8
D7H Series II	610	28	2.93	4560	82	11.7
	560	22	3.24	5016	75	10.6
	610	24	3.53	5472	69	9.9
	660	26	3.82	5928	64	9.1
D7H XR Series II	560	22	3.43	5315	71.5	10.16
	610	24	3.76	5808	65.9	9.37
	660	26	4.06	6282	61.2	8.70
D7H LGP Series II	760	30	4.8	7504	54	7.74
	915	36	5.82	9029	46	6.66
D8H	560	22	3.59	5565	100.6	14.6
	610	24	3.91	6062	92.3	13.4
	660	26	4.23	6559	85.8	12.4
	710	28	4.55	7056	79.2	11.5
D8H LGP*	965	38	6.2	9576	53.7	7.8
D9N	560	22	3.86	6009	107.0	15.51
	610	24	4.21	6555	99.1	14.37
	665	27	4.74	7374	89.2	12.84
	760	30	5.28	8194	79.4	11.51
D10M	610	24	4.73	7326	124.1	18.0
	710	28	5.50	8527	107.8	15.6
	860	31.5	6.66	10,328	89.8	13.0
D11M	710	28	6.31	9781	150.2	21.8
	810	32	7.20	11,169	132.7	19.3
	915	36	8.13	12,605	118.6	17.2

←Standard shoe. \*Offered as a Custom Product.

NOTE: Ground contact area = width of track shoe × length of track on ground × 2.

$$\text{Ground pressure} = \frac{\text{operating weight}}{\text{ground contact area}}$$

**ATTACHMENT 2**

**TABLE 3.31 TYPICAL PROPERTIES OF COMPACTED SOILS**



TABLE 3.51  
TYPICAL PROPERTIES OF COMPACTED SOILS\*

Group symbol	Soil type	Typical value of compression		Typical strength characteristics						Typical coefficient of permeability, ft/mic	Range of CBR values	Range of ungrade modulus $k_v$ , lb/in <sup>2</sup>
		Range of maximum dry unit weight, pcf	Range of optimum moisture, %	Percent of original height		Cohesion (as compacted), pcf	Cohesive envelope (as compacted), pcf	Effective stress envelope A, degrees	I <sub>bc</sub> †			
				At 1.4 bf (28 pcf)	At 1.0 bf (20 pcf)							
GW	Well-graded clean gravels, gravel-sand mixtures	125-135	11-8	0.3	0.8	0	0	>28	>0.70	$1 \times 10^{-5}$	40-80	300-600
GP	Poorly graded clean gravels, gravel-sand mix	115-125	14-11	0.4	0.9	0	0	>27	>0.74	$10^{-4}$	30-60	250-600
GM	Silty gravels, poorly graded gravel-sand silt	120-130	12-8	0.5	1.1	...	...	>24	>0.67	$>10^{-6}$	20-60	100-400
GC	Clayey gravels, poorly graded gravel-sand-clay	115-130	14-9	0.7	1.8	...	...	>21	>0.60	$>10^{-7}$	20-60	100-300
BW	Well-graded clean sands, gravelly sands	110-120	16-9	0.8	1.3	0	0	45	0.70	$>10^{-6}$	30-60	200-300
SP	Poorly-graded clean sands, sand-gravel mix	100-120	21-13	0.8	1.4	0	0	37	0.74	$>10^{-6}$	10-60	200-300
SM	Silty sands, poorly graded sand-silt mix	110-125	16-11	0.6	1.6	1000	420	24	0.67	$1 \times 10^{-4}$	10-60	200-300
SM-SC	Sand-silt clay mix with slightly plastic fines	110-130	18-11	0.6	1.6	1000	300	33	0.66	$1 \times 10^{-6}$	...	...
SC	Clayey sands, poorly graded sand-clay mix	105-125	19-11	1.1	2.1	1000	280	31	0.60	$1 \times 10^{-7}$	5-20	100-300
ML	Inorganic silts and clayey silts	95-120	24-12	0.8	1.7	1400	180	33	0.62	$10^{-6}$	15 or less	100-200
ML-CL	Mixture of inorganic silt and clay	100-120	23-11	1.0	2.1	1800	460	32	0.62	$1 \times 10^{-7}$	...	...
CL	Inorganic clays of low to medium plasticity	95-120	24-12	1.1	2.8	1800	370	28	0.54	$10^{-7}$	15 or less	50-200
OL	Organic silts and silt-clays, low plasticity	80-100	23-21	...	...	...	...	...	...	...	5 or less	30-100
MH	Inorganic clayey silts, elastic silts	70-90	40-24	2.0	3.0	1600	420	25	0.47	$1 \times 10^{-6}$	10 or less	50-100
CH	Inorganic clays of high plasticity	75-105	26-19	2.0	3.0	2100	280	19	0.38	$10^{-7}$	10 or less	50-100
OH	Organic clays and silty clays	65-100	45-23	...	...	...	...	...	...	...	5 or less	25-100

\*From NAVFAC Manual DM 7 (1971). † All properties are for condition of "standard Proctor" maximum density, except values of  $I_{bc}$  and CBR which are for "modified Proctor" maximum density. Typical strength characteristics are for effective stress envelopes and are obtained from USSR data. Compression values are for vertical loading with complete lateral confinement. (...) Indicates insufficient data available for an estimate.

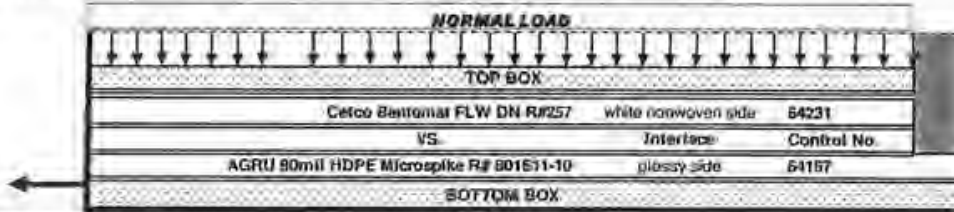
**ATTACHMENT 3**

**INTERFACE SHEAR TESTING REPORTS (AGRU 80-MIL TEXTURED HDPE  
GEOMEMBRANE VS. CETCO BENTOMAT GCL)**

Reviewed by: *[Signature]*  
 Date: 01/29/10

INTERFACE SHEAR TEST RESULT (ASTM D6243)  
 PGL Job No. G10-0020

TEST CONFIGURATION 4B



TEST CONDITIONS:

SAMPLE PREPARATION:

1. Specimens were cut along machine direction to 14" x 17" for the upper box, and 14" x 19" for the lower box, with an effective test area of 12" x 12"
2. Geosynthetic specimens were secured via flat bar clamping mechanisms complete with bolts and nuts (7/pairs).

CONSOLIDATION:

1. Each set of specimen was consolidated under flooding condition for 24 hrs @ normal load before shearing.
2. Normal loads were applied using Bladder for all loads.

SHEAR TEST:

1. Shear test was conducted @ 0.040 in/min.
2. Sheared @ minimum 3.0 inch horizontal displacement.
3. The test specimens were sheared at flooding condition.
4. Test were performed in general accordance with ASTM D6243 using Braibard-Kümar LG-112 Direct Shear machine with effective test area of 12 in X 12 in.

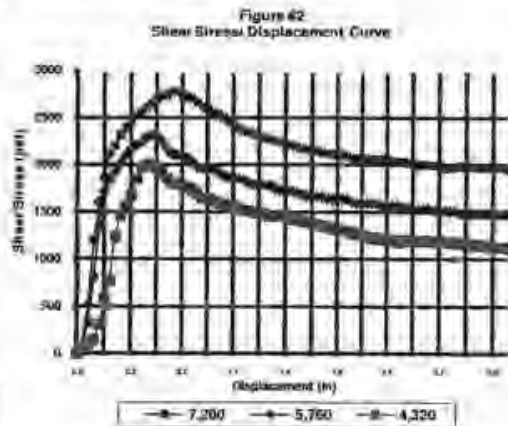
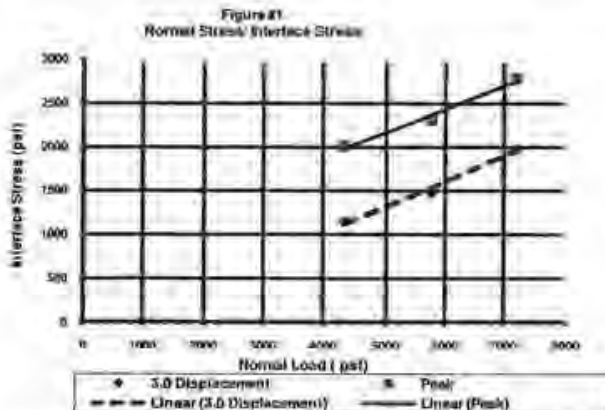
TEST RESULTS:

Normal Stresses Applied	GCL Moisture Content		Asperity Heights		PEAK STRENGTH		POST-PEAK STRENGTH AT 3.0 INCHES		
	Before	After	Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle	
(psf)	(psf)	(%)	(%)	(mils)	(mils)	(psi)	(degrees)	(psf)	(degrees)
30.00	4,920	22.2	65.5	32	29	2005	25	1147	15
40.00	5,760	22.2	61.0	31	27	2312	22	1477	14
50.00	7,200	22.2	52.8	31	24	2778	21	1976	15
Note:	COHESION (psf):					625		0	
	COEFFICIENT OF FRICTION:					0.27		0.26	
	FRICTION ANGLE (degrees):					15.0		16.1	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

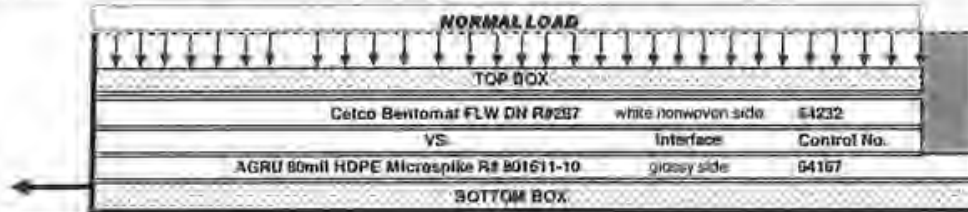
OBSERVATIONS:

1. No tilting of the system or any abnormalities observed during and after the test.
2. Superficial abrasion on the geosynthetics interfacial sides (typical to all loads).
3. Sliding occurred between the two interfacial surfaces.



By accepting the data and results presented in this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from filing and all other parties for claims or losses due to the use of this data, in the case for the respective items presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned sum.

**TEST CONFIGURATION 4BR**



**TEST CONDITIONS:**

**SAMPLE PREPARATION:**

1. Specimens were cut along machine direction to 14" x 17" for the upper box, and 14" x 19" for the lower box, with an effective test area of 12" x 12".

2. Geosynthetic specimens were secured via the clamping mechanism complete with bolts and nuts (7-pairs).

**CONSOLIDATION:**

1. Each set of specimen was consolidated under flooded condition.
2. Normal loads were applied using Bladder for all loads.

**SHEAR TEST:**

1. Shear test was conducted @ 0.040 in/min.
2. Sheared @ minimum 3.0 inch horizontal displacement.
3. The test specimens were sheared at flooded condition.
4. Test were performed in general accordance with ASTM D6243 using Brainard-Kilmar LG-112 Direct Shear machine with effective test area of 12 in X 12 in.

**DRAFT**

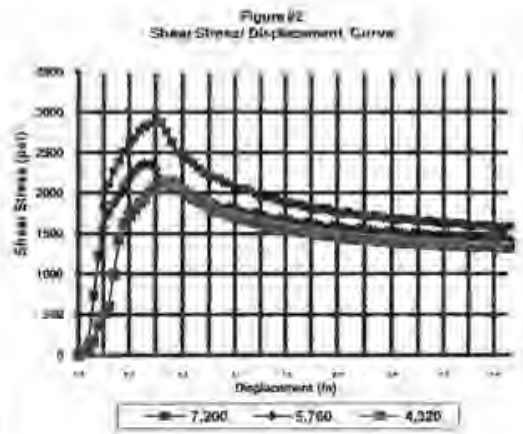
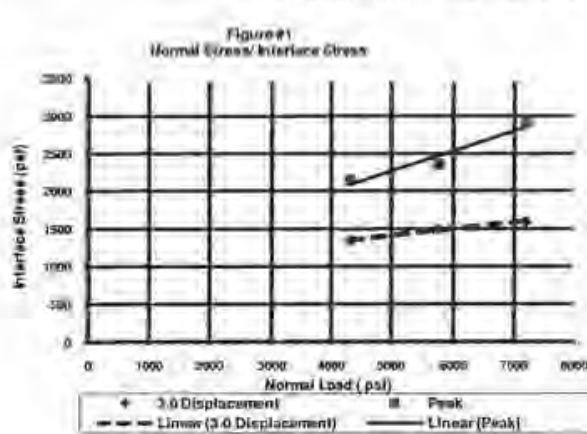
**TEST RESULTS:**

Normal Stresses Applied		GCL Moisture Content		Asperity Heights		PEAK STRENGTH		POST-PEAK STRENGTH AT 3.0 INCHES	
		Before	After	Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psf)	(psf)	(%)	(%)	(mil)	(mil)	(psf)	(degrees)	(psf)	(degrees)
30.00	4,320	22.2	75.5	29	28	2147	26	1335	17
40.00	5,760	22.2	88.5	30	28	2256	22	1491	15
50.00	7,200	22.2	64.7	30	26	2512	22	1591	12
<b>Note:</b>						<b>COHESION (psf) :</b>		<b>942</b>	
						<b>COEFFICIENT OF FRICTION :</b>		<b>0.27</b>	
						<b>FRICTION ANGLE (degrees) :</b>		<b>14.9</b>	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

**OBSERVATIONS:**

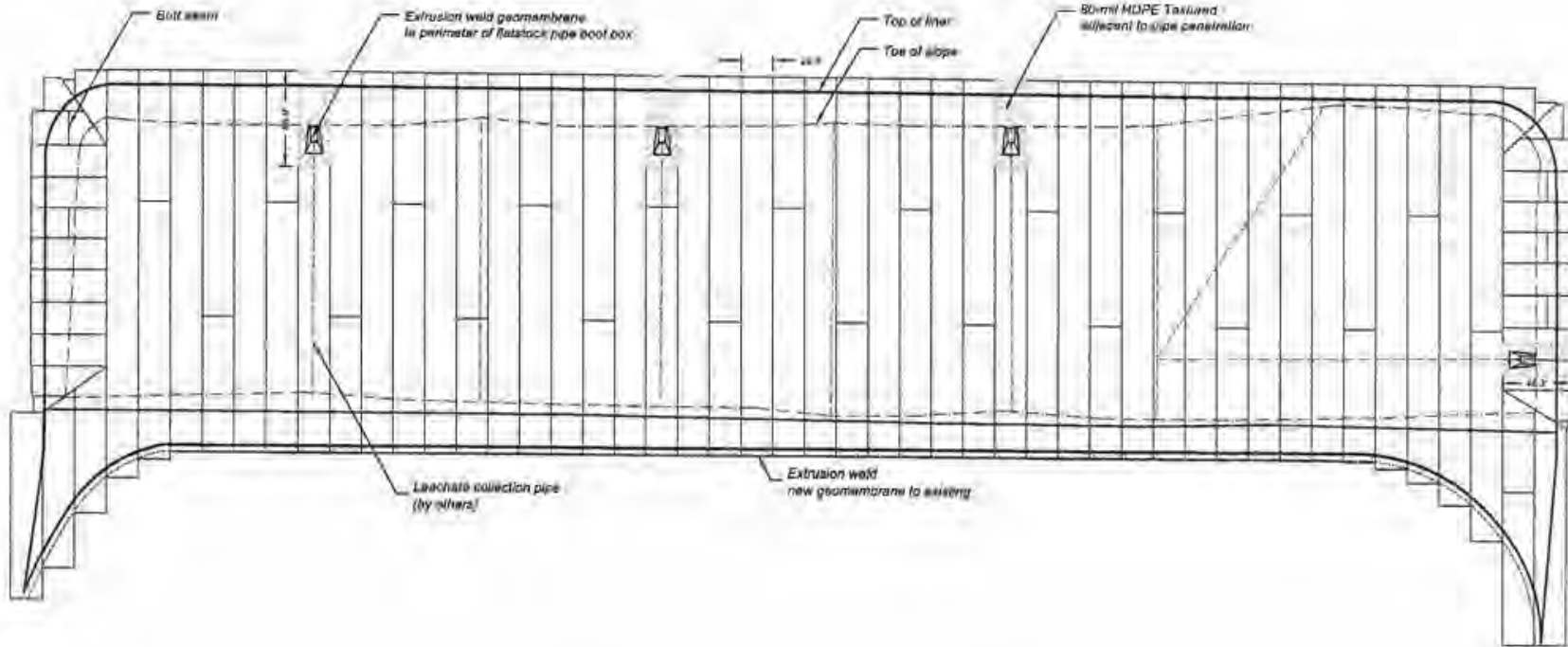
1. No tilting of the system or any abnormalities observed during and after the test.
2. Superficial abrasion on the geosynthetics interfacing sides (typical to all loads).
3. Sliding occurred between the two interfacing surfaces.



By accepting the data and results presentation in this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims or losses, due to the use of this data, to the extent the respective tests presented in this report, and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.

**ATTACHMENT 4**

**PROPOSED PANEL LAYOUT FOR CELL 1  
(SUBMITTED BY NORTHWEST LINING & GEOTEXTILE PRODUCTS, INC.)**



Notes: exact location, condition and  
 location of every installation will  
 be described in the field in the  
 field log notebook.

**Kekaha Sanitary Landfill Phase II Lateral Expansion - Cell 1**  
 Proposed 80-mil textured HDPE liner Panel Layout



SHEET NO.

DETAIL

1 of 1



**NORTHWEST LININGS &  
 GEOTEXTILE PRODUCTS, Inc.**

www.northwestlinings.com  
 10007710115151000  
 4001 W. 100th St.  
 Overland Park, KS 66211

JOB NAME:		Kekaha Sanitary Landfill	
JOB NO.		N 08130	
DATE:	11 17 09	DRAWN:	CC
BY:	TS	SCALE:	AS SHOWN

GOODFELLOW BROS., INC.  
P.O. Box 3029 Lihue, Hawaii 96766  
(808) 241-4601 phone (808) 241-4605 fax

---

## REQUEST FOR INFORMATION

TO: Waste Management of Hawaii	RFI No.: 6
ATTN: Jesse Frey	Request submitted: February 3, 2010
	Respond requested by: Keith Suga
	Project: Kekaha Sanitary Landfill Phase II Lateral Expansion

Specification Reference: 02062, Parts 2.01 & 2.02      Plan Reference:

Subject:  Discrepancy     Clarification     Suggestion     Other

---

**Request:**

The attached submittals are proposed for:

- (1) the 1.5" minus Granular Drainage Layer (Cell 1)/Granular Operations Layer (NLEP) (Section 02062, Part 2.01); and
- (2) the 3/8" minus Operations Layer (Cell 1)/Granular Protection Layer (NLEP) (Section 02062, Part 2.02)

These materials are screened products from available materials at the local Kauai Aggregates quarry. Based on passing performance test results including interface shear strength tests on preliminary samples and permeability tests (attached), these materials are submitted for approval as exceptions to the gradation specifications. If acceptable, please provide revised gradation specifications for use of these two materials.

Signed: \_\_\_\_\_

Date: February 3, 2010 \_\_\_\_\_


GOODFELLOW BROS., INC.  
P.O. Box 3029 Lihue, Hawaii 96766  
(808) 241-4601 phone (808) 241-4605 fax

---

Reply: The proposed material for Section 02062, Part 2.01 is approved for use. The d50 as specified can modified to an allowable range of 15 to 25 mm (0.6 to 1 inch). The maximum particle size of 1.5 inches remains as well as less than 5% passing a #200 sieve. This approval is contingent upon passing interface friction angle tests and permeability tests.

The proposed material for Section 02062, Part 2.02 is not approved as provided. The amount of material passing the #200 sieve is greater than 5%. Please submit a revised gradation meeting the #200 sieve requirement even though permeability has been meet.

Gradations provided for this RFI are attached and are the basis for this review.

Signed: 

Date: 2/9/2010

---

Request VIA:  Telephone  Facsimile  Email  
Copies to:  File



### 3/8" Material Sieve Analysis

100%	3/8"
70%	#4
40%	#8
25%	16
19%	30
15%	50
13%	100
8.5%	200

### 1 1/2" Material Sieve Analysis

100%	1 1/2"
68%	1"
50%	3/4"
5%	3/8"
2.5%	200

**PARTICLE SIZE DISTRIBUTION AND SOIL CLASSIFICATION TEST RESULTS**

(ASTM D 422) (ASTM D 2487)

PROJECT: Kekaha Landfill Expansion  
 LOCATION: Kekaha, HI PROJECT NO.: \_\_\_\_\_ TASK NO.: \_\_\_\_\_  
 DESCRIPTION: Granular Layer DAY: \_\_\_\_\_ MONTH: \_\_\_\_\_ YEAR: \_\_\_\_\_  
 MATERIAL TYPE: 1 1/2" Aggregate Material MATERIAL SOURCE: Kauai Aggregate SAMPLE NO.: \_\_\_\_\_

COEFFICIENT OF UNIFORMITY ( $C_u = D_{60}/D_{10}$ ):

COEFFICIENT OF CONCAVITY ( $C_c = D_{30}^2/D_{10}D_{60}$ ):

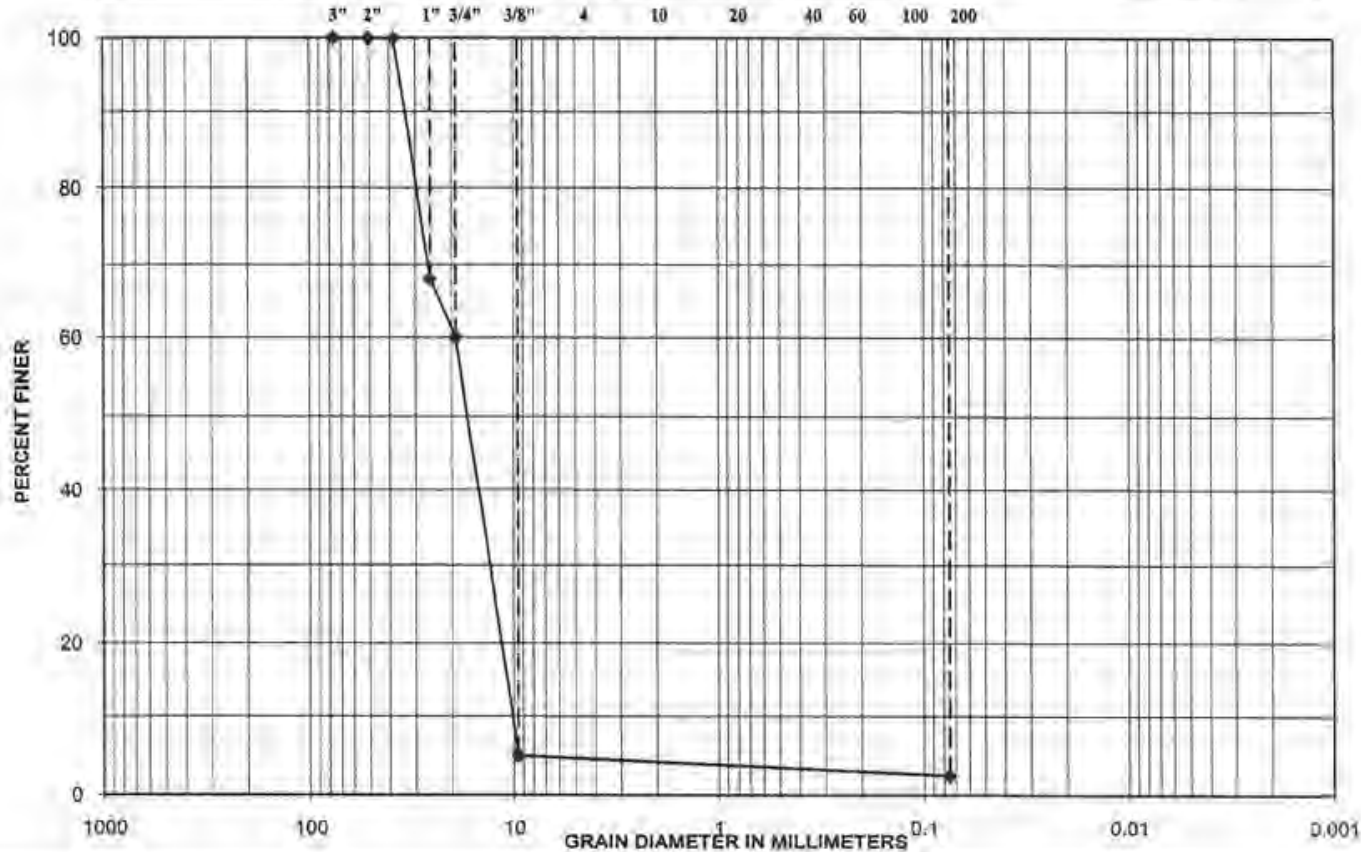
BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARS	MEDIUM	FINE	SILT SIZES	CLAY
U.S. STANDRAD SIEVE SIZES								

**ATTERBERG LIMITS**

LL: \_\_\_\_\_  
 PL: \_\_\_\_\_  
 PI: \_\_\_\_\_

**% CLAY:**

SIEVE SIZE	% FINER
3-in.	100.0
2-in.	100.0
1 1/2-in.	100.0
1-in.	68.0
3/4-in.	60.0
1/2-in.	
3/8-in.	5
NO. 4	
NO. 10	
NO. 20	
NO. 40	
NO. 60	
NO. 100	
NO. 200	2.5
0.0290 mm	
0.0190 mm	
0.0120 mm	
0.0084 mm	
0.0061 mm	
0.0030 mm	
0.0013 mm	



**USCS CLASSIFICATION**

Performed for: Goodfellow Bros  
 Project: Kekaha Landfill  
 Sample: 1-1/2" minus  
 Performed by: BT

Location: Kauai  
 Job No.:  
 Constant Head Test  
 Date of test: 01.29.10

wt of mold = 10.45 lbs.  
 wt of mold+soil = 13.35 lbs.

diameter = 4 inches → 10.16 cm  
 area = 81.07 sq. cm  
 length = 4.563 inches → 11.59 cm  
 volume = 939.64 cu. cm  
 mass soil = 2.90 lbs. → 1315.42 g

% Void 35.00  
 % over 3/4" removed 0.00  
 Dry Density → 1.40 g/cu. cm

Trial Number	1	2	3	4	5	6
elapsed time (sec)	5	10	15	20	30	45
Water Volume (mL)	186	294	506	703	975	1510
Δh of water (cm)	96.52	96.52	96.52	96.52	96.52	96.52
temp (deg C)	25	25	25	25	25	25
unit wt. of water	0.9970	0.9970	0.9970	0.9970	0.9970	0.9970
viscosity of water	9.045	9.045	9.045	9.045	9.045	9.045
coefficient of permeability	3.306E+00	2.613E+00	2.998E+00	3.124E+00	2.888E+00	2.982E+00

average	2.99E+00	cm/s
---------	----------	------

MASA FUJIOKA & ASSOCIATES  
 PERMEABILITY CONSTANT HEAD

Performed for: Goodfellow Bros  
 Project: Kekaha Landfill  
 Sample: 3/8" minus  
 Performed by: BT

Location: Kauai  
 Job No.:  
 Constant Head Test  
 Date of test: 01,29,10

wt of mold = 10.45 lbs.  
 wt of mold+soil = 13.75 lbs.

diameter = 4 inches → 10.16 cm  
 area = 81.07 sq. cm  
 length = 4.563 inches → 11.59 cm  
 volume = 939.64 cu. cm  
 mass soil = 3.30 lbs. → 1496.85 g  
 sq. cm  
 % Void 35.00 Dry Density → 1.59 g/cu. cm  
 % over 3/4" removed 0.00

Trial Number	1	2	3	4	5	6
elapsed time (sec)	5	10	15	30	45	60
Water Volume (mL)	78	767	244	484	725	955
Δh of water (cm)	96.52	96.52	96.52	96.52	96.52	96.52
temp (deg C)	25	25	25	25	25	25
unit wt. of water	0.9970	0.9970	0.9970	0.9970	0.9970	0.9970
viscosity of water	9.045	9.045	9.045	9.045	9.045	9.045
coefficient of permeability	1.386E+00	6.816E+00	1.446E+00	1.434E+00	1.432E+00	1.414E+00

average	2.32E+00	cm/s
---------	----------	------

MASA FUJIOKA & ASSOCIATES  
 PERMEABILITY CONSTANT HEAD

Kim Huynh

---

**From:** Chris Scott  
**Sent:** Saturday, February 27, 2010 10:09 PM  
**To:** Mike Minch; Kim Huynh  
**Subject:** FW: Revised Specification Section 02062  
**Attachments:** 02062 rev6.pdf

Mike,

Based on the revised Section 02062 (attached) it looks like no interface testing is required for the drainage gravel. <sup>3/4"</sup>  
Chris

---

**From:** Bergschultz, Ken [mailto:KEN.BERGSCHULTZ@aecom.com]  
**Sent:** Friday, February 26, 2010 1:35 PM  
**To:** Bergschultz, Ken; Frey, Jesse; Impens, Jeffrey  
**Cc:** Keith Suga; jeffg@goodfellowbros.com; Chris Scott  
**Subject:** Revised Specification Section 02062

Everyone,

As discussed in the project meeting on Tuesday, attached is the revised specification Section 02062 reflecting the change in the operations layer in the leachate evaporation pond. The change aligns this material with the permit defined gradation of maximum 0.75 inches versus the approved design of 1.5 inches. I would suggest a material that is as close to 0.75" as possible as the preferred selection. Portions of the specification that are deleted have been crossed out/highlighted and items added are highlighted in yellow.

GBI has acknowledged the change in the material and has also confirmed no schedule impact or additional costs for this material change.

Any questions, please let me know.

Have a good day.

**Kenneth J. Bergschultz, PE**  
Office Manager, Midwest Region  
Environment  
D 920.451.2452 C 920.918.3299  
[ken.bergschultz@aecom.com](mailto:ken.bergschultz@aecom.com)

**AECOM**  
4135 Technology Parkway  
Sheboygan, WI 53083  
T 920.458.8711 F 920.458.0560  
[www.aecom.com](http://www.aecom.com)

SECTION 02062  
GRANULAR DRAINAGE MATERIAL

PART 1 GENERAL

1.01 SUBMITTALS

A. Samples:

1. Granular drainage layer (Cell 1) and granular operations layer material (New Leachate Evaporation Pond). Minimum sample size 50 lb, each material type.
2. Operation layer (Cell 1) and granular protection layer material (New Leachate Evaporation Pond). Minimum sample size 50 lb.
3. Granular fill. Minimum sample size 50 lb.

B. Test Results:

1. Results of source evaluation tests for granular drainage materials.

C. Submit in accordance with Section 01330.

1.02 PROJECT/SITE CONDITIONS

- A. Do not block or obstruct roads, streets or pavements except when authorized by OWNER.
- B. Coordinate staging and stockpiling of materials with OWNER prior to transporting to site.

PART 2 PRODUCTS

2.01 GRANULAR DRAINAGE LAYER (CELL 1) ~~AND GRANULAR OPERATIONS LAYER (NEW LEACHATE EVAPORATION POND)~~

- A. Clean gravels or other ENGINEER approved permeable material generally classified according to Unified Soil Classification System as GW or GP. No sands will be allowed as this layer.
- B. Durable washed, coarse rounded to subangular gravel or crushed gravel:
  1. Grain Size: Maximum particle size 1.5 inches, d85 particle size of 1 inch or larger, average particle size (d50) range of 1 inch to 0.6 inches (15 mm), and less than 5% passing a US #200 sieve.
  2. Permeability:  $3 \times 10^{-1}$  cm/sec or greater.
  3. Calcium content: <12%

2.02 OPERATIONS LAYER MATERIAL (CELL 1) AND GRANULAR PROTECTION LAYER (NEW LEACHATE EVAPORATION POND)

- A. Clean gravels or other ENGINEER approved permeable material generally classified according to Unified Soil Classification System as GW or GP. No sands will be allowed as this layer.
- B. Durable washed, coarse rounded to subangular gravel or crushed gravel:
  1. Grain Size: Maximum particle size 3/8-inch and less than 5% passing a #200 US Sieve.
  2. Permeability:  $6 \times 10^{-3}$  cm/sec or greater.
  3. Calcium content: <12%

## 2.03 GRANULAR FILL (NEW LEACHATE EVAPORATION POND SIDESLOPES)

- A. Clean gravels or other ENGINEER approved permeable material generally classified according to Unified Soil Classification System as GW or GP. No sands will be allowed as this layer.
- B. Durable washed, coarse rounded to subangular gravel or crushed gravel:
  - 1. Grain Size: Maximum particle size 3-inches in all directions, between 40 and 60% passing a 1.5 inch sieve, and less than 5% passing a #200 US Sieve.
  - 2. Calcium content: <12%

## 2.04 SOURCE QUALITY CONTROL

- A. Source evaluation tests, including 2.04.A of this Section, shall be performed to confirm granular drainage materials procured from each on or off-site source area. Material evaluation tests shall be performed by QAC. Material will be accepted or rejected according to these results.

At minimum following tests shall be conducted:

- 1. Particle Size (ASTM D1140 and D422)
  - 2. Laboratory Hydraulic Conductivity at specified density (ASTM D2434)
  - 3. Calcium Carbonate content (test maybe waived at ENGINEER's discretion based upon source, i.e. volcanic, limestone, etc.).
- B. Perform tests at frequency of minimum of one sample per source for qualification and a minimum of one per 3000 cu yd (2500 cu m) per source placed, or upon visually observable changes in material type. If identification of additional drainage material sources becomes necessary during construction, same material qualification and consistency checking procedures shall be applied to each such source.

## 2.05 INTERFACE FRICTION ANGLE TESTING

- A. Prior to acceptance of source, provide sample of each source for interface friction angle testing per Section 02072. Material defined in 2.06 of this Section do not need interface friction angle testing.

## 2.06 GRANULAR OPERATIONS LAYER (NEW LEACHATE EVAPORATION POND)

- A. Clean gravels or other ENGINEER approved permeable material generally classified according to Unified Soil Classification System as GW or GP. No sands will be allowed as this layer.
- B. Durable washed, coarse rounded to subangular gravel or crushed gravel:
  - 1. Grain Size: Maximum particle size 0.75 inches and less than 5% passing a US #200 sieve.
  - 2. Permeability:  $3 \times 10^{-1}$  cm/sec or greater.
  - 3. Calcium content: <12%

## PART 3 EXECUTION

### 3.02 MATERIAL USAGE

- A. Granular Material: Granular drainage layer as defined on Drawings.
- B. Operations Layer Material: Operations layer as defined on Drawings.

### 3.04 PLACEMENT OF GRANULAR DRAINAGE MATERIAL:

#### A. Placement on Geomembrane:

1. Placement of materials on geomembrane shall not proceed at an ambient temperature below 32° F (0° C) nor above 104° F (40° C) unless otherwise specified.
2. Placement of materials on geomembrane should be done during the coolest part of day to minimize development of wrinkles in geomembrane.
3. Equipment used for placing materials shall not be driven directly on geomembrane.
4. Minimum thickness of 1 ft (0.3 m) of materials is specified between light dozer, ground pressure of 5 psi (935 kPa) or lighter, and geomembrane. Dozer used shall be no heavier than a Caterpillar D6H LGP dozer. Consult ENGINEER for other equivalent equipment approval.
5. In areas traversed by vehicles other than low ground pressure vehicles approved by ENGINEER; soil layer shall have minimum thickness of 3 ft (0.9 m). This requirement may be waived if provisions are made to protect geomembrane through an engineered design. Drivers shall proceed with caution when on overlying soil and prevent spinning of tires or sharp turns.
6. When placing overlying material on geomembrane, minimize wrinkle development. Small wrinkles should be isolated and covered as quickly as possible to prevent their growth. Placement of cover materials shall be observed by Geosynthetic QAC to ensure that wrinkle formation is minimized and that, geomembrane is not folded over on itself.

### 3.05 FIELD QUALITY CONTROL:

- #### A. Granular drainage materials not in conformance with Specifications shall be removed and replaced at no cost to OWNER.

\*\*\* END OF SECTION \*\*\*



GOODFELLOW BROS., INC.  
P.O. Box 3029 Lihue, Hawaii 96766  
(808) 241-4601 phone (808) 241-4605 fax

---

**REQUEST FOR INFORMATION**

TO: Waste Management of Hawaii  
ATTN: Jesse Frey

RFI No.: 7  
Request submitted: March 1, 2010  
Response requested by: Keith Suga  
Project: Kekaha Sanitary Landfill  
Phase II Lateral Expansion

Specification Reference:

Plan Reference:

Subject:  Discrepancy  Clarification  Suggestion  Other

Request: Today we discovered an existing force main cleanout that was previously buried with about 2 feet of material. This cleanout is shown on Drawing #2 to be removed. We have attached pictures to illustrate cleanout structure and location. We will provide additional survey information tomorrow. In previous discussions we established that this line would stay active until such time it could be abandoned in place. This decision was made to help expedite cell 1 construction. It appears that this cleanout structure may interfere with liner tie-in. We will confirm with survey, but it looks as though the top of this structure is just above liner subgrade at that location.

Signed: Keith Suga

Date: March 1, 2010

Reply: Please remove the vault and associated backfill/aggregate from the pipe area. Remove the "wye" connection and install a replacement section of piping equivalent to the existing pipe. All connections should be electro-fusion. Contractor to manage work without release of leachate. Monitor new connection for 24 hours for visible signs of leakage during active pumping of the existing system. Contractor to perform work in accordance with approved health and safety plan. Backfill excavation and prepare subbase per project specifications.

Signed: 

Date: March 5, 2010

Request VIA:  Telephone  Facsimile  Email  
Copies to:  File

GOODFELLOW BROS., INC.  
P.O. Box 3029 Lihue, Hawaii 96766  
(808) 241-4601 phone (808) 241-4605 fax

---

## REQUEST FOR INFORMATION

TO: Waste Management of Hawaii  
ATTN: Jesse Frey

RFI No.: 9  
Request submitted: March 2, 2010  
Respond requested by: Keith Suga  
Project: Kekaha Sanitary Landfill  
Phase II Lateral Expansion

Specification Reference:

Plan Reference: Drawing #9

Subject:  Discrepancy  Clarification  Suggestion  Other

Request: Per project drawing #9, 2 - 12" CMP pipes are to be installed under the entrance road and outlet into the infiltration basin. Wondering if there is an headwall structure detail for this outlet. The concern would be erosion of sand and possible undermining of the entrance road. Please advise.

Signed: Keith Suga

Date: March 2, 2010

Reply: The application of standard flare end section for the designed 12" CMPs is appropriate. Please install on both ends of the designated pipe.

Signed: 

Date: 08/27/10

Request VIA:  Telephone  Facsimile  Email  
Copies to:  File

GOODFELLOW BROS., INC.  
P.O. Box 3029 Lihue, Hawaii 96766  
(808) 241-4601 phone (808) 241-4605 fax

---

**REQUEST FOR INFORMATION**

TO: Waste Management of Hawaii  
ATTN: Jesse Frey

RFI No.: 10  
Request submitted: March 8, 2010  
Respond requested by: Keith Suga  
Project: Kekaha Sanitary Landfill  
Phase II Lateral Expansion

Specification Reference:

Plan Reference: Drawing #18

Subject:  Discrepancy  Clarification  Suggestion  Other

Request: Northwest Linings has completed factory air testing of the first pipe penetration assembly. While testing at 3 psig the assembly bulged out about 6 inches. Our understanding is that the air test is to determine whether the assembly is water tightness and doesn't have any leaks. With that could we air test at 1.5 psig to avoid any problems with the assembly bulging out. Please advise.

Signed: Keith Suga

Date: March 8, 2010

Reply: As a follow-up with the review of the penetration submittal, I had noted the need to make sure of support structure between the flat stocks as to not allow the flat stock to sag or compress once installed.

The test as prescribed is to test integrity of the welds and liquid tightness. Based upon the observations provided above and if the structure was installed as noted for flatstock support, I agree the test parameters maybe reduced to 1.5 psig.

Signed: 

Date: March 8, 2010

Request VIA:  Telephone  
Copies to:  File

Facsimile

Email

GOODFELLOW BROS., INC.  
P.O. Box 3029 Lihoe, Hawaii 96766  
(808) 241-4601 phone (808) 241-4605 fax

GBI Rescinded

**REQUEST FOR INFORMATION**

TO: Waste Management of Hawaii  
ATTN: Jesse Frey

RFI No.: **11**  
Request submitted: **March 10, 2010**  
Respond requested by: **Keith Suga**  
Project: **Kekaha Sanitary Landfill  
Phase II Lateral Expansion**

Specification Reference:

Plan Reference: **Drawing #18**

Subject:  Discrepancy  Clarification  Suggestion  Other

Request: We are preparing to install the new gas monitoring probes and needed to clarify a couple items. When our driller bores the 6" diameter hole, can he utilize bentonite to help keep the hole integrity? That would allow us to then install the pea gravel and pvc pipe. Also, detail 4 on drawing 22 calls out cement-bentonite grout. Is there a special specification for that material? Or can we just use the hydrated bentonite granules all the way up to existing grade?

Signed: Keith Suga

Date: March 10, 2010

Reply:

Signed:

Date:

Request VIA:  Telephone  Facsimile  Email  
Copies to:  File

Geosyntec Consultants, Inc.  
475 14<sup>th</sup> Street, Suite 400 Oakland, California 94612  
(510) 836-3034 phone (510) 836-3036 fax

## REQUEST FOR INFORMATION

TO: <u>Waste Management of Hawaii</u>	RFI No.: <u>12</u>
ATTN: <u>Jesse Frey</u>	Request submitted: <u>17 March 2010</u>
	Respond requested by: <u>Mike Minch, Geosyntec</u>
cc: <u>Hari Sharma, Chris Scott</u>	Project: <u>Kekaha Sanitary Landfill Phase II Lateral Expansion</u>


Specification Reference: 02074, Part 3.02F Plan Reference: \_\_\_\_\_

Subject:  Discrepancy  Clarification  Suggestion  Other

Requests: Section 02074 Part 3.02F of the specifications specifies removing "GCL exposed to moisture and prematurely hydrated prior to placement of overlying material" and replacing with new GCL. Following the initial GCL deployment on 15 March, a brief rain event exposed the GCL to moisture, resulting in partial hydration of the deployed material. Such rain events are common and are expected to continue throughout the construction of the NLEP and Cell 1. As discussed during the 16 March construction meeting, unacceptably hydrated GCL should be removed and replaced with new GCL. However, partially hydrated GCL may still function as designed and be acceptable if the degree hydration is minimal. As requested by AECOM, we propose following field verification method to determine the acceptability of partially-hydrated GCL:

If hydration is suspected, cut open a sample of the partially hydrated GCL in question to expose and inspect the sandwiched bentonite. If the bentonite granules remain separate and fall out of the cut, then accept the partial hydration and patch the test area per the specifications. If the bentonite granules have swollen, stick together, or otherwise appear hydrated, then remove the hydrated GCL and replace with fresh, unaffected GCL.

Please confirm whether this proposed field verification approach is consistent with the design intent.


Signed:   
Date: 30 March 2010

Geosyntec Consultants, Inc.

475 14<sup>th</sup> Street, Suite 400 Oakland, California 94612  
(510) 836-3034 phone (510) 836-3036 fax

---

Reply: This response to RF1 #12 is formal and coincides with the verbal approval to the proposed procedures as discussed in the project weekly meeting on March 16, 2010 and presented above.

Signed: 

Date: 05/11/10

Request VIA:  Telephone  
Copies to:  File

Facsimile

Email

Geosyntec Consultants, Inc.  
475 14<sup>th</sup> Street, Suite 400 Oakland, California 94612  
(510) 836-3034 phone (510) 836-3036 fax

---


## REQUEST FOR INFORMATION

TO:	<u>Waste Management of Hawaii</u>	RFI No.:	<u>13</u>
ATTN:	<u>Jesse Frey</u>	Request submitted:	<u>17 March 2010</u>
		Respond requested by:	<u>Mike Minch, Geosyntec</u>
		Project:	<u>Kekaha Sanitary Landfill Phase II Lateral Expansion</u>

Specification Reference: 01457, Parts 3.03 Plan Reference: \_\_\_\_\_

Subject:  Discrepancy  Clarification  Suggestion  Other

Requests: Section 01457 Part 3.03 specifies final pressure testing of installed HDPE pipes. At the terminal end of solid leachate conveyance lines where the pipes enter the wet wells or connect to the perforated HDPE pipes, pressure testing of the final welds would require specially configured plugs and, in the wet wells, confined space entry. Please clarify whether pressure testing of the ending, terminal HDPE pipe welds will be required.

Signed:   
Date: 17 March 2010

Reply:

Signed: \_\_\_\_\_  
Date: \_\_\_\_\_

Request VIA:  Telephone  Facsimile  Email  
Copies to:  File

Geosyntec Consultants, Inc.  
475 14<sup>th</sup> Street, Suite 400 Oakland, California 94612  
(510) 836-3034 phone (510) 836-3036 fax

Reply: Pipe testing should be completed on all installed solid wall HDPE pipes, with the exception of the leachate cleanout risers pipes in the cell which extend from the "wye" in the sump to the crest of slope. The cleanout pipes need to be continuous and not liquid tight for this application.

Of note to be tested as well, is the interstitial space of Wet Well #3 and the temporary wet well. This space is a monitoring point for the dual containment piping. This space should be tested at the manufacturer and upon installation in the field at a maximum 3 psig for 5 minutes. No temperature adjustment is required, just verification of liquid tightness and weld completeness. Verify at each wet well that the dual containment pipe drains to the interstitial space as designed.

Piping and wet well testing should be completed as:

1. Interstitial space of Wet Well #3 and the temporary wet well is tested by the manufacturer and in the field upon installation as noted above.
2. Once all carrier pipe of the dual containment piping (forcemain or gravity) is installed, it should be tested as a system. This means the piping will need to be sealed at the wet well (as applicable) and at the sumps for the gravity drains and from the wet well (as applicable) to LCM-14 for the forcemain. This will verify no cold joints when completing connections of assembled pipe segments.
3. With the completion of Item 2 above and given the interstitial space at the wet wells, the dual containment pipe will need only to be tested during pipe segment assembly and not required as a whole system.

Signed: 

Date: 3/25/10

Request VIA:  Telephone  Facsimile  Email  
Copies to:  File



GOODFELLOW BROS., INC.  
P.O. Box 3029 Lihue, Hawaii 96766  
(808) 241-4601 phone (808) 241-4605 fax

---

**REQUEST FOR INFORMATION**

TO: Waste Management of Hawaii  
ATTN: Jesse Frey

RFI No.: **15**  
Request submitted: March 24, 2010  
Respond requested by: Keith Suga  
Project: Kekaha Sanitary Landfill  
Phase II Lateral Expansion

Specification Reference: 15019

Plan Reference: Drawing #24

Subject:  Discrepancy  Clarification  Suggestion  Other

Request: If you refer to Specification section 15019, 2.02D Flange Joint Fittings it calls out 150lb carbon steel or convoluted epoxy coated ductile iron back up flanges; what our subcontractor has provided in the field is galvanized backup flanges. Also called out is cadmium plated carbon steel nuts and bolts; which our subcontractor has supplied galvanized nuts and bolts in the field. Please advise if these galvanized materials are acceptable.

Signed: Keith Suga

Date: March 24, 2010

Reply: With regard to the back-up flanges...  
Galvanized back-up flanges will perform better than carbon steel, but not as well as epoxy coated ductile iron, so we will allow the substitution.  
With regard to fasteners...  
Cadmium plated fasteners perform better than galvanized fasteners because the coating does not "flake off" when tightening the fastener. They can however be difficult to procure. A more acceptable alternative to the Cadmium plated fasteners is Stainless Steel fasteners. The installation contractor must exercise additional care when using the stainless fasteners to prevent them from galling.  
The only acceptable alternate to the Cadmium plated fasteners is Stainless Steel.

Signed: Paul Matz

Date: March 25, 2010

---

Request VIA:  Telephone  Facsimile  Email  
Copies to:  File

Northwest Linings & Geotextile Products, Inc.

21000 77<sup>th</sup> Avenue South Kent, WA 98032  
Phone (253) 872-0244 Fax (253) 872-0245

**REQUEST FOR INFORMATION**

TO: Waste Management of Hawaii RFI No.: 16  
ATTN: Jesse Frey Request submitted: April 6, 2010  
Respond requested by: Joel Mondragon, Northwest Linings  
Project: Kekaha Sanitary Landfill Phase II Lateral Expansion

Specification Reference: 02075, Parts 3.03A Plan Reference: \_\_\_\_\_

Subject:  Discrepancy  Clarification  Suggestion  Other

Requests: Section 02075 Part 3.03A specifies to "sew patch in place or thermally bond" for repairs of the geotextile, but that thermal bonding requires the engineer's approval. Thermal bonding of the geotextile is anticipated to be used at the T-intersections of deployed panels and for repair patches, as well as along the Phase II/Cell 1 tie-in as allowed by the Construction Drawings (Detail 4, Drawing 15). Please confirm that thermal bonding with a Leister is an approved method for geotextile patching within Cell 1 and the new leachate evaporation pond containment systems.

Signed: \_\_\_\_\_  
Date: April 6, 2010

Reply: Thermally bonding of repairs as presented above and approved in the weekly construction meeting discussion are approved methods.

This seam type will also be applicable cushion/separation geotextile flap in the leachate evaporation pond along the toe of slope between the geocells and granular operations layer.

Close attention during thermal bonding show be maintained to insure no burnouts or holes.

Signed:   
Date: 04/12/10

Request VIA:  Telephone  Facsimile  Email  
Copies to:  File

GOODFELLOW BROS., INC.  
P.O. Box 3029 Lihue, Hawaii 96766  
(808) 241-4601 phone (808) 241-4605 fax

---

**REQUEST FOR INFORMATION**

TO: Waste Management of Hawaii  
ATTN: Jesse Frey

RFI No.: ~~X~~ 18  
Request submitted: April 1, 2010  
Respond requested by: Keith Suga  
Project: Kekaha Sanitary Landfill  
Phase II Lateral Expansion

Specification Reference:

Plan Reference: Drawing #22

Subject:  Discrepancy  Clarification  Suggestion  Other

---

Request: We would like to propose substituting 12" ductile iron pipe for the Pre-fabricated aluminum protective casing called out on drawing no.22 detail 4 for the Gas Monitoring Probe. Please advise if this is acceptable.

Signed: Keith Suga

Date: April 1, 2010

---

Reply: Not approved!

Signed: Jeff Impens

Date: April 2, 2010

---

Request VIA:  Telephone  Facsimile  Email  
Copies to:  File

GOODFELLOW BROS., INC.  
P.O. Box 3029 Lihue, Hawaii 96766  
(808) 241-4601 phone. (808) 241-4605 fax

---

**REQUEST FOR INFORMATION**

TO: Waste Management of Hawaii  
ATTN: Jesse Frey

RFI No.: 19  
Request submitted: April 9, 2010  
Respond requested by: Keith Suga  
Project: Kekaha Sanitary Landfill  
Phase II Lateral Expansion

Specification Reference:

Plan Reference:

Subject:  Discrepancy  Clarification  Suggestion  Other

---

Request: During installation of the pipe penetration at the Cell 1D location concerns were raised with the backfilling of the under the pipe penetration. Once the penetration is installed, gravity pipe connected and backfilling commences on the pipe there is a void created between the flatstock and that sand that cannot be physically compacted. A suggestion was brought up in the field to use lean concrete/flowable fill to fill the void. Please advise if this method is acceptable.

Signed: Keith Suga

Date: April 9, 2010

---

GOODFELLOW BROS., INC.  
P.O. Box 3029 Lihue, Hawaii 96766  
(808) 241-4601 phone (808) 241-4605 fax

Reply: I understand through conversations today with Geosyntec that a sand slurry was attempted and seeped right out under the pipe penetration assembly. I am concerned that this may happen as well with concrete. The concrete mix should be stiff enough as to not flow under the installed the pipe penetration assembly onto the sump bottom, out the sides of the penetration flatstock sides on the sideslopes, cause the flatstock to bow, and should only extend as far needed into the trench as to complete backfilling and compaction under traditional compaction.

If concrete is to be used, a layer of 16 oz nonwoven cushion geotextile should be installed on the backside of the flatstock which is to reside against the concrete. The geotextile should extend a minimum of 5 feet past the edges of the bottom flatstock on the sideslope and a minimum of 2 feet onto the sump bottom. This geotextile provides additional protection for the secondary geomembrane as well.

The mix as noted should be stiff enough to allow flow and should not include large aggregate as part of the mix. Please provide a proposed mix and compressive strength for review.

Other options for consideration in completing compaction could be the potential use of hand held pneumatic or air driven tampers completing compaction of thin lifts of soils.

Signed: 

Date: 04/09/10

Request VIA:  Telephone  Facsimile  Email  
Copies to:  File

RFI Update May 17, 2010. Geosyntec has provided the 30-day test results for the in-place concrete mix by e-mail on May 26, 2010. The previous requirement of 500 psi for the 7-day strength as discussed in e-mail correspondence dated April 15, 2010 was not achieved however, both 30-day cylinders have met this requirement. Based upon the 30-day tests, the concrete as installed for the Cell 10 and 10 pipe penetrations is accepted.



Kim Huynh

---

**From:** Chris Scott  
**Sent:** Tuesday, April 13, 2010 9:24 PM  
**To:** Kim Huynh  
**Subject:** Fw: RFI 19 Backfilling Pipe penetrations FOLLOW UP

Fyi

---

**From:** Bergschultz, Ken <KEN.BERGSCHULTZ@aecom.com>  
**To:** Keith Suga <keiths@goodfellowbros.com>; Frey, Jesse <JFrey@wm.com>; Impens, Jeffrey <Jeffrey.Impens@aecom.com>  
**Cc:** Chris Scott; Mike Minch; Christine Erorita <christinee@goodfellowbros.com>; Jeff Griffin <jeffg@goodfellowbros.com>  
**Sent:** Wed Apr 14 00:17:45 2010  
**Subject:** RE: RFI 19 Backfilling Pipe penetrations FOLLOW UP

Jesse,

The proposed concrete mix is acceptable. Upon review of the mix, there is no large aggregate (>3/4 inch) and consists primarily of finer particles and cement. During the pour, one cylinder should be taken for a seven-day compression test to confirm minimum 500 psi compressive strength. The pipe penetration should be installed as discussed in the previous RFI #19 response.

Any further question, please let me know.

**Kenneth J. Bergschultz, PE**  
Office Manager, Midwest Region  
Environment  
920.451.2452 C 920.918.3298  
[ken.bergschultz@aecom.com](mailto:ken.bergschultz@aecom.com)

**AECOM**  
4135 Technology Parkway  
Sheboygan, WI 53083  
T 920.458.8711 F 920.458.0550  
[www.aecom.com](http://www.aecom.com)

---

**From:** Keith Suga [mailto:keiths@goodfellowbros.com]  
**Sent:** Tuesday, April 13, 2010 10:05 PM  
**To:** Frey, Jesse; Bergschultz, Ken  
**Cc:** CScott@Geosyntec.com; MMinch@Geosyntec.com; Christine Erorita; Jeff Griffin  
**Subject:** FW: RFI 19 Backfilling Pipe penetrations FOLLOW UP

Jesse,

I've attached the CLSM mix design as follow up information as requested in RFI #19's response. This is a 500-1000psi mix design for a CLSM concrete. Please forward for approval to be used for backfilling the pipe penetrations.

Keith

---

**From:** Bergschultz, Ken [mailto:KEN.BERGSCHULTZ@aecom.com]  
**Sent:** Friday, April 09, 2010 6:44 PM  
**To:** Frey, Jesse; Impens, Jeffrey  
**Cc:** Keith Suga; Jeff Griffin; CScott@Geosyntec.com; MMinch@Geosyntec.com  
**Subject:** RE: RFI 19 Backfilling Pipe penetrations

## MIX DESIGN FOR PORTLAND CEMENT CONCRETE

(APPROVAL OF MIX DESIGN BY Q.A. ENGINEER REQUIRED PRIOR TO USAGE IN CONCRETE WORK)

DOT 4-151

TO: QUALITY ASSURANCE ENGINEER, STATE HIGHWAYS

FROM: GOODFELLOW BROS.

DATE: 4/13/2010

PROJECT#:

LOCATION:

CLASS: CLSM (500-1000 psi) concrete will be supplied by O. Thomas Inc.

MIX NUMBER: CLSM2

### DESIGN WEIGHTS PER CUBIC YARD

MATERIAL	CEMENT	3C #57	3F #57	#4 FINE	SAND	WATER	AIR %	TOTAL / FT <sup>3</sup>
	TYPE I&II	#113	#106	#108				
SOURCE:	HAWAIIAN	KAUAI AGG	KAUAI AGG	KAUAI AGG	KEKAHA	COUNTY		
SSD WTS LBS	282	0	0	3183	0	500	0	3965
SP. GRAV.	3.15	2.82	2.90	2.91	2.41	1		
AB. VOL.:	1.43	0.00	0.00	17.56	0.00	8.01	0	27.00
% MOISTURE		2.7	0.5	3.4	7.2			
% ABSORPTION		2.7	3.5	2.8	3.8			
CORRECTIONS %:		0	-3	0.6	3.4			
CORRECTION LBS		0	0	19	0	-19		
BATCH WTS LBS	282	0	0	3202	0	481		3965
	1.77 = W/C RATIO					57.7 GALLONS/YD <sup>3</sup>		
ADMIXTURE	WRDA-20		DARATARD-HC		DAREX II AEA			
DOSAGE:	0	OZ/ CWT	0	OZ/ CWT	0	OZ/ CWT		
ADMIX/ YD <sup>3</sup>	0	OZ/ YD <sup>3</sup>	0	OZ/ YD <sup>3</sup>	0	OZ/ YD <sup>3</sup>		

Slump: 8" +/- 1"

% Air: 0

Unit WL: 146.90 lbs/ft<sup>3</sup>

SUBMITTED BY: Wayland K. Reynolds  
 WAYLAND K. REYNOLDS  
 CONCRETE DESIGN TECHNICIAN

By: \_\_\_\_\_  
 Prime Contractor

MIX DESIGN SUBJECT TO MODIFICATION TO MAINTAIN YIELD, STRENGTH, WORKABILITY, AND/ OR SETTING TIME.  
 UPON ARRIVAL AT JOB SITE, UP TO ONE (1) GALS OF WATER / CUBIC YARD MAY BE ADDED, ONCE, PROVIDED MAXIMUM  
 SLUMP IS NOT EXCEEDED, AND WITHIN 90 MINUTES FROM TIME OF BATCHING. I.A.W. ASTM C94 para. 11.7.

GOODFELLOW BROS., INC.  
P.O. Box 3029 Lihue, Hawaii 96766  
(808) 241-4601 phone (808) 241-4605 fax

**REQUEST FOR INFORMATION**

TO: Waste Management of Hawaii  
ATTN: Jesse Frey

RFI No.: 20  
Request submitted: April 12, 2010  
Respond requested by: Keith Suga  
Project: Kekaha Sanitary Landfill  
Phase II Lateral Expansion

Specification Reference: Section 02062,  
2.02B

Plan Reference:

Subject:  Discrepancy  Clarification  Suggestion  Other

Request: We recently received the results back for the 3/8" material which indicates a gradation of 100% passing the 1/2" sieve, 93% passing the 3/8" sieve and 0% passing the #200 sieve. The permeability of  $4.1 \times 10^{-1}$  meets the specifications. Specifications call out a max particle size of 3/8". Can this material be utilized for the operations later in the cell and the protection layer in the leachate pond? Please advise.

Signed: Keith Suga

Date: April 12, 2010

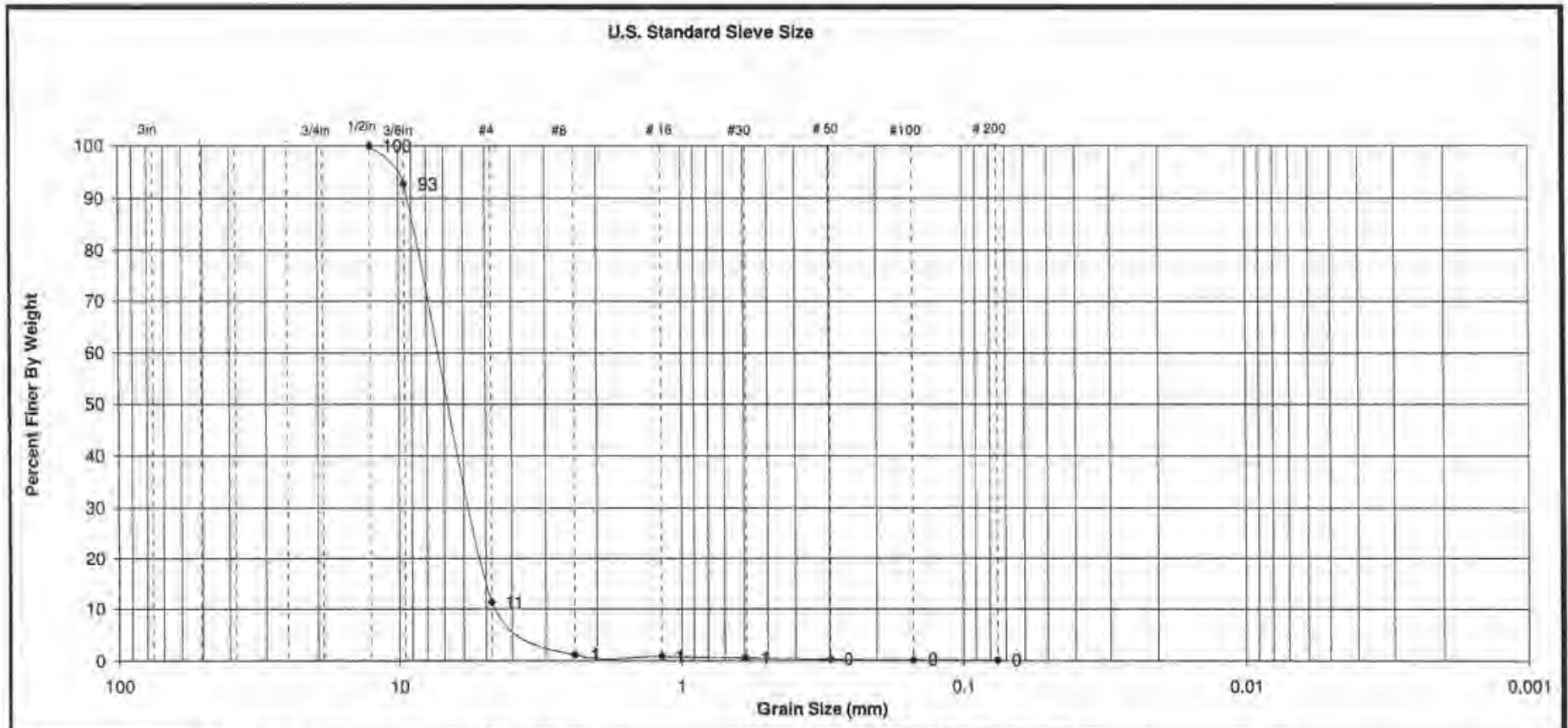
Reply: I have reviewed the site permit Section B 1.b.viii and 1.c.x and did not see a defined maximum for the particle size and in review of the ER calculations this particle size does not affect any of the calculations since the permeability is greater than specified. This test result will be acceptable given the application of the operations layer for Cell 1 and protection layer in the leachate pond. All remaining tests should meet the 100% less than 1/2" sieve, a minimum of 93% passing the 3/8" sieve, and less than 5% passing the #200 sieve and acceptable interface friction angle test results.

Signed: 

Date: 4/14/10

Request VIA:  Telephone  Facsimile  Email  
Copies to:  File





Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	Test Moist. (%)	Permeability, K (cm/sec)	LL	PL	PI	Unified Soil Class.	Description
3/8" minus quarry sand										

# CONSTANT-HEAD PRESSURE PERMEABILITY TESTS ASTM D 2434

PROJECT Precision Lab # G100274

Date 4/9/2010

Job No 2001-068

By LD

Sample			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k (cm/sec)
6815.3	Tare			11:20:00		11:20:10	1800	4.1E-01
10040	Init. Wet wt			11:22:00		11:22:10	1821	4.1E-01
	Sat. Wt.	10140		11:23:00		11:23:10	1855	4.2E-01
	Trimmed Wt.	10140		11:24:00		11:24:10	1834	4.2E-01
1	% water	4.1						
94.0	Dry Density pcf	94.0						
			PSI	0.4	Total (Ave.)		7310	4.1E-01

Sample			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k
	Tare							
	Init. Wet wt							
	Sat. Wt.							
	Trimmed Wt.							
	% water							
	Dry Density							
			PSI		Total (Ave.)			

Sample			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k
	Tare							
	Init. Wet wt							
	Sat. Wt.							
	Trimmed Wt.							
	% water							
	Dry Density							
			PSI		Total (Ave.)			

K = coefficient of permeability (cm/sec)

L = sample height = 11.633 cm

A = area of sample = 182.322 cm<sup>2</sup>

H = Hydrostatic head (cm of H<sub>2</sub>O)     1 psi = 70.43 cm

$$K = QL / Ahf$$

GOODFELLOW BROS., INC.  
P.O. Box 3029 Lihue, Hawaii 96766  
(808) 241-4601 phone (808) 241-4605 fax

---

**REQUEST FOR INFORMATION**

TO: Waste Management of Hawaii  
ATTN: Jesse Frey

RFI No.: 22  
Request submitted: May 5, 2010  
Respond requested by: Keith Suga  
Project: Kekaha Sanitary Landfill  
Phase II Lateral Expansion

Specification Reference:

Plan Reference: Drawing 15 Details 2 and 3

Subject:  Discrepancy  Clarification  Suggestion  Other

Request: Drawing 15, Detail 3 shows the 6 oz/sy nonwoven separator geotextile installed in the perimeter anchor trench with 6-inches of backfill between the geotextile and the underlying containment system geosynthetics.

After construction of the containment system geosynthetics, the anchor trench was fully backfilled to support the containment system on the side slopes during installation of the 1 1/2-inch granular drainage layer. To avoid potential damage to the installed containment system geosynthetics and nearby buried force main by re-digging an anchor trench, Goodfellow Bros. proposes to run the separator geotextile a minimum of 8 ft past the crest of the slope and under the access road geotextile. The separator geotextile will be covered with 1 ft of "general fill soils" and 9 inches of crushed aggregate as shown in Detail 2 on Drawing 15.

Please advise if this alternate anchorage method is acceptable.

Signed: Keith Suga

Date: May 5, 2010

GOODFELLOW BROS., INC.  
P.O. Box 3029 Lihue, Hawaii 96766  
(808) 241-4601 phone (808) 241-4605 fax

---

Reply: The proposed method of anchoring is consistent with the method and approved verbally during the weekly construction meeting on May 4, 2010. The separator geotextile will only need to be overlapped a minimum of 1 foot with the perimeter access road geotextile.

This anchoring method is approved as the stability of the liner system is based upon interface friction and no tensile forces applied to the geotextile or geosynthetics.

As discussed, this method of run out should also be applied to remaining construction activities of Cells 1A and 1B.

Any questions please let me know.

Signed: 

Date: 5/5/10

---

Request VIA:  
Copies to:

File

Telephone

Facsimile

Email

GOODFELLOW BROS., INC.  
P.O. Box 3029 Lihue, Hawaii 96766  
(808) 241-4601 phone (808) 241-4605 fax

---

## REQUEST FOR INFORMATION

TO: Waste Management of Hawaii  
ATTN: Jesse Frey

RFI No.: 23  
Request submitted: May 5, 2010  
Respond requested by: Keith Suga  
Project: Kekaha Sanitary Landfill  
Phase II Lateral Expansion

Specification Reference:

Plan Reference: Drawing 17 Detail 6

Subject:  Discrepancy  Clarification  Suggestion  Other

Request: Detail 6 on Drawing 17 shows the temporary termination for Cell 1C at the boundary between Cells 1C and 1B. To construct the termination as shown would require sequencing several construction steps. The attached sketch shows a proposed alternate configuration for the temporary termination that would essentially meet the design intent and would be simpler and faster to construct. The attached detail would be used for 60-days. In the event that the temporary termination will be left for longer than 60 days before completing the tie-in, an alternative method to protect the 20-ft liner run-out will be proposed for Engineer approval.

Please confirm whether the proposed alternate termination is acceptable.

Signed: Keith Suga

Date: May 5, 2010

Reply: The detail as submitted (and attached) is approved with the noted exception on the rain flap removal. Coordinate rain flap removal with DOH as Cell 1B may need to be approved and certified prior to removal of the flap to maintain and keep leachate out of the Cell 1B especially during rain events and operation of Cell 1C.

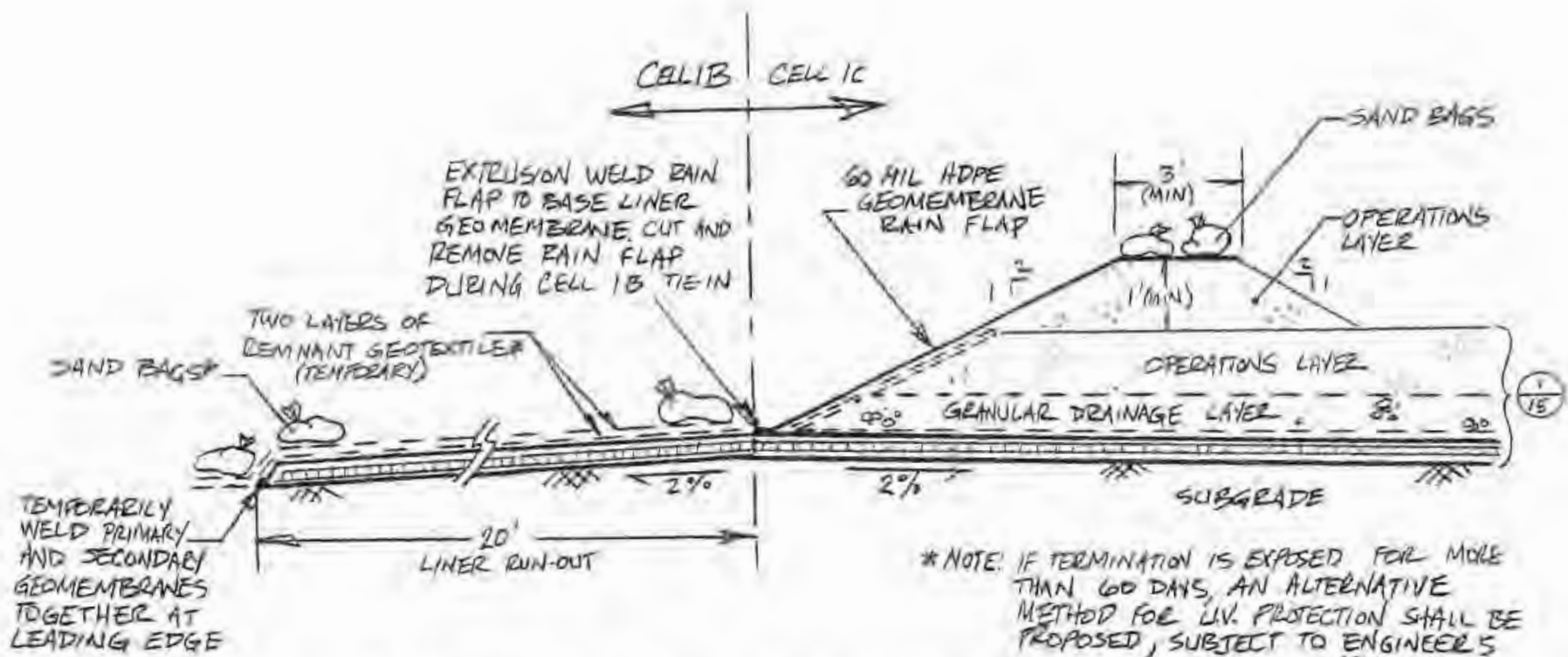
Signed: 

Date: 5/11/10

---

Request VIA:  Telephone  Facsimile  Email  
Copies to:  File

Written by: M. MINCH Date: 5.5.10 Reviewed by: \_\_\_\_\_ Date: \_\_\_\_\_  
DD MM YY DD MM YY  
 Client: WMH Project: KEKAHA Project/Proposal No: WG1298 Task No: 01



6 DETAIL (TYP) PROPOSED TEMPORARY CELL SEPARATION BERM  
 NOT TO SCALE

## REQUEST FOR INFORMATION

TO: <u>Waste Management of Hawaii</u>	RFT No.: <u>24</u>
ATTN: <u>Jesse Frey</u>	Request submitted: <u>May 11, 2010</u>
	Respond requested by: <u>Mike Minch, Geosyntec</u>
	Project: <u>Kekaha Sanitary Landfill Phase II Lateral Expansion</u>

Specification Reference: 02072, Parts 2.04F Plan Reference: \_\_\_\_\_

Subject:  Discrepancy  Clarification  Suggestion  Other

---

Requests: Interface direct shear testing was recently performed for interfaces involving the newly-produced 1.5-inch minus granular drainage layer material: interfaces 2, 3A, 3B, 8, and 9 as shown in the attached table and lab data sheets. Tests of these interfaces were previously performed using a preliminary granular drainage layer material in order to approve the geosynthetic materials. Since this initial testing, a new granular drainage layer material has been submitted and approved. The new interface friction angle tests were performed using the approved granular drainage layer material and new samples of the approved geosynthetic materials.

The new interface test results for the low normal stress condition (interfaces 8 and 9) meets the project specifications; the results for the higher normal stress condition (interfaces 2, 3A, and 3B) do not meet the project specifications. The laboratory reported the following results for the three interfaces:

Interface 2: Peak friction angle of 22.1 degrees and 821 psf apparent adhesion.

Interface 3A: Peak friction angle of 21.0 degrees and 0 psf apparent adhesion.

Interface 3B: Peak friction angle of 19.2 degrees and 0 psf apparent adhesion.

Please review the attached test results, and confirm whether the results for interfaces 2, 3A, and 3B are acceptable and satisfy the design intent.

Signed: /s/ Mike Minch

Date: May 11, 2010

**INTERFACE SHEAR TEST TABLE for Kehaka LF 2010**

Test No.	No. of runs per Config	Normal Stress (psf)	MATERIALS							Spec Peak	Spec Peak	Lab Peak	Lab Post-Peak	PASS OR FAIL
										(Cell 1)	(NLEP)			
1	1	30,40,50	Operations Layer (-3/8")	5oz NW GT						25	---	33.0	14.1	Pass
2	1	30,40,50		5oz NW GT	Drainage Gravel (-1.5")					25	---	22.1	10.1	
3A	3	30,40,50		5oz NW GT	Drainage Gravel (-1.5")	16 oz NW GT	80mil HDT (shiny side)			25	---	21	12.3	
3B	3	30,40,50		5oz NW GT	Drainage Gravel (-1.5")	16 oz NW GT	80mil HDT (shiny side)		80mil HDT (shiny side)	25	---	19.7	11.4	
4A	3	30,40,50		5oz NW GT			80mil HDT (shiny side)	GCL (white side)		25	---	24.5	18.1	Fail
4B	3	30,40,50		5oz NW GT			80mil HDT (shiny side)	GCL (white side)	80mil HDT (shiny side)	25	---	15 (i, reject) & 3	16.1 (reject) & 1.0	Fail
5A	3	30,40,50		5oz NW GT			60mil HDT (dull side)	GCL (black side)		25	---	23.1	11.1	Pass
5B	3	30,40,50		5oz NW GT			60mil HDT (dull side)	GCL (black side)	80mil HDT (dull side)	25	---	21.8	11.5	Pass
5A	3	30,40,50		5oz NW GT			60mil HDT (dull side)		Subbase Soil 1	25	---	30.9	28.5	Pass
6B	3	30,40,50		5oz NW GT			60mil HDT (dull side)		Subbase Soil 1	25	---	27.0	24.1	Pass
6C	3	30,40,50		5oz NW GT			60mil HDT (dull side)		Subbase Soil 2	25	---	---	---	---
6D	3	30,40,50		5oz NW GT			60mil HDT (dull side)		Subbase Soil 2	25	---	---	---	---
7	3	2,5,10	Operations Layer (-3/8")	5oz NW GT						15	---	53.2	17	Pass
8	3	2,5,10		5oz NW GT	Drainage Gravel (-1.5")					25	---	44.1	42.1	Pass
9	3	2,5,10		5oz NW GT	Drainage Gravel (-1.5")	16 oz NW GT	80mil HDT (shiny side)			25	15	18.0	15.6	Pass
10	3	2,5,10		5oz NW GT			80mil HDT (shiny side)	GCL (white side)		25	15	30.8	20.7	Pass
11	3	2,5,10		5oz NW GT			60mil HDT (dull side)	GCL (black side)		15	15	37.9	17.1	Pass
12A	3	2,5,10		5oz NW GT			60mil HDT (dull side)		Subbase Soil 1	15	15	42.0	34.3	Pass
12B	3	2,5,10		5oz NW GT			60mil HDT (dull side)		Subbase Soil 2	15	15	---	---	---
<b>Total</b>	<b>17</b>													
Total Configs where materials will be used			2	4	5	8	10	6	3	3	5			
No. of runs per material			6	12	15	9	30	18	9	8	15			
No. of runs/ buckets of 60 lbs of materials needed			2	3	2	2	4	3	3	1	1			

<sup>4</sup> Initial interface 3B shear strength results previously approved by AECOM per response to RFI #5 (5 February 2010).

\*\* Interface 4B initial and re-test peak shear strength results. Rejected in RFI #5, but later approved in email dated 2/24/2010.

Normal Stress (psf)	Initial Test Peak Shear Strength (psf)	Re-Test Peak Shear Strength (psf)
30	2008	2147
40	2312	2358
50	2778	2912



Geosyntec Consultants, Inc.  
475 14<sup>th</sup> Street, Suite 400 Oakland, California 94612  
(510) 836-3034 phone (510) 836-3036 fax

Reply: As discussed during the teleconference held May 10, 2010 at 10 am HST, we discussed the recent resulting interface friction angles in regards to the granular drainage layer of Cell 1. Based upon the information provided below and the teleconference I understand the following test results based new samples of the drainage layer:

1. Interface 2 Peak value of 22.1 degrees and 821 psf apparent adhesion.
2. Interface 3A Peak value of 21.0 degrees and 0 psf apparent adhesion.
3. Interface 3B Peak value of 19.2 degrees and 0 psf apparent adhesion.

In review of the Engineering Report, AECOM had prepared slope stability calculation representing granular layer and operation layer placement on the sideslopes of Cell 1. This calculation provided the minimum interface friction angles for a factor of safety of 1.1 during material placement while accounting for equipment loading and the varying thickness of material during placement. The specification values were typical values based upon published values. The ER calc provided conservatism and planned for instances like this in which there is some variability in the test and materials.

The review of the calculation and the maximum slope length (40 feet, sump area), the minimum interface friction angle for the placement of 1-foot of granular drainage layer is 19.3 degrees at FS = 1.1. However, I revisited the calculation for 19.2 degrees and the FS = 1.095 and GBI using a Caterpillar D6H LGP for placement and a minimum of 1-foot a material was under the dozer tracks, the geosynthetics were not put into tension (i.e. FS >1.0) and reflects observations of the installed materials at the facility.

I have attached the approved ER calc and the spreadsheet calculation for the 19.2 degrees for a maximum slope length of 40 feet demonstrating a FS of 1.095 which is equal to 1.1. Note the longest slope is in the sump area which is the only area where the 80-mil geomembrane is present and as soon as placement occurs way from the sump, the FS increases as the slope length decreases and 60-mil HDPE geomembrane is present.

This is a formal response to RFI #24 further documenting my email approval on May 10, 2010 and internal review of the spreadsheet/calc on May 12, 2010.

Signed:

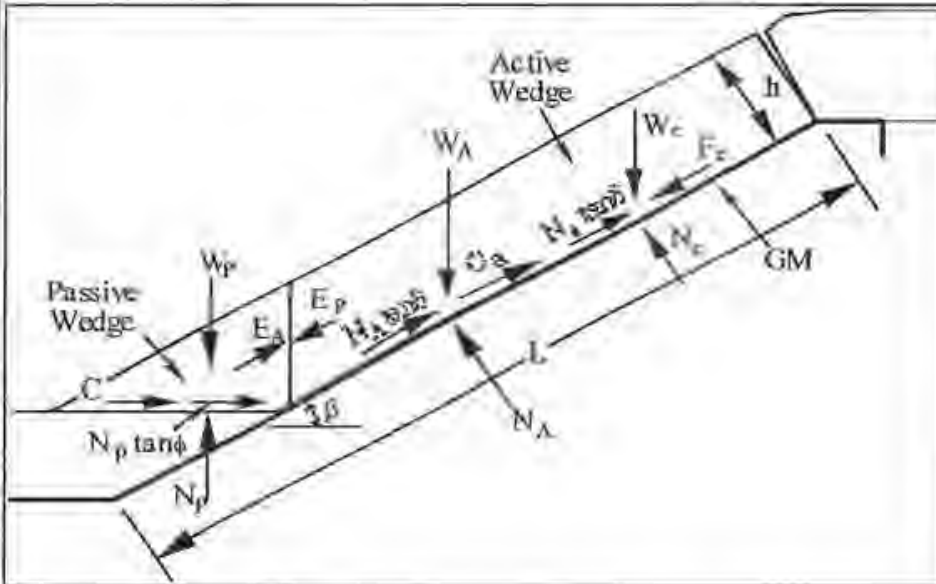


Date: May 27, 2010

Request VIA:  Telephone  Facsimile  Email  
Copies to:  File

## Interface Friction Angle Verification - Interface 3B (5/10/10) Kekaha LF Cell 1

**Uniform Cover Soil Thickness with the Incorporation of Equipment Loads**  
**1-foot Thickness (1-foot Granular Drainage Layer Placed Only)**



### Calculation of FS

#### Active Wedge:

$$W_a = 4766.5 \text{ kpounds}$$

$$N_a = 4522.8 \text{ kpounds}$$

#### Passive Wedge:

$$W_p = 217.0 \text{ kpounds}$$

$$FS = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

$$a = 3612.1$$

$$b = -4702$$

$$c = 816.9$$

$$FS = 1.095$$

thickness of cover soil = h =	1.00	ft		
soil slope angle beneath the geomembrane = $\beta$ =	18.4	°	= 0.32	(rad.)
finished cover soil slope angle = $\omega$ =	18.4	°	= 0.32	(rad.)
length of slope measured along the geomembrane = L =	40.0	ft		
unit weight of the cover soil = $\gamma$ =	130.0	pcf		
friction angle of the cover soil = $\phi$ =	33.0	°	= 0.58	(rad.)
cohesion of the cover soil = c =	0.0	psf		C = 0 kpounds
interface friction angle between cover soil and geomembrane = $\delta$ =	19.2	°	= 0.34	(rad.)
adhesion between cover soil and geomembrane = ca =	0.0	psf		Ca = 0 kpounds

thickness of cover soil = h =	1.00	ft		
equipment ground pressure (= wt. of equipment/(2w)) = q =	702.7	psf		b/h = 3.0
length of each equipment track = w =	10.7	ft		We = q w l = 7293.3
width of each equipment track = b =	3.0	ft		Ne = We cos $\beta$ = 6920.5
influence factor* at geomembrane interface = I =	0.97			Fe = We (a/g) = 0.0
acceleration/deceleration of the bulldozer = a =	0.00	g		

#### \*Influence Factor Default Values

Cover Soil Thickness	Equipment Track Width		
	Very Wide	Wide	Standard
<sup>a</sup> 300 mm	1.00	0.97	0.94
300-1000 mm	0.97	0.92	0.70
<sup>a</sup> 1000 mm	0.95	0.75	0.30

Note: numbers in boxes are input values

numbers in italics are calculated values

## CALCULATION SHEET

AECOM

Page 1 Of 4

Project No. 95561

Client	<u>County of Kauai</u>	Subject	<u>Drainage Layer</u>	Prepared By	<u>MZ</u>	Date	<u>12/22/08</u>
Project	<u>Kekaha Landfill</u>		<u>Stability Analysis with</u>	Reviewed By	<u>KJB</u>	Date	<u>12/30/08</u>
Phase II	<u>Lateral Expansion</u>		<u>Equipment Loading</u>	Approved By	<u>KJB</u>	Date	<u>12/30/08</u>

### DRAINAGE LAYER STABILITY ANALYSIS WITH EQUIPMENT LOADING

#### Objective

Determine the maximum slope length for granular drainage layer placement and operations layer placement over the geosynthetic base liner on the sideslopes of Cell 1.

#### Design Criteria and Assumptions

1. The base liner systems for Cell 1 is depicted in Figure 1 from Reference 1.
2. The drainage layer material is expected to be a sub-angular or angular gravel.
3. The placement of the granular drainage layer and the operations layer will be completed in two stages. The first stage would be placement of the 1-foot granular drainage layer and installation of the separator geotextile. After installation of the geotextile the 2-foot operations layer will be placed. This analysis will evaluate both conditions including placement of the operations layer in two 1-foot lifts as well. It is also assumed that the granular drainage layer or operations layer will be in place across the cell floor prior to placement on the sideslope.
4. This analysis will determine the minimum critical interface friction angles required for varied slope lengths from a typical length of 10 feet to the maximum slope length for the proposed expansion. Slope length will be dependant upon equipment loadings, placement of the granular drainage layer and/or the operations layer on the slope, and assumed no tension applied to the geotextile or geomembrane.
5. Slope length for granular drainage layer and operations layer placement is defined as the actual slope length, not a vertical or horizontal length.
6. Sideslopes are a maximum 3:1 (H:V) slope.
7. The dozer to be used for deployment of the drainage layer is expected to be a Caterpillar D6H LGP. This dozer has a ground pressure of less than 5 psi, typical for placement of soil material layers over geosynthetics. Model specifications are included as Attachment 1.
8. The dozer is operated from the bottom of the slope with no abrupt braking or change in direction during granular drainage layer placement.
9. Interface friction angle testing will be completed prior to cell construction or a resulting change of geosynthetic materials.

#### Calculations

##### Caterpillar D6H LGP Dozer Properties (Attachment 1, Reference 5)

Dozer track width:	36 inches
Track length on ground:	128.5 inches (10.7 ft)
Ground pressure:	4.88 psi (702.7 psi) < 5 psi

##### Drainage Layer Properties

Unit Weight:	130 pcf
Internal friction angle:	*34+ degrees

\*Table 3.31 of Reference 2 for SM, SP, SW, GM, GP, GW soils that could be used as drainage layer materials.

## CALCULATION SHEET

AECOM

Page 2 Of 4

Project No. 95561

Client <u>County of Kauai</u>	Subject <u>Drainage Layer</u>	Prepared By <u>MZ</u>	Date <u>12/22/08</u>
Project <u>Kekaha Landfill</u>	Stability Analysis with	Reviewed By <u>KJB</u>	Date <u>12/30/08</u>
Phase II Lateral Expansion	Equipment Loading	Approved By <u>KJB</u>	Date <u>12/30/08</u>

For conservatism, the internal friction angle used in the model and analysis is 33 degrees which is equal to the typical interface friction angle between sand/nonwoven geotextiles and gravel/nonwoven geotextile (Table 1, Reference 4). This will allow the model to evaluate a uniform layer thickness (granular drainage layer or with the added operations layer) with the separator geotextile included to determine the critical interface friction angle needed on the sideslope base liner system.

### Maximum Slope Angle

$$3H:1V: \quad \tan^{-1} (1/3) = 18.4 \text{ degrees}$$

### Maximum Slope Length

Based upon visual observation of the base liner grades shown on Drawing 4 of Reference 1, the maximum slope height for Cell 1 is 11 feet (vertical) on the west sideslope of Cell 1A. The resulting maximum slope length is determined to be:

$$(11) \left( \sqrt{3^2 + 1^2} \right) = 34.8 \text{ feet or } 35 \text{ feet, say } \Rightarrow 40 \text{ feet}$$

### Typical Interface Friction Angles

A review of Reference 4 for typical peak interface friction angles and peak adhesion in relation to the proposed base liner system include:

**Table 1  
Critical Base Liner Interfaces and Friction Angles**

Interface	Typical Interface Friction Test Results	
	Friction Angle (degrees)	Adhesion (kPa)
Nonwoven geotextile (separator and cushion) / granular drainage layer (gravel) or operations layer	33	0
Nonwoven geotextile (geocomposite and cushion) / textured HDPE geomembrane	25	8
Nonwoven geotextile (GCL) / textured HDPE geomembrane	23	8
Woven geotextile (GCL) / textured HDPE Geomembrane	18	11
Textured HDPE geomembrane to subbase (sand)	34	0
Needle-punched GCL (internal friction angle)	39.7	19.9

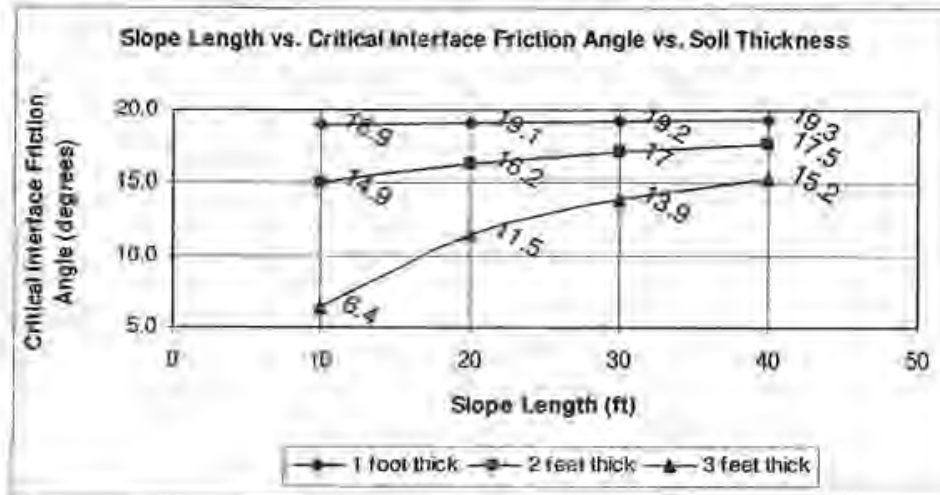
# CALCULATION SHEET

Client <u>County of Kaua'i</u>	Subject <u>Drainage Layer</u>	Prepared By <u>MZ</u>	Date <u>12/22/08</u>
Project <u>Kekaha Landfill</u>	Stability Analysis with	Reviewed By <u>KJB</u>	Date <u>12/30/08</u>
Phase II <u>Lateral Expansion</u>	<u>Equipment Loading</u>	Approved By <u>KJB</u>	Date <u>12/30/08</u>

Method of Analysis

Attached as Figures 2, 3 and 4, is a calibrated spreadsheet depicting the analysis presented by Koerner and Soong, 1998 (Reference 3). This spreadsheet depicts the driving and resisting forces experienced along the critical interface with the incorporation of equipment loading. A factor of safety of 1.1 was deemed as a qualifier for slope stability as equipment loading is a brief and temporary load condition.

**Table 2**  
**Slope Length vs. Critical Interface Friction Angles vs. Soil Thickness**



By varying the slope lengths in Figures 2, 3, and 4, varying drainage layer and operations layer thickness on the sideslope, and calculating the minimum critical interface friction angle for the specific slope length, the resulting Table 2 above was derived. The table itself specifically defines the critical interface solely as friction without the application of apparent adhesion that could occur between the interfaces of geosynthetic layers to geosynthetics layers or a geosynthetic layer to a soil layer. Added conservatism is provided by not considering adhesion.

## CALCULATION SHEET

AECOM

Page 4 Of 4  
Project No. 95561

<b>Client</b> <u>County of Kaua'i</u>	<b>Subject</b> <u>Drainage Layer</u>	<b>Prepared By</b> <u>MZ</u>	<b>Date</b> <u>12/22/08</u>
<b>Project</b> <u>Kekaha Landfill</u>	<b>Stability Analysis with</b>	<b>Reviewed By</b> <u>KJB</u>	<b>Date</b> <u>12/30/08</u>
<b>Phase II Lateral Expansion</b>	<b>Equipment Loading</b>	<b>Approved By</b> <u>KJB</u>	<b>Date</b> <u>12/30/08</u>

### Conclusions

Upon review of Table 2, the critical placement period will be during the placement of the 1-foot granular drainage layer. In order to place the entire lift up the sideslope, a minimum critical interface friction angle of 19.3 degrees is required. As the lift thickness increases (the 1-foot drainage layer is then overlain by the operations layer) the critical interface requirement decreases as a result of the increased buttress effect at the toe of slope and distribution of the equipment loading through the granular soils.

Review of the typical peak values in Table 1 determines that the sideslope geomembrane should be textured to allow for placement of the granular drainage layer on the sideslopes without added tension to the underlying geotextile or geomembrane.

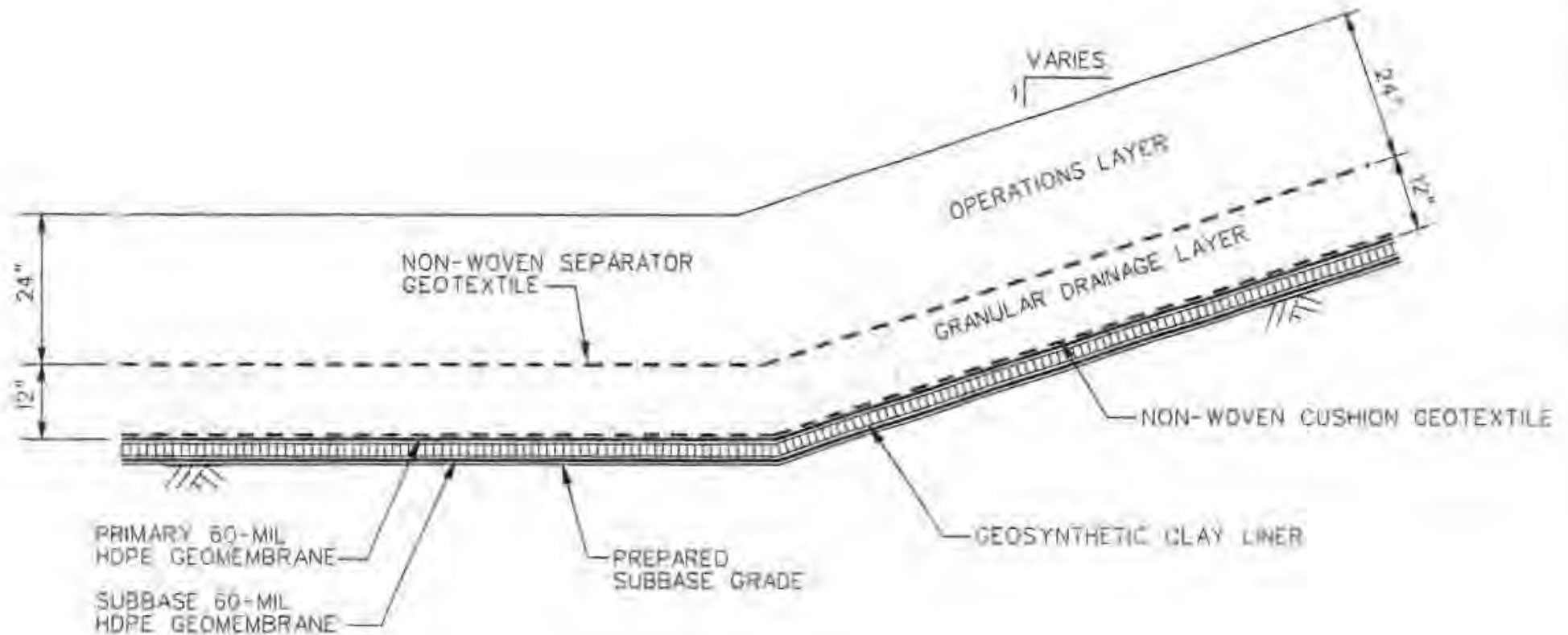
This calculation should be revisited if placement equipment is different or a change in the granular drainage layer. This calculation should also be revisited for the addition of any further base liner components or removal of any of the proposed base liner components.

### References

1. Drawings entitled, "Engineering Report, Phase II Lateral Expansion, Kekaha Landfill", prepared by AECOM, dated January 2009.
2. Table 3.31, Hunt, Roy E., "Geotechnical Engineering Investigation Manual," 1984.
3. Koerner, R. M. and Soong, T.-Y. (1998). "Analysis and Design of Veneer Cover Soils" *Proc. 6th Int. Conf. on Geosynthetics, Atlanta, USA*, IFAI, pp. 1-23.
4. Koerner, George R. and Nejaro, Dhani, "Direct Shear Database of Geosynthetic-to-Geosynthetic and Geosynthetic-to-Soil Interfaces," Geosynthetic Research Institute, GRI Report #30, June 14, 2005.
5. "Caterpillar Performance Handbook," Edition 24, pages 1-8 and 1-21.

**FIGURE 1**

**TYPICAL CELL 1 BASE LINER SYSTEM DETAILS**



## **TYPICAL BASE LINER DETAIL - CELL 1**

**1**

NTS

### NOTES:

1. ALL GEOMEMBRANE IS TEXTURED ON BOTH SIDES.
2. WHEN DEPLOYING GCL OR GEOTEXTILES OVER TEXTURED GEOMEMBRANE OR WHEN DEPLOYING TEXTURED GEOMEMBRANE OVER GCL OR GEOTEXTILES, A RUBSHEET SHALL BE USED BETWEEN THE TWO MATERIALS AND REMOVED AFTER FINAL MATERIAL POSITIONING.

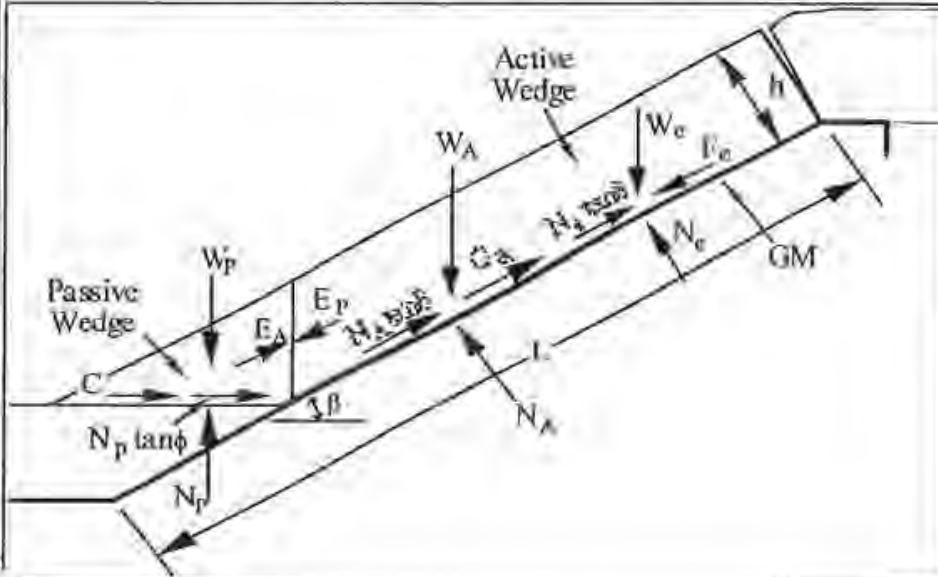


**FIGURE 2**

**DRAINAGE LAYER STABILITY CALCULATION WITH EQUIPMENT LOADING  
(MAXIMUM SLOPE LENGTH ONLY, 1-FOOT GRANULAR DRAINAGE LAYER)**

**Figure 2**

**Uniform Cover Soil Thickness with the Incorporation of Equipment Loads  
1-foot Thickness (1-foot Granular Drainage Layer Placed Only)**



**Calculation of FS**

**Active Wedge:**

$W_a = 4766.5$  kpounds

$N_a = 4522.8$  kpounds

**Passive Wedge:**

$W_p = 217.0$  kpounds

$$FS = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

$a = 3612.1$

$b = -4719$

$c = 820.5$

**FS = 1.10**

thickness of cover soil = $h$	=	1.00	ft		
soil slope angle beneath the geomembrane = $\beta$	=	18.4	°	= 0.32	(rad.)
finished cover soil slope angle = $\omega$	=	18.4	°	= 0.32	(rad.)
length of slope measured along the geomembrane = $L$	=	40.0	ft		
unit weight of the cover soil = $\gamma$	=	130.0	pcf		
friction angle of the cover soil = $\phi$	=	33.0	°	= 0.58	(rad.)
cohesion of the cover soil = $c$	=	0.0	psf	$C = 0$	kpounds
interface friction angle between cover soil and geomembrane = $\delta$	=	19.3	°	= 0.34	(rad.)
adhesion between cover soil and geomembrane = $ca$	=	0.0	psf	$Ca = 0$	kpounds

thickness of cover soil = $h$	=	1.00	ft		
equipment ground pressure (= wt. of equipment/(2wb)) $F = q$	=	702.7	psf	$b/h = 3.0$	
length of each equipment track = $w$	=	10.7	ft	$We = q w l = 7293.3$	
width of each equipment track = $b$	=	3.0	ft	$Ne = We \cos \beta = 6920.5$	
influence factor* at geomembrane interface = $l$	=	0.97		$Fe = We (a/g) = 0.0$	
acceleration/deceleration of the bulldozer = $a$	=	0.00	g		

**\*Influence Factor Default Values**

Cover Soil Thickness	Equipment Track Width		
	Very Wide	Wide	Standard
<sup>2</sup> 300 mm	1.00	0.97	0.94
300-1000 mm	0.97	0.92	0.70
>sup> 1000 mm	0.95	0.75	0.30

Note: numbers in boxes are input values

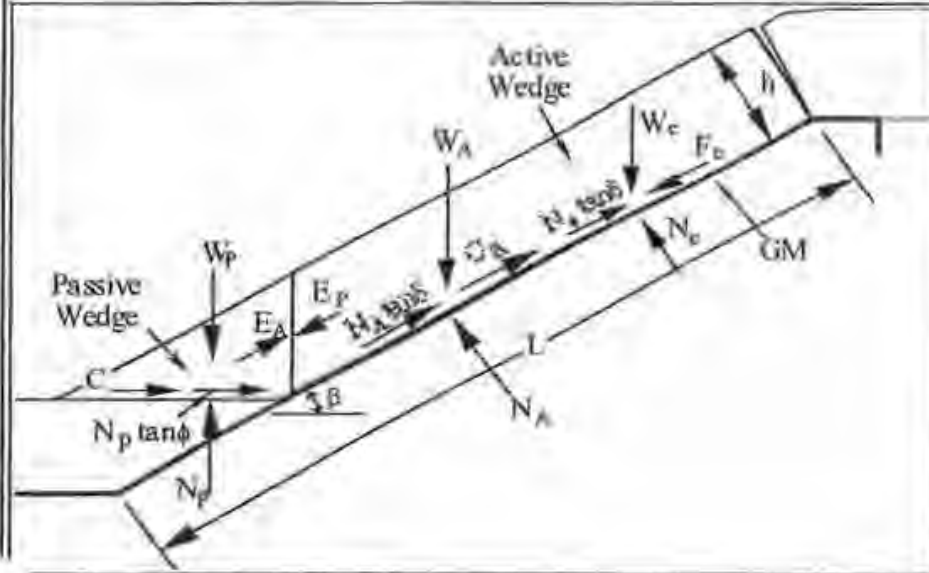
numbers in italics are calculated values

**FIGURE 3**

**DRAINAGE LAYER STABILITY CALCULATION WITH EQUIPMENT LOADING  
(MAXIMUM SLOPE LENGTH ONLY, 1-FOOT GRANULAR DRAINAGE LAYER WITH 1-  
FOOT OF OPERATIONS LAYER)**

**Figure 3**

**Uniform Cover Soil Thickness with the Incorporation of Equipment Loads  
2-foot Thickness (1-foot Granular Drainage Layer and 1-foot Operations Layer)**



**Calculation of FS**

**Active Wedge:**

$W_a = 8666.1$  kpounds

$N_a = 8223.1$  kpounds

**Passive Wedge:**

$W_p = 866.1$  kpounds

$$FS = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

$a = 4667.4$

$b = -6005$

$c = 957.7$

**FS = 1.10**

thickness of cover soil = $h$	=	2.00	ft		
soil slope angle beneath the geomembrane = $\beta$	=	18.4	°	= 0.32	(rad.)
finished cover soil slope angle = $\omega$	=	18.4	°	= 0.32	(rad.)
length of slope measured along the geomembrane = $L$	=	40.0	ft		
unit weight of the cover soil = $\gamma$	=	130.0	pcf		
friction angle of the cover soil = $\phi$	=	33.0	°	= 0.58	(rad.)
cohesion of the cover soil = $c$	=	0.0	psf		$C = 0$ kpounds
interface friction angle between cover soil and geomembrane $\delta$	=	17.5	°	= 0.31	(rad.)
adhesion between cover soil and geomembrane = $ca$	=	0.0	psf		$Ca = 0$ kpounds

thickness of cover soil = $h$	=	2.00	ft		
equipment ground pressure (= wt. of equipment/(2wb)) = $q$	=	702.7	psf		$b/h = 1.5$
length of each equipment track = $w$	=	10.7	ft		$W_e = qwl = 6917.4$
width of each equipment track = $b$	=	3.0	ft		$N_e = W_e \cos \beta = 6563.7$
influence factor* at geomembrane interface = $l$	=	0.92			$F_e = W_e (a/g) = 0.0$
acceleration/deceleration of the bulldozer = $a$	=	0.00	g		

**\*Influence Factor Default Values**

Cover Soil Thickness	Equipment Track Width		
	Very Wide	Wide	Standard
≥ 300 mm	1.00	0.97	0.94
300-1000 mm	0.97	0.92	0.70
≥ 1000 mm	0.95	0.75	0.30

Note: numbers in boxes are input values

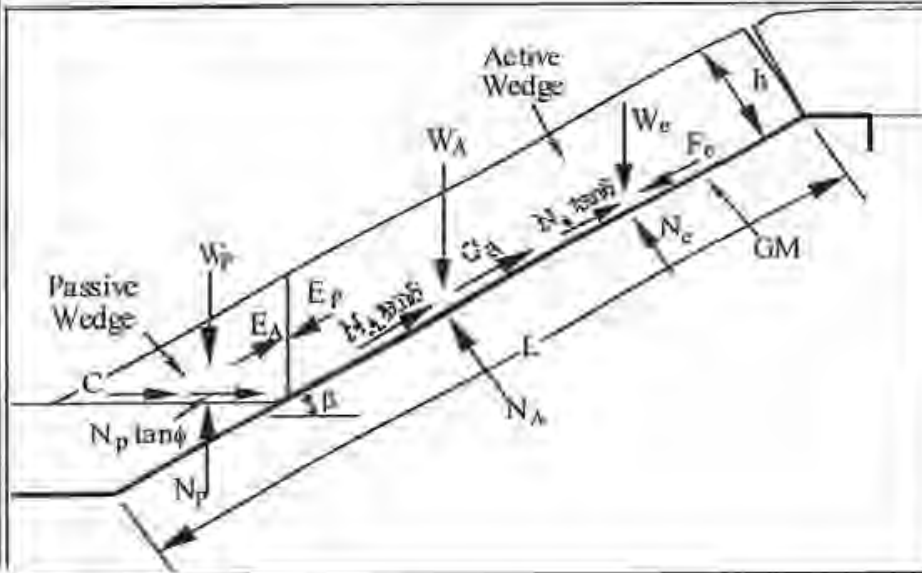
numbers in italics are calculated values

**FIGURE 4**

**DRAINAGE LAYER STABILITY CALCULATION WITH EQUIPMENT LOADING  
(MAXIMUM SLOPE LENGTH ONLY, 1-FOOT GRANULAR DRAINAGE LAYER WITH 2-FEET  
OF OPERATIONS LAYER)**

**Figure 4**

**Uniform Cover Soil Thickness with the Incorporation of Equipment Loads  
3-foot Thickness (1-foot Granular Drainage Layer and 2-foot Operations Layer)**



**Calculation of FS**

**Active Wedge:**

$W_a = 11698.7$  kpounds

$N_a = 11100.7$  kpounds

**Passive Wedge:**

$W_p = 1953.2$  kpounds

$$FS = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

$a = 5575.7$

$b = -7032$

$c = 984.9$

**FS = 1.10**

thickness of cover soil = $h$	=	3.00	ft		
soil slope angle beneath the geomembrane = $\beta$	=	18.4	°	=	0.32 (rad.)
finished cover soil slope angle = $\alpha$	=	18.4	°	=	0.32 (rad.)
length of slope measured along the geomembrane = $L$	=	40.0	ft		
unit weight of the cover soil = $\gamma$	=	130.0	pcf		
friction angle of the cover soil = $\phi$	=	33.0	°	=	0.58 (rad.)
cohesion of the cover soil = $c$	=	0.0	psf	$C = 0$	kpounds
interface friction angle between cover soil and geomembrane = $\delta$	=	15.2	°	=	0.27 (rad.)
adhesion between cover soil and geomembrane = $ca$	=	0.0	psf	$Ca = 0$	kpounds

thickness of cover soil = $h$	=	3.00	ft		
equipment ground pressure (= wt. of equipment/(2wb)) = $q$	=	702.7	psf	$b/h = 1.0$	
length of each equipment track = $w$	=	10.7	ft	$W_e = q w l = 6917.4$	
width of each equipment track = $b$	=	3.0	ft	$N_e = W_e \cos \beta = 6563.7$	
influence factor* at geomembrane interface = $I$	=	0.92		$F_e = W_e (a/g) = 0.0$	
acceleration/deceleration of the bulldozer = $a$	=	0.00	g		

\*Influence Factor Default Values

Cover Soil Thickness	Equipment Track Wd/ft		
	Very Wide	Wide	Standard
≥ 300 mm	1.00	0.97	0.94
300-1000 mm	0.97	0.92	0.70
≥ 1000 mm	0.85	0.75	0.30

Note: numbers in boxes are input values

numbers in italics are calculated values

**ATTACHMENT 1**

**EQUIPMENT PROPERTIES FOR CATERPILLAR D6H LGP DOZER**

# Track-Type Tractors | Specifications



MODEL	D6H XR Series II		D6H LGP Series II		D7G		D7H Series II	
Flywheel Power	130 kW	175 hp	127 kW	170 hp	149 kW	200 hp	160 kW	215 hp
Operating Weight*								
(Power Shift)	18,684 kg	41,192 lb	19,814 kg	43,590 lb	20,666 kg	45,560 lb	24,894 kg	54,401 lb
(Direct Drive)	—	—	19,989 kg	43,976 lb	20,510 kg	45,218 lb	—	—
(Power Shift Differential Steer)	18,799 kg	41,444 lb	—	—	—	—	24,993 kg	55,100 lb
Engine Model	3306		3306		3306		3306	
Rated Engine RPM	1900		1900		2000		2100	
No. of Cylinders	6		6		6		6	
Bore	121 mm	4.75"	121 mm	4.75"	121 mm	4.75"	121 mm	4.75"
Stroke	152 mm	6"	152 mm	6"	152 mm	6"	152 mm	6"
Displacement	10.5 L	638 in <sup>3</sup>	10.5 L	638 in <sup>3</sup>	10.5 L	638 in <sup>3</sup>	10.5 L	638 in <sup>3</sup>
Track Rollers (Each Side)	7		8		6		7	
Width of Standard Track Shoe	560 mm	22"	915 mm	36"	508 mm	20"	560 mm	22"
Length of Track on Ground	2.77 m	9'1"	3.27 m	10'8.5"	2.70 m	8'11"	2.90 m	9'6"
Ground Contact Area (W/Std. Shoe)	3.11 m <sup>2</sup>	4815 in <sup>2</sup>	6.97 m <sup>2</sup>	9254 in <sup>2</sup>	2.76 m <sup>2</sup>	4280 in <sup>2</sup>	3.24 m <sup>2</sup>	5016 in <sup>2</sup>
Track Gauge	1.88 m	6'2"	2.23 m	7'3"	1.98 m	6'5"	1.98 m	6'5"
GENERAL DIMENSIONS:								
Height (Stripped Top)**	3.26 m	7'5"	2.92 m	7'7"	2.27 m	7'5"	2.44 m	8'0"
Height (To Top of ROPS)	3.12 m	10'3"	3.16 m	10'5"	3.20 m	10'6"	3.33 m	10'11"
Height (To Top of Cab ROPS)	3.12 m	10'3"	3.16 m	10'5"	—	—	3.42 m	11'3"
Height (To Top of ROPS Canopy)	—	—	3.16 m	10'5"	—	—	—	—
Overall Length (With P Blade)	—	—	5.38 m	17'8"	—	—	—	—
(Without Blade)	—	—	4.49 m	14'9"	—	—	—	—
Overall Length (With S Blade)	5.28 m	17'4"	—	—	5.28 m	17'4"	5.83 m	19'9"
(Without Blade)	4.21 m	13'10"	—	—	4.19 m	13'9"	4.73 m	15'6"
Width (Over Trunnion)	2.64 m	8'8"	3.43 m	11'3"	—	—	2.86 m	9'5"
Width (W/O Trunnion — Std. Shoe)	2.44 m	8'0"	3.14 m	10'3.6"	2.55 m	8'5"	2.84 m	9'4"
Ground Clearance	377 mm	14.8"	392 mm	15"	347 mm	13.7"	406 mm	16"
Blade Types and Widths:								
Straight	3.36 m	11'0"	3.99 m	13'1"	3.66 m	12'0"	3.91 m	12'10"
Angle	—	—	—	—	4.27 m	14'0"	—	—
Angle Straight	4.16 m	13'8"	—	—	—	—	4.49 m	14'9"
Full Angle	3.78 m	12'5"	—	—	—	—	4.08 m	13'5"
Universal	—	—	—	—	3.81 m	12'6"	3.98 m	13'1"
Semi-U	3.26 m	10'8"	—	—	—	—	3.65 m	12'1"
Fuel Tank Roll Capacity	397 L	105 U.S. gal	337 L	89 U.S. gal	435 L	115 U.S. gal	479 L	127 U.S. gal

\*Operating Weight includes ROPS canopy, operator, lubricants, coolant, full fuel tank, hydraulic controls and fluid, straight blade with lift, fern, backup alarm, retrieval hitch and front pull hook.  
 — D7G includes end track guiding guards.  
 \*\*Height (stripped top) — without ROPS canopy, exhaust, seat back or other easily removed encumbrances.





**GROUND PRESSURES**

Pressures computed from operating weights given earlier in this section in the specifications tables.

MODEL	SHOE WIDTH		CONTACT AREA		GROUND PRESSURE	
	mm	in	m <sup>2</sup>	in <sup>2</sup>	kPa	psi
D3C Series II	356	14	1.35	2097	52	7.5
	406	16	1.54	2394	44	6.45
D3C LGP Series II	635	25	2.61	4045	29	4.2
D3C LGP-S Series II	690	29	4.05	7524	17	2.52
D4C Series II	406	16	1.67	2589	44	6.44
D4C LGP Series II	635	25	2.61	4045	30	4.3
D5C	457	18	1.92	3038	42.3	6.14
D5C LGP	690	26	2.834	4389	31.0	4.51
D4H Series II	360	14	1.59	2464	64	9.1
	410	16	1.82	2826	56	8.0
	460	18	2.05	3169	50	7.1
D4H XL Series III	510	20	2.45	3799	47	6.73
	560	22	2.69	4172	44	6.17
D4H LGP Series III	610	24	3.20	4953	38	5.34
	780	30	4.03	6252	31	4.39
	770	30	3.98	6170	31	4.41
D5E	406	16	1.77	2745	62	9.0
	457	18	1.89	3085	55	7.90
	508	20	2.21	3426	49.6	7.22
	560	22	2.44	3784	45	6.53
D5H Series II	460	18	2.11	3270	60.9	8.89
	510	20	2.35	3646	54.4	7.8
D5H XL Series II	560	22	2.78	4309	50	7.10
	600	24	3.03	4686	47	6.87
D5H LGP Series II	710	28	4.43	6866	36	5.15
	660	26	5.37	8321	30	4.24
	665	26	5.40	8369	29	4.17
D6D	457	18	2.17	3364	65	9.42
	508	20	2.41	3736	59	8.56
	560	22	2.65	4108	59	7.58
	610	24	2.89	4480	49	7.10
D6E	457	18	2.43	3765	60	8.70
	508	20	2.71	4200	54	7.83
	560	22	2.98	4619	49	7.10
	610	24	3.25	5040	45	6.54
D6H Series II	508	20	2.67	4140	65.0	9.44
	560	22	2.94	4564	59.0	8.50
	610	24	3.21	4971	54.2	7.86

\*Standard Shoe

MODEL	SHOE WIDTH		CONTACT AREA		GROUND PRESSURE	
	mm	in	m <sup>2</sup>	in <sup>2</sup>	kPa	psi
D6H XL Series II	510	20	2.89	4484	66	9.42
	560	22	3.18	4923	60	8.49
	610	24	3.48	5363	56	7.88
D6H XR Series II	508	20	2.83	4386	67	9.48
	560	22	3.11	4815	60	8.55
	610	24	3.38	5246	58	7.93
D6H LGP Series II	760	30	4.86	7396	40	5.74
	915	36	6.97	9261	34	4.83
	1000	39	8.53	10,122	32	4.48
D7G	508	20	2.76	4280	73	10.6
	568	22	3.04	4708	68	9.6
	610	24	3.31	5138	60	8.3
D7H Series II	510	20	2.94	4580	62	11.7
	560	22	3.24	5019	75	10.6
	610	24	3.53	5472	69	9.8
	660	26	3.82	5928	64	9.1
D7H XR Series II	560	22	3.43	5315	71.5	10.16
	610	24	3.75	5806	65.9	9.37
	660	26	4.06	6282	61.2	8.70
D7H LGP Series II	760	30	4.8	7504	54	7.74
	915	36	6.82	9029	46	6.55
D8N	500	22	3.50	5565	100.6	14.6
	610	24	3.91	6082	92.3	13.4
	660	26	4.23	6559	85.4	12.4
	710	28	4.55	7066	79.2	11.6
D8N LGP*	955	38	6.2	9576	53.7	7.8
D9N	500	22	3.86	6009	107.0	15.51
	610	24	4.21	6556	99.1	14.37
	665	27	4.74	7374	89.2	12.94
	760	30	5.26	8194	79.4	11.61
D10N	610	24	4.73	7326	134.1	18.8
	710	28	5.50	8527	107.6	15.6
	860	31.5	6.69	10,328	89.8	13.0
D11N	710	28	6.31	9781	150.2	21.8
	810	32	7.20	11,198	132.7	19.3
	915	36	8.13	12,605	118.6	17.2

\*Standard shoe

\*Offered as a Custom Product.

NOTE: Ground contact area = width of track shoe × length of track on ground × 2.

$$\text{Ground pressure} = \frac{\text{operating weight}}{\text{ground contact area}}$$

ATTACHMENT 2

TABLE 3.31 TYPICAL PROPERTIES OF COMPACTED SOILS

TABLE 2.51  
TYPICAL PROPERTIES OF COMPACTED SOILS\*

Group symbol	Soil type	Range of maximum dry unit weight, pcf	Range of optimum moisture, %	Typical value of compression		Typical strength characteristics				Typical coefficient of permeability, ft/min	Range of CBR values	Range of subgrade modulus $k_v$ , lb/in <sup>2</sup>
				Percent of original height		Cohesion (as compacted), pcf	Cohesion (retained), pcf	Effective stress envelope $\phi$ , degrees	$c_u$ , k			
				At 1.4 in (36 mm)	At 2.5 in (64 mm)							
GW	Well-graded clean gravels, gravel-sand mixtures	125-155	11-8	0.2	0.6	0	0	>35	>2.79	$5 \times 10^{-4}$	40-80	300-600
GP	Poorly graded clean gravels, gravel-sand mix	115-135	14-11	0.4	0.9	0	0	>37	>0.79	$10^{-4}$	30-60	250-400
GM	Silty gravels, poorly graded gravel-sand silt	120-130	12-8	0.5	1.1	—	—	>34	>0.67	> $10^{-4}$	20-50	100-400
GC	Clayey gravels, poorly graded gravel-sand-clay	115-120	14-9	0.7	1.4	—	—	>31	>0.60	> $10^{-4}$	20-40	150-300
SW	Well-graded clean sands, gravelly sands	110-130	15-9	0.8	1.5	0	0	35	0.79	> $10^{-4}$	20-40	300-400
SP	Poorly graded clean sands, sand-gravel mix	100-120	21-12	0.8	1.4	0	0	37	0.74	> $10^{-4}$	10-40	300-300
SM	Silty sands, poorly graded sand-silt mix	110-125	16-11	0.8	1.8	1050	420	34	0.87	$5 \times 10^{-4}$	10-40	100-400
SM-SC	Sand-silt clay mix with slightly plastic fines	110-130	18-11	0.8	1.4	1050	390	33	0.84	$4 \times 10^{-4}$	...	...
SC	Clayey sands, poorly graded sand-clay mix	105-125	19-11	1.1	2.2	1550	530	31	0.90	$3 \times 10^{-4}$	1-20	100-300
ML	Inorganic silts and clayey silts	95-120	24-12	0.6	1.7	1400	600	32	0.82	$10^{-4}$	15 or less	100-300
ML-CL	Mixture of inorganic silt and clay	100-120	23-12	1.0	2.3	1350	480	32	0.83	$8 \times 10^{-4}$	...	...
CL	Inorganic clays of low to medium plasticity	95-120	24-12	1.3	2.5	1800	570	33	0.84	$10^{-4}$	15 or less	50-200
OL	Organic silts and silty clays, low plasticity	80-100	33-31	...	...	...	...	...	...	...	5 or less	50-100
MH	Inorganic clayey silts, elastic silts	70-90	34-24	2.0	2.6	1500	420	36	0.67	$5 \times 10^{-4}$	10 or less	50-100
CH	Inorganic clays of high plasticity	75-105	35-19	2.8	3.9	2150	530	18	0.33	$10^{-4}$	15 or less	50-150
OH	Organic clays and silty clays	85-120	45-23	...	...	...	...	...	...	...	5 or less	25-100

\*From NAVFAC Manual DM 7 (1971). All properties are for conditions of "standard Proctor" maximum density, except values of  $\phi$  and CBR, which are for "modified Proctor" maximum density. Typical strength characteristics are for effective stress envelopes and are obtained from UCBR data. Compression values are for vertical loading with complete lateral confinement. (...) indicates insufficient data available for an estimate.

GOODFELLOW BROS., INC.  
P.O. Box 3029 Lihue, Hawaii 96766  
(808) 241-4601 phone (808) 241-4605 fax

## REQUEST FOR INFORMATION

TO: Waste Management of Hawaii  
ATTN: Jesse Frey

RFI No.: 25  
Request submitted: June 4, 2010  
Respond requested by: Keith Suga  
Project: Kekaha Sanitary Landfill  
Phase II Lateral Expansion

Specification Reference: Plan Reference: Drawing 17 Detail 3

Subject:  Discrepancy  Clarification  Suggestion  Other

Request: There is a conflict within Detail 3 of Drawing No. 17 regarding the designation for the dual containment pipes. The profile calls out gravity piping to have SDR 11 HDPE pipe inside of SDR 17 HDPE pipe. The plan view calls out forcemain piping to have SDR 17 HDPE pipe inside SDR 11 HDPE pipe. Our wet well structure is being fabricated with forcemain/gravity piping with SDR 11 HDPE pipe inside SDR 17 HDPE pipe. Please confirm whether this is acceptable.

Signed: Keith Suga

Date: June 4, 2010

Reply: Based upon email correspondence on March 18, 2010: Upon review there is a conflict in the details, but however the profile drawing is correct. The piping should be as noted for Drawing 17 for the Wet Well #3 and Temporary Wet Well have forcemain/gravity piping of 4-inch SDR11 HDPE pipe inside of 8-inch SDR17 HDPE pipe.

A revised Drawing #17 has been provided correcting the SDR designations.

Signed: 

Date: June 7, 2010

Request VIA:  Telephone  Facsimile  Email  
Copies to:  File

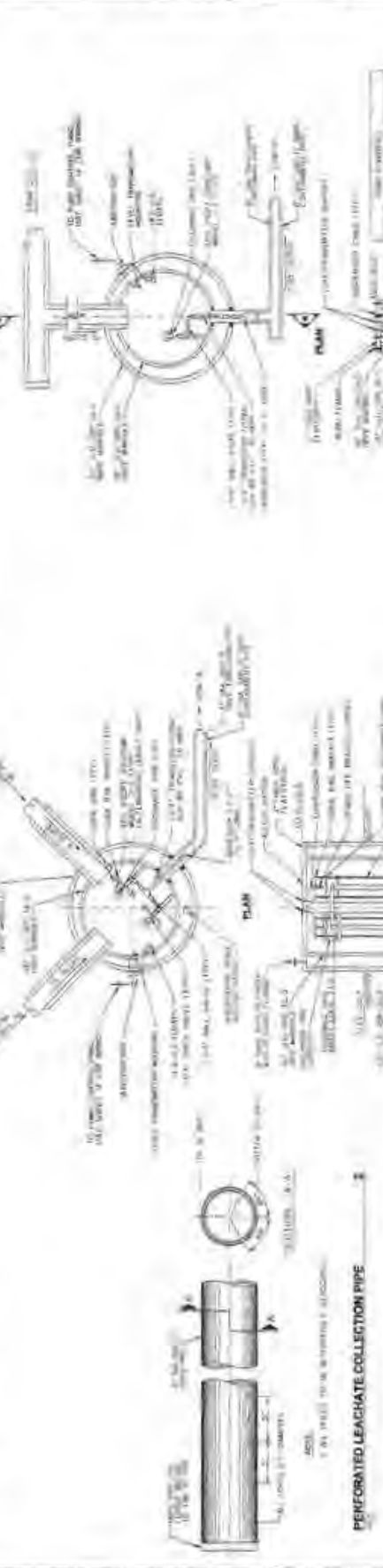
NO.	DATE	REVISION
1	10/20/01	ISSUED FOR PERMITS
2	11/15/01	REVISED TO REFLECT PERMIT COMMENTS
3	01/10/02	REVISED TO REFLECT PERMIT COMMENTS
4	03/20/02	REVISED TO REFLECT PERMIT COMMENTS
5	05/15/02	REVISED TO REFLECT PERMIT COMMENTS
6	07/10/02	REVISED TO REFLECT PERMIT COMMENTS
7	09/05/02	REVISED TO REFLECT PERMIT COMMENTS
8	11/01/02	REVISED TO REFLECT PERMIT COMMENTS
9	01/05/03	REVISED TO REFLECT PERMIT COMMENTS
10	03/01/03	REVISED TO REFLECT PERMIT COMMENTS
11	05/01/03	REVISED TO REFLECT PERMIT COMMENTS
12	07/01/03	REVISED TO REFLECT PERMIT COMMENTS
13	09/01/03	REVISED TO REFLECT PERMIT COMMENTS
14	11/01/03	REVISED TO REFLECT PERMIT COMMENTS
15	01/01/04	REVISED TO REFLECT PERMIT COMMENTS
16	03/01/04	REVISED TO REFLECT PERMIT COMMENTS
17	05/01/04	REVISED TO REFLECT PERMIT COMMENTS
18	07/01/04	REVISED TO REFLECT PERMIT COMMENTS
19	09/01/04	REVISED TO REFLECT PERMIT COMMENTS
20	11/01/04	REVISED TO REFLECT PERMIT COMMENTS



**AECOM**

**CELL 1 LEACHATE MANAGEMENT SYSTEM DETAILS**

CELL 1 LEACHATE MANAGEMENT SYSTEM  
 PROJECT: CELL 1 LEACHATE MANAGEMENT SYSTEM  
 SHEET NO. 11 OF 12  
 DATE: 11/15/01



GOODFELLOW BROS., INC.  
P.O. Box 3029 Lihue, Hawaii 96766  
(808) 241-4601 phone (808) 241-4605 fax

---

## REQUEST FOR INFORMATION

TO:	Waste Management of Hawaii	RFI No.:	26 Revised
ATTN:	Jesse Frey	Request submitted:	June 16, 2010
		Respond requested by:	Keith Suga
		Project:	Kekaha Sanitary Landfill Phase II Lateral Expansion

Specification Reference: \_\_\_\_\_ Plan Reference: Drawing 19 Detail 5

Subject:  Discrepancy  Clarification  Suggestion  Other

Request: Drawing 19, Detail 5 calls for a 6-ft diameter HDPE manhole installed as a valve box at the edge of the existing roadway to house the check valves and Tee leading to the new leachate pond. Due to the alignment of the existing piping and the existing roadway, we would like to substitute a 6-ft traffic-rated concrete vault for the HDPE manhole shown in the drawings. The interior of the concrete valve box will be lined with an epoxy coating. Please confirm whether this substitution is acceptable.

Along with the substitution request we would like to propose a credit in the amount of \$3,000.00; if acceptable to install a concrete valve box in lieu of HDPE manhole.

Signed: Keith Suga

Date: June 16, 2010

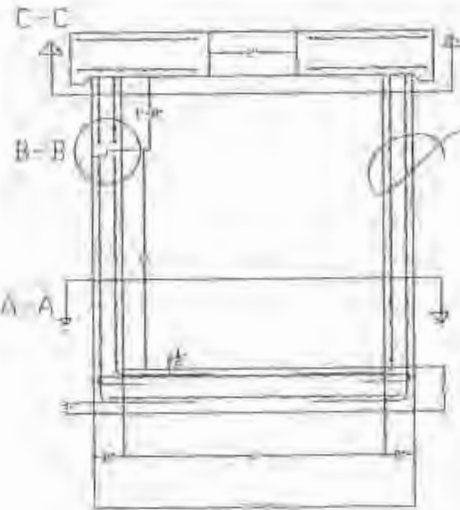
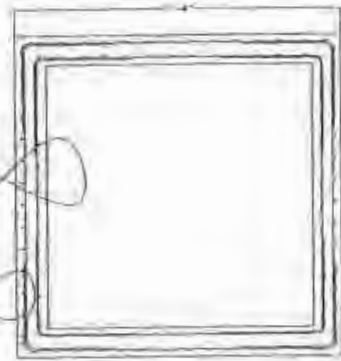
---

U-B



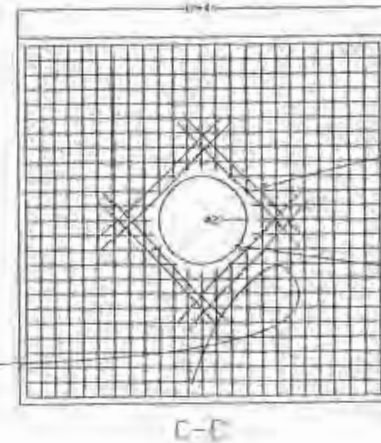
#4 @ 6" E.W.  
T.B.

Typ. Bend  
24"



#4 @ 6" E.W.  
T.B.

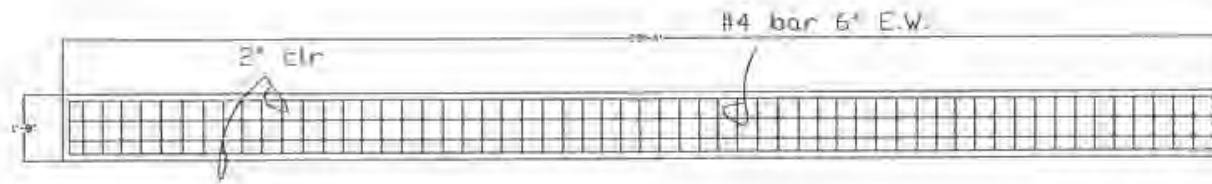
Provide 180 mesh of  
top mat 12" Typ. dia



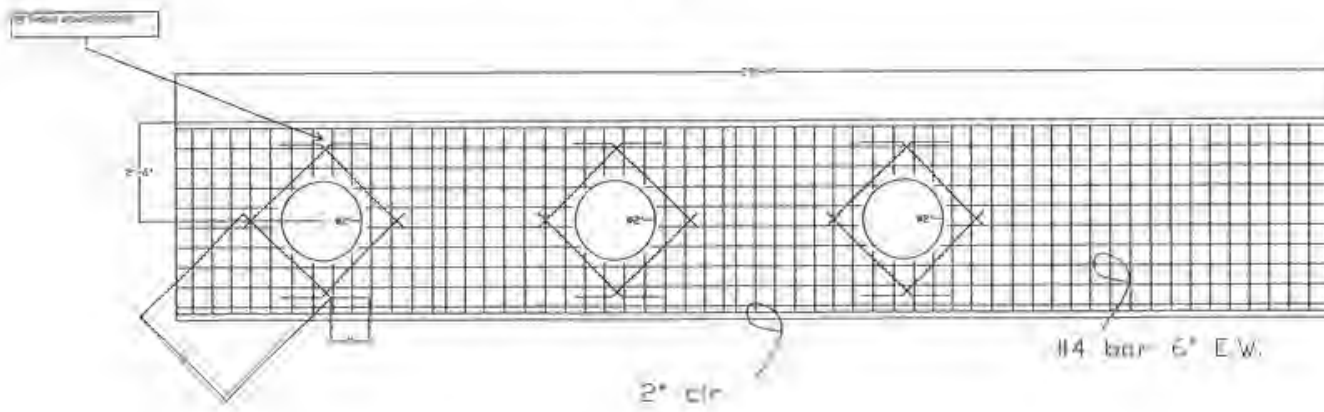
1" Diameter Polypropylene Rings

12" Manhole

- 1" Diameter Polypropylene Rings @ 12" on center
- Class A Concrete Mix Design (3000 PSI)
- Epoxy Coating, Carlisle CCW-525 Liquid Applied Waterproofing Membrane, Interior and Exterior
- 24" Cast Iron Manhole Frame and Cover to be provided



Riser Section



Base Section



## CCW-525 Liquid Applied Waterproofing Membrane

CCW-525 may be learned for greater strength and protection. It provides excellent adhesion to concrete substrates providing lateral water migration for both vertical and horizontal surfaces. CCW-525 performance is enhanced when combined with the appropriate CCW Primer/Adhesive (see appropriate CCW Product Manual) for waterproofing membranes, provides a thermal barrier, water vapor retention and flame-retardant protection. The inherent toughness and resilience of the CCW-525 membrane enables it to bridge structural or shrinkage cracks which may develop in the substrate, providing long-term waterproofing protection.

### TYPICAL USES

CCW-525 is suitable in wet, potable (H<sub>2</sub>O) for applications to horizontal and vertical surfaces. Typical applications are basement exterior walls, parking garages, plaza decks, balconies, roof decks, window and mechanical enclosures, CCW-525 is ideally suited for waterproofing on below-grade foundation walls, tunnels, pipelines and other areas where seamless, elastomeric waterproofing is required.

### STANDARD TESTS, CERTIFICATES

- ASTM Specification: ASTM C 816-95
- PACKAGING, TYPES & ACCESSORIES
- 5-gallon pails and 55-gallon drums
- CCW-525-H - Horizontal Grade (full flexibility)
- CCW-525-V - Vertical Grade (roller applied)
- Carlsle DCH Polyester Reinforcing Fabric - 40" x 32"
- CCW-201 Mastic - 1.5-Gallon Kit
- CCW-557 Epoxy Primer - 4.8 (10-Gallon) Kit
- CCW-559 Heat Primer - 2-Quart Kit

### INSTALLATION

Surface Preparation: New concrete shall be water-cured, followed by a light (air broom) trowel finish and in place for 14 days minimum. 28 days preferred. If curing compound is required, use the self-dispersing type or as approved by Carlsle. CCW-525 adheres to surfaces that are structurally sound, dry, and free of oil, grease, dirt, laitance, curing or release agents.

CCW-525 may be learned for greater strength and protection. It provides excellent adhesion to concrete substrates providing lateral water migration for both vertical and horizontal surfaces. CCW-525 performance is enhanced when combined with the appropriate CCW Primer/Adhesive (see appropriate CCW Product Manual) for waterproofing membranes, provides a thermal barrier, water vapor retention and flame-retardant protection. The inherent toughness and resilience of the CCW-525 membrane enables it to bridge structural or shrinkage cracks which may develop in the substrate, providing long-term waterproofing protection.



Carlsle, allows for rigging or other projections to provide a smooth, level surface. Fill in cold holes, honeycombs, voids, protrusions, etc. with a suitable repair material. Flash and receive joints (wall to window frame).

Carlsle, allows for rigging or other projections to provide a smooth, level surface. Fill in cold holes, honeycombs, voids, protrusions, etc. with a suitable repair material. Flash and receive joints (wall to window frame).

For detail work, clean joints and sand/crack areas per the dimensions provided above. All moving cracks over 1/16" wide and all expansion joints less than 1" wide shall be cleaned, primed, filled with a backing rod and caulked with Carlsle Polyurethane Sealant as recommended by the data sheet. For larger joints, contact a Carlsle representative.

Apply a 1/4-inch (45° angle) salting coat of CCW-201 to the junctions of all vertical and horizontal surfaces including around pipes, vents and other projections. Apply bond-breaker tape for wet over the sealant installed in expansion joints and saw-out cracks. When using bond-breaker tape, apply three times the width of the joint.

Apply a four-inch to six-inch wide strip coat of CCW-525-V over all sealed cracks, joints and over all hairline cracks and cold joints. Apply a slope coat of CCW-525-V over wall and ceiling and up the vertical wall to the height referred to on the applicable detail drawing (minimum eight inches recessed) and over the horizontal deck. Four inch to six inch. Apply strips coat at 45° to 5 mil and allow to cure overnight.

Priming: For adhesion to dry substrates, primer is not necessary. However, if joints and similar problems occur as a result of air or moisture vapors, primer will be required in one day.

Applications: Prior to steel work, wipe all areas with a clean cloth containing acetone solvent and allow the prepared area to dry. Primer: Apply CCW-525-H over the prepared, primed base of steel, using care not to skip holes. Using a trowel, apply CCW-525-H at 22 sq. ft./gal. per gallon or as required to achieve a uniform, smooth finish.

Vertical: Using a trowel, apply CCW-525-V to vertical surfaces at a rate of 22 sq. ft./gal. per gallon or as required to achieve a uniform, smooth finish.

Use a 1/4" rounded sponges or flat sponges with guide pins to achieve a uniform thickness. Intermixing: Carlsle DCH water polymer reinforcing fabric (as required) be surface in cold joints where each joint is a different plane. Clean steel to support a bright finish.

For detail work, clean joints and sand/crack areas per the dimensions provided above. All moving cracks over 1/16" wide and all expansion joints less than 1" wide shall be cleaned, primed, filled with a backing rod and caulked with Carlsle Polyurethane Sealant as recommended by the data sheet. For larger joints, contact a Carlsle representative.

Apply a 1/4-inch (45° angle) salting coat of CCW-201 to the junctions of all vertical and horizontal surfaces including around pipes, vents and other projections. Apply bond-breaker tape for wet over the sealant installed in expansion joints and saw-out cracks. When using bond-breaker tape, apply three times the width of the joint.

Apply a four-inch to six-inch wide strip coat of CCW-525-V over all sealed cracks, joints and over all hairline cracks and cold joints. Apply a slope coat of CCW-525-V over wall and ceiling and up the vertical wall to the height referred to on the applicable detail drawing (minimum eight inches recessed) and over the horizontal deck. Four inch to six inch. Apply strips coat at 45° to 5 mil and allow to cure overnight.



The membrane must be protected from damage by future operations and other trades. CCW-525 is not recommended for both vertical and horizontal surfaces. Intermixing: Carlsle DCH water polymer reinforcing fabric (as required) be surface in cold joints where each joint is a different plane. Clean steel to support a bright finish.

Use a 1/4" rounded sponges or flat sponges with guide pins to achieve a uniform thickness. Intermixing: Carlsle DCH water polymer reinforcing fabric (as required) be surface in cold joints where each joint is a different plane. Clean steel to support a bright finish.

For detail work, clean joints and sand/crack areas per the dimensions provided above. All moving cracks over 1/16" wide and all expansion joints less than 1" wide shall be cleaned, primed, filled with a backing rod and caulked with Carlsle Polyurethane Sealant as recommended by the data sheet. For larger joints, contact a Carlsle representative.

Apply a 1/4-inch (45° angle) salting coat of CCW-201 to the junctions of all vertical and horizontal surfaces including around pipes, vents and other projections. Apply bond-breaker tape for wet over the sealant installed in expansion joints and saw-out cracks. When using bond-breaker tape, apply three times the width of the joint.

Apply a four-inch to six-inch wide strip coat of CCW-525-V over all sealed cracks, joints and over all hairline cracks and cold joints. Apply a slope coat of CCW-525-V over wall and ceiling and up the vertical wall to the height referred to on the applicable detail drawing (minimum eight inches recessed) and over the horizontal deck. Four inch to six inch. Apply strips coat at 45° to 5 mil and allow to cure overnight.

Apply a four-inch to six-inch wide strip coat of CCW-525-V over all sealed cracks, joints and over all hairline cracks and cold joints. Apply a slope coat of CCW-525-V over wall and ceiling and up the vertical wall to the height referred to on the applicable detail drawing (minimum eight inches recessed) and over the horizontal deck. Four inch to six inch. Apply strips coat at 45° to 5 mil and allow to cure overnight.

Property	Test Method	Result
Composition	—	Proprietary Polyurethane
Color	—	Black
Tack Free Time	ASTM D 2266	16 hrs
Cure Time	ASTM D 412	36 hrs
Solids Content	ASTM D 412	82% (14.2)
Hardness	ASTM D 2266	30 Shore A (100)
Elongation	ASTM D 412	375%
Tensile	ASTM D 412	400 psi
Permeability	ASTM E 91	0.02784 perms
Adhesion as Primed Concrete	ASTM D 88	0.07774 psi
	ASTM D 903	14.8 lbs/in <sup>2</sup> (13.3 lb/in <sup>2</sup> )

\* Individual lots may vary +/- 10% from typical value

GOODFELLOW BROS., INC.  
P.O. Box 3029 Lihue, Hawaii 96766  
(808) 241-4601 phone (808) 241-4605 fax

Reply Substitution of the HDPE manhole with a concrete manhole is approved with the following criteria in design.

Use a waterstop along the interior corner of the joint where the precast vault will reside on the cast in place vault bottom (see sketch) and add additional 4" of concrete once vault walls are waterstops are in place. The waterstop to be used shall be:

Hydrophilic Type Waterstop:

- a. Hydrotec CJ-1020-2K by Greenstreak, Inc.
- b. Ultraseal MC-2010M by Adeka Ultra Seal.

In addition waterstops are to be provided around the circumference of the pipe entering the vault as well as along the precast opening sides and bottom for the pipe penetration.

The structure of the vault should be designed to meet the follow design criteria.

- The manhole should be designed for uplift with min Factor of Safety=1.1 highest ground water table possible.
- Top slab should be designed for HS20 truck loading.
- Walls should be designed for LL surcharge pressure of 200 psf, dry equivalent lateral soil pressure of 70 psf above the ground water table and saturated equivalent lateral pressure of 90 psf below the ground water table.
- The floor/base of the vault is to extend past the exterior width of the precast walls and the precast walls are to be placed into a recessed "notch" in the base. The floor/base will be cast in place.

#### Coatings

You have proposed to use the Carlisle Coatings and Waterproofing CCW-525. This coating has been approved and will need to only be applied to the interior walls and floor of the vault once constructed. The coating submittal was sent by email on July 30, 2010.

Please provide the Owner documentation from the precaster that design criteria has been met.

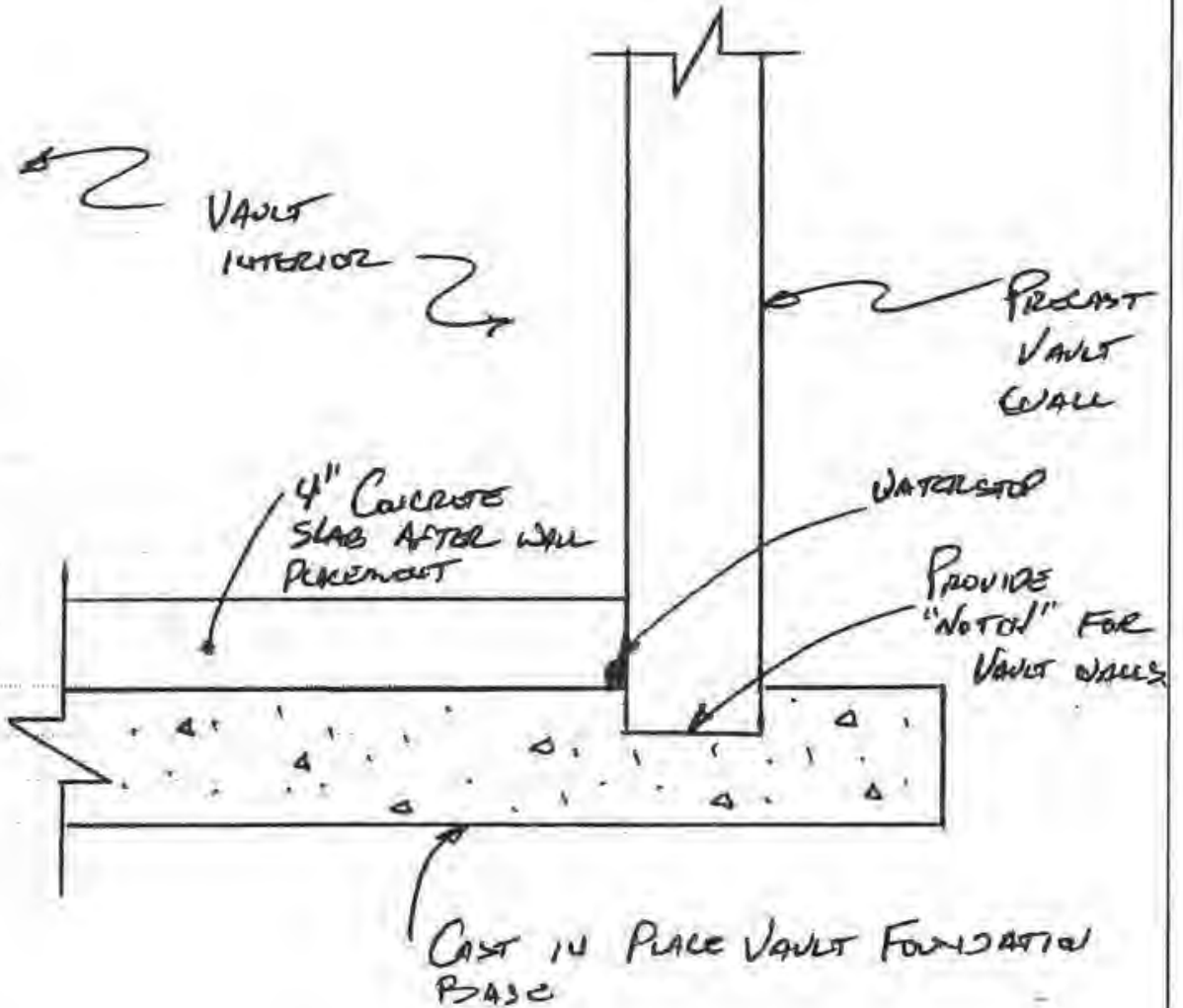
This RFI response is the culmination of multiple submittals and conversations on the vault to date.

Signed: 

Date: 8/27/10

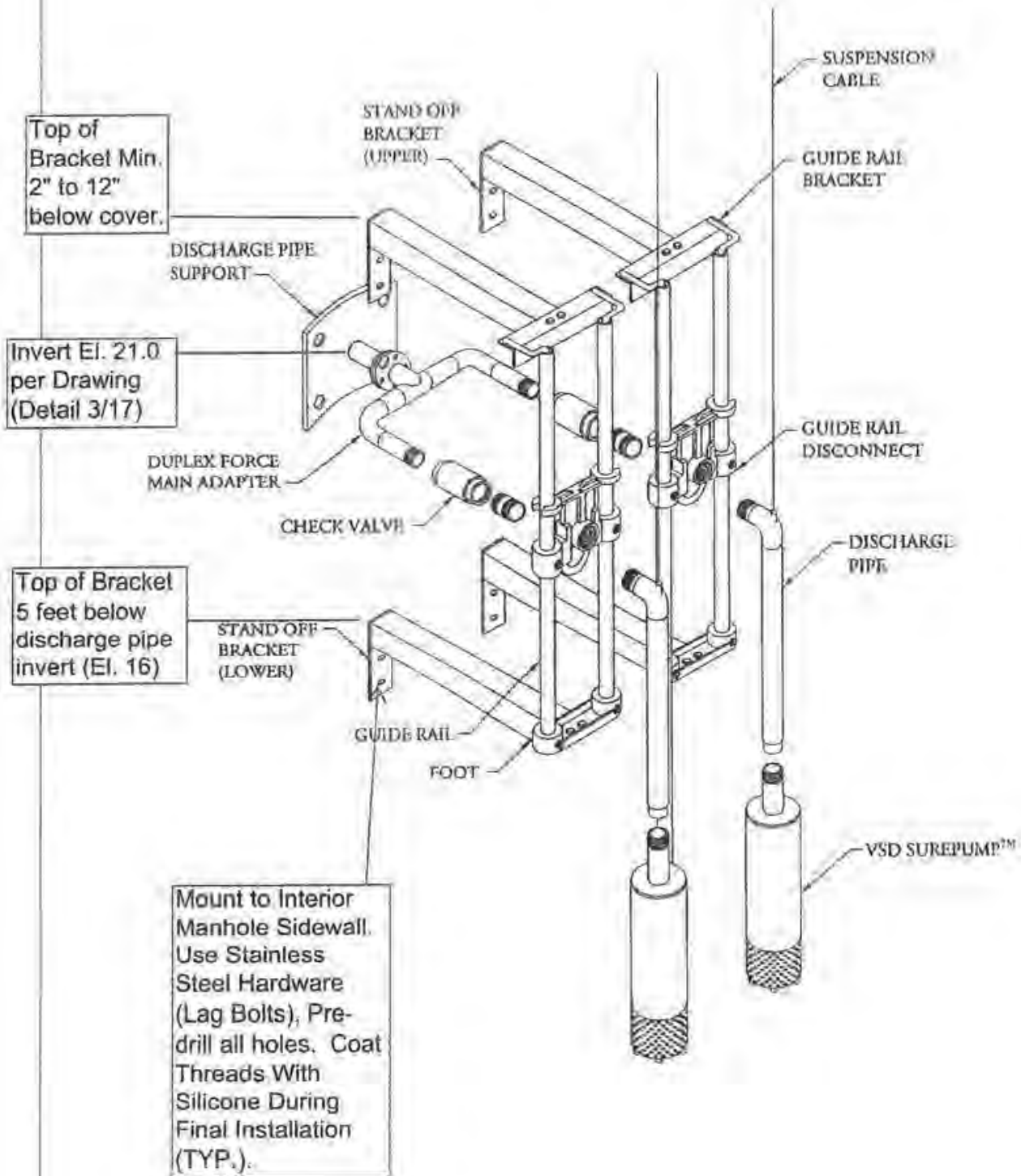
Request VIA:  Telephone  Facsimile  Email  
Copies to:  File

JOB TITLE KERRAMA LF COL 1 - VALVE VAULT  
JOB NO. 60135722 CALCULATION NO. \_\_\_\_\_  
ORIGINATOR KB DATE 8/27/10  
REVIEWER \_\_\_\_\_ DATE \_\_\_\_\_  
SCALE NTS SHEET NO. 1 OF 1



VAULT JOINT + WATER STOP LOCATION

## DUPLEX GUIDE RAIL DISCONNECT SYSTEM (Side Mounted)



Kim Huynh

---

**From:** Bergschultz, Ken [KEN.BERGSCHULTZ@aecom.com]  
**Sent:** Thursday, September 02, 2010 4:42 PM  
**To:** Keith Suga; JFrey@wm.com  
**Cc:** Mike Minch; Kim Huynh; Doug Hamilton; Chris Scott; Cloffi, Frank  
**Subject:** RE: CHANGE FROM CARILSE TO PACPOLY

Keith,

AECOM has reviewed the requested change and is approving the use of the Elasto-Deck BT product manufactured by Pacific Polymers International as submitted.

Any questions, please let us know.

**Kenneth J. Bergschultz, PE**  
Office Manager, Midwest Region  
Environment  
D 920.451.2452 C 920.918.3289  
[ken.bergschultz@aecom.com](mailto:ken.bergschultz@aecom.com)

**AECOM**  
4135 Technology Parkway  
Sheboygan, WI 53083  
T 920.458.8711 F 920.458.0550  
[www.aecom.com](http://www.aecom.com)

---

**From:** Keith Suga [mailto:keiths@goodfellowbros.com]  
**Sent:** Wednesday, September 01, 2010 10:02 PM  
**To:** Bergschultz, Ken; JFrey@wm.com  
**Cc:** MMinch@Geosyntec.com; KHuynh@Geosyntec.com; DHamilton@Geosyntec.com; CScott@Geosyntec.com  
**Subject:** FW: CHANGE FROM CARILSE TO PACPOLY

Kenny,

I called several distributors that bring in the Carilse line and that product currently has to be brought in from Texas. And due to the content this material can't be flown in, it has to come in via barge. Our ETA would be 2.5 weeks to the Kauai Docks. I've attached another waterproofing product that this particular distributor on Kauai said is comparable and equal to the Carilse line. If deemed equivalent this product is available at Rosa's Supply on Kauai. Please take a look to see if this material can be used as a substitute for the Carilse Product. If after review the product is not approved as a substitute then the approved Carilse product will be brought in from Texas. Thanks.

Keith

---

**From:** Earl.Balai@rsihawaii.com [mailto:Earl.Balai@rsihawaii.com]  
**Sent:** Wednesday, September 01, 2010 11:02 AM  
**To:** Keith Suga  
**Subject:** CHANGE FROM CARILSE TO PACPOLY

HI KEITH  
HERES SOME SPECS ON BT PRODUCT THANK YOU

---

CONFIDENTIALITY NOTICE: If you have received this communication in error, please notify us immediately. This message is intended only for the use of the person, firm, or company it is addressed, and may contain information that is privileged, confidential and exempt from disclosure under applicable law. If the reader of this message is not the intended recipient, you are hereby notified that any dissemination, distribution or copying of this information is prohibited.

GOODFELLOW BROS., INC.  
P.O. Box 3029 Lihue, Hawaii 96766  
(808) 241-4601 phone (808) 241-4605 fax

**REQUEST FOR INFORMATION**

TO: Waste Management of Hawaii  
ATTN: Jesse Frey

RFI No.: **27 Revised**  
Request submitted: **June 16, 2010**  
Respond requested by: **Keith Suga**  
Project: **Kekaha Sanitary Landfill  
Phase II Lateral Expansion**

Specification Reference:

Plan Reference: **Drawing 17 Detail 3**

Subject:  Discrepancy  Clarification  Suggestion  Other

Request: Wet well no. 3 was delivered to the site on 6-4-10. After further review it was discovered that the gravity and forcemain lines are not per approved shop drawings or plan drawings. I have attached a picture to help illustrate the inconsistencies. The layout with the black is per shop and plan drawings. The green reflects the structure that is onsite. We would like to propose using the structure onsite and add a few fittings as indicated on the picture to connect piping to Pipe Penetration 1A, 1B, 1C and the forcemain.

If this structure is acceptable to use as constructed then we would like to propose a \$7,000.00 credit.


Please advise

Signed: Keith Suga

Date: June 16, 2010

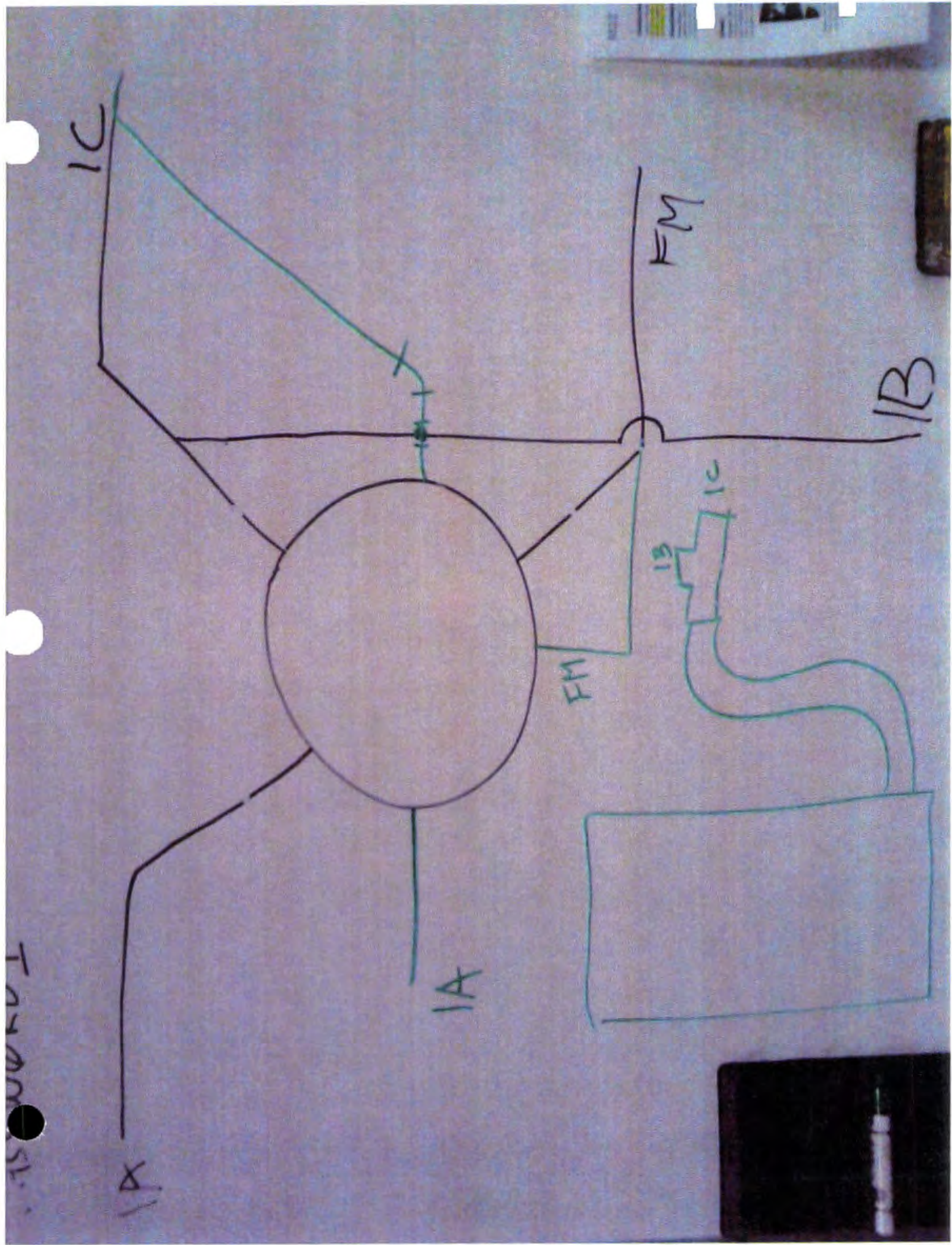
Reply: In review of the provided schematic of the actual received Wet Well #3, AECOM approves the modification with the following conditions:

1. All pipe slopes defined on the plans and profiles are maintained as minimums.
2. Long sweep elbows verses 90 degree elbows.
3. Maintain pipe alignment as shown on Drawing #6 except when completing tie-in to Wet Well #3.
4. Maintain the invert elevations of the gravity feed lines as shown in Detail 3/17.

Signed: 

Date: 06/23/2010

Request VIA:  Telephone  Facsimile  Email  
Copies to:  File



GOODFELLOW BROS., INC.  
P.O. Box 3029 Lihue, Hawaii 96766  
(808) 241-4601 phone (808) 241-4605 fax

---

**REQUEST FOR INFORMATION**

TO: Waste Management of Hawaii  
ATTN: Jesse Frey

RFI No.: 28  
Request submitted: July 7, 2010  
Respond requested by: Keith Suga  
Project: Kekaha Sanitary Landfill  
Phase II Lateral Expansion

Specification Reference: Section 02330,2.01B Plan Reference:

Subject:  Discrepancy  Clarification  Suggestion  Other

---

Request: Goodfellow Bros., Inc. has submitted several samples for use as compacted fill under Specification Section 02330, 2.01B. All of the samples were taken from a stockpile at the Kauai Aggregates Quarry. The stockpile was created through the crushing process with screens pulling material out prior to the primary and secondary units. If approved the compacted fill material will be subjected to conformance testing per the project specifications.

Please advise

Signed: Keith Suga

Date: July 7, 2010

---

Reply:

Signed:

Date:

---

Request VIA:  Telephone  Facsimile  Email  
Copies to:  File



GOODFELLOW BROS., INC.  
P.O. Box 3029 Lihue, Hawaii 96766  
(808) 241-4601 phone (808) 241-4605 fax

Reply: In review of the photographs, and the additional 2 grain size curves provided by GBI, I am of the opinion after further consulting my other geotech engineer, that the sample and grain size previously provided on June 17 from GBI, and updated on June 21, does not fully represent the actual material proposed. The June 17 sample has twice the silt when compared to grain sizes (one by Precision Geosynthetic Laboratories and the other by Hirata and Associates) provided today and may just have been a bad sample.

Based upon the additional laboratory sieve analysis and USCS classifications, the material proposed is angular to subangular in shape, and review of the submitted permit document calcs for global stability, AECOM is approving the material for compacted fill as defined in Section 02330 Article 2.01.B pending all specified testing is completed on different representative samples. I do note the one grain size provided today is defined as a GP and does not match Article 2.01.B.3. The GP material is suitable for this application based upon the grain size curve provided.

Placement of this stockpile material should be observed and documented to be well distributed during placement and compaction.

The stockpile should remain dedicated and controlled for only this project and GBI.

This material can not be used for the final 6-inch (foundation layer) of the facility.

This response coincides with my email approval on 6/23/10 for the stockpile and use.

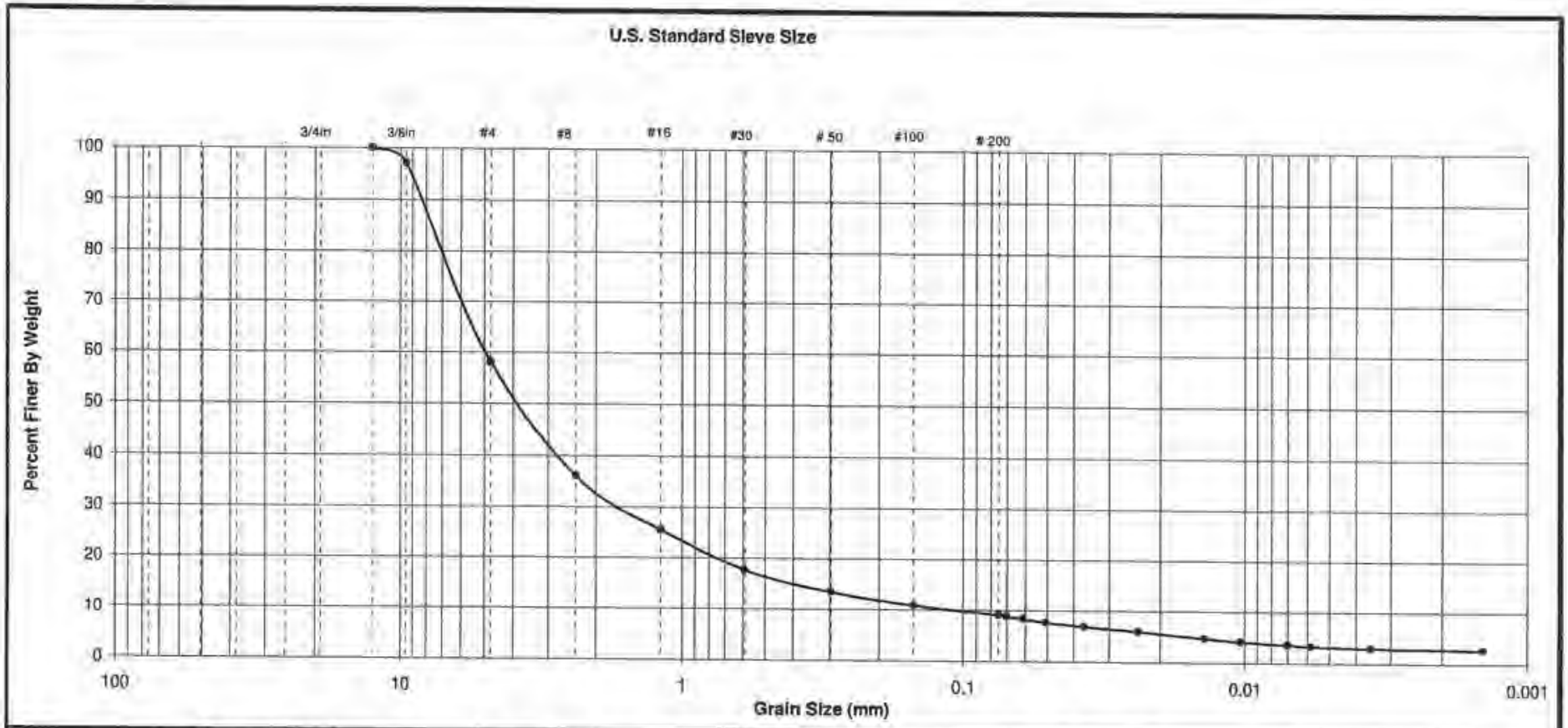
Signed: 

Date: 8/27/10

Request VIA:  Telephone  
Copies to:  File

Facsimile

Email



Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	Test Moist. (%)	Permeability, K (cm/sec)	LL	PL	PI	Unified Soil Class.	Description
01 3/8 Quarry Fine									GP	



Hiras & Associates

GEOTECHNICAL  
ENGINEERING

Hiras & Associates, Inc.

99-1433 Kiha Pl  
Aiea, HI 96701  
tel 808 486-0787  
fax 808 486-0970

# MEMORANDUM

June 18, 2010  
W.O. 10-4907.0

**TO:** Mr. Keith Suga  
Goodfellow Brothers Inc.  
via email: Keiths@goodfellowbros.com

**FROM:** David Kitamura

**RE:** Laboratory Test Results for Bag #11  
Kekaha Landfill: Phase II Lateral Expansion  
Kekaha, Kauai, Hawaii

As requested, Laboratory testing was performed on the Thronas quarry rock dust material for the above referenced project. The bulk soil sample was provided by Geosyntec field personnel for laboratory testing, consisting of a maximum density (modified Proctor), Atterberg Limits, California Bearing Ratio and sieve analysis tests. This memo presents the results for the maximum density, Atterberg Limits, California Bearing ratio and sieve analysis tests, summarized below and the Proctor curve is on the next page. Based on the sieve analysis results the soil sample was classified as SM, silty sand, using the Unified Soil Classification System (ASTM D2487).

Test

Modified Proctor (ASTM D1557)

Result

Maximum density = 143.0 pcf  
Optimum moisture = 9.0%

Atterberg Limits (ASTM D4318)

Non-plastic

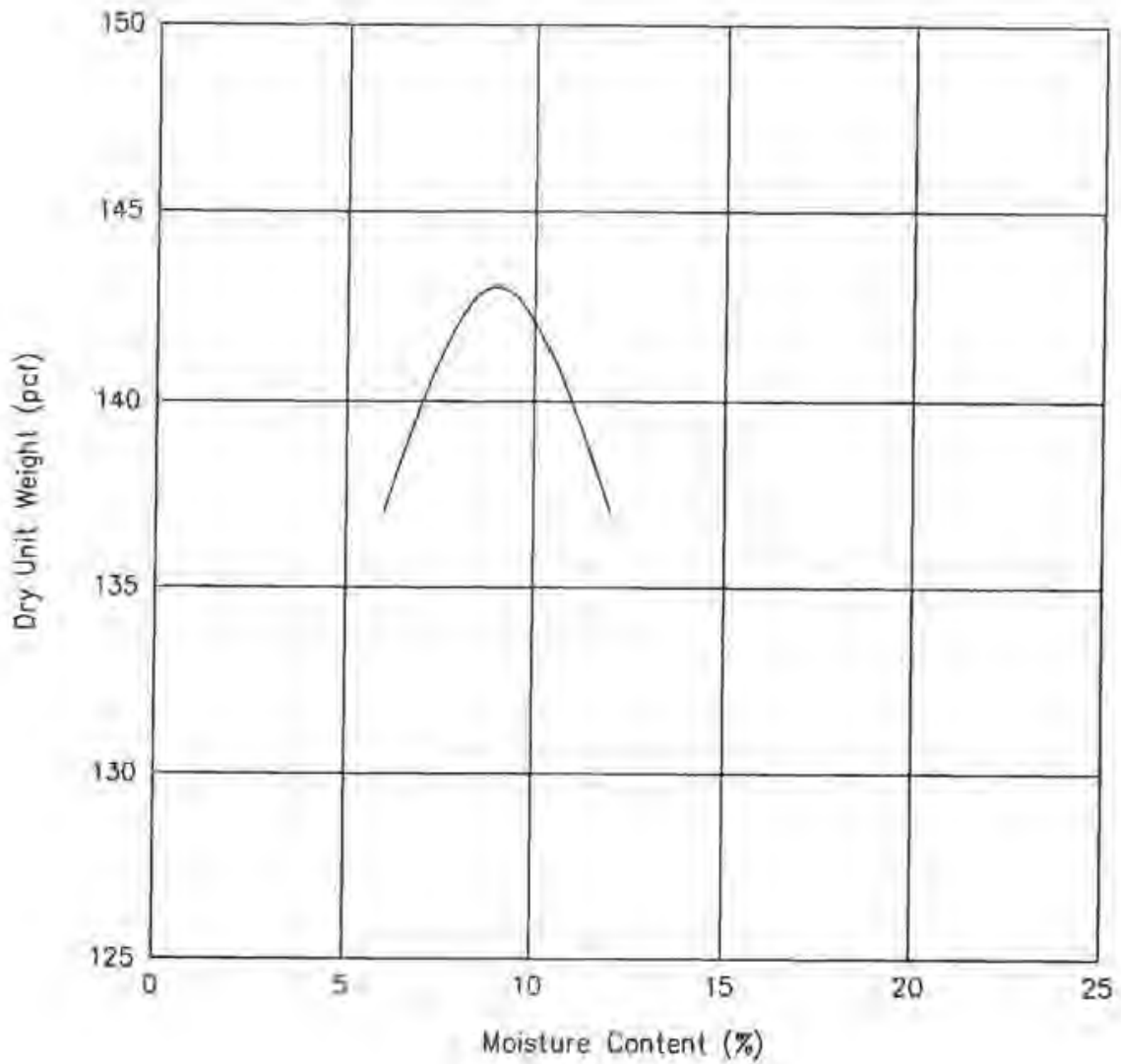
Sieve Analysis (ASTM C136)

<u>Sieve Size</u>	<u>Percent finer (%)</u>
#4	85.6
#10	61.2
#20	40.3
#40	30.1
#100	21.8
#200	18.8

California Bearing Ratio (ASTM D1883)

Corrected CBR value at 0.1" penetration = 84.4%

Feel free to call us if you have any questions.



Soil Data

Bag No.: 11  
 Location: Thronas quarry  
 Description: Brownish gray silty sand (rock dust)

Test Results

Maximum Dry Density: 143.0  
 Optimum Moisture Content: 9.0%

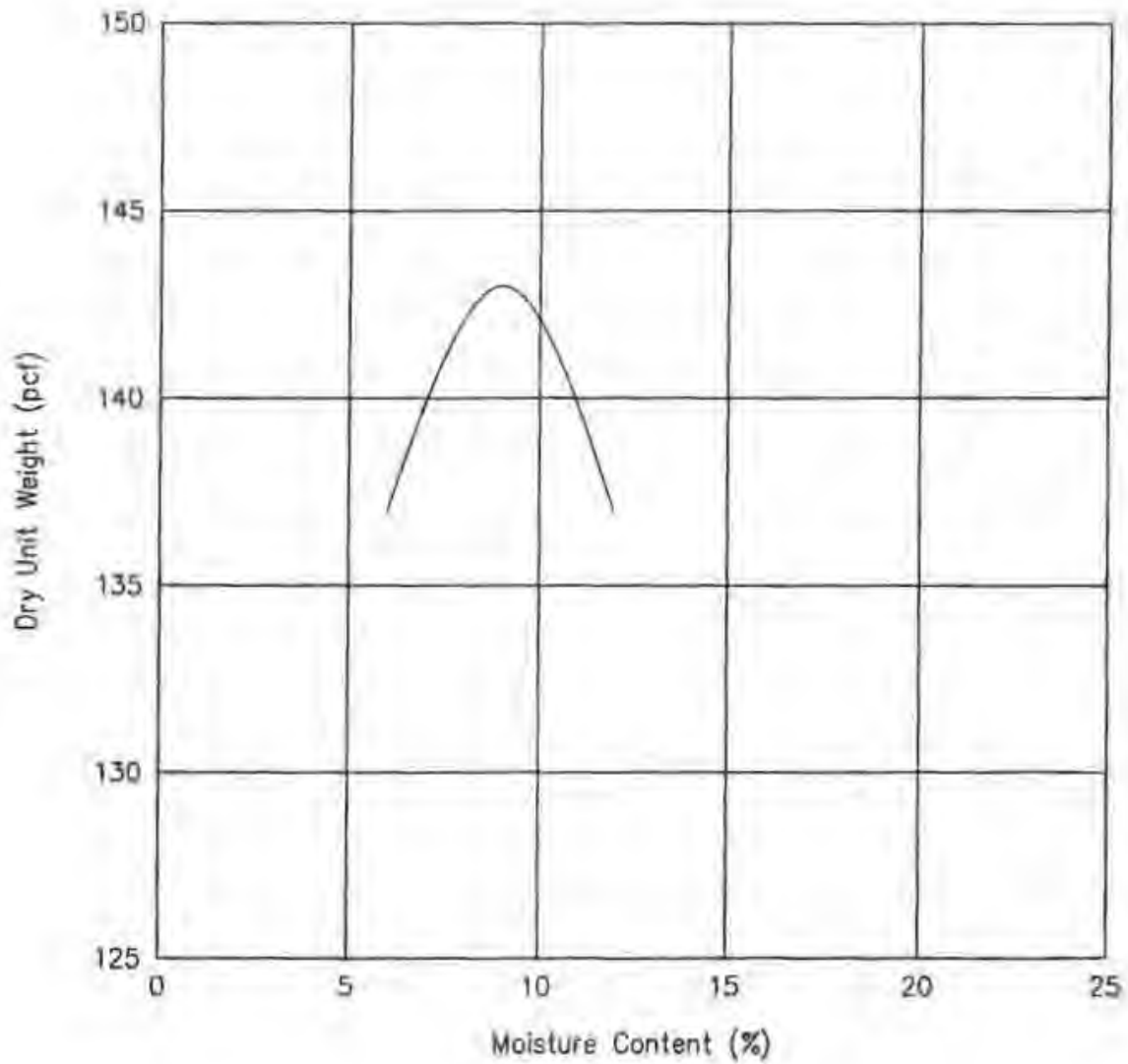
W.O. 4907.0

Kekaha Landfill Expansion

Hirata & Associates, Inc.

**MODIFIED PROCTOR CURVE**

Plate A



Soil Data

Bag No.: 11  
 Location: Thronas quarry  
 Description: Brownish gray silty sand (rock dust)

Test Results

Maximum Dry Density: 143.0  
 Optimum Moisture Content: 9.0%

W.O. 4907.0

Kekaha Landfill Expansion

Hirata & Associates, Inc.

**MODIFIED PROCTOR CURVE**

Plate A



Hirata & Associates

Geotechnical  
Engineering

Hirata & Associates, Inc.

99-1435 Lanihale Pl.

Kaunoi, HI 96701

TEL 808 486-0747

FAX 808 486-0711

# MEMORANDUM

June 23, 2010  
W.O. 10-4907.1

**TO:** Mr. Keith Suga  
Goodfellow Brothers Inc.  
via email: Keiths@goodfellowbrs.com

**FROM:** David Kitamura

**RE:** Laboratory Test Results for Bag #12  
Kekaha Landfill: Phase II Lateral Expansion  
Kekaha, Kauai, Hawaii

As requested, Laboratory testing was performed on the Thronas quarry rock dust material for the above referenced project. The bulk soil sample was provided by Geosyntec field personnel for laboratory testing, consisting of a sieve analysis test. This memo presents the results for the sieve analysis test, summarized below. Based on the sieve analysis results the soil sample was classified as SW-SM, Well graded sand with silt and gravel, using the Unified Soil Classification System (ASTM D2487).

<u>Test</u>	<u>Result</u>	
Sieve Analysis (ASTM C136)	<u>Sieve Size</u>	<u>Percent finer (%)</u>
	1/2"	100.0
	#4	56.5
	#10	24.9
	#20	15.2
	#40	12.1
	#100	9.2
	#200	7.1

Feel free to call us if you have any questions.

W907memorandum013ProctorBag12.wpd

GOODFELLOW BROS., INC.  
P.O. Box 3029 Lihue, Hawaii 96766  
(808) 241-4601 phone (808) 241-4605 fax

**REQUEST FOR INFORMATION**

TO: Waste Management of Hawaii  
ATTN: Jesse Frey

RFI No.: 29  
Request submitted: July 7, 2010  
Respond requested by: Keith Suga  
Project: Kekaha Sanitary Landfill  
Phase II Lateral Expansion

Specification Reference: Plan Reference: Drawing 22, Detail 3

Subject:  Discrepancy  Clarification  Suggestion  Other

Request: As indicated on the attached picture the new flow meter has been installed on the discharge line per the project drawings. It has been brought to our attention that the flow meter being exposed may increase chances of damage. Should the meter be enclosed with a protective vault yet still provide visual line of sight to read the digital display? Or is the flow meter acceptable as installed?

Please advise

Signed: Keith Suga

Date: July 7, 2010

Reply: The application of the meter as designed is correct as long as the meter installed complies with specification Section 13420 and more specifically Articles 2.02.B for NEMA 6 housing and 2.04 for sun shielding.

A NEMA 6 housing is defined as: Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against hose-directed water and the entry of water during occasional temporary submersion at a limited depth; and that will be undamaged by the external formation of ice on the enclosure.

If there is a concern about being hit during routine activities, place a fence post on both side of the meter and label.

Signed: 

Date: July 13, 2010

Request VIA:  Telephone  Facsimile  Email  
Copies to:  File





GOODFELLOW BROS., INC.  
P.O. Box 3029 Lihue, Hawaii 96766  
(808) 241-4601 phone (808) 241-4605 fax

**REQUEST FOR INFORMATION**

TO: Waste Management of Hawaii  
ATTN: Jesse Frey

RFI No.: 30  
Request submitted: July 12, 2010  
Respond requested by: Keith Suga  
Project: Kekaha Sanitary Landfill  
Phase II Lateral Expansion

Specification Reference: Section 02330,2.01C Plan Reference:

Subject:  Discrepancy  Clarification  Suggestion  Other

Request: Goodfellow Bros., Inc. proposes using a quarry fines material from the Kauai Aggregates quarry as the upper 6-inch subbase layer for Cells 1A and 1B. The attached gradation curve meets the grain size requirements (attached). Geosyntec obtained samples and had Precision complete the required interface shear strength testing with passing results (attached). The USCS soil classification of this material is SW-SM. The specification allows for SP-SM material, but not SW-SM. The sand fraction of our proposed material is well graded rather than poorly graded which contributes to the high shear strength observed. Please confirm whether the specification can be revised to allow a well graded sand in addition to the original specified poorly graded sand. Please advise

Signed: Keith Suga

Date: July 12, 2010

Reply: Based upon the information provided in regards to grain size and interface friction angle tests results, the proposed material is approved for use. Continued QC/CQA must still be employed during handling and placement to insure project specifications are still met and particle size gradation maintained. A well graded sand (SW) and the provided well graded sand with silt (SW-SM) are acceptable.

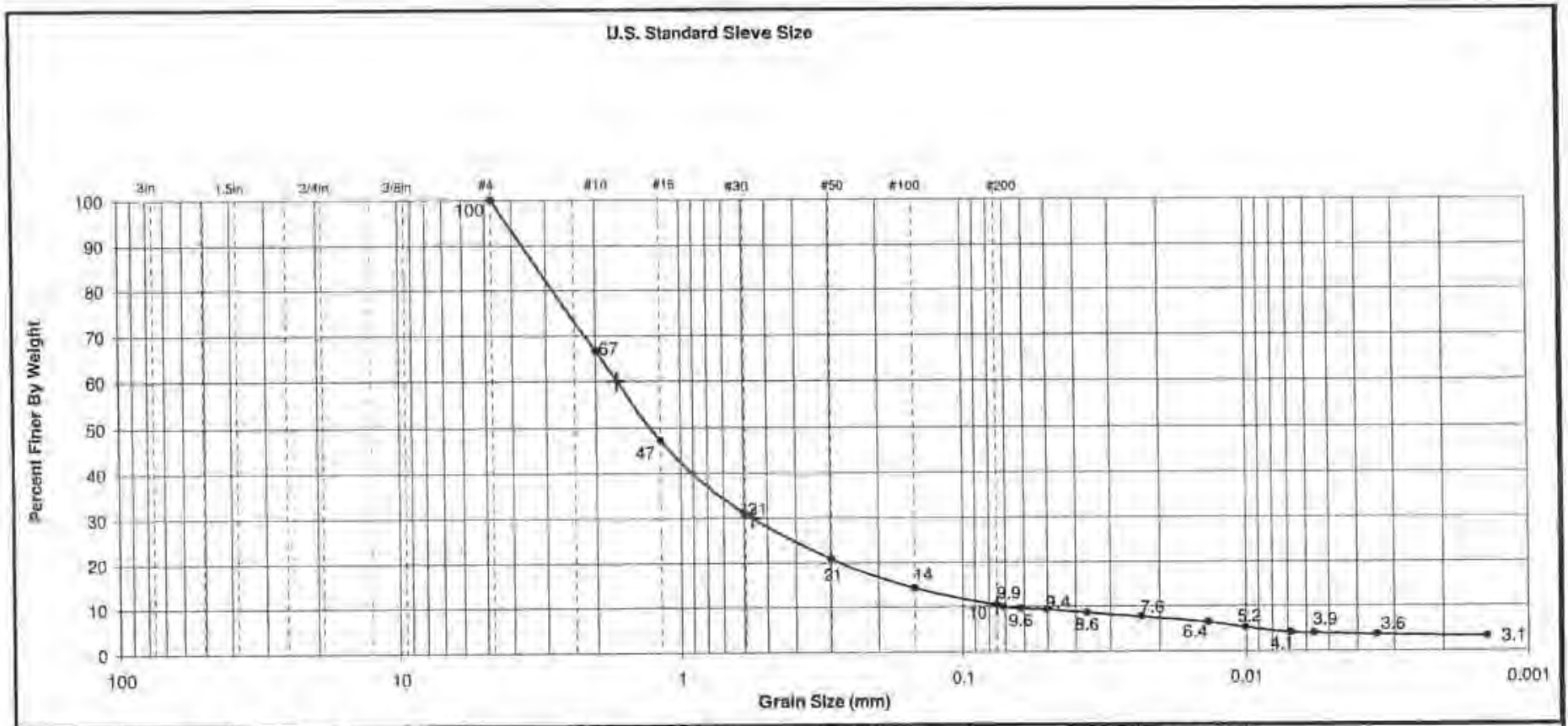
Signed: 

Date: July 14, 2010

Request VIA  Telephone  
Copies to:  File

Facsimile

Email



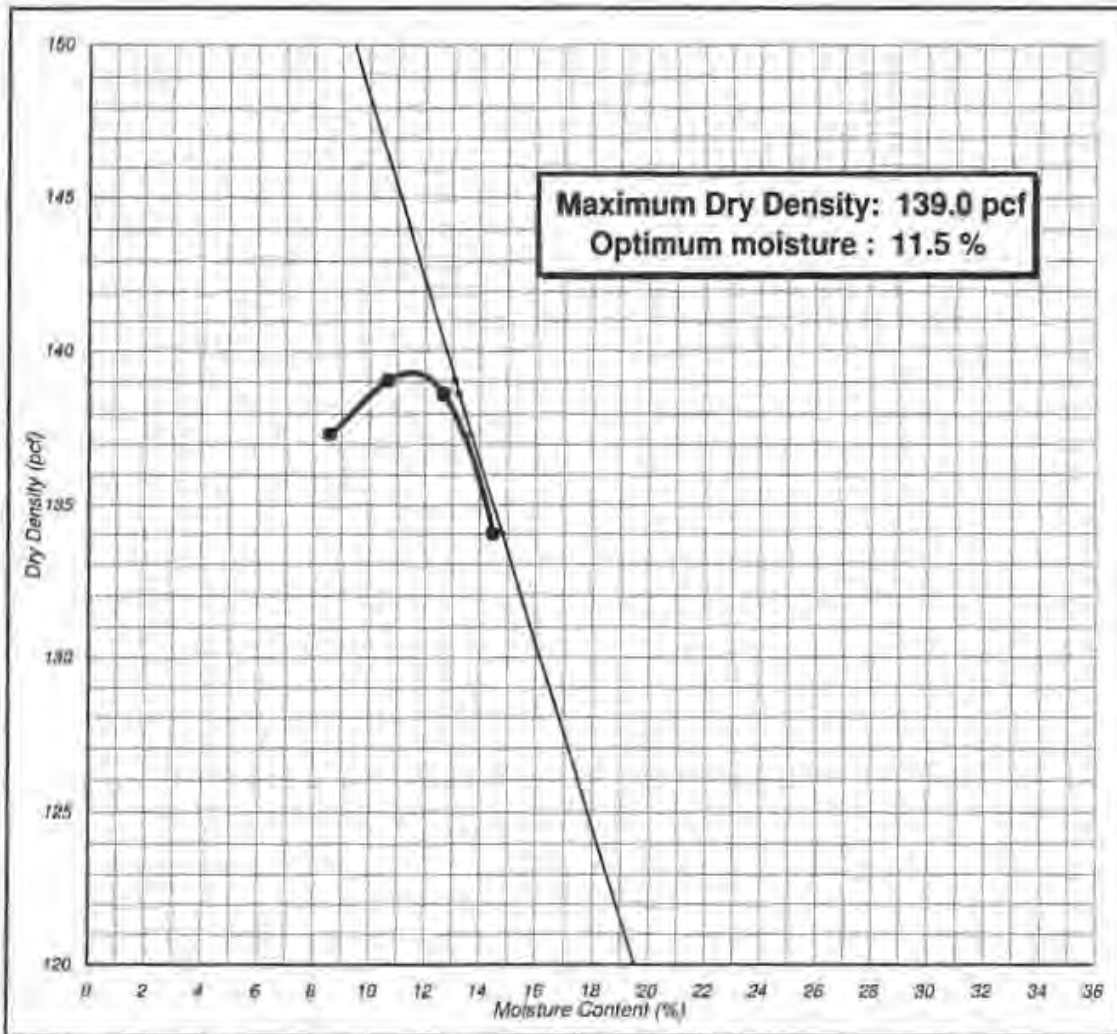
Sample	Max. Dry Density (pcf)	Opt. Water Content (%)	Expansion Index	Test W.C. (%)	Final W.C. (%)	Resistivity (ohm-cm)	pH	SO <sub>4</sub> (ppm)	Chloride Content (ppm)	Unified Soil Class.	Classification
# 67967										SW-SM	Well graded sand with Silt

MAXIMUM DENSITY TEST ASTM D1557

Job Name Precision Geosynthetic Lab, # G100772  
 Job No. 2001-068  
 Boring/Sample No. # 67967  
 Description: Gray, F.C. Sand w. Silt

Date: 7/7/2010  
 By: LD

Method:	<b>A</b>	Mold Volume (cf):	<b>0.0333</b>	Blows:	<b>25</b>	Layers:	<b>5</b>
Specimen	A	B	C	D	E		
Total Wet Weight (grs)	4115	4150	4043	4108			
Weight of Mold (grs)	1788	1788	1788	1788			
Wet Weight of Soil (grs)	2327	2362	2255	2320			
Wet Density (pcf)	153.9	156.2	149.1	153.4			
Moisture Can No.							
Dry Weight							
Moisture Content (%)	10.7	12.7	8.6	14.5			
Dry Density (pcf)	139.0	138.6	137.3	134.0			



MAXIMUM DENSITY TEST ASTM D1557

3.15

13.13756	13.27137	13.69202	14.81835	14.84289
139.0	138.6	137.3	134.0	



# Precision Geosynthetic Laboratories



Kirk Lilleskare  
Northwest Linings & Geotextile Products, Inc.  
21000 77th Ave. South,  
Kent, WA 98032

Dear Mr. Lilleskare,

Thank you for consulting Precision Geosynthetic Laboratories (PGL) for your material testing needs.

Enclosed is the *final* laboratory report for the **Interface Shear** testing of the materials in accordance to the test configurations listed below.

**PROJECT NAME:** Kekaha Landfill

**REFERENCE PGL JOB NO.:** G100772

**DATE REPORTED:** July 12, 2010

**SAMPLES SENT BY:** Geosyntec Consultants and AGRU America

**MATERIAL DESCRIPTION & IDENTIFICATIONS:**

Material	Type	Manufacturer	Roll No.	PGL Control No.	Date Received
Soil	Subbase SB005	NA	NA	67966	7/2/2010
Geomembrane	60mil HDPE Microspike	AGRU	801613-10	64168	1/18/2010
Geomembrane	80mil HDPE Microspike	AGRU	801611-10	64167	1/30/2010

**TEST REQUIRED:**

**TEST METHOD**  
ASTM D5321

**DESCRIPTION**  
Interface Shear

**TEST CONFIGURATIONS:**

Test No.	Configuration
6C	60mil HDPE Microspike vs Subbase 005
6D	80mil HDPE Microspike vs Subbase 005
12B	60mil HDPE Microspike vs Subbase 005

**TEST CONDITIONS:** The samples were conditioned for a minimum of one hour in the laboratory at  $22 \pm 2^{\circ}\text{C}$  ( $71.6 \pm 3.6^{\circ}\text{F}$ ) and at  $60 \pm 10\%$  relative humidity prior to test.



# Precision Geosynthetic Laboratories



**TEST RESULTS:** The test results are summarized in Tables 6C, 6D and 12B.

## PRECISION GEOSYNTHETIC LABORATORIES

Belinda Jade R. Yeo  
Quality Assurance

Carmelo V. Zantua  
Technical/Laboratory Director

It shall be noted that the samples tested are believed to be true representatives of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. Precision Geosynthetic Laboratories neither accepts responsibility for nor makes claims to the intended final use and purpose of the material. The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent entity duly authorized by the respective client or from the client itself. It is a policy of the company to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. **Tested specimens and retained samples are kept for one (1) month.** On the other hand, should you need us to keep them at longer time, please advise us in writing.

Reviewed By: \_\_\_\_\_  
 Date: 07/16/18

TEST CONFIGURATION 6C



TEST CONDITIONS:

SAMPLE PREPARATION:

- The TOP box contained the soil.  
 Specimens were cut along machine direction to 1/4" x 1/4" for the BOTTOM box, with effective test area of 12" x 12".
- The Maximum Dry Density (MDD) of the soil is 139 pcf at 11.5% Optimum Moisture Content (OMC).
- Soil specimen was remolded to 13.1 pct at 13.6% moisture content.
- Specimens were secured via flat bar clamping mechanisms complete with bolts and nuts (7-pairs).

CONSOLIDATION:

- Each set of specimen was consolidated under loaded condition for 1 hr @ normal load (base straining).
- Normal loads were applied using bladder.

SHEAR TEST:

- Shear test was conducted @ 0.040 in/min.
- Sheared @ minimum 3.0 inch horizontal displacement.
- The test specimens were sheared at loaded condition.
- Tests were performed in general accordance with ASTM D5321 using Brainerd-Kilman LG-112 Direct Shear machine with effective test area of 12 in X 12 in.

TEST RESULTS:

Normal Stresses Applied		Moisture Content		Asperity Heights		PEAK STRENGTH		POST-PEAK STRENGTH AT 3.0 INCHES	
		Before	After	Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psf)	(psi)	(%)	(%)	(mils)	(mils)	(psf)	(degrees)	(psf)	(degrees)
30.00	4820	13.5	10.0	25	24	5716	41	2888	34
40.00	5760	13.5	17.9	26	23	4229	36	3315	30
50.00	7,200	13.5	16.6	26	22	5366	37	4473	32
Notes:						COHESION (psf):		414	
						COEFFICIENT OF FRICTION:		0.58	
						FRICTION ANGLE (degrees):		30.3	

NOTE: The friction angle and cohesion results given here are based on mathematically determined best fit line.

OBSERVATIONS:

- No tilting of the system or any abnormalities observed during and after the test.
- Superficial abrasion on the geosynthetic interlocking sides (typical to all loads).
- Slipping occurred within the soil substrate on all tests as soil film was retained on the surface of the geosynthetic.

Figure #1  
 Normal Stress Versus Stress

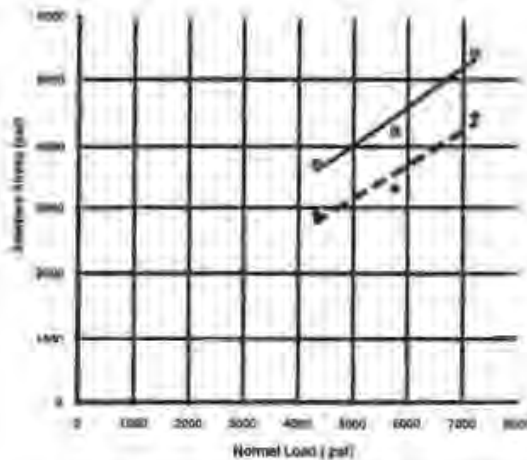
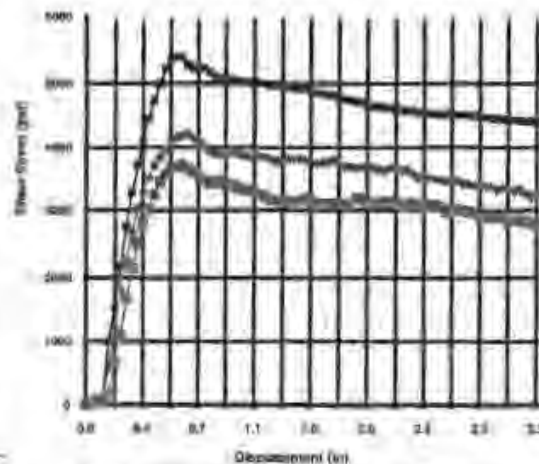


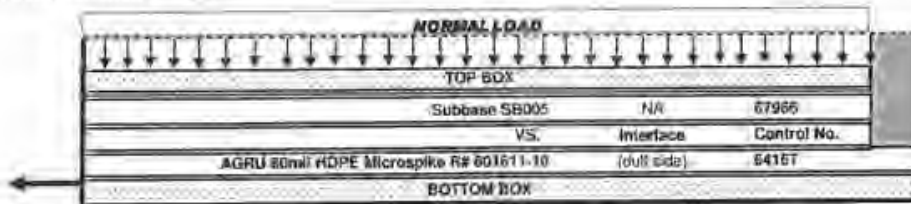
Figure #2  
 Shear Stress Displacement Curve



By accepting this test report, the client agrees to limit the liability of Precision Geosynthetic Laboratories from client and user's reliance on the test results for the project. The client shall be responsible for the accuracy and reliability of the test results. Precision Geosynthetic Laboratories is not responsible for the accuracy or reliability of the test results.



TEST CONFIGURATION **6D**



TEST CONDITIONS:

SAMPLE PREPARATION:

- The TOP box contained the soil. Specimens were cut along machine direction to 14" x 19" for the BOTTOM box, with effective test area of 12" x 12".
- The Maximum Dry Density (MDD) of the soil is: **139** pcf at **11.5%** Optimum Moisture Content (OMC).
- Soil specimen was remolded to **132.1** pcf at **13.5%** moisture content, forming 2 inch layer in the TOP box.
- Specimens were secured via flat bar clamping mechanism complete with bolts and nuts (7-pairs).

CONSOLIDATION:

- Each leg of specimen was consolidated under **flashed** condition for **1 hr** @ normal load before shearing.
- Normal loads were applied using **bladder** for all tests.

SHEAR TEST:

- Shear test was conducted @ **0.040** in/min.
- Sheared @ minimum **3.0** inch horizontal displacement.
- The test specimens were sheared at **flashed** condition.
- Test were performed in general accordance with ASTM D5321 using Brainard Kilmer LG-112 Direct Shear machine with effective test area of 12 in X 12 in.

TEST RESULTS:

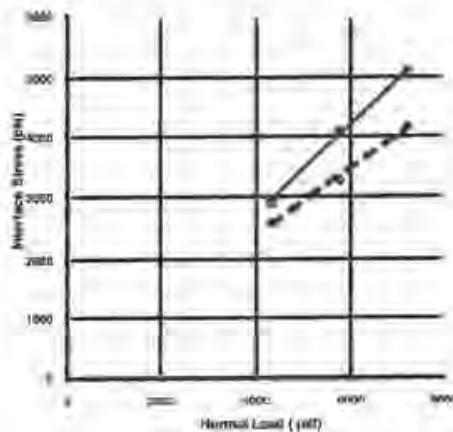
Normal Stresses Applied		Soil Moisture Content		Asperity Heights		PEAK STRENGTH		POST-PEAK STRENGTH AT 3.0 INCHES	
		Before	After	Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psf)	(pcf)	(%)	(%)	(mils)	(mils)	(psf)	(degrees)	(psf)	(degrees)
30.00	4,320	13.5	20.2	27	25	2912	34	2596	31
40.00	5,760	13.5	19.9	27	24	4091	35	3255	29
50.00	7,200	13.5	15.6	27	25	5087	35	4171	30
Note:						COHESION (psf):		191	
						COEFFICIENT OF FRICTION:		0.76	
						FRICTION ANGLE (degrees):		37.1	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

OBSERVATIONS:

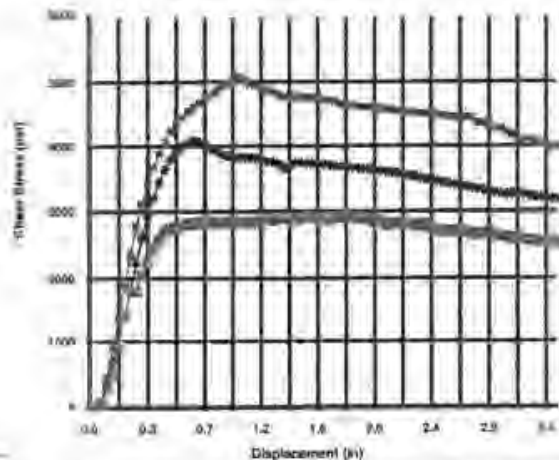
- No jacking of the system or any abnormalities observed during and after the test.
- Superficial abrasion on the geosynthetic (interfacing sides) (typical to all loads).
- Sliding occurred within the soil substrate on all tests as soil film was retained on the surface of the geomembrane.

Figure #1  
Normal Stress Interface Stress



• 3.0 Displacement  
 • Peak  
 - - - Linear (3.0 Displacement)

Figure #2  
Shear Stress Displacement Curve

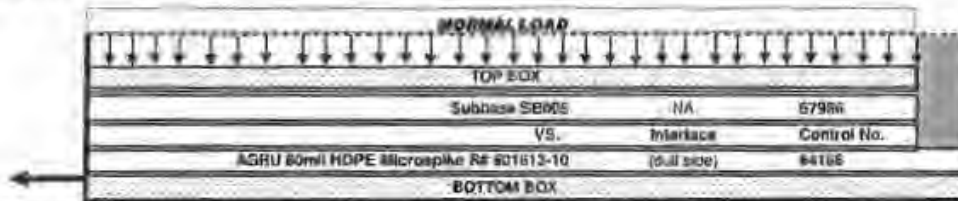


— 7,200      — 5,760      — 4,320

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for damages caused by the use of this data, to the extent that the same were presented in this report and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the fees presented here.



TEST CONFIGURATION **12B**



**TEST CONDITIONS:**

**SAMPLE PREPARATION:**

- The TOP box contained the soil.  
 Specimens were cut along machine direction to 14" x 19" for the BOTTOM box, with effective test area of 12" x 12".
- The Maximum Dry Density (MDD) of the soil is **128** pcf at **11.5%** Optimum Moisture Content (OMC).
- Soil specimen was remolded to **132.1** pcf at **13.5%** moisture content forming 2 inch layer in the TOP box.
- Specimens were spoured via fat bar stamping mechanisms complete with bolts and nuts (7 pairs).

**CONSOLIDATION:**

- Each set of specimen was consolidated under **floating** condition for **1 hr** @ normal load before shearing.
- Normal loads were applied using **bladder** for the highest load and **wood weights** for the rest of the loads.

**SHEAR TEST:**

- Shear test was conducted @ **0.040** in/min.
- Sheared @ minimum **3.0** inch horizontal displacement.
- The test specimens were sheared at **floating** condition.
- Test were performed in general accordance with ASTM D5321 using Bishop-Kilman LG-112 Direct Shear machine with effective test area of 12 in X 12 in.

**TEST RESULTS:**

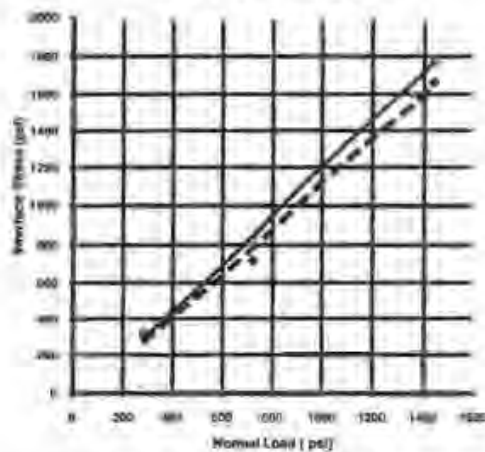
Normal Stresses Applied		Moisture Content		Aspirity Heights		PEAK STRENGTH		POST- PEAK STRENGTH AT <b>3.0</b> INCHES	
		Before	After	Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psf)	(pcf)	(%)	(%)	(mils)	(mils)	(psf)	(degrees)	(psf)	(degrees)
2.00	288	13.5	19.3	27	25	312	47	312	47
5.00	720	13.5	17.2	27	25	617	48	722	45
10.00	1,440	13.5	16.1	27	24	1735	51	1654	48
<b>Note:</b>						COHESION (pcf):		0	
						COEFFICIENT OF FRICTION:		1.28	
						FRICTION ANGLE (degrees):		52.0	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

**OBSERVATIONS:**

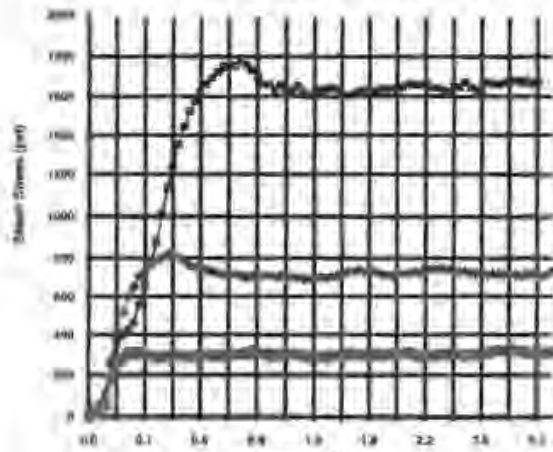
- No tilting of the system or any abnormalities observed during and after the test.
- Superficial abrasion on the geosynthetic interfacing sides (typical to all loads).
- Sliding occurred within the soil subbase on all loads as soil film was retained on the surface of the geomembrane.

**Figure #1**  
Normal Stress/ Interface Stress



• 3.0 Displacement      ▽ Peak  
 - - - Linear (3.0 Displacement)      — Linear (Peak)

**Figure #2**  
Shear Stress/ Displacement Curve



— 1,440      — 720      — 288

By accepting the data and results presented on this report, the Client agrees to the jurisdiction of Precision Geosynthetic Laboratories from Client and all other parties claims arising out of the use of this data, to the extent that the results are contained in this report, and the Client agrees to indemnify and hold harmless to extent allowed under applicable law and agrees all liabilities to remain with the Client and not the laboratory.

GOODFELLOW BROS., INC.  
P.O. Box 3029 Lihue, Hawaii 96766  
(808) 241-4601 phone (808) 241-4605 fax

## REQUEST FOR INFORMATION

TO: Waste Management of Hawaii  
ATTN: Jesse Frey

RFI No.: 31  
Request submitted: July 26, 2010  
Respond requested by: Keith Suga  
Project: Kekaha Sanitary Landfill  
Phase II Lateral Expansion

Specification Reference:

Plan Reference: Drawing No. 17, Detail 4

Subject:  Discrepancy  Clarification  Suggestion  Other

Request: On Drawing No. 17, detail 4 Leachate Transfer Pipe a granular backfill is being indicated from the pipe springline to the soil backfill level. We would like to utilize onsite granular sand material for this granular backfill zone. Also at no cost we would like to propose to install backfill warning tape one foot above top of leachate pipe.

Please advise

Signed: Keith Suga

Date: July 26, 2010

Reply: As discussed in the weekly construction meetings, the onsite material for the backfill around the pipe is suitable since the pipes are being placed as the berm is being constructed and soils are compacted for the berm and around the piping. Addition of the warning tape is also acceptable.

Signed: 

Date: 8/27/10

Request VIA:  Telephone  Facsimile  Email  
Copies to:  File

GOODFELLOW BROS., INC.  
P.O. Box 3029 Lihue, Hawaii 96766  
(808) 241-4601 phone (808) 241-4605 fax

**REQUEST FOR INFORMATION**

TO: Waste Management of Hawaii  
ATTN: Jesse Frey

RFI No.: 32  
Request submitted: July 26, 2010  
Respond requested by: Keith Suga  
Project: Kekaha Sanitary Landfill  
Phase II Lateral Expansion

Specification Reference:

Plan Reference: Drawing No. 11, Detail 2

Subject:  Discrepancy  Clarification  Suggestion  Other

Request: On Drawing No. 11, detail 2 Float Level Switch Detail there is a call out for FSH and FSL which we believe that refers to the High and Low level settings for the floats. There isn't an elevation provided to indicate where these floats need to be installed. Please provide elevation or measurement from top of stainless steel plate so the aerator float system can be completed.

Signed: Keith Suga

Date: July 26, 2010

Reply: Based upon your provided information on 8/16/10 by email for the top of the concrete aerator pads elevations of 9.30 and 9.34 and the minimum aerator operating depth of 8 inches, the floats should be set at for the New Leachate Evaporation Pond:

1. Low level (turns off the aerators) 12" above the pads or elevation 10.30' (9.30 plus 1.0)
2. High level (turns on the aerators) 18" above the pads or elevation 10.80' (9.30 plus 1.5)

This coincides with my email submitted on 8/17/10.

Signed: 

Date: 8/27/10

Request VIA:  Telephone  Facsimile  Email  
Copies to:  File

GOODFELLOW BROS., INC.  
P.O. Box 3029 Lihue, Hawaii 96766  
(808) 241-4601 phone (808) 241-4605 fax

**REQUEST FOR INFORMATION**

TO: Waste Management of Hawaii  
ATTN: Jesse Frey

RFI No.: 33  
Request submitted: July 26, 2010  
Respond requested by: Keith Suga  
Project: Kekaha Sanitary Landfill  
Phase II Lateral Expansion

Specification Reference:

Plan Reference: Drawing No. 4

Subject:  Discrepancy  Clarification  Suggestion  Other

Request: In the South East corner of Cell 1A we have a field fit scenario to tie in to the existing liner system. We have provided a sketch and pictures to help illustrate the field conditions. We would like to propose the attached sketch to tie-in to the existing liner system. Please advise.

Signed: Keith Suga

Date: July 26, 2010

Reply: The proposed tie-in location as noted is a field fit situation. I concur with the tie-in location as long as the liner system from existing Phase II to Cell I is continuous and documented. Maintain positive slope towards Phase II and Cell I to promote leachate collection.

Signed: 

Date: July 26, 2010

Request VIA:  Telephone  Facsimile  Email  
Copies to:  File

PHOTO 1: DESIGN LINER  
LIMIT

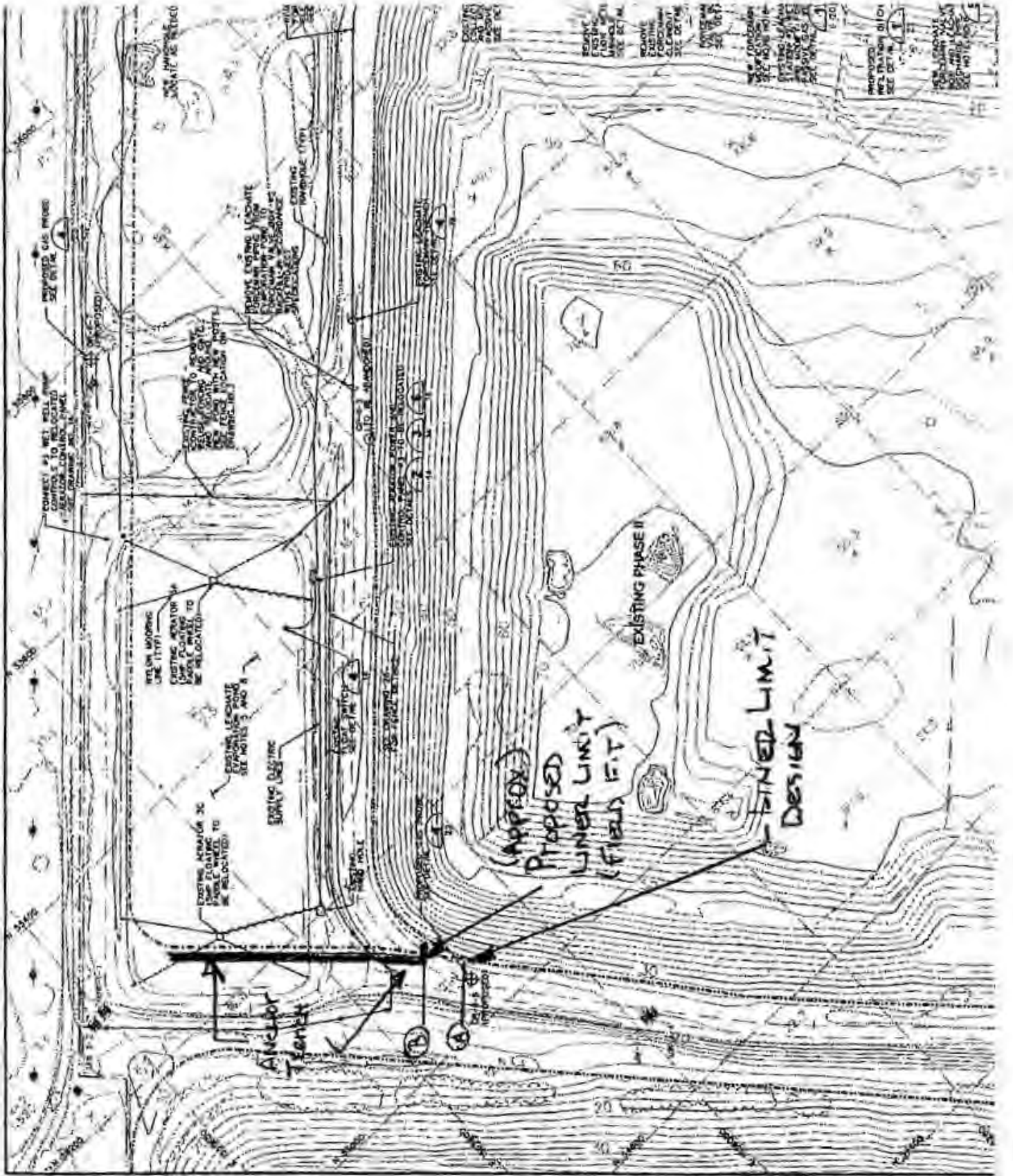


PHOTO 2: PROPOSED LINER LIMIT



PHOTO 3: PROPOSED  
TIE-IN





DESIGN  
 LIMER LIMIT:  
 A N: 56221.3  
 E: 1557286.4  
 EC: 21.6  
 Proposed Limer  
 Limit:  
 (FIELD FIT)  
 N: 56264.7  
 E: 1557264.6  
 EC: 22.8



GOODFELLOW BROS., INC.  
P.O. Box 3029 Lilue, Hawaii 96766  
(808) 241-4601 phone (808) 241-4605 fax

---

## REQUEST FOR INFORMATION

TO: Waste Management of Hawaii  
ATTN: Jesse Frey

RFI No.: 34  
Request submitted: July 29, 2010  
Respond requested by: Keith Suga  
Project: Kekaha Sanitary Landfill  
Phase II Lateral Expansion

Specification Reference:

Plan Reference: Drawing No. 6 & 18

Subject:  Discrepancy  Clarification  Suggestion  Other

Request: We have asbuiltd subgrades for the pipe penetrations 1A and 1B on the attached sheet. Points "E" and "F" for pipe penetration 1A and 1B are slightly out of tolerance, about a tenth. Based on these asbuiltd shots I have shown what the slopes on the perforated and gravity pipes would be. Please advise if ok to proceed with asbuiltd grades.

Signed: Keith Suga

Date: July 29, 2010

Reply: The asbuiltd elevations of 10.70 for points E and F for sumps in Cell 1A and 1B are acceptable verses design elevation of 10.50. The purpose of the recessed sump was to allow construction of the pipe penetration and a mechanism of which to connect multiple liner systems in a constructable/accessible environment. This RFI approval is only for the points noted and the CQA firm will need to verify final pipe slopes and elevations.

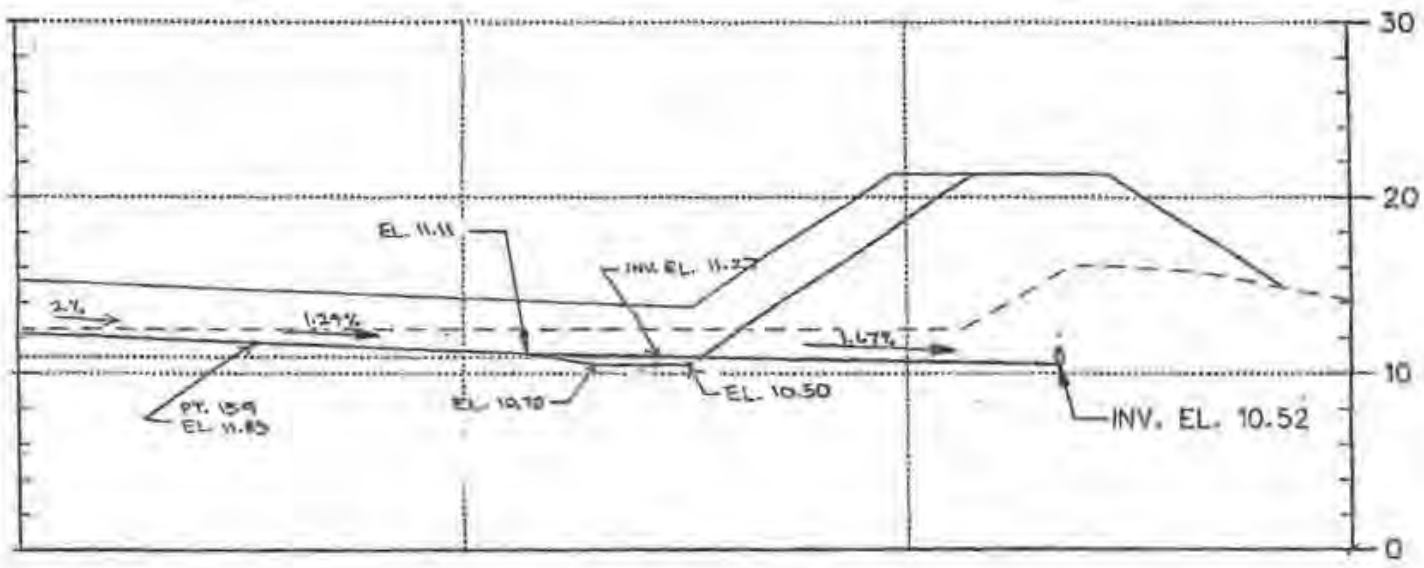
Signed: 

Date: July 29, 2010

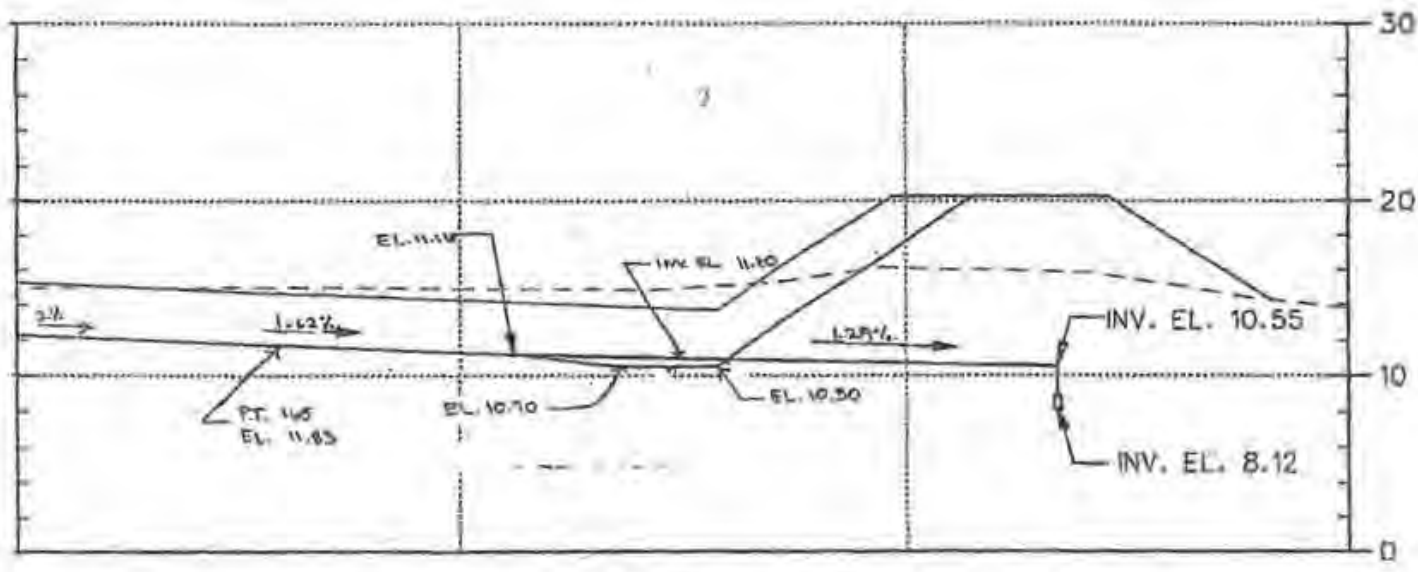
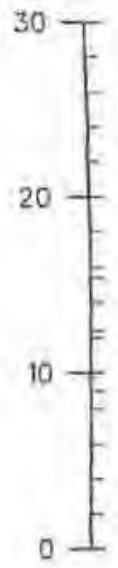
Request VIA:  Telephone  
Copies to:  File

Facsimile

Email



PROFILE 1A



PROFILE 1B



GOODFELLOW BROS., INC.  
P.O. Box 3029 Lihue, Hawaii 96766  
(808) 241-4601 phone (808) 241-4605 fax

---

**REQUEST FOR INFORMATION**

TO: Waste Management of Hawaii  
ATTN: Jesse Frey

RFI No.: 35  
Request submitted: July 29, 2010  
Respond requested by: Keith Suga  
Project: Kekaha Sanitary Landfill  
Phase II Lateral Expansion

Specification Reference:

Plan Reference: Drawing No. 4

Subject:  Discrepancy  Clarification  Suggestion  Other

---

Request: On the Cell 1 Subbase Grades, Drawing No. 4; Point 66 is showing an elevation of 23.49 which we believe to be in error similar to Point 87 in cell 1D. We have graded the subgrade to promote drainage towards Penetration 1A and will have Esaki Surveying provide an asbuilt elevation for Point 66. Please confirm that these steps are acceptable.

Signed: Keith Suga

Date: July 29, 2010

---

Reply: (SEE ATTACHED EMAIL RESPONSES)

Signed:

Date:

---

Request VIA:  Telephone  Facsimile  Email  
Copies to:  File

Kim Huynh

---

**From:** Bergschultz, Ken [KEN.BERGSCHULTZ@aecom.com]  
**Sent:** Monday, August 02, 2010 1:14 PM  
**To:** keiths@goodfellowbros.com; JFrey@wm.com  
**Cc:** Chris Scott, Mike Minch; Kim Huynh; christinee@goodfellowbros.com; john@esakimap.com; Cloffi, Frank; Doug Hamilton  
**Subject:** Re: RFI #35 Point 66 Subgrade Elevation

Keith,

Please meet the design elevation and tolerances.

Any questions, please let me know.

Kenny Bergschultz

---

**From:** Keith Suga <keiths@goodfellowbros.com>  
**To:** Bergschultz, Ken; JFrey@wm.com <JFrey@wm.com>  
**Cc:** CScott@Geosyntec.com <CScott@Geosyntec.com>; MMinch@Geosyntec.com <MMinch@Geosyntec.com>; KHuynh@Geosyntec.com <KHuynh@Geosyntec.com>; Christine Erorita <christinee@goodfellowbros.com>; john@esakimap.com <john@esakimap.com>; Cloffi, Frank; DHamilton@Geosyntec.com <DHamilton@Geosyntec.com>  
**Sent:** Mon Aug 02 12:18:34 2010  
**Subject:** RE: RFI #35 Point 66 Subgrade Elevation

Jesse/Kenny,

Thanks for the response. Prior to receiving this I had Esaki survey and asbuilt point 66. The asbuilt elevation for Point 66 is 17.07. Comparing that and the corrected elevation below we would be out of the specified tolerance. Based on still having flow from point 65 to point 67, can the asbuilt Point 66 be accepted on the basis of still meeting the intent of the design? Please let me know if you would like me to write up a new RFI for this matter. Thanks.

Keith

---

**From:** Bergschultz, Ken [mailto:KEN.BERGSCHULTZ@aecom.com]  
**Sent:** Friday, July 30, 2010 4:06 AM  
**To:** Keith Suga; JFrey@wm.com  
**Cc:** CScott@Geosyntec.com; MMinch@Geosyntec.com; KHuynh@Geosyntec.com; Christine Erorita; john@esakimap.com; Cloffi, Frank  
**Subject:** Re: RFI # 35 Point 66 Subgrade Elevation

Keith,

The correct elevation for pt 66 is 17.27.

Any questions please let me know.

Kenny

---

**From:** Keith Suga <keiths@goodfellowbros.com>  
**To:** Frey, Jesse <JFrey@wm.com>  
**Cc:** CScott@Geosyntec.com <CScott@Geosyntec.com>; MMinch@Geosyntec.com <MMinch@Geosyntec.com>; KHuynh@Geosyntec.com <KHuynh@Geosyntec.com>; Christine Erorita <christinee@goodfellowbros.com>; Bergschultz, Ken; John <john@esakimap.com>

**Sent:** Thu Jul 29 14:11:36 2010  
**Subject:** RFI #35 Point 66 Subgrade Elevation

Jesse,

Please see attached RFI #35 regarding Point #66 subgrade elevation.

Keith Suga

Goodfellow Bros., Inc.  
P.O. Box 3029  
Lihue, HI 96766  
PH: 808-241-4601  
FX: 808-241-4605  
[keiths@goodfellowbros.com](mailto:keiths@goodfellowbros.com)

---

CONFIDENTIALITY NOTICE: If you have received this communication in error, please notify us immediately. This message is intended only for the use of the person, firm, or company it is addressed, and may contain information that is privileged, confidential and exempt from disclosure under applicable law. If the reader of this message is not the intended recipient, you are hereby notified that any dissemination, distribution or copying of this information is prohibited.

---

CONFIDENTIALITY NOTICE: If you have received this communication in error, please notify us immediately. This message is intended only for the use of the person, firm, or company it is addressed, and may contain information that is privileged, confidential and exempt from disclosure under applicable law. If the reader of this message is not the intended recipient, you are hereby notified that any dissemination, distribution or copying of this information is prohibited.

GOODFELLOW BROS., INC.  
P.O. Box 3029 Lihue, Hawaii 96766  
(808) 241-4601 phone (808) 241-4605 fax

---

**REQUEST FOR INFORMATION**

TO: Waste Management of Hawaii  
ATTN: Jesse Frey

RFI No.: 36  
Request submitted: September 28, 2010  
Respond requested by: Keith Suga  
Project: Kekaha Sanitary Landfill  
Phase II Lateral Expansion

Specification Reference:

Plan Reference: Drawing Nos. 2 and 9

Subject:  Discrepancy  Clarification  Suggestion  Other

---

Request: The attached drawings show the as-built elevation and grades for the new infiltration basin and infiltration ditch. These grades were built in accordance with our previous discussions during multiple construction meetings. During a rain the week of 9/13/10 it was observed by GBI that water flowed towards the infiltration basin and seeped into the ground. Please confirm that these grades meet the design intent.

Signed: Keith Suga

Date: September 28, 2010

---

Reply: The partial approval of this RFI is based upon performance and visual observation from the site CQA staff. I approve the grades designated as "low" within the infiltration basin as the design is infiltration and not retention.

However the grading of the infiltration ditch along evaporation pond and scale house does not appear to be constant as requested and varies in grade between up gradient and down gradient points. Discussions were to grade this portion of ditch to slope towards the infiltration basin from the rip rap area at a constant slope. I was not present for actual storm performance nor is 3rd party documentation provided with this RFI. If the water collected flows to the basin as requested, final acceptance of this ditch will be between the Owner (or Owner's rep) and the CQA firm.

Signed: 

Date: 10/4/10

---

Request VIA:  Telephone  
Copies to:  File

Facsimile

Email



**Appendix E**  
**Daily Field Reports**



**DAILY FIELD REPORT**

**Report Sequence No.: 001**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Tuesday

DATE: DAY: 12      MONTH: January      YEAR: 2010

WEATHER: Sunny and warm during the day.

0600	I arrived on site. I introduced myself to Jeffery Kaohi (District Manager). Mr. Kaohi showed me around the site and identified the secure area for storage of the nuclear gauge. The nuclear gauge is currently in locked and secure in the building.
1000	I attended the weekly construction meeting for the project. See meeting minutes for meeting discussions.
1100	I returned from the weekly construction meeting.
	During the weekly construction meeting, Goodfellow Bros. identified a concern with shipping soil samples to the mainland for interface direct shear testing. Geosyntec was requested by Waste Management to assist with the shipping and collection of interface direct shear samples.
	Keith Suga (Goodfellow Bros. Superintendent) and I identified the site-specific soil which will be used for the construction of the subbase material and compacted fill in the Cell 1 and the new leachate evaporation pond (NLEP) embankments. I collected two (2) 5-gallon buckets of the sandy compacted fill material which was stockpiled along the southern end of the site.
	Keith identified that the borrow source for the 3/8-in minus Cell 1 operations layer /NLEP granular protection layer material and the 1 1/2-in minus granular Cell 1 granular drainage layer/NLEP granular operations layer material will be provided by Kauai Aggregate. Keith and I traveled to the quarry to collect samples of the proposed materials.
	I spoke with Scott Pingrey (contact number 808.652.1050) of Kauai Aggregate Quarry. Mr. Pingrey identified the proposed materials (3/8-inch minus quarry fines and 1 1/2-inch base course) which was stockpiled at the site and proposed for construction. The material visually appeared to have over 20% fines content (vs. 5% passing #200 US Sieve per the specifications). However Mr. Pingrey assured me that if the material does not meet the project requirements the quarry would adjust the screening operation to meet the project requirements.
	I collected samples of the 3/8-inch minus drainage gravel and 1 1/2-inch base course for interface direct shear and conformance testing.
	Keith and I traveled to FedEx to ship the samples under Precision Geosynthetics Laboratory's soil permit. The samples were received by FedEx and are pending shipping approval by the Agricultural Inspector.
1630	I left the site.

Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 002**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Wednesday

DATE: DAY: 13      MONTH: January

YEAR: 2010

WEATHER: Sunny and warm during the day.

0630	I arrived on site. Goodfellow Bros. already on site.
	Equipment on site during construction:  Deer 350D Excavator, Caterpillar 140H motor grader, Deer 644J front end loader, and a Komatsu backhoe.
	<u>Clearing and Grubbing</u>  The contractor is working to clear and grub the area of the Cell 1 containment system and the new leachate evaporation pond (NLEP). The spoils are hauled to an onsite stockpile approved by the Owner.
	<u>Interface Direct Shear</u>  I received a call from Nad (USDA inspector). Precision Geosynthetics Laboratory's soil sample permit was approved and validated. However, based on the permit requirements, the soil samples must be dual contained in a sealed water tight container. Nad has requested that I return to Fed Ex to remove the soil samples from the buckets, place the soils in plastic bags, seal the bags, and then replace the bags in the buckets and place the water tight covers on the buckets.  I returned to Fed Ex and corrected the shipping container condition. Nad approved the soil samples for delivery to Precision Laboratory.
1630	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

Report Sequence No.: 003

PROJECT: Kekaha Landfill  
 LOCATION: Kekaha, Kauai, Hawaii  
 DESCRIPTION: Phase II Lateral Expansion  
 Cell 1 Base Liner Construction  
 DAY OF WEEK: Thursday  
 WEATHER: Sunny and warm during the day.

PROJECT NO.: WG1298  
 TASK NO.: 02  
 CONTRACTORS: Goodfellow Bros. / Northwest Linings  
 DATE: DAY: 14 MONTH: January YEAR: 2010

0630	I arrived on site. Goodfellow Bros. already on site.
	Equipment on site during construction:  Deer 350D Excavator, Caterpillar 140H motor grader, Deer 644J front end loader, and a Komatsu backhoe.
	<u>Clearing and Grubbing</u>  The contractor continues working to clear and grub the area of the Cell 1 containment system and the new leachate evaporation pond (NLEP). The spoils are hauled to an onsite stockpile approved by the Owner.
	<u>Cell 1 Construction</u>  One (1) operator using a WB 146 Komatsu backhoe with a straight edge bucket and a laborer are working to expose the existing Phase II / Cell 1 liner tie-in and stake the perimeter berm every 50 ft along the construction area in accordance with Note 4 on Drawing 4 of the Construction Drawings: "The contractor shall provide a survey stakeout of the perimeter berm and Phase II / Cell 1 liner tie-in prior to berm and Cell 1 construction."  Esaki Surveying & Mapping, Inc. will be onsite next week to document the tie-in as-built condition.
	<u>New Leachate Evaporation Pond (NLEP)</u>  The contractor is working to expose the force main piping to the NLEP.
	<u>Interface Direct Shear Testing</u>  Cora Queja (Precision Laboratory) confirmed that all of the samples (eight 5-gallon buckets) arrived this morning at the laboratory.
1630	I left the site.

Curtis Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 004**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Friday

DATE: DAY: 15 MONTH: January

YEAR: 2010

WEATHER: Sunny and warm during the day.

0630	I arrived on site. Goodfellow Bros. already on site.
	Equipment on site during construction:  Deer 350D Excavator, Caterpillar 140H motor grader, Deer 644J front end loader, and a Komatsu backhoe.
	<u>Clearing and Grubbing</u>  The contractor continues working to clear and grub the area of the Cell 1 containment system and the new leachate evaporation pond (NLEP). The spoils are hauled to an onsite stockpile approved by the Owner.
	<u>Cell 1 Construction</u>  The contractor has pot holed at 50-ft intervals along the Phase II / Cell 1 liner tie-in to identify the as-built condition. During excavation, a small area of the existing Phase II liner system was inadvertently damaged next to the anchor trench. Esaki Surveying & Mapping has provided the survey location of the damaged area:  Repair location: N:55837.75, E: 1556683.57, El: 13.60  The contractor will cover and protect the damaged area until repairs can be completed by Northwest Lining.  Esaki Surveying & Mapping, Inc. is onsite to document the existing Phase II tie-in as-built condition.
	<u>New Leachate Evaporation Pond (NLEP)</u>  The contractor is working to expose the force main piping to the NLEP.
1330	I left the site to pick up field supplies.

Chris Scott  
Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 005**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298 TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings


DAY OF WEEK: Monday

DATE: DAY: 18 MONTH: January YEAR: 2010

WEATHER: Sunny and warm during the day.

0700	Mike Minch (Geosyntec Sr. Project Engineer) and I arrived on site. Goodfellow Bros. is currently off site.
	<p>Keith Suga (Goodfellow Bros. Construction) has arranged for an informal meeting between Geosyntec and Dennis Esaki (Esaki Surveying &amp; Mapping) to introduce the surveying team to the project CQA team (Geosyntec).</p> <p>Esaki Surveying and Goodfellow Bros. Construction appear to have a good understanding of the project specifications and survey requirements for the project.</p> <p>Keith escorted Mike and I to the Kauai Aggregate Quarry to meet with Scott Pingrey (Kauai Aggregates Superintendent). Mr. Pingrey showed us around the quarry and identified the materials proposed for use during construction. Although the materials required for the project have not yet been processed, similar materials are currently being processed which are close to the gradation required by the Kekaha project specifications.</p> <p>Mr. Pingrey assured Goodfellow Bros and Geosyntec that the quarry has the capabilities to meet the project specifications for the proposed materials and that an onsite laboratory would be utilized to verify that the material is in conformance.</p>
1230	Mike and I left the quarry.

iris Scott  
Printed Name

  
Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 006**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Tuesday

DATE: DAY: 19      MONTH: January      YEAR: 2010

WEATHER: Sunny and warm during the day.

0800	Mike Minch (Geosyntec Sr. Project Engineer) and I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site during construction:</p> <p>Deer 350D Excavator, Caterpillar 140H motor grader, Deer 644J front end loader, and a Komatsu backhoe.</p> <p>Equipment arrived on site today:</p> <p>Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p>
1030	Mike and I attended the weekly construction meeting. See meeting minutes for discussions during the meeting. 1200 Returned from construction meeting.
	<p><u>Clearing and Grubbing</u></p> <p>The contractor has completed the clearing and grubbing the Cell 1 subbase.</p>
	<p><u>Cell 1 Construction</u></p> <p>The contractor has proof-rolled the subbase using an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor. The subbase condition was visually observed to be firm and non-yielding in accordance with the project specifications.</p> <p>The contractor identified the haul truck (Caterpillar 740 articulated haul truck) to be used to haul compacted fill material to construct the Cell 1 subbase grades. Before placement of the compacted fill material, a loaded Caterpillar 740 haul truck was driven over the subbase to verify that the equipment does not damage the existing condition. Visual observation indicated that the equipment does not damage the existing subbase.</p>
1500	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 007**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Wednesday

DATE: DAY: 20      MONTH: January      YEAR: 2010

WEATHER: Sunny and warm during the day.

0800	I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site during construction:</p> <p>Deer 350D Excavator, Caterpillar 140H motor grader, Deer 644J front end loader, Komatsu backhoe, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p> <p>Equipment arrived on site today: Caterpillar 735 articulated haul truck.</p>
	<p><u>Clearing and Grubbing</u></p> <p>The County of Kauai has removed the majority of the green waste and white goods from within the new leachate evaporation pond (NLEP) construction area.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>The contractor has cleared the area and proof-rolled the perimeter of the NLEP area to received compacted fill. The area was proof-rolled using an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p> <p>The subbase was observed to be firm and non-yielding in accordance with the project requirements.</p>
	<p><u>Cell 1 Construction</u></p> <p>Jesse Frey (Waste Management of Hawaii) notified me that AECOM (design engineer) would be preparing a revision to the Cell 1 design based on the re-surveyed western property line. The contractor has temporarily suspended construction within the Cell 1 construction area pending the revised grading plan from AECOM.</p>
1500	I left the site.

is Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

Report Sequence No.: 008

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Thursday

DATE: DAY: 21 MONTH: January

YEAR: 2010

WEATHER: Sunny and warm during the day.

0800	I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site during construction:</p> <p>Caterpillar 140H motor grader, Deere 544J front end loader, Komatsu backhoe, Caterpillar 740 articulated haul truck, Caterpillar 735 articulated haul truck, Caterpillar D6 LGP dozer, and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p> <p>Equipment arrived on site today: Hitachi 450 LC excavator Equipment removed from site today: Deere 350D Excavator.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>The contractor has begun to excavate the NLEP to construct the design grades. The excavated material is being placed along the "west" side (shrimp ponds side) of the NLEP to construct the design grades along the perimeter.</p> <p>The compacted fill material is being placed using a Hitachi 450 LC excavator. The lifts are uniformly graded to an 8-inch loose lift, moisture-conditioned using a water truck, and then compacted using an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor. Several field density tests (FDTs) using a Troxler portable nuclear moisture/density gauge indicate the compaction effort was in accordance with the project specifications.</p> <p>A 3-inch thin-wall Shelby tube was advanced into the compacted fill within the nuclear gauge footprint at field density test location FDT-02 using an Army Corps sampler. The sample was extracted by hand, capped at each end, and then labeled TW-001. The sample will be used to compare the in-place moisture and density as measured by the nuclear gauge and by method ASTM D 2937 (Density of Soils by Drive Cylinder Method).</p>
	<p><u>Cell 1 Construction</u></p> <p>The contractor has suspended construction within the Cell 1 area pending a design revision by AECOM (design engineer).</p>
1500	I left site.

Chris Scott

Printed Name



Signature

cc: Mike Minch



**DAILY FIELD REPORT**

**Report Sequence No.: 009**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Friday

DATE:      DAY: 22      MONTH: January      YEAR: 2010

WEATHER: Sunny and warm during the day.

0800	I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 740 articulated haul truck, Caterpillar 735 articulated haul truck, Caterpillar D6 LGP dozer, and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>The contractor continues to excavate the NLEP pond to construct the design grades. The excavated material is being placed along the western side of the pond to construct the design grades along the perimeter.</p> <p>The compacted fill material is being placed into a Cat. 735 articulated haul truck using a Hitachi 450 LC excavator, and then the haul truck dumps the compacted fill material directly onto the perimeter berm of the NLEP. The lifts are uniformly graded to an 8-inch loose layer using a Cat. D6 LGP dozer, moisture-conditioned using a water truck and then compacted using a Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor. Several field density tests (FDTs) using a Troxler portable nuclear moisture/density gauge indicate the compaction effort was in accordance with the project specifications.</p> <p>A 3-inch thin-wall Shelby tube was advanced into the compacted fill within the nuclear gauge footprint at field density test location FDT-13 using an Army Corps sampler. The sample was extracted by hand, capped at each end, and then labeled TW-002. The sample will be used to compare the in-place moisture and density as measured by the nuclear gauge and by method ASTM D 2937 (Density of Soils by Drive Cylinder Method).</p> <p>A bulk sample of the compacted fill (onsite soils) was collected from within the field density test location FDT-13. The sample was placed into a 5-gallon bucket labeled SB-003 and then shipped via Fed Ex to Precision Laboratories for conformance testing.</p>
	<p><u>Cell 1 Construction</u></p> <p>The contractor has suspended construction within the Cell 1 area pending a design revision by AECOM (design engineer).</p>
1500	I left the site and traveled to Fed Ex to drop off sample SB-003.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 010**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO. 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Monday

DATE: DAY: 25      MONTH: January      YEAR: 2010

WEATHER: Sunny and warm during the day.

0730	I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 740 articulated haul truck, Caterpillar 735 articulated haul truck, Caterpillar D6 LGP dozer, and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>The contractor continues to excavate the NLEP pond to construct the design grades. The excavated material is being placed along the "north" side (mountain side) of the pond to construct the design grades along the perimeter.</p> <p>The compacted fill material is being placed into a Cat. 735 articulated haul truck using a Hitachi 450 LC excavator, and then the haul truck dumps the compacted fill material directly onto the perimeter berm of the NLEP. The lifts are uniformly graded to an 8-inch loose layer using a Cat. D6 LGP dozer, moisture-conditioned using a water truck and then compacted using a Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor. Several field density tests (FDTs) using a Troxler portable nuclear moisture/density gauge indicate the compaction effort was in accordance with the project specifications.</p> <p>A 3-inch thin-wall Shelby tube was advanced into the compacted fill within the nuclear gauge footprint at field density test location FDT-27 using an Army Corps sampler. The sample was extracted by hand, capped at each end, and then labeled TW-003. The sample will be used to compare the in-place moisture and density as measured by the nuclear gauge and by method ASTM D 2937 (Density of Soils by Drive Cylinder Method).</p>
	<p><u>Cell 1 Construction</u></p> <p>The contractor has suspended construction within the Cell 1 area pending a design revision by AECOM (design engineer).</p>
1600	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 011**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Tuesday

DATE: DAY: 26    MONTH: January      YEAR: 2010

WEATHER: Overcast and cloudy with rain in the morning.

0730	I arrived on site. Goodfellow Bros. is already on site.
	Equipment on site today:  Hitachi 450 LC excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 740 articulated haul truck, Caterpillar 735 articulated haul truck, Caterpillar D6 LGP dozer, and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.
1000	I attended the weekly construction meeting.
	<u>New Leachate Evaporation Pond (NLEP)</u>  Suspended construction today due to rain.
	<u>Cell 1 Construction</u>  The contractor has suspended construction within the Cell 1 area pending a design revision by AECOM (design engineer).
1400	I left the site.

Chris Scott  
Printed Name

  
Signature

cc: Mike Minch

**DAILY FIELD REPORT**

Report Sequence No.: 012

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Wednesday

DATE: DAY: 27      MONTH: January      YEAR: 2010

WEATHER: Sunny and warm during the day.

0700	I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 740 articulated haul truck, Caterpillar 735 articulated haul truck, Caterpillar D6 LGP dozer, and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>The contractor continues to excavate the NLEP pond to construct the design grades. The excavated material being placed along the "north" side (mountain side) of the pond to construct the design grades along the perimeter.</p> <p>The compacted fill material is being placed into two Cat. 735 articulated haul trucks using a Hitachi 450 LC excavator, and then the haul truck dumps the compacted fill material directly onto the perimeter berm of the NLEP. The lifts are uniformly graded to an 8-inch loose layer using a Cat. D6 LGP dozer, moisture-conditioned using two water trucks and then compacted using an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor. Several field density tests (FDTs) using a Troxler portable nuclear moisture/density gauge indicate the compaction effort was in accordance with the project specifications.</p> <p>A 3-inch thin-wall Shelby tube was advanced into the compacted fill within the nuclear gauge footprint at field density test location FDT-39 using an Army Corps sampler. The sample was extracted by hand, capped at each end, and then labeled TW-004. The sample will be used to compare the in-place moisture and density as measured by the nuclear gauge and by method ASTM D 2937 (Density of Soils by Drive Cylinder Method).</p>
	<p><u>Cell 1 Construction</u></p> <p>The contractor has suspended construction within the Cell 1 area pending a design revision by AECOM (design engineer).</p>
1600	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 013**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Thursday

DATE: DAY: 28 MONTH: January

YEAR: 2010

WEATHER: Sunny and warm during the day.

0730	I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 740 articulated haul truck, Caterpillar 735 articulated haul truck, Caterpillar D6 LGP dozer, and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>The contractor continues to excavate the NLEP to construct the design grades. The excavated material is being placed along the "north" side (mountain side) and "west" side (administration building) of the NLEP to construct the design grades along the perimeter.</p> <p>The compacted fill material is being placed into two Cat. 735 articulated haul trucks using a Hitachi 450 LC excavator, and then the haul truck dumps the compacted fill directly onto the perimeter berm of the NLEP. The lifts are uniformly graded to an 8-inch loose layer using a Cat. D6 LGP dozer, moisture-conditioned using two water trucks and then compacted using an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor. Several field density tests (FDTs) using a Troxler portable nuclear moisture/density gauge indicate the compaction effort was in accordance with the project specifications.</p> <p>The contractor has begun to cut the NLEP slopes and floor to the final subbase design grades. During grading, an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor continually rolls the surface to maintain compaction.</p>
	<p><u>Cell 1 Construction</u></p> <p>The contractor has suspended construction within the Cell 1 area pending a design revision by AECOM (design engineer).</p>
1600	I left the site.

is Scott

Printed Name



Signature

Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 014**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Friday

DATE: DAY: 29      MONTH: January      YEAR: 2010

WEATHER: Light rain during the day.

0730	I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 740 articulated haul truck, Caterpillar 735 articulated haul truck, Caterpillar D6 LGP dozer, and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>The contractor continues to excavate the NLEP to construct the design grades. The excavated material is being placed along the "north" side (mountain side) of the NLEP to construct the design grades along the perimeter.</p> <p>The compacted fill material is being placed into two (2) Cat. 735 articulated haul trucks using a Hitachi 450 LC excavator, and then the haul truck dumps the compacted fill material directly onto the perimeter berm of the NLEP. The lifts are uniformly graded to an 8-inch loose layer using a Cat. D6 LGP dozer, moisture conditioned using two water trucks and then compacted using an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor. Several field density tests (FDTs) using a Troxler portable nuclear moisture/density gauge indicate the compaction effort was in accordance with the project specifications.</p> <p>The contractor continues to cut the NLEP slopes and floor to construct the final subbase design grades. During grading, an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor continually rolls the surface to maintain compaction.</p>
	<p><u>Cell 1 Construction</u></p> <p>The contractor's grade setter has begun to set stakes for the revised Cell 1 design grades.</p>
1600	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 015**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Monday

DATE:      DAY: 1      MONTH: February      YEAR: 2010

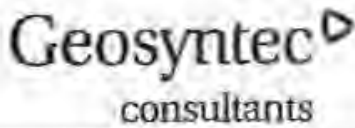
WEATHER: Warm and sunny during the day.

0730	I arrived on site. Goodfellow Bros. is already on site.
	Equipment on site today:  Hitachi 450 LC excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 740 articulated haul truck, Caterpillar 735 articulated haul truck, Caterpillar D6 LGP dozer, and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.
1000	I attend the weekly construction meeting.
1100	Returned from the weekly construction meeting.
	<u>New Leachate Evaporation Pond (NLEP)</u>  The contractor continues to excavate the NLEP pond to construct the design grades. The excavated material is being placed along the northern side (mountain side) of the NLEP to construct the design grades along the perimeter.  The contractor has placed and compacted the compacted fill material to complete the NLEP subbase. The subbase was intentionally overbuilt to accommodate the lines and grades of the final product. The contractor continues to cut the NLEP slopes and floor to construct the final subbase design grades. During grading, an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor continually rolls the surface to maintain compaction.
	<u>Cell 1 Construction</u>  No work in the Cell 1 construction area today.
1800	I left the site.

Chris Scott  
Printed Name

  
Signature

cc: Mike Minch



Kekaha Landfill  
Kekaha, Kauai, Hawaii

DAILY FIELD REPORT

Report Sequence No.: 016

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Tuesday

DATE: DAY: 2 MONTH: February

YEAR: 2010

WEATHER: Light rain in the morning, sunny and warm during the afternoon.

0730	I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 740 articulated haul truck, Caterpillar 735 articulated haul truck, Caterpillar D6 LGP dozer, and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>The contractor continues to excavate the NLEP pond to construct the design grades. The excavated material is being placed along the northern side (mountain side) of the NLEP to construct the design grades along the perimeter.</p> <p>The contractor has placed and compacted the compacted fill (onsite soils) material to complete the NLEP subbase. The subbase was intentionally overbuilt to accommodate the lines and grades of the final design. The contractor continues to cut the NLEP slopes and floor to construct the final subbase design grades. During grading, an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor continually rolls the surface to maintain compaction.</p>
	<p><u>Cell 1 Construction</u></p> <p>No work in the Cell 1 construction area today.</p>
1600	I left the site.

Chris Scott  
Printed Name

cc: Mike Minch



**DAILY FIELD REPORT**

**Report Sequence No.: 017**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Wednesday

DATE: DAY: 3 MONTH: February

YEAR: 2010

WEATHER: Cool and breezy during the morning, sunny and warm during the afternoon.

0730	I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 740 articulated haul truck, Caterpillar 735 articulated haul truck, Caterpillar D6 LGP dozer, and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>The contractor continues to excavate the NLEP pond to construct the design grades. The excavated material is being placed along the "north" side (mountain side) of the NLEP to construct the design grades along the perimeter.</p> <p>The contractor has placed and compacted the compacted fill (onsite soils) material to complete the NLEP subbase. The subbase was intentionally overbuilt to accommodate the lines and grades of the final design. The contractor continues to cut the NLEP slopes and floor to construct the final subbase design grades. During grading, an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor continually rolls the surface to maintain compaction.</p>
	<p><u>Cell 1 Construction</u></p> <p>No work in the Cell 1 construction area today.</p>
	<p><u>Geosynthetic Materials</u></p> <p>As of today, the following geosynthetics for the project are approved for delivery:</p> <p>CETCO Bentomat FWL GCL, Agru 60 mil double-sided textured HDPE Microspike geomembrane, Geocell System, 16 oz/sy nonwoven geotextile, and 6 oz/sy nonwoven geotextile.</p>
1600	I left the site.

Curtis Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 018**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Thursday

DATE: DAY: 4 MONTH: February

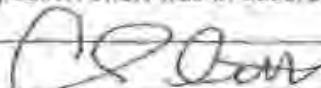
YEAR: 2010

WEATHER: Sunny and warm during the day.

0700	I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 740 articulated haul truck, Caterpillar 735 articulated haul truck, Caterpillar D6 LGP dozer, and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>The contractor continues to excavate the NLEP pond to construct the design grades. The excavated material is being placed along the northern side (mountain side) of the NLEP to construct the design grades along the perimeter.</p> <p>The contractor continues to cut the NLEP slopes and floor to construct the final subbase design grades. During grading, an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor continually rolls the surface to maintain compaction.</p>
	<p><u>Cell 1 Construction</u></p> <p>The contractor has begun to place compacted fill (onsite soils) to construct the subbase design grades within Cell 1 (Cells 1C &amp; 1D). The existing subbase condition was scarified using a Caterpillar 140H motor grader, moisture conditioned using a water truck, and finally compacted using Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p> <p>The contractor is hauling the NLEP trimmings, which are being excavated to obtain final NLEP subbase grades, to the Cell 1 area to be used as compacted fill (onsite soils) material.</p> <p>The NLEP trimmings material is being placed into two Caterpillar 735 articulated haul trucks using a Hitachi 450 LC excavator. The haul trucks then dump the material directly into the limits of Cell 1 (Cells 1C &amp; 1D) construction. The lifts are uniformly graded to 8-inch loose layers using a Caterpillar D6 LGP dozer, moisture conditioned using two water trucks, and then compacted using an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor. Several field density tests (FDTs) using a Troxler portable nuclear moisture/density gauge indicate the compaction effort was in accordance with the project specifications.</p>

s Scott

Printed Name



Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion

LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02

DAY/DATE: 4 February 2010

	A 3-inch thin-wall Shelby tube was advanced into the compacted fill within the nuclear gauge footprint at fill density test location FDT-1 using an Army Corps sampler. The sample was extracted by hand, capped at each end, and then labeled TW-001. The sample will be used to compare the in-place moisture and density as measured by the nuclear gauge and by method ASTM D 2937 (Density of Soils by Drive Cylinder Method).
1600	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 019**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Friday

DATE DAY 5 MONTH February

YEAR: 2010

WEATHER: Sunny and warm during the day.

0700	I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Caterpillar 140H motor grader, Deere B44J front end loader, Komatsu backhoe, Caterpillar 740 articulated haul truck, Caterpillar 735 articulated haul truck, Caterpillar D6 LGP dozer, and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p> <p>Equipment arrived on site today: End dump "Bobcat" haul truck, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>The contractor has temporarily suspended construction of NLEP earthwork.</p>
	<p><u>Cell 1 Construction</u></p> <p>The contractor continues to place compacted fill (onsite soils) to construct the subbase design grades within Cell 1 (Cells 1C &amp; 1D). The existing subbase condition was scarified using a Caterpillar 140H motor grader, moisture conditioned using a water truck, and finally compacted using Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p> <p>The contractor is hauling the compacted fill (onsite soils) material from the existing sand stockpile which is located west of the NLEP. The compacted fill material is being placed into two Caterpillar 735 articulated haul trucks and one end dump "bobcat" haul truck using a Hitachi 450 LC excavator. The haul trucks dump the compacted fill material directly into the limits of Cell 1 (Cells 1C &amp; 1D) construction. The lifts are uniformly graded to 8-inch to 10-inch loose lifts using a Caterpillar D6 LGP dozer, moisture conditioned using two water trucks, and then compacted using an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor. Several field density tests (FDTs) using a Troxler portable nuclear moisture/density gauge indicate the compaction effort was in accordance with the project specifications.</p>
1800	I left the site.

C. J. Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

Report Sequence No.: 020

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Monday

DATE:      DAY: 8      MONTH: February      YEAR: 2010

WEATHER: Sunny and warm during the day.

0630	I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 740 articulated haul truck, Caterpillar 735 articulated haul truck, Caterpillar D6 LGP dozer, End dump "Bobcat" haul truck, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>The contractor has temporarily suspended construction of NLEP earthwork.</p>
	<p><u>Cell 1 Construction</u></p> <p>The contractor continues to place compacted fill (onsite soils) to construct the subbase design grades within Cell 1 (Cells 1C &amp; 1D).</p> <p>The contractor depleted the existing sand stockpile which is located west of the NLEP, and has begun to excavate the grades for the New Infiltration Basin (NIB). The excavated sand material is hauled to Cell 1 and used as subbase compacted fill (onsite soils).</p> <p>The compacted fill (onsite soils) material is being placed into two Caterpillar 735 articulated haul trucks and one end dump "bobcat" haul truck using a Hitachi 450 LC excavator. The haul trucks dump the compacted fill material directly into the limits of Cell 1 (Cells 1C &amp; 1D) construction. The lifts are uniformly graded to 8-inch to 10-inch loose lifts using a Caterpillar D6 LGP dozer, moisture-conditioned using two water trucks, and then compacted using an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor. Several field density tests (FDTs) using a Troxler portable nuclear moisture/density gauge indicate the compaction effort was in accordance with the project specifications.</p>
	<p><u>Survey</u></p> <p>A survey crew from Esaki Surveying &amp; Mapping, Inc. is on site this morning to set grade control for the new infiltration basin and to establish limits of Cell 1 (Cells 1C &amp; 1D) to facilitate the final subbase compacted fill construction.</p>

Scott  
Printed Name



Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion

LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02

DAY/DATE: 8 February 2010

	<u>New Infiltration Basin (NIB)</u> The contractor has begun to excavate the lines and grades to construct the new infiltration basin.
1600	I left the site.

Chris Scott  
Printed Name

  
Signature

cc: Mike Minch

**DAILY FIELD REPORT**

Report Sequence No.: 021

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298 TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Tuesday

DATE: DAY 9 MONTH: February YEAR: 2010

WEATHER: Sunny and warm during the day.

0630	I arrived on site. Goodfellow Bros. is already on site.
	Equipment on site today:  Hitachi 450 LC excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 740 articulated haul truck, Caterpillar 735 articulated haul truck, Caterpillar D6 LGP dozer, End dump "Bobcat" haul truck, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.
1000	I attended the weekly construction meeting.
1100	Returned from the weekly construction meeting.
	<u>New Leachate Evaporation Pond (NLEP)</u>  The contractor continues to final grade the NLEP floor and side slope using a Caterpillar 140H motor grader.
	<u>Cell 1 Construction</u>  The contractor continues to place compacted fill (onsite soils) to construct the subbase design grades within Cell 1 (Cells 1C & 1D).  The contractor continues to excavate the grades for the New Infiltration Basin (NIB). The excavated sand is hauled to Cell 1 and used as subbase compacted fill (onsite soils).  The compacted fill material is being placed into two Caterpillar 735 articulated haul trucks and one end dump "bobcat" haul truck using a Hitachi 450 LC excavator. The haul trucks dump the compacted fill material directly into the limits of Cell 1 (Cells 1C & 1D) construction. The lifts are uniformly graded to 8-inch to 10-inch loose lifts using a Caterpillar D6 LGP dozer, moisture-conditioned using two water trucks, and then compacted using an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor. Several field density tests (FDTs) using a Troxler portable nuclear moisture/density gauge indicate the compaction effort was in accordance with the project specifications.
	<u>New Infiltration Basin (NIB)</u>  The contractor continues to excavate the lines and grades to construct the new infiltration basin.
1600	I left the site.

Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 022**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Wednesday

DATE: DAY: 10    MONTH: February    YEAR: 2010

WEATHER: Overcast, cloudy and warm during the day.

0630	I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 740 articulated haul truck, Caterpillar 735 articulated haul truck, Caterpillar D6 LGP dozer, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p> <p>Equipment off site today: End dump "Bobcat" haul truck.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>The contractor continues to final grade the NLEP floor and side slope using a Caterpillar 140H motor grader.</p>
	<p><u>Cell 1 Construction</u></p> <p>The contractor continues to place compacted fill (onsite soils) to construct the subbase design grades within Cell 1 (Cells 1C &amp; 1D).</p> <p>The contractor continues to excavate the grades for the New Infiltration Basin (NIB). The excavated sand is hauled to Cell 1 and used as subbase compacted fill (onsite soils).</p> <p>A sample (SB-004) was collected from the excavated NIB sand and was sent to Precision Laboratories for geotechnical testing.</p> <p>The compacted fill material is being placed into two Cat 735 articulated haul trucks and one end dump "bobcat" haul truck using a Hitachi 450 LC excavator. The haul trucks dump the compacted fill material directly into the limits of Cell 1 (Cells 1C &amp; 1D) construction. The lifts are uniformly graded to 8-inch to 10-inch loose lifts using a Caterpillar D6 LGP dozer, moisture-conditioned using two (2) water trucks, and then compacted using an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor. Several field density tests (FDTs) using a Troxler portable nuclear moisture/density gauge indicate the compaction effort was in accordance with the project specifications.</p> <p>The contractor has removed the existing electrical conduit from within the limits of Cell 1 (Cells 1C &amp; 1D). The</p>

Scott

Printed Name



Signature

cc: Mike Minch



PROJECT: Phase II Lateral Expansion

LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02

DAY/DATE: 10 February 2010

	excavated utility trench was backfilled and compacted using sand (onsite soils).
	<u>New Infiltration Basin (NIB)</u> The contractor continues to excavate the lines and grades to construct the new infiltration basin.
	<u>Fencing</u> Wellington Fencing company is on site working to install the new fencing along the western side of the access road into the landfill as shown on Drawing 2 of the Construction Drawings.
	<u>Mixed Waste Drop Off</u> The contractor sawcuts and removes the existing concrete sidewalk adjacent to the mixed waste drop off in accordance with the "Site Plan" identified on Drawing 25 of the Construction Drawings.
1600	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 023**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298 TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

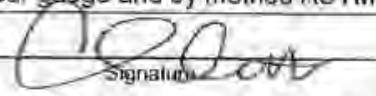
DAY OF WEEK: Thursday

DATE: DAY: 11 MONTH: February YEAR: 2010

WEATHER: Sunny and warm during the day.

0630	I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 740 articulated haul truck, Caterpillar 735 articulated haul truck, Caterpillar D6 LGP dozer, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p> <p>Equipment arrived on site today: Hitachi BH278 excavator.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>The contractor continues to final grade the floor and side slope of the NLEP using a Caterpillar 140H motor grader.</p>
	<p><u>Cell 1 Construction</u></p> <p>The contractor continues to place compacted fill (onsite soils) to construct the subbase design grades within Cell 1 (Cells 1C &amp; 1D).</p> <p>The contractor continues to excavate the grades for the New Infiltration Basin (NIB). The excavated sand is hauled to Cell 1 and used as subbase compacted fill (onsite soils).</p> <p>The compacted fill (onsite soils) material is being placed into two Caterpillar 735 articulated haul trucks using a Hitachi 450 LC excavator. The haul trucks dump the compacted fill material directly into the limits of Cell 1 (Cells 1C &amp; 1D) construction. The lifts are uniformly graded to 8-inch to 10-inch loose lifts using a Caterpillar D6 LGP dozer, moisture-conditioned using two water trucks, and then compacted using an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor. Several field density tests (FDTs) using a Troxler portable nuclear moisture/density gauge indicate the compaction effort was in accordance with the project specifications.</p> <p>A 3-inch thin-wall Shelby tube was advanced into the compacted fill within the nuclear gauge footprint at field density test location FDT-50 using an Army Corps sampler. The sample was extracted by hand, capped at each end, and then labeled TW-003. The sample will be used to compare the in-place moisture and density as measured by the nuclear gauge and by method ASTM D 2937 (Density of Soils by Drive Cylinder Method).</p>

is Scott  
Printed Name



cc: Mike Minch

PROJECT: Phase II Lateral Expansion  
LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02  
DAY/DATE: 11 February 2010

	The contractor has removed the existing electrical conduit from within the limits of Cell 1 (Cells 1C & 1D). The excavated utility trench was backfilled and compacted using excavated NIB sand material
	<u>New Infiltration Basin (NIB)</u> The contractor has suspended construction in this area today.
	<u>Fencing</u> Wellington Fencing company is on site working to install the new fencing along the western side of the access road into the landfill as shown on Drawing 2 of the Construction Drawings.
	<u>Mixed Waste Drop Off</u> The contractor has sawcut and removed the existing concrete sidewalk adjacent to the mixed waste drop off in accordance with the "Site Plan" identified on Drawing 25 of the Construction Drawings.
1600	I left the site.

Chris Scott  
Printed Name

  
Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 024**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Friday

DATE: DAY: 12 MONTH: February

YEAR: 2010

WEATHER: Sunny and warm during the day.

0630	I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 740 articulated haul truck, Caterpillar 735 articulated haul truck, Caterpillar D6 LGP dozer, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p> <p>Equipment arrived on site today: Caterpillar D5 dozer with GPS grade control.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>The contractor has suspended construction on the NLEP today.</p>
	<p><u>Cell 1 Construction</u></p> <p>The contractor continues to place compacted fill (onsite soils) to construct the subbase design grades within Cell 1 (Cells 1C &amp; 1D).</p> <p>The contractor continues to excavate the grades for the New Infiltration Basin (NIB). The excavated sand is hauled to Cell 1 and used as subbase compacted fill (onsite soils).</p> <p>The compacted fill material is being placed into two Caterpillar 735 articulated haul trucks using a Hitachi 450 LC excavator. The haul trucks dump the compacted fill material directly into the limits of Cell 1 (Cells 1C &amp; 1D) construction. The lifts are uniformly graded to 8-inch to 10-inch loose lifts using a Caterpillar D6 LGP dozer, moisture-conditioned using two water trucks, and then compacted using an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor. Several field density tests (FDTs) using a Troxler portable nuclear moisture/density gauge indicate the compaction effort was in accordance with the project specifications.</p>
	<p><u>New Infiltration Basin (NIB)</u></p> <p>The contractor has suspended construction in this area today.</p>
	<p><u>Fencing</u></p> <p>Wellington Fencing company has completed installation of the new fencing along the western side of the</p>

Scott

Printed Name



Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion  
LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02  
DAY/DATE: 12 February 2010

	access road into the landfill as shown on Drawing 2 of the Construction Drawings.
1600	I left the site.

Chris Scott  
Printed Name

  
Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 025**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Tuesday

DATE:      DAY: 16      MONTH: February      YEAR: 2010

WEATHER: Sunny and warm during the day.

0630	I arrived on site. Goodfellow Bros. is already on site.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 740 articulated haul truck, Caterpillar 735 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.
1000	I attended the weekly construction meeting.
	I returned from the weekly construction meeting.
	<u>New Leachate Evaporation Pond (NLEP)</u>  The contractor has begun the process of final grading to achieve design grades of the leachate impoundment.
	<u>Cell 1 Construction</u>  The contractor continues to place compacted fill (onsite soils) to construct the subbase design grades within Cell 1 (Cells 1C & 1D).  The contractor continues to excavate the grades for the New Infiltration Basin (NIB). The excavated sand is hauled to Cell 1 and used as subbase compacted fill (onsite soils).  The compacted fill material is being placed into two (2) Caterpillar 735 articulated haul trucks using a Hitachi 450 LC excavator. The haul trucks dump the compacted fill material directly into the limits of Cell 1 (Cells 1C & 1D) construction. The lifts are uniformly graded to 8-inch to 10-inch loose lifts using a Caterpillar D6 LGP dozer, moisture-conditioned using two (2) water trucks, and then compacted using an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.  Keith Suga (Goodfellow Bros.) has informed me that the Kauai Aggregate Quarry has produced stockpiles of the 1½-inch base course and ¾-inch minus gravel materials which Goodfellow Bros. proposes to be used for the Cell 1 Granular Drainage Layer and the NLEP Granular Operations Layer, respectively. I went to the quarry and collected samples of 1½-inch base course and ¾-inch minus gravel from the stockpiled sources.

Chris Scott

Printed Name



Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion

LOCATION: Kekaha Landfill

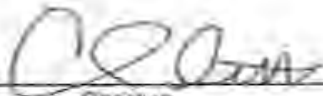
PROJECT NO.: WG1298 / 02

DAY/DATE: 16 February 2010

	<p><u><i>New Infiltration Basin (NIB)</i></u></p> <p>Due to the identification of existing underground utilities within the footprint of the infiltration basin design side slope, the contractor has suspended construction in this area until the issue can be resolved.</p>
1600	I left the site and traveled to Fed Ex to drop off the quarry samples (1½-inch base course and ¾-inch minus granular drainage materials) for delivery to Precision Laboratory.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 026**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Wednesday

DATE: DAY: 17      MONTH: February      YEAR: 2010

WEATHER: Sunny and warm during the day.

0630	I arrived on site. Goodfellow Bros. is already on site.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 740 articulated haul truck, Caterpillar 735 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u>  The contractor continues final grading operations to achieve design grades of the NLEP.
	<u>Cell 1 Construction</u>  The contractor has temporarily suspended construction of Cell 1.
	<u>New Infiltration Basin (NIB)</u>  The contractor has suspended construction in the NIB due to the identification of existing underground utilities within the NIB side slope.
1600	I left the site

Chris Scott

Printed Name



Signature

cc: Mike Minch



**DAILY FIELD REPORT**

Report Sequence No.: 027

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Thursday

DATE: DAY: 18 MONTH: February

YEAR: 2010

WEATHER: Sunny and warm during the day.

0630	I arrived on site. Goodfellow Bros. is already on site.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 740 articulated haul truck, Caterpillar 735 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u>  The contractor continues final grading operations to achieve design grades of the NLEP.  No compacted fill was placed in this area today.
	<u>Cell 1 Construction</u>  The contractor has temporarily suspended construction of Cell 1.
	<u>New Infiltration Basin (NIB)</u>  The contractor is working to final grade the eastern and northern ends of the NIB side slopes to achieve design grades.  No compacted fill was placed in this area today.
1600	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 028**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Friday

DATE: DAY: 19 MONTH: February

YEAR: 2010

WEATHER: Sunny and warm during the day

0630	I arrived on site. Goodfellow Bros. is already on site.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator. Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 740 articulated haul truck, Caterpillar 735 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u>  The contractor continues final grading operations to achieve design grades of the NLEP.  No compacted fill was placed in this area today
	<u>Cell 1 Construction</u>  The contractor has temporarily suspended construction of Cell 1.
	<u>New Infiltration Basin (NIB)</u>  The contractor is working to final grade the eastern and northern ends of the NIB side slopes to achieve design grades.  No compacted fill was placed in this area today.
1600	I left the site.

\_\_\_\_\_  
is Scott  
Printed Name

  
Signature

cc: \_\_\_\_\_  
Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 029**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Monday

DATE: DAY: 22      MONTH: February      YEAR: 2010

WEATHER: Sunny and warm during the day.

0630	I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 740 articulated haul truck, Caterpillar 735 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>The contractor has begun to excavate the anchor trench using a Hitachi BH278 excavator. The anchor trench is visually observed to be constructed in accordance with the project requirements.</p> <p>The contractor continues to final grade the floor of the NLEP using a Caterpillar 140H motor grader with GPS grade control. The trimmings from final grading operations are hauled from the pond to Cell 1 and placed as compacted fill (onsite soils).</p>
	<p><u>Cell 1 Construction</u></p> <p>The contractor continues to place compacted fill (onsite soils), taken from the NLEP final grading trimmings, to construct the subbase design grades within Cell 1 (Cells 1C &amp; 1D).</p> <p>The compacted fill material is being placed into two Cat. 735 articulated haul trucks using a Hitachi 450 LC excavator. The haul trucks dump the compacted fill material directly into the limits of Cell 1 (Cells 1C &amp; 1D) construction. The lifts are uniformly graded to 8-inch to 10-inch loose lifts using a Cat. D5 dozer with GPS grade control, moisture conditioned using two water trucks, and then compacted using an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor. Several field density tests (FDTs) using a Troxler portable nuclear moisture/density gauge indicate the compaction effort was in accordance with the project specifications.</p>
	<p><u>New Infiltration Basin (NIB)</u></p> <p>The contractor has suspended construction in this area today.</p>

Chris Scott

Printed Name



Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion  
LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02  
DAY/DATE: 22 February 2010

	<p><u>Geosynthetics Inventory</u></p> <p>Three (3) shipping containers were delivered to the site today. The following materials were inventoried and received in good condition;</p> <ul style="list-style-type: none"><li>• 14 rolls of CETCO Bentomat FWL Geosynthetic Clay Liner (GCL);</li><li>• 28 rolls of TNS E160 16 oz/sy nonwoven geotextile; and</li><li>• 84 rolls of TNS E060 6 oz/sy nonwoven geotextile.</li></ul>
1630	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 030**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298 TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Tuesday

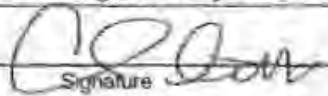
DATE: DAY: 23 MONTH: February YEAR: 2010

WEATHER: Sunny and warm during the day.

0630	I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 740 articulated haul truck, Caterpillar 735 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p>
1000	<p>I attended the weekly construction meeting.</p> <p>Returned from the construction meeting.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>The contractor continues to excavate the anchor trench using a Hitachi BH278 excavator. The anchor trench is visually observed to be constructed in accordance with the project requirements.</p> <p>The contractor continues to final grade the NLEP floor using a Caterpillar 140H motor grader. The trimmings from final grading operations are hauled from the pond to Cell 1 and placed as compacted fill (onsite soils).</p>
	<p><u>Cell 1 Construction</u></p> <p>The contractor continues to place compacted fill (onsite soils), taken from the NLEP final grading trimmings, to construct the subbase design grades within Cell 1 (Cells 1C &amp; 1D).</p> <p>The compacted fill material is being placed into two Cat. 735 articulated haul trucks using a Hitachi 450 LC excavator. The haul trucks dump the compacted fill material directly into the limits of Cell 1 (Cells 1C &amp; 1D) construction. The lifts are uniformly graded to 8-inch to 10-inch loose lifts using a Cat. D5 LGP dozer with GPS grade control, moisture-conditioned using two water trucks, and then compacted using an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor. Several field density tests (FDTs) using a Troxler portable nuclear moisture/density gauge indicate the compaction effort was in accordance with the project specifications.</p> <p>A 3-inch thin-wall Shelby tube was advanced into the compacted fill within the nuclear gauge footprint at field density test location FDT-66 using an Army Corps sampler. The sample was extracted by hand, capped at</p>

L. S. Scott

Printed Name



Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion  
LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02  
DAY/DATE: 23 February 2010

	each end, and then labeled TW-004. The sample will be used to compare the in-place moisture and density measured by the nuclear gauge and by method ASTM D 2937 (Density of Soils by Drive Cylinder Method).
	<u>New Infiltration Basin (NIB)</u> The contractor has suspended construction in this area today.
	<u>Geosynthetics Inventory</u> Two (2) shipping containers were delivered to the site today. The following materials were inventoried and received in good condition; <ul style="list-style-type: none"><li>• 27 rolls of TNS E160 16 oz/sy nonwoven geotextile; and</li><li>• 14 rolls of AGRU 60 mil double-sided textured HDPE Microspike geomembrane.</li></ul>
1630	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 031**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Wednesday

DATE: DAY: 24 MONTH: February

YEAR: 2010

WEATHER: Sunny and warm during the day.

0630	I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 740 articulated haul truck, Caterpillar 735 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>The contractor continues to excavate the anchor trench using a Hitachi BH278 excavator. The anchor trench is visually observed to be constructed in accordance with the project requirements.</p> <p>The contractor continues to final grade the NLEP floor using a Caterpillar 140H motor grader. The trimmings from final grading operations are hauled from the pond to Cell 1 and placed as compacted fill (onsite soils).</p> <p>Keith Suga (Goodfellow Bros.) has identified a 3-inch minus granular drainage material from the Kauai Aggregate Quarry as a proposed source for the NLEP Granular Fill (backfill for sideslope Geocell). I went to the quarry and visually observed a poorly-graded, clean, subangular coarse gravel. A sample of the 3-inch minus material was collected into a 5-gallon bucket and delivered to Precision Laboratories for gradation testing.</p>
	<p><u>Cell 1 Construction</u></p> <p>The contractor has suspended construction on Cell 1 at this time.</p>
	<p><u>New Infiltration Basin (NIB)</u></p> <p>The contractor has suspended construction in this area today.</p>
	<p><u>Geosynthetics Inventory</u></p> <p>Three (3) shipping containers were delivered to the site today. The following materials were inventoried and received in good condition:</p> <ul style="list-style-type: none"> <li>• 42 rolls of AGRU 60 mil double-sided textured HDPE Microspike geomembrane and 16 rolls of HDPE welding rod.</li> </ul>

Chris Scott  
Printed Name

  
Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion  
LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02  
DAY/DATE: 24 February 2010

	<p><u>Perimeter Access Road Improvement</u></p> <p>Keith has identified a 1.5-inch minus base course gravel material located at the Kauai Aggregate Quarry as a proposed source to be used for the perimeter access road improvement. I went to the quarry and visually observed a poorly-graded gravel with fines. A sample of the 1.5-inch minus gravel was collected into a 5-gallon bucket and delivered to Hirata &amp; Associates for gradation testing.</p>
1630	I left the site.

Chris Scott  
Printed Name

  
Signature

cc: Mike Minch



**DAILY FIELD REPORT**

**Report Sequence No.: 032**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Thursday

DATE: DAY: 25      MONTH: February      YEAR: 2010

WEATHER: Sunny and warm during the day.

0630	I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>The contractor continues to excavate the anchor trench using a Hitachi BH278 excavator. The anchor trench is visually observed to be constructed in accordance with the project requirements.</p> <p>The contractor has completed the final grading of the floor within the NLEP. Several field density tests using a portable Nuclear moisture/density gauge indicate the 6-inch final subbase compacted fill was placed and compacted in accordance with the project specifications.</p>
	<p><u>Cell 1 Construction</u></p> <p>The contractor continues to final grade the Cell 1 (Cells 1C &amp; 1D) floor using a D5 dozer with GPS grade control. An Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor continually compacts the graded surface.</p>
	<p><u>New Infiltration Basin (NIB)</u></p> <p>The contractor has suspended construction in this area today.</p>
	<p><u>Geosynthetics Inventory</u></p> <p>One (1) shipping container was delivered to the site today. The following materials were inventoried and received in good condition:</p> <ul style="list-style-type: none"> <li>• 16 pallets of Geosystem's GEOCELL, Model number GW30V80834; and</li> <li>• one pallet of Presto ATRA -4 clips.</li> </ul>
1630	I left the site.

\_\_\_\_\_, s Scott

Printed Name



Signature

cc: \_\_\_\_\_ Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 033**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Friday

DATE:    DAY: 26    MONTH: February      YEAR: 2010

WEATHER: Sunny and warm during the day.

0630	I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D8 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>The contractor continues to excavate the anchor trench using a Hitachi BH278 excavator. The anchor trench is visually observed to be constructed in accordance with the project requirements.</p> <p>The western end of the NLEP was intentionally left partially constructed to allow for access into the floor of the NLEP. The final grading will be completed and surveyed later in the project.</p> <p>The contractor has completed the final grading of the floor within the NLEP.</p> <p>Esaki Surveying and Wagner Engineering Services, Inc. arrived on site this morning to survey the NLEP design grades.</p> <p>During construction today Goodfellow Bros, Esaki and Wagner checked control points at locations K1 thru K4. The survey control data is as follows:</p> <p><u>Goodfellow Bros</u></p> <p>K-1 (Southeast Corner of the site): N.55154.01, E.1557985.58, EL: 11.58          K-2 (Southwest Corner of the site): N.56416.93, E.156890.86, EL: 11.62          K-3 (Northwest Corner of the site): N.57580.74, E.1557995.96, EL: 11.96          K-4 (Northeast Corner of the site): N.56311.73, E.1559172.81, EL: 12.67</p>

Scott

Printed Name



Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion

LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02

DAY/DATE: 26 February 2010

	<p><u>Wagner Engineering Services, Inc.</u></p> <p>K-1 (Southeast Corner of the site): N.53989.07, E.1556599.02, EL: 11.58 K2 (Southwest Corner of the site): N.55251.87, E.1555504.29, EL: 11.62 K3 (Northwest Corner of the site): N.56415.60, E.1556609.42, EL: 11.99 K4 (Northeast Corner of the site): N.55146.68, E.1557786.08, EL: 12.60</p> <p><u>Esaki Surveying and Mapping</u></p> <p>K-1 (Southeast Corner of the site): N.53989.050, E.1556598.904, EL: 11.24 K2 (Southwest Corner of the site): N.55251.931, E.1555504.216, EL: 11.41 K3 (Northwest Corner of the site): N.56415.6723, E.1556609.358, EL: 11.986 K4 (Northeast Corner of the site): N.55146.783, E.1557786.202, EL: 12.42</p> <p>All of the prepared NLEP subbase grades completed, including anchor trench, were surveyed today by both Esaki and Wagner.</p>
	<p><u>Cell 1 Construction</u></p> <p>The contractor continues to final grade the floor of Cell 1 (Cells 1C &amp; 1D) using a D5 dozer with GPS grade control. An Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor continually compacts the graded surface.</p>
	<p><u>New Infiltration Basin (NIB)</u></p> <p>The contractor has suspended construction in this area today.</p>
	<p><u>Geosynthetics Inventory</u></p> <p>No materials were delivered to the site today.</p>
1630	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 034**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Monday

DATE: DAY: 1      MONTH: March      YEAR: 2010

WEATHER: Sunny and warm during the day.

0630	I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>The contractor continues to excavate the anchor trench along the western end of the NLEP using a Hitachi BH278 excavator. The anchor trench is visually observed to be constructed in accordance with the project requirements.</p> <p>The section of the western end of the NLEP will be intentionally left partially constructed to allow for access in to the floor of the NLEP. The final grading will be completed and surveyed later in the project.</p>
	<p><u>Cell 1 Construction</u></p> <p>The contractor continues to final grade the Cell 1 (Cells 1C &amp; 1D) floor using a D5 dozer with GPS grade control. An Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor continually compacts the graded surface.</p>
	<p><u>New Infiltration Basin (NIB)</u></p> <p>The contractor has suspended construction in this area today.</p>
	<p><u>Geosynthetics Inventory</u></p> <p>Five (5) shipping containers were delivered to the site today. The following materials were inventoried and received in good condition:</p> <ul style="list-style-type: none"> <li>• 42 rolls of Agru 60 mil double-sided textured HDPE Microspike geomembrane with 15 spools of HDPE welding rod; and</li> <li>• 30 rolls of CETCO FWL GCL</li> </ul>

Chris Scott  
Printed Name



Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion  
LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02  
DAY/DATE: 1 March 2010

	The GCL material was stockpiled onto wooden pallets and protected with plastic sheeting. The plastic cover was anchored to the ground using sand bags.
1630	I left the site.

Chris Scott  
Printed Name

  
Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 035**

**PROJECT:** Kekaha Landfill

**LOCATION:** Kekaha, Kauai, Hawaii

**PROJECT NO.:** WG1298      **TASK NO.:** 02

**DESCRIPTION:** Phase II Lateral Expansion  
Cell 1 Base Liner Construction

**CONTRACTORS:** Goodfellow Bros. / Northwest Linings

**DAY OF WEEK:** Tuesday

**DATE:** DAY: 2      MONTH: March      YEAR: 2010

**WEATHER:** Sunny and warm during the day.

0630	I arrived on site. Goodfellow Bros. is already on site.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.
1000	I attended the weekly construction meeting.
	Returned from the weekly construction meeting
	<u>New Leachate Evaporation Pond (NLEP)</u>  The contractor continues to excavate the anchor trench along the western end of the NLEP using a Hitachi BH278 excavator. The anchor trench is visually observed to be constructed in accordance with the project requirements.  The section of the western end of the NLEP will be intentionally left partially constructed to allow for access in to the floor of the NLEP. The final grading will be completed and surveyed later in the project.
	<u>Cell 1 Construction</u>  The contractor has completed the majority of the floor and has begun to construct the perimeter berm within the limits of Cell 1 (Cells 1C & 1D). Material is excavated from the floor of the New Infiltration Basin (NIB), loaded into a haul truck, and then placed within the limits of the Cell 1 perimeter berm to construct the design grades. A Caterpillar D5 dozer with GPS grade control uniformly grades the placed material to a uniform 8 to 10-inch loose lift. Once the lift has been spread over the entire width of the berm, an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor provides compaction effort. Several field density tests using a Troxler portable nuclear moisture/density gauge indicate the compaction effort meets the project specifications.
	<u>New Infiltration Basin (NIB)</u>  The contractor has begun to over-excavate the floor of the NIB to obtain compacted fill (onsite soils) material for the construction of the Cell 1 (Cells 1C & 1D) perimeter berm.

Scott  
Printed Name

  
Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion

LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02

DAY/DATE: 2 March 2010

	<p><u>Geosynthetics Inventory</u></p> <p>Six (6) shipping containers were delivered to the site today. The following materials were inventoried and received in good condition:</p> <ul style="list-style-type: none"><li>• 90 rolls of CETCO FWL GCL.</li></ul> <p>The GCL material was stockpiled onto wooden pallets and protected with plastic sheeting. The plastic covering was anchored to the ground using sand bags.</p>
1630	I left the site.

Chris Scott \_\_\_\_\_

Printed Name



Signature

cc: Mike Minch \_\_\_\_\_

**DAILY FIELD REPORT**

**Report Sequence No.: 036**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298 TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

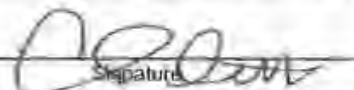
DAY OF WEEK: Wednesday

DATE: DAY: 3 MONTH: March YEAR: 2010

WEATHER: Sunny and warm during the day.

0600	I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>Survey:</p> <p>Esaki Surveying and Mapping was on site this afternoon to collect additional as-built survey points along the eastern limits of the NLEP. The survey crew collected data from the inside slope and anchor trench.</p> <p>Survey points 436, 447, 458 and 461 will require survey once the temporary access ramp has been removed, and the west end of the NLEP has been constructed to the design grades.</p>
	<p><u>Cell 1 Construction</u></p> <p>The contractor continues to construct the perimeter berm within the limits of Cell 1 (Cells 1C &amp; 1D). Material is excavated from the floor of the New Infiltration Basin (NIB), loaded into a haul truck using an excavator, and then placed within the limits of the Cell 1 perimeter berm to construct the design grades.</p> <p>A Caterpillar D5 dozer with GPS grade control uniformly grades the placed material to a uniform 8 to 10-inch loose lift. Once the lift has been spread over the entire width of the berm, an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor provides compaction effort. Several field density tests using a Troxler portable nuclear moisture/density gauge indicate the compaction effort meets the project specifications.</p>
	<p><u>New Infiltration Basin (NIB)</u></p> <p>The contractor continues to over-excavate the floor of the NIB to obtain compacted fill (onsite soils) material for the construction of the Cell 1 (Cells 1C &amp; 1D) perimeter berm.</p>
	<p><u>Geosynthetics Inventory</u></p> <p>Four (4) shipping containers were delivered to the site today. The following materials were inventoried and</p>

Scott  
Printed Name

  
Signature

cc: Mike Minch



PROJECT: Phase II Lateral Expansion

LOCATION: Kekaha Landfill

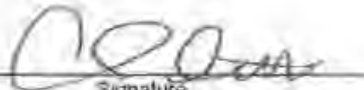
PROJECT NO.: WG1298 / 02

DAY/DATE: 3 March 2010

	<p>received in good condition:</p> <ul style="list-style-type: none"><li>• 60 rolls of CETCO FWL GCL.</li></ul> <p>The GCL material was stockpiled onto wooden pallets and protected with plastic sheeling. The plastic covering was anchored to the ground using sand bags.</p>
1630	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Finch

**DAILY FIELD REPORT**

**Report Sequence No.: 037**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Thursday

DATE: DAY: 4      MONTH: March

YEAR: 2010

WEATHER: Sunny and warm during the day

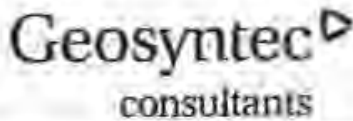
0630	I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>No work in this area today.</p>
	<p><u>Cell 1 Construction</u></p> <p>The contractor continues to construct the perimeter berm within the limits of Cell 1 (Cells 1C &amp; 1D). Material is excavated from the floor of the New Infiltration Basin (NIB), loaded into a haul truck using an excavator, and then placed within the limits of the Cell 1 perimeter berm to construct the design grades.</p> <p>A Caterpillar D5 dozer with GPS grade control uniformly grades the placed material to a uniform 8 to 10-inch loose lift. Once the lift has been spread over the entire width of the berm, an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor provides compaction effort. Several field density tests using a Troxler portable nuclear moisture/density gauge indicate the compaction effort meets the project specifications.</p>
	<p><u>New Infiltration Basin (NIB)</u></p> <p>The contractor continues to over-excavate the floor of the NIB to obtain compacted fill (onsite soils) material for the construction of the Cell 1 (Cells 1C &amp; 1D) perimeter berm.</p>
	<p><u>Geosynthetics Inventory</u></p> <p>Three (3) shipping containers were delivered to the site today. The following materials were inventoried and received in good condition:</p> <ul style="list-style-type: none"> <li>• 45 rolls of CETCO FWL GCL.</li> </ul> <p>The GCL material was stockpiled onto wooden pallets and protected with plastic sheeting. The plastic covering was anchored to the ground using sand bags.</p>
1630	I left the site.

s Scott  
Printed Name



Signature

cc: Mike Minch



Kekaha Landfill  
Kekaha, Kauai, Hawaii

DAILY FIELD REPORT

Report Sequence No.: 038

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298 TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Friday

DATE: DAY: 5 MONTH: March YEAR: 2010

WEATHER: Cool and cloudy with light rain during the day.

0630	I arrived on site. Goodfellow Bros. is already on site.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D8 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u>  No work in this area today.
	<u>Cell 1 Construction</u>  The contractor continues to construct the perimeter berm within the limits of Cell 1 (Cells 1C & 1D). Material is excavated from the floor of the New Infiltration Basin (NIB), loaded into a haul truck using an excavator, and then placed within the limits of the Cell 1 perimeter berm to construct the design grades.  A Caterpillar D5 dozer with GPS grade control uniformly grades the placed material to a uniform 8 to 10-inch loose lift. Once the lift has been spread over the entire width of the berm, an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor provides compaction effort. Several field density tests using a Troxler portable nuclear moisture/density gauge indicate the compaction effort meets the project specifications.
	<u>New Infiltration Basin (NIB)</u>  The contractor continues to over-excavate the floor of the NIB to obtain compacted fill (onsite soils) material for construction of the Cell 1 (Cells 1C & 1D) perimeter berm.
	<u>Geosynthetics Inventory</u>  No materials were delivered to the site today.
1630	I left the site.

Chris Scott

Printed Name

Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 039**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Monday

DATE:

DAY: 8

MONTH: March

YEAR: 2010

WEATHER: Cool and cloudy with light rain during the day.

0630	I arrived on site. Goodfellow Bros. is already on site.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u>  The contractor was rolling the floor of the NLEP using an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.
	<u>Cell 1 Construction</u>  The contractor continues to construct the perimeter berm within the limits of Cell 1 (Cells 1C & 1D). Material is excavated from the floor of the New Infiltration Basin (NIB), loaded into a haul truck using an excavator, and then placed within the limits of the Cell 1 perimeter berm to construct the design grades.  A Caterpillar D5 dozer with GPS grade control uniformly grades the placed material to a uniform 8 to 10-inch loose lift. Once the lift has been spread over the entire width of the berm, an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor provides compaction effort. Several field density tests using a Troxler portable nuclear moisture/density gauge indicate the compaction effort meets the project specifications.
	<u>New Infiltration Basin (NIB)</u>  The contractor continues to over-excavate the floor of the NIB to obtain compacted fill (onsite soils) material for construction of the Cell 1 (Cells 1C & 1D) perimeter berm.  The contractor has begun to remove the fire hydrant supply line along the southern side of the NIB. The pipe is removed in sections so as to not damage the pipe.
	<u>Geosynthetics Inventory</u>  No materials were delivered to the site today.
1630	I left the site.

Scott  
Printed Name:

  
Signature:

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 040**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298 TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Tuesday

DATE: DAY: 9 MONTH: March

YEAR: 2010

WEATHER: Cloudy and overcast during the day.

0630	I arrived on site. Goodfellow Bros. is already on site.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.
0930	Hari Sharma and Mike Minch (both of Geosyntec) are on site today for the weekly construction meeting and to conduct a site visit.
1000	Hari, Mike and I attend the weekly construction meeting.
1120	Returned from the weekly construction meeting.
	<u>New Leachate Evaporation Pond (NLEP)</u>  The contractor was rolling the floor of the NLEP using an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.
	<u>Cell 1 Construction</u>  The contractor continues to construct the perimeter berm within the limits of Cell 1 (Cells 1C & 1D).  The contractor has temporarily suspended the subbase compacted fill placement within the limits of the Cell 1 perimeter berm, and has begun to final grade the floor and sideslopes to obtain the design grades. Once the forcemain and forcemain penetration have been installed, the Cell 1 perimeter berm construction will resume.  The contractor has begun to expose the existing Phase II containment system tie-in along the western anchor trench.
	<u>New Infiltration Basin (NIB)</u>  The contractor continues to over-excavate the floor of the NIB to obtain compacted fill (onsite soils) material for construction of the Cell 1 (Cells 1C & 1D) perimeter berm.  The contractor continues to remove the fire hydrant supply line along the southern side of the NIB. The pipe is

is Scott

Printed Name

Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion  
LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02  
DAY/DATE: 9 March 2010

	removed in section so as to not damage the pipe.
	<u>Geosynthetics Installation</u> Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today. No geosynthetics installation work today as the construction equipment container is not on site. NWL is waiting for delivery of the container.
	<u>Geosynthetics Inventory</u> No materials were delivered to the site today.
1630	I left the site

Chris Scott  
Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 041**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Wednesday

DATE: DAY: 10 MONTH: March

YEAR: 2010

WEATHER: Cloudy and overcast during the day.

0630	I arrived on site. Goodfellow Bros. is already on site.
0700	Joel Mondragon (Northwest Lining Superintendent [NWL]) and five (5) technicians are on site today.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p> <p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p><u>Geosynthetics Installation</u></p> <p>NWL unloaded the equipment container and began to fill sand bags in preparation for deployment.</p> <p><u>Cell 1 Construction</u></p> <p>The contractor continues to construct the perimeter berm within the limits of Cell 1 (Cells 1C &amp; 1D).</p> <p>The contractor has temporarily suspended the subbase compacted fill placement within the limits of the Cell 1 perimeter berm, and has begun to final grade the floor and sideslopes to obtain the design grades. Once the forcemain and forcemain penetration have been installed, the Cell 1 perimeter berm construction will resume.</p> <p>The contractor continues to expose the existing Phase II containment system tie-in along the western anchor trench.</p> <p>ITC Water Management, Inc. (HDPE pipe welding subcontractor) is on site to remove a section of the existing cleanout within Cell 1D. The cleanout pipe was cut 1.80 feet below top of subbase grade and capped using an HDPE cap with an electro-fusion coupler. The existing cleanout section, existing vault, and backfill material were removed per AECOM's response to RFI #7, dated 5 March 2010. Goodfellow Bros. will monitor the new connection for 24 hours before backfilling to ensure the connection does not leak.</p> <p>Cleanout pipe GPS survey data by GBI as follows: N: 57015.00, E: 1557878.29; EL 11.61 (fill 1.8 ft)</p> <p><u>New Infiltration Basin (NIB)</u></p> <p>No work in this area today.</p>

G...s Scott

Printed Name

Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion

LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02

DAY/DATE: 10 March 2010

	<p><u>Geosynthetics Inventory</u></p> <p>One (1) shipping container was delivered to the site today. The following materials were inventoried and received in good condition:</p> <ul style="list-style-type: none"><li>• two (2) rolls of Agru 80-mil HDPE geomembrane;</li><li>• six (6) rolls of Agru 60-mil HDPE geomembrane; and</li><li>• fourteen (14) rolls of TNS E160 16 oz/sy geotextile.</li></ul>
1630	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch



DAILY FIELD REPORT

Report Sequence No.: 042

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Thursday

DATE: DAY: 11 MONTH: March

YEAR: 2010

WEATHER: Cool in the morning (69 degrees) sunny and warm (81 degrees) during the day.

0600	I arrived on site. Goodfellow Bros. is already on site.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p><u>Geosynthetic Installation</u></p> <p>NWL began to install the subbase 60 mil double-sided textured HDPE geomembrane in the NLEP today.</p> <p><u>60 mil DST geomembrane:</u></p> <p>NWL installed <u>67,724 sq ft</u> of 60 mil double-sided textured HDPE geomembrane above the approved NLEP subbase during construction today.</p> <p>Total subbase 60 mil HDPE geomembrane deployed to date is <u>67,724 sq ft</u>.</p> <p><u>28 panels</u> of subbase 60 mil HDPE geomembrane were used today in various widths and lengths for a total of <u>28 panels</u> to date.</p> <p><u>2,992 linear feet (lf)</u> of subbase 60 mil HDPE geomembrane fusion-welded seams were recorded today, for a total of <u>2,992 lf</u>. None of the seams were air tested today. The production seams not tested are documented and the seam air tests are pending.</p> <p>All trial welds for both fusion and extrusion welders were prepared and tested in the field. The field tensiometer tests results indicate the welders were able to achieve the required seam strengths for the project.</p> <p>Eight seam samples (DS-B-1 thru DS-B-8) were marked within the fusion-welded production seams for</p>

C. Scott

Printed Name



Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion

LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02

DAY/DATE: 11 March 2010

	destructive seam testing.
	<u>Cell 1 Construction</u> The contractor continues to construct the perimeter berm within the limits of Cell 1 (Cells 1C & 1D). The contractor has temporarily suspended the subbase compacted fill placement within the limits of the Cell 1 perimeter berm, and has begun to final grade the floor and sideslopes to obtain the design grades. Once the forcemain and forcemain penetration have been installed, the Cell 1 perimeter berm construction will resume. The contractor continues to expose the existing Phase II containment system tie-in along its western anchor trench (eastern side of Cell 1). The existing cleanout, which was cut and capped during construction yesterday, had been exposed for 24 hours for monitoring. No leaks were observed at the new connection; therefore, GBI backfilled the pipe using clean sand (onsite soils). The fill was placed in uniform lifts then compacted using a walk-behind pad-footed "jumping jack" compactor.
	<u>New Infiltration Basin (NIB)</u> No work in this area today.
	<u>Geosynthetics Inventory</u> No materials were delivered to the site today.
1630	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

Report Sequence No.: 043

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Friday

DATE: DAY: 12      MONTH: March

YEAR: 2010

WEATHER: Cool in the morning (69 degrees) sunny and warm (81 degrees) during the day.

0600	I arrived on site. Goodfellow Bros. is already on site.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	Equipment on site today:
	Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u>
	<u>Geosynthetics Installation</u>
	NWL continues to install the subbase 60 mil HDPE geomembrane today.
	<u>60 mil DST geomembrane:</u>
	NWL installed <u>30,407 sq ft</u> of subbase 60 mil HDPE geomembrane above the approved subbase during construction today.
	Total subbase 60 mil HDPE geomembrane deployed to date is <u>98,131 sq ft</u> .
	<u>17 panels</u> of subbase 60 mil HDPE geomembrane were used today in various widths and lengths for a total of <u>45 panels</u> to date.
	<u>1,407 linear feet</u> (lf) of subbase 60 mil HDPE geomembrane fusion-welded seams were recorded today, for a total of <u>4399 lf</u> . The majority of the seams were air tested in accordance with the project specifications. The remaining production seams not tested are documented and the seam air tests are pending.
	All trial welds for both fusion and extrusion welders were prepared and tested in the field. The field tensiometer tests results indicate the welders were able to achieve the required seam strengths for the project.
	Eight seam samples (DS-B-1 thru DS-B-8) were collected from the fusion-welded production seams and delivered to Precision Geosynthetics Laboratory, located in Anaheim, CA. for destructive seam testing. A

\_\_\_\_\_  
Printed Name

  
Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion

LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02

DAY/DATE: 12 March 2010

	<p>specimen from each of the seam samples was tested in the field in accordance with the project specification. The field destructive seam tests showed passing results.</p> <p><u>25 repairs</u> were performed today in various lengths and widths for a total of <u>25 repairs</u> to date. The repairs have been documented, and the non-destructive tests of the repairs are pending.</p>
	<p><u>Cell 1 Construction</u></p> <p>The contractor has suspended work in this area today.</p>
	<p><u>New Infiltration Basin (NIB)</u></p> <p>No work in this area today.</p>
	<p><u>Existing Leachate Evaporation Pond</u></p> <p>The contractor is working to remove the existing fencing and to clear and grub the area around the perimeter of the existing leachate evaporation pond.</p>
	<p><u>Geosynthetics Inventory</u></p> <p>No materials were delivered to the site today.</p>
1730	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 044**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Saturday

DATE: DAY: 13 MONTH: March

YEAR: 2010

WEATHER: Cool in the morning (69 degrees) sunny and warm (81 degrees) during the day.

0600	I arrived on site. Goodfellow Bros. is not on site today.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p><u>Geosynthetics Installation</u></p> <p>Destructive test results were received from Precision Laboratories today. The test results for seam samples DS-B-1 through DS-B-8 showed passing results.</p> <p>NWL did not deploy 60 mil HDPE geomembrane today. Construction activities were concentrated on completing the non-destructive testing and repairs.</p> <p><u>60 mil DST geomembrane:</u></p> <p>Total subbase 60 mil HDPE geomembrane deployed to date is <u>98,131 sq ft</u>.</p> <p>A total of <u>45 panels</u> of subbase 60 mil HDPE geomembrane have been installed to date.</p> <p>All of the seams were air tested in accordance with the project specifications; all air test results met the project requirements.</p> <p>All trial welds for extrusion welder were prepared and tested in the field. The field tensiometer test results indicate the welders were able to achieve the required seam strengths for the project.</p> <p>Four (4) seam samples (DS-B-9 thru DS-B-12) were collected from the subbase 60 mil HDPE geomembrane fusion-welded production seams and delivered to Precision Geosynthetics Laboratory for destructive seam testing. A specimen from each of the seam samples was tested in the field in accordance with the project</p>

Chris Scott  
Printed Name



Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion  
LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02  
DAY/DATE: 13 March 2010

	specifications. The field destructive seam tests showed passing results.  <u>Seventeen (17) repairs</u> were performed today in various lengths and widths for a total of <u>42 repairs</u> to date. The repairs have been documented, and all of the non-destructive tests were completed today with passing results.
	<u>Cell 1 Construction</u>  The contractor has suspended work in this area today.
	<u>New Infiltration Basin (NIB)</u>  No work in this area today.
	<u>Existing Leachate Evaporation Pond</u>  No work in this area today.
	<u>Geosynthetics Inventory</u>  No materials delivered to the site today.
1430	I left the site.

Chris Scott  
Printed Name

  
Signature

cc Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 045**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Monday

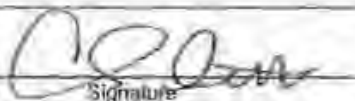
DATE: DAY: 15 MONTH: March

YEAR: 2010

WEATHER: Cloudy and overcast with light rainfall during the day

0600	I arrived on site. Goodfellow Bros. is already on site.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p><u>Geosynthetics Installation</u></p> <p>NWL has completed the majority of the subbase 60-mil HDPE geomembrane installation. The contractor begins to install the secondary containment system within the NLEP. Four seam samples are en-route to Precision Laboratories for destructive seam testing, and test results are pending.</p> <p>The temporary ramp into the NLEP, located at the west end of the NLEP, will be removed later in the project.</p> <p><u>GCL deployment:</u></p> <p>NWL deployed approximately <u>12,821 sq ft</u> of secondary GCL along the NLEP western sideslopes and floor, providing 12-inch overlaps along the width and 6-inch overlaps along the length. Granular bentonite was placed along the width of the seam (butt seam) overlaps, and the super groove factory seam was used along the length of the seam overlaps. The GCL was installed in accordance with the project specifications and the design engineer recommendations (23 December 2009 email correspondence from AECOM).</p> <p>Total secondary GCL deployed to date: approximately <u>12,821 sq ft</u>.</p> <p>During the rain event today, all of the installed secondary GCL was observed to be prematurely hydrated. Section 02074, Part 3.02F specifies to "Remove GCL exposed to moisture and prematurely hydrated prior to placement of overlying material and replaced with new GCL."</p>

Chris Scott  
Printed Name

  
Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion

LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02

DAY/DATE: 15 March 2010

	<p>I have informed the contractor that the GCL material deployed today (approximately 12,821 sq ft) has been exposed to premature hydration.</p> <p><u>60 mil DST geomembrane</u></p> <p>NWL installed <u>12,821 sq ft</u> of secondary 60 mil HDPE geomembrane above the prematurely-hydrated GCL during construction today.</p> <p>Total secondary 60 mil HDPE geomembrane deployed to date: <u>12,821 sq ft</u>. Total 60 mil HDPE geomembrane deployed to date (subbase and secondary) is <u>110,952 sq ft</u>.</p> <p><u>11 panels</u> of secondary 60 mil HDPE geomembrane were used today in various widths and lengths for a total of <u>11 panels</u> of secondary 60 mil HDPE geomembrane to date.</p> <p><u>541 linear feet (lf)</u> of secondary 60 mil HDPE geomembrane fusion-welded seams were recorded today, for a total of <u>541 lf</u>. All of the production seams were documented, and the seam air tests are pending.</p> <p>All trial welds for fusion welders were prepared and tested in the field. The field tensiometer tests results indicate the welders were able to achieve the required seam strengths for the project.</p>
	<p><u>Cell 1 Construction</u></p> <p>Esaki Surveying &amp; Mapping and Wagner Engineering Services, Inc. arrived on site this morning to survey the Cell 1 (Cells 1C &amp; 1D) subbase grades.</p>
	<p><u>New Infiltration Basin (NIB)</u></p> <p>The contractor is working to final grade the floor and side slopes of the NIB.</p>
	<p><u>Existing Leachate Evaporation Pond</u></p> <p>The contractor continues to clear and grub the areas around the pond.</p>
	<p><u>Geosynthetics Inventory</u></p> <p>No materials were delivered to the site today.</p>
1430	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch



**DAILY FIELD REPORT**

**Report Sequence No.: 046**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Tuesday

DATE:

DAY: 16

MONTH: March

YEAR: 2010

WEATHER: Cloudy and overcast with light rainfall during the day.

0600	I arrived on site. Goodfellow Bros. is already on site.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.
J	I attended weekly construction meeting.
1130	Returned from weekly construction meeting.
	<u>New Leachate Evaporation Pond (NLEP)</u>  <u>Geosynthetics Installation</u>  Destructive test results were received from Precision Laboratories today. The test results for seam samples DS-B-9 through DS-B-12 showed passing results.  Due to yesterday's rain event the NWL has suspended the geosynthetics installation to remove the standing water on the subbase geomembrane.  <u>GCL deployment:</u>  NWL has suspended deployment of the GCL today due to rain.  Total secondary GCL deployed to date: approximately <u>12,821 sq ft</u> .  The GCL material installed on 15 March 2010 was inspected today due to exposure to yesterday's rain event.  During today's weekly construction meeting, Ken Bergschultz (AECOM design engineer) provided acceptance criteria for the prematurely-hydrated GCL: if the prematurely hydrated GCL is cut open, and the bentonite sandwiched between the carrier geotextile layers is still in the granular form and the geotextile components

C...s Scott

Printed Name



Signature

cc: Mike Minch

	<p>have not been damaged, then the GCL will provide protection within the liner system as designed and can be accepted. Refer to AECOM's response to RFI #12 for this clarification to Section 02074 of the specifications.</p> <p>During construction today, the secondary GCL under the secondary 60 mil HDPE geomembrane Panel #1 (located on the far east end of the floor) was evaluated and did not meet the acceptance criteria for prematurely-hydrated GCL as the bentonite appeared saturated and was not in granular form. The GCL was removed, and will be replaced with new GCL when the rain has stopped and all standing water has been removed. As for the remaining secondary GCL panels along the eastern side slope (beneath secondary geomembrane panels 2 through 11), the bentonite was inspected and visually observed to be in the granular form and the geotextile components were not damaged. Therefore, the remaining secondary GCL was accepted.</p> <p><u>60 mil DST geomembrane:</u></p> <p>NWL suspended deployment of the secondary 60 mil HDPE geomembrane today.</p> <p>Total secondary 60 mil HDPE geomembrane deployed to date: <u>12,821 sq ft.</u> Total 60 mil HDPE geomembrane deployed to date (subbase and secondary) is <u>110,952 sq ft.</u></p> <p>A total of <u>11 panels</u> of secondary 60 mil HDPE geomembrane panels have been installed to date.</p> <p>All of the production seams were documented, and the seam air tests are pending.</p>
	<p><u>Cell 1 Construction</u></p> <p>No work in this area today.</p>
	<p><u>New Infiltration Basin (NIB)</u></p> <p>The contractor is working to final grade the floor and side slopes of the NIB.</p>
	<p><u>Existing Leachate Evaporation Pond</u></p> <p>The contractor continues to clear and grub the areas around the pond.</p>
	<p><u>Geosynthetics Inventory</u></p> <p>No materials were delivered to the site today.</p>
1630	I left the site.

Chris Scott

Printed Name



Signature



Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 047**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298 TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Wednesday


DATE: DAY: 17 MONTH: March

YEAR: 2010

WEATHER: Cloudy and overcast with light rainfall during the day.

0600	I arrived on site. Goodfellow Bros. is already on site.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p> <p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p><u>Geosynthetics Installation</u></p> <p>Due to yesterday's and today's rain event, NWL has suspended the geosynthetics installation to remove the standing water on the subbase geomembrane.</p> <p><u>GCL deployment:</u></p> <p>NWL has suspended deployment of the secondary GCL today due to rain.</p> <p>Total secondary GCL deployed to date: approximately <u>12,821 sq ft.</u></p> <p><u>60 mil DST geomembrane:</u></p> <p>NWL suspended deployment of the secondary 60 mil HDPE geomembrane today.</p> <p>Total secondary 60 mil HDPE geomembrane deployed to date: <u>12,821 sq ft.</u> Total geomembrane deployed to date (subbase and secondary) is <u>110,952 sq ft.</u></p> <p>A total of <u>11 panels</u> of secondary 60 mil HDPE geomembrane panels have been installed to date.</p> <p>All of the production seams were documented, and the seam air tests are pending.</p>

Louis Scott  
Printed Name



CC: Mike Minch

PROJECT: Phase II Lateral Expansion

LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02

DAY/DATE: 17 March 2010

	<p><u>Cell 1 Construction</u></p> <p>GBI subcontractor ITC Water Management, located on Kauai (phone number 808-742-7243), continues to production weld the double-wall forcemain pipe. Visual observation of the production welds indicates that the welds were constructed in accordance to the manufacturer's recommendations, and therefore meets the project requirements. Non-destructive air tests of the welds are pending.</p> <p>During construction today, the contractor has begun to expose the cleanout riser pipes along the southern end of the existing landfill. One operator with a small excavator carefully exposes the HDPE tee section while a laborer spots the work to ensure that the operator does not damage the existing landfill containment system.</p> <p>Eight of the 14 cleanout risers were exposed during construction today. Visual observation around the cleanouts confirmed that do damage was observed in or around the existing landfill containment system.</p>
	<p><u>New Infiltration Basin (NIB)</u></p> <p>No work in this area today.</p>
	<p><u>Existing Leachate Evaporation Pond</u></p> <p>No work in this area today.</p>
	<p><u>Geosynthetics Inventory</u></p> <p>No materials were delivered to the site today.</p>
1630	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 048**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros / Northwest Linings

DAY OF WEEK: Thursday

DATE: DAY: 18      MONTH: March

YEAR: 2010

WEATHER: Cloudy and overcast during the day.

0600	I arrived on site. Goodfellow Bros. is already on site.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p> <p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p><u>Geosynthetics Installation</u></p> <p>All destructive test results for the subbase 60-mil geomembrane production seam testing were reviewed and showed passing results. Destructive test results for the secondary geomembrane seam samples DS-S-1 through DS-S-2 showed passing results, NWL continues to install the secondary containment system above the approved subbase 60-mil HDPE geomembrane within the NLEP.</p> <p><u>GCL deployment:</u></p> <p>NWL continues deployment of the secondary GCL above the 60-mil HDPE subbase geomembrane, providing 12-inch overlaps along the width and 6-inch overlaps along the length. Granular bentonite was placed along the width of the seam (butt seam) overlaps, and the super groove factory seam was used along the length of the seam overlaps. The GCL was installed in accordance with the project specifications and the design engineer recommendations (23 December 2009 email correspondence from AECOM).</p> <p>Total secondary GCL deployed to date: approximately <u>51,185 sq ft</u>.</p> <p><u>60 mil DST geomembrane:</u></p> <p>NWL installed <u>38,364 sq ft</u> of secondary 60-mil HDPE geomembrane during construction today.</p>

is Scott  
Printed Name

  
Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion

LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02

DAY/DATE: 18 March 2010

	<p>Total secondary 60 mil HDPE geomembrane deployed to date: <u>51,185 sq ft.</u> Total geomembrane deployed to date (subbase and secondary) is <u>149,316 sq ft.</u></p> <p>Twelve secondary 60 mil HDPE geomembrane panels were used today in various widths and lengths for a total of <u>23 secondary panels</u> to date.</p> <p><u>1,083 linear feet (lf)</u> of secondary 60 mil HDPE geomembrane fusion-welded seams were recorded today, for a total of <u>1,624 lf</u> of secondary fusion-welded-seams. None of the seams were air tested today. The production seams not tested are documented and air tests are pending.</p> <p>All trial welds for both fusion and extrusion welders were prepared and tested in the field. The field tensiometer tests results indicate the welders were able to achieve the required seam strengths for the project.</p> <p>Six seam samples (DS-S-1 through DS-S-6) were marked within the secondary 60 mil HDPE geomembrane welded production seams for destructive testing.</p>
	<p><u>Cell 1 Construction</u></p> <p>GBI subcontractor ITC Water Management continues to production weld the double-wall forcemain pipe. Visual observation of the production weld indicates that the welds were constructed in accordance to the manufacturer's recommendations, and therefore meets the project requirements. Non-destructive air tests of the welds are pending.</p> <p>During construction today, the contractor has exposed all the remaining cleanout riser pipes along the southern end of the existing Phase II landfill. One operator with a small excavator carefully exposes the HDPE section while a laborer spots the work to ensure that the operator does not damage the existing landfill containment system.</p> <p>Fourteen of the 14 cleanout risers were exposed during construction today. Visual observation around the cleanouts confirmed that no damage was observed in or around the existing landfill containment system.</p>
	<p><u>New Infiltration Basin (NIB)</u></p> <p>No work in this area today.</p>
	<p><u>Existing Leachate Evaporation Pond</u></p> <p>No work in this area today.</p>
	<p><u>Geosynthetics Inventory</u></p> <p>No materials were delivered to the site today.</p>
1830	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Mirch

**DAILY FIELD REPORT**

**Report Sequence No.: 049**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Friday

DATE

DAY: 19

MONTH: March

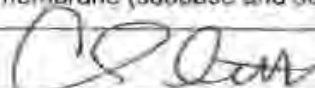
YEAR: 2010

WEATHER: Cloudy and overcast during the day.

0600	I arrived on site. Goodfellow Bros. is already on site.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p><u>Geosynthetics Installation</u></p> <p>Destructive test results were received from Precision Laboratories today. The tests results for seam samples DS-S-1 through DS-S-6 showed passing results. NWL continues to install the secondary containment system above the approved subbase 60-mil HDPE geomembrane.</p> <p><u>GCL deployment:</u></p> <p>NWL continues the deployment of the secondary GCL above the approved subbase 60-mil HDPE geomembrane, providing 12-inch overlaps along the width and 8-inch overlaps along the length. Granular bentonite was placed along the width of the seam (butt seam) overlaps, and the super groove factory seam was used along the length of the seam overlaps. The GCL was installed in accordance with the project specifications and the design engineer recommendations (23 December 2009 email correspondence from AECOM).</p> <p>Total secondary GCL deployed to date: approximately <u>84,420 sq ft</u>.</p> <p><u>60 mil DST geomembrane:</u></p> <p>NWL installed <u>33,235 sq ft</u> of the secondary 60-mil HDPE geomembrane during construction today.</p> <p>Total secondary 60 mil HDPE geomembrane deployed to date: <u>84,420 sq ft</u> Total 60-mil HDPE geomembrane (subbase and secondary) deployed to date is <u>182,551 sq ft</u>.</p>

Chris Scott

Printed Name



Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion

LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02

DAY/DATE: 19 March 2010

	<p>Twelve secondary 60 mil HDPE geomembrane panels were used today in various widths and lengths for a total of <u>35 secondary panels</u> to date.</p> <p><u>2,147 linear feet</u> (lf) of secondary 60 mil HDPE geomembrane fusion-welded seams were recorded today, for a total of <u>3,771 lf</u> of secondary fusion-welded-seams. The production seams where seam samples (for destructive testing) were marked have been air tested and showed passing results. The seam samples were cut from the production seams and delivered to Precision Laboratories for conformance testing. The remaining production seams not tested are documented and seam air tests are pending.</p> <p>All trial welds for both fusion and extrusion welders were prepared and tested in the field. The field tensiometer tests results indicate the welders were able to achieve the required seam strengths for the project.</p> <p>Three seam samples (DS-S-7 thru DS-S-9) were marked within the secondary 60 mil HDPE geomembrane welded production seams for destructive seam testing.</p> <p>GBI delivered one truck load of 3-inch minus subangular gravel to the site today. A sample of the material was collected and submitted to Hirata and Associates for gradation testing.</p>
	<p><u>Cell 1 Construction</u></p> <p>GBI subcontractor ITC Water Management located continues to production weld the double-wall force-main pipe. Visual observation of the production weld indicates that the welds were constructed in accordance to the manufacturer's recommendations, and therefore meets the project requirements. Non-destructive air tests of the welds are pending.</p>
	<p><u>New Infiltration Basin (NIB)</u></p> <p>No work in this area today.</p>
	<p><u>Existing Leachate Evaporation Pond</u></p> <p>No work in this area today.</p>
	<p><u>Geosynthetics Inventory</u></p> <p>No materials were delivered to the site today.</p>
1830	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch



**DAILY FIELD REPORT**

Report Sequence No.: 050

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Saturday

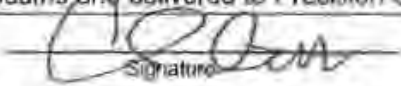
DATE: DAY: 20      MONTH: March

YEAR: 2010

WEATHER: Cool in the morning (69 degrees) sunny and warm (81 degrees) during the day.

0600	I arrived on site. Goodfellow Bros. is not on site today.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p><u>Geosynthetics Installation</u></p> <p>Destructive test results were received from Precision Laboratories today. The test results for seam samples DS-S-3 through DS-S-6 showed passing results.</p> <p>NWL did not deploy secondary 60 mil HDPE geomembrane today; construction activities were concentrated on completing the non-destructive testing and repairs of the deployed secondary geomembrane.</p> <p><u>60 mil DST geomembrane:</u></p> <p>Total secondary 60 mil HDPE geomembrane deployed to date: <u>84,420 sq ft.</u> Total geomembrane (subbase and secondary) deployed to date is <u>182,551 sq ft.</u></p> <p>A total of <u>35 panels</u> of secondary 60-mil HDPE geomembrane have been installed to date.</p> <p>All of the seams were air tested in accordance with the project specifications. All air tests performed today were found meeting the project requirements.</p> <p>All trial welds for the extrusion welder were prepared and tested in the field. The field tensiometer test results indicate the welders were able to achieve the required seam strengths for the project.</p> <p>Three seam samples (DS-S-7 through DS-S-9) were collected from the 60 mil HDPE geomembrane fusion-welded production seams and delivered to Precision Geosynthetics Laboratory for destructive seam testing. A</p>

Scott  
Printed Name



Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion  
LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02  
DAY/DATE: 20 March 2010

	<p>specimen from each of the seam samples was tested in the field in accordance with the project specification. The field seam tests samples showed passing results.</p> <p><u>Thirty-nine repairs</u> were installed within the secondary 60-mil HDPE geomembrane today in various lengths and widths for a total of <u>39 secondary repairs</u> to date. The repairs have been documented and all non-destructive tests were completed with passing results.</p>
	<p><u>Cell 1 Construction</u></p> <p>The contractor has suspended work in this area today.</p>
	<p><u>New Infiltration Basin (NIB)</u></p> <p>No work in this area today.</p>
	<p><u>Existing Leachate Evaporation Pond</u></p> <p>No work in this area today.</p>
	<p><u>Geosynthetics Inventory</u></p> <p>No materials delivered to the site today.</p>
1430	I left the site.

Chris Scott  
Printed Name

  
Signature

cc: Mike Minch

**DAILY FIELD REPORT**

Report Sequence No.: 051

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298 TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Monday

DATE: DAY: 22 MONTH: March

YEAR: 2010

WEATHER: Sunny and warm during the day.

0600	I arrived on site. Goodfellow Bros. is already on site. Kim Huynh (Geosyntec CQA Monitor) is on site to assist in the geosynthetics CQA of the NLEP.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p><u>Geosynthetics Installation</u></p> <p>Kim Huynh is observing the geosynthetics installation activities in the NLEP. NWL completes the secondary layer and begins to install the primary layer of the NLEP containment system.</p>
	<p><u>Cell 1 Construction</u></p> <p>GBI subcontractor ITC Water Management (ITC) continues to production weld the double-wall forcemain pipe. Visual observation of the production weld indicates that the welds were constructed in accordance to the manufacturer's recommendations, and therefore meets the project requirements.</p> <p>During construction today, ITC performs field pressure testing of the section of double-wall pipe which will be used to extend the new wet well located at Cell 1C and will extend to the gravity sump located at Cell 1D. The double-wall pipe components (carrier and containment) were tested independently of each other and test results met the project requirements with less than 1% pressure drop (see pressure test certification form).</p>
	<p><u>New Infiltration Basin (NIB)</u></p> <p>No work in this area today.</p>
	<p><u>Existing Leachate Evaporation Pond</u></p> <p>No work in this area today.</p>

Scott  
Printed Name

  
Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion

LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02

DAY/DATE: 22 March 2010

	<u>Geosynthetics Inventory</u> No materials were delivered to the site today.
	<u>Phase II Cleanout retrofit</u> ITC has removed the first cleanout riser located on the southwest corner of the existing Phase II landfill, and modified the existing cleanout riser in accordance with Detail 2 on Drawing 24 of the Construction Drawings. The final connection was completed using an electro-fusion coupler. The cleanout riser modified today was completed in accordance with the project requirements.
1830	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 051A**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Monday

DATE: DAY: 22 MONTH: March

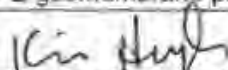
YEAR: 2010

WEATHER: Cool in the morning (69 degrees) sunny and warm (85 degrees) during the day.

0630	I arrived on site. Goodfellow Bros. is already on site today.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p><u>Geosynthetics Installation</u></p> <p>During today's construction, NWL completes the majority of the secondary containment system above the approved subbase 60-mil HDPE geomembrane, and begins to install the primary containment system above the approved secondary 60-mil HDPE geomembrane.</p> <p><u>GCL deployment:</u></p> <p>NWL completes the majority of the secondary GCL above the subbase 60-mil HDPE geomembrane along the western sideslopes and floor, and begins to deploy the primary GCL above the secondary 60-mil HDPE geomembrane along the eastern sideslopes and floor. GCL deployment included 12-inch overlaps along the width and 6-inch overlaps along the length. Granular bentonite was placed along the width of the seam (butt seam) overlaps, and the super groove factory seam was used along the length of the seam overlaps. The GCL was installed in accordance with the project specifications and the design engineer recommendations (23 December 2009 email correspondence from AECOM).</p> <p>Total secondary GCL deployed to date: approximately <u>98,667 sq ft</u>. Total primary GCL deployed to date: approximately <u>12,990 sq ft</u>.</p> <p><u>60 mil DST geomembrane:</u></p> <p>During construction today, NWL installed <u>14,247 sq ft</u> of the secondary 60-mil HDPE geomembrane and <u>12,990 sq ft</u> of primary 60-mil HDPE geomembrane.</p> <p>Total secondary 60 mil HDPE geomembrane deployed to date: <u>98,667 sq ft</u>. Total primary 60 mil HDPE geomembrane deployed to date: <u>12,990 sq ft</u>. Total 60-mil HDPE geomembrane (subbase, secondary, and primary) deployed to date is <u>209,788 sq ft</u>.</p> <p>Ten secondary 60 mil HDPE geomembrane panels were used today in random widths and lengths for a total of</p>

Huynh

Printed Name



Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion

LOCATION: Kekaha Landfill

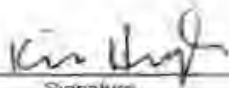
PROJECT NO.: WG1298 / 02

DAY/DATE: 22 March 2010

	<p><u>45 secondary panels</u> to date. Eleven primary 60 mil HDPE geomembrane panels were used today in various widths and lengths for a total of <u>11 primary panels</u> to date.</p> <p><u>1,252 linear feet</u> (lf) of 60-mil HDPE geomembrane fusion-welded seams were recorded today. The production seams are documented and air tests are pending.</p> <p>All trial welds for fusion welders were prepared and tested in the field. The field tensiometer tests results indicate the welders were able to achieve the required seam strengths for the project.</p>
1830	I left the site.

Kim Huynh

Printed Name



Signature

cc

Mike Minch

**DAILY FIELD REPORT**

Report Sequence No.: 052

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Tuesday

DATE: DAY: 23      MONTH: March

YEAR: 2010

WEATHER: Sunny and warm during the day.

0600	I arrived on site. Goodfellow Bros. is already on site. Kim Huynh (Geosyntec CQA Monitor) is on site to assist in the geosynthetics CQA of the NLEP.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.
1000	Kim and I attended the weekly construction meeting.
1115	Kim and I returned from weekly construction meeting.
	<u>New Leachate Evaporation Pond (NLEP)</u>  <u>Geosynthetics Installation</u>  Destructive test results were received from Precision Laboratories today. The destructive seam test results for DS-S-7 through DS-S-9, showed passing results.  Kim Huynh is observing the geosynthetics installation activities in the NLEP. NWL continues to install the primary layer of the NLEP containment system.
	<u>Cell 1 Construction</u>  GBI subcontractor ITC Water Management continues to production weld the double-wall forcemain pipe. Visual observation of the production weld indicates that the welds were constructed in accordance to the manufacturer's recommendations, and therefore meets the project requirements.  During construction today, a 430-foot long section of double-wall pipe, constructed for various locations along the forcemain system within Cell 1 (Cells 1C & 1D) was pressure tested in the field. The carrier component of the double-wall pipe section was tested independently of the dual containment pipe section; test results met the project requirements with less than 1% pressure drop (see pressure test certification form).

Chris Scott

Printed Name



Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion  
LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02  
DAY/DATE: 23 March 2010

	The testing of the 480-ft dual containment pipe section is pending.
	<u>New Infiltration Basin (NIB)</u> No work in this area today.
	<u>Existing Leachate Evaporation Pond</u> No work in this area today.
	<u>Geosynthetics Inventory</u> No materials were delivered to the site today.
	<u>Phase II Cleanout retrofit</u> ITC Water Management has removed the 2nd through the 5th cleanout risers located on the southern end of the existing Phase II landfill, and modified the existing cleanout risers in accordance with Detail 2 on Drawing 24 of the Construction Drawings. The final connection was completed using an electro-fusion coupler. Six of the 13 the cleanout risers were modified today, and were completed in accordance with the project requirements.
1830	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch



**DAILY FIELD REPORT**

**Report Sequence No.: 052A**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Tuesday

DATE: DAY: 23 MONTH: March

YEAR: 2010

WEATHER: Cool in the morning (65 degrees) sunny and warm (85 degrees) during the day.

0630	I arrived on site. Goodfellow Bros. is already on site today.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p><u>Geosynthetics Installation</u></p> <p>Destructive tests results were received from Precision Laboratories today. The tests results for DS-S-7 through DS-S-9 showed passing results.</p> <p>NWL continues to install the primary containment system above the approved secondary containment system.</p> <p><u>GCL deployment:</u></p> <p>NWL continues the deployment of the primary GCL above the secondary 60-mil HDPE geomembrane along the north and south sideslopes and the floor, providing 12-inch overlaps along the width and 6-inch overlaps along the length. Granular bentonite was placed along the width of the seam (butt seam) overlaps, and the super groove factory seam was used along the length of the seam overlaps. The GCL was installed in accordance with the project specifications and the design engineer recommendations (23 December 2009 email correspondence from AECOM).</p> <p>Total primary GCL deployed to date: approximately <u>46,731 sq ft.</u></p> <p><u>60 mil DST geomembrane:</u></p> <p>NWL installed <u>33,741 sq ft</u> of the primary 60-mil HDPE geomembrane during construction today.</p> <p>Total primary 60 mil HDPE geomembrane deployed to date: <u>46,731 sq ft.</u></p> <p>Total 60-mil HDPE geomembrane (subbase, secondary, and primary) deployed to date is <u>243,529 sq ft.</u></p> <p>Ten primary 60 mil HDPE geomembrane panels were used today in various widths and lengths for a total of <u>21 primary panels</u> to date.</p> <p><u>1,533 linear feet (lf)</u> of 60 mil HDPE geomembrane fusion-welded seams were recorded today. Today's</p>

Huynh  
Printed Name

  
Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion


LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02

DAY/DATE: 23 March 2010

	production seams are documented and air tests are pending.  All trial welds for fusion welders were prepared and tested in the field. The field tensiometer tests results indicate the welders were able to achieve the required seam strengths for the project.
1830	I left the site.

Kim Huynh  
Printed Name

  
Signature

cc: Mike Minch

**DAILY FIELD REPORT**

Report Sequence No.: 053

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Wednesday

DATE: DAY: 24 MONTH: March

YEAR: 2010

WEATHER: Sunny and warm during the day.

0600	I arrived on site. Goodfellow Bros. is already on site. Kim Huynh (Geosyntec CQA Monitor) is on site to assist in the geosynthetics CQA of the NLEP.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u>  <u>Geosynthetics Installation</u>  Kim Huynh is observing the geosynthetics installation activities in the NLEP. NWL continues to install the primary barrier layer of the containment system.
	<u>Cell 1 Construction</u>  GBI subcontractor ITC Water Management continues to fabricate the new pipe sections to modify the remaining existing cleanout risers in the Phase II landfill.  During construction today, GBI requested that I collect a sample of the 3-inch minus gravel material stockpiled at the Kauai Aggregate Quarry. GBI is proposing to use this material as the granular fill on the NLEP sideslopes. I traveled to the quarry and collected a sample of the 3-inch minus subangular, well-graded gravel. The sample was delivered to Hirata and Associates for gradation testing.
	<u>New Infiltration Basin (NIB)</u>  No work in this area today.
	<u>Existing Leachate Evaporation Pond</u>  No work in this area today.

Chris Scott

Printed Name



Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion  
LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02  
DAY/DATE: 24 March 2010

	<u>Geosynthetics Inventory</u> No materials were delivered to the site today.
	<u>Phase II Cleanout retrofit</u> ITC Water Management has only modified the cleanout riser sections today. No installation has been completed.
1830	I left the site.

Chris Scott  
Printed Name

  
Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 053A**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298 TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Wednesday

DATE: DAY: 24 MONTH: March

YEAR: 2010

WEATHER: Cool in the morning (85 degrees) sunny and warm (80 degrees) during the day.

0630	I arrived on site. Goodfellow Bros. is already on site today.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p><u>Geosynthetics Installation</u></p> <p>NWL continues to install the primary containment system above the approved secondary containment system.</p> <p><u>GCL deployment:</u></p> <p>NWL continues the deployment of the primary GCL above the secondary 60-mil HDPE geomembrane along the north and south sideslopes and the floor, providing 12-inch overlaps along the width and 6-inch overlaps along the length. Granular bentonite was placed along the width of the seam (butt seam) overlaps, and the super groove factory seam was used along the length of the seam overlaps. The GCL was installed in accordance with the project specifications and the design engineer recommendations (23 December 2009 email correspondence from AECOM).</p> <p>Total primary GCL deployed to date: approximately <u>64,165 sq ft</u>.</p> <p><u>60 mil DST geomembrane:</u></p> <p>NWL installed <u>17,434 sq ft</u> of the primary 60-mil HDPE geomembrane during construction today.</p> <p>Total primary 60 mil HDPE geomembrane deployed to date: <u>64,165 sq ft</u>. Total 60-mil HDPE geomembrane (subbase, secondary, and primary) deployed to date is <u>260,963 sq ft</u>.</p> <p>Six primary 60 mil HDPE geomembrane panels were used today in various widths and lengths for a total of <u>27 primary panels</u> to date.</p> <p><u>835 linear feet</u> (lf) of 60 mil HDPE geomembrane fusion-welded seams were recorded today. Production seams where seam samples (for destructive testing) were marked, have been air tested and showed passing results. The seam samples were cut from the production seams and delivered to Precision Laboratories for destructive seam testing. The remaining production seams not tested are documented and air tests are pending.</p>

Printed Name: Huynh

Printed Name

Signature: 

Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion

LOCATION: Kekaha Landfill

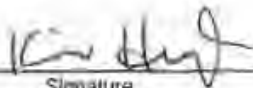
PROJECT NO.: WG1298 / 02

DAY/DATE: 24 March 2010

	<p>All trial welds for both fusion and extrusion welders were prepared and tested in the field. The field tensiometer tests results indicate the welders were able to achieve the required seam strengths for the project.</p> <p><u>Nine repairs</u> were installed on the secondary 60-mil HDPE geomembrane repairs today in various lengths and widths for a total of <u>48 secondary repairs</u> to date. <u>Twenty repairs</u> were installed on the primary 60-mil HDPE geomembrane repairs were installed today in various lengths and widths for a total of <u>20 primary repairs</u> to date. All repairs have been documented and all non-destructive tests were completed with passing results.</p> <p>Four seam samples (DS-S-10 through DS-S-13) were marked within the welded production seams of the secondary liner, and 4 seam samples (DS-P-1 through DS-P-4) were marked within the welded production seams of the primary liner. A specimen from each seam sample was tested in the field in accordance with the project specifications. The field seam tests showed passing results.</p>
1645	I left the site.

Kim Huynh

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

Report Sequence No.: 054

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Thursday

DATE: DAY: 25 MONTH: March

YEAR: 2010

WEATHER: Sunny and warm during the day.

0600	I arrived on site. Goodfellow Bros. is already on site. Kim Huynh (Geosyntec CQA Monitor) is on site to assist in the geosynthetics CQA of the NLEP.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p><u>Geosynthetics Installation</u></p> <p>Destructive tests results were received from Precision Laboratories today. The tests results for DS-S10 through DS-S13 and DS-P-1 through DS-P-4, showed passing results.</p> <p>Kim Huynh is observing the geosynthetics installation activities. NWL continues to install the primary layer of the NLEP containment system.</p>
	<p><u>Cell 1 Construction</u></p> <p>GBI has installed the double-wall forcemain piping section into the trench within the Cell 1 perimeter berm. The forcemain extends from Wet Well #3 to the Cell 1D gravity drain sump.</p> <p>The double-wall pipe section was covered with 6 inches of clean sand fill and then compacted using a walk-behind vibratory compactor. Once the backfill lift was compacted, two electrical conduits were installed within the trench and along the outside of the perimeter berm. The electrical conduits were covered with clean sand fill then compacted using a walk-behind vibratory compactor. Once the backfill lift was completed, "marker" tape was installed above the utilities for future identification.</p>

Chris Scott

Printed Name



Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion  
LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02  
DAY/DATE: 25 March 2010

	<u>New Infiltration Basin (NIB)</u> No work in this area today.
	<u>Existing Leachate Evaporation Pond</u> No work in this area today.
	<u>Geosynthetics Inventory</u> No materials were delivered to the site today.
	<u>Phase II Cleanout retrofit</u> GBI subcontractor ITC Water Management has only modified the cleanout riser sections today. No installation has been completed.
1830	I left the site.

Chris Scott  
Printed Name



Signature

cc: Mike Minch



**DAILY FIELD REPORT**

**Report Sequence No.: 054A**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Thursday

DATE: DAY: 25      MONTH: March

YEAR: 2010

WEATHER: Cool in the morning (65 degrees) sunny and warm (85 degrees) during the day.

0630	I arrived on site. Goodfellow Bros. is already on site today.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p><u>Geosynthetics Installation</u></p> <p>Destructive tests results were received from Precision Laboratories today. The tests results for seam samples DS-S-10 through DS-S-13 and DS-P-1 through DS-P-4 showed passing results.</p> <p>NWL continues installation of the primary containment system above the approved secondary containment system.</p> <p><u>GCL deployment:</u></p> <p>NWL continues the deployment of the primary GCL above the secondary 60-mil HDPE geomembrane, along the western sideslopes and floor, providing 12-inch overlaps along the width and 6-inch overlaps along the length. Granular bentonite was placed along the width of the seam (butt seam) overlaps, and the super groove factory seam was used along the length of the seam overlaps. The GCL was installed in accordance with the project specifications and the design engineer recommendations (23 December 2009 email correspondence from AECOM).</p> <p>Total primary GCL deployed to date: approximately <u>98,344 sq ft.</u></p> <p><u>60 mil DST geomembrane:</u></p> <p>NWL installed <u>34,179 sq ft</u> of the primary 60-mil HDPE geomembrane during construction today.</p> <p>Total primary 60 mil HDPE geomembrane deployed to date: <u>98,344 sq ft.</u></p> <p>Total 60-mil HDPE geomembrane (subbase, secondary, and primary) deployed to date is <u>295,142 sq ft.</u></p> <p>Seventeen primary 60 mil HDPE geomembrane panels were used today in various widths and lengths for a total of <u>44 primary panels</u> to date.</p> <p><u>1,032 linear feet (lf)</u> of 60 mil HDPE geomembrane fusion-welded seams were recorded today. The production</p>

J. Huynh  
Printed Name

*Kim Huynh*  
Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion

LOCATION: Kekaha Landfill

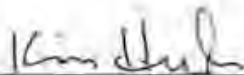
PROJECT NO.: WG1298 / 02

DAY/DATE: 25 March 2010

	seams are documented and air tests are pending.  All trial welds for fusion welders were prepared and tested in the field. The field lensiometer tests results indicate the welders were able to achieve the required seam strengths for the project.
1700	I left the site.

Kim Huynh

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

Report Sequence No.: 055

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Friday

DATE: DAY: 26 MONTH: March


YEAR: 2010

WEATHER: Sunny and warm during the day.

0600	Goodfellow Bros. is not on site today in recognition of the Hawaiian holiday Prince Kuhio Day. Kim Huynh (Geosyntec CQA Monitor) is on site to monitor the geosynthetics CQA of the NLEP.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u>  <u>Geosynthetics Installation</u>  Kim Huynh is observing the geosynthetics installation activities. NWL has completed the majority of the primary containment system installation and has begun to install the 16 oz/sy nonwoven cushion geotextile.
	<u>Cell 1 Construction</u>  No work in this area today.
	<u>New Infiltration Basin (NIB)</u>  No work in this area today.
	<u>Existing Leachate Evaporation Pond</u>  No work in this area today.
	<u>Geosynthetics Inventory</u>  No materials were delivered to the site today.
	<u>Phase II Cleanout retrofit</u>  No work in this area today.
1510	I left the site.

Cris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 055A**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Friday

DATE: DAY: 26      MONTH: March

YEAR: 2010

WEATHER: Cool in the morning (65 degrees) sunny and warm (80 degrees) during the day.

0630	I arrived on site. Goodfellow Bros. is not onsite today.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p><i>Geosynthetics Installation</i></p> <p>NWL has completed installation of the composite liner system (subbase, secondary, and primary layers) for the NLEP. NWL performs repairs and non-destructive testing (air and vacuum box testing) of all production seams for the installed primary 60 mil HDPE geomembrane.</p> <p><u>Twenty-two</u> primary 60-mil HDPE geomembrane repairs were installed today in various lengths and widths for a total of <u>42 primary repairs</u> to date. The repairs have been documented and all non-destructive tests were completed with passing results.</p> <p>Trial welds for the extrusion welder were prepared and tested in the field. The field tensionometer test results indicate the welder was able to achieve the required seam strengths for the project.</p> <p>Eight seam samples (DS-P-5 through DS-P-12) were marked and cut within the welded production seams of the primary 60 mil HDPE geomembrane. A specimen from each seam sample was tested in the field in accordance with the project specifications. The field seam tests showed passing results. The 8 seam samples were cut from the production seams and delivered to Precision Laboratories for destructive seam testing.</p>
1510	I left the site.

Huynh

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

Report Sequence No.: 056

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Saturday

DATE: DAY: 27      MONTH: March

YEAR: 2010

WEATHER: Cool in the morning (65 degrees) sunny and warm (80 degrees) during the day.

0630	I arrived on site. Goodfellow Bros. is not onsite today.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p><i>Geosynthetics Installation</i></p> <p>NWL begins installation of the 16 oz/sy nonwoven cushion geotextile above the approved primary 60 mil HDPE geomembrane within the NLEP. Adjacent geotextile panels were overlapped 3 inches prior to seaming and sewn in accordance with the project specifications.</p> <p>However, where cross seams (end width seams) met length-wise seams, NWL was unable to sew across the two intersecting seams as the combined material was thick and caused the sewing needles to break. NWL trimmed roughly 2.9 inches off the 3-inch overlaps at the final 6 to 9 inches of the cross seams to enable sewing at the cross seams. I discuss this seaming procedure with Chris Scott and Mike Minch (Geosyntec), and it was agreed that a Leister patch will need to be constructed at the cross seams to repair the trimmed overlap.</p>
1200	I left the site.

by Huynh  
Printed Name

*Kim Huynh*  
Signature

cc: Mike Minch

**DAILY FIELD REPORT**

Report Sequence No.: 057

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Monday

DATE: DAY: 29 MONTH: March

YEAR: 2010

WEATHER: Sunny and warm during the day.

0630	I arrived on site. Goodfellow Bros. is already on site. Kim Huynh (Geosyntec CQA Monitor) is currently off site.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u>  <u>Geosynthetics Installation</u>  NWL has completed the majority of the NLEP containment system with exception to a portion of the west berm where a temporary access ramp has been left in place. The ramp will be used to import ¾-inch minus granular operations layer material into the NLEP, and will be removed and the west berm completed after import operations are completed.  NWL has begun to install the Geocell system along the southern side slope of the NLEP. The Geocell installed today was visually observed to be constructed in accordance with the project requirements.
	<u>Cell 1 Construction</u>  GBI has begun to expose the Phase II / Cell 1 (Cells 1C & 1D) tie-in, and to field-adjust the Cell 1 subbase grades to tie to the existing Phase II subbase.
	<u>New Infiltration Basin (NIB)</u>  No work in this area today.
	<u>Existing Leachate Evaporation Pond</u>  No work in this area today.

CHRIS SCOTT

Printed Name



Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion

LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02

DAY/DATE: 29 March 2010

	<p><u>Geosynthetics Inventory</u></p> <p>No materials were delivered to the site today.</p>
	<p><u>Phase II Cleanout Retrofit</u></p> <p>GBI subcontractor ITC Water Management has removed the sixth (6th), ninth (9th), eleventh (11th), thirteenth (13th), and fourteen (14th) cleanout risers located on the southern end of the existing Phase II landfill, and modified the existing cleanouts in accordance with Detail 2 on Drawing 24 of the Construction Drawings. The final connection was completed using an electro-fusion coupler.</p> <p>Ten of the 14 cleanout risers requiring modification have been completed in accordance with the project requirements.</p>
1830	I left the site.

Chris Scott

Printed Name



Signature

cc. Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 058**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Tuesday

DATE: DAY: 30      MONTH: March

YEAR: 2010

WEATHER: Sunny and warm during the day.

0630	I arrived on site. Goodfellow Bros. is already on site.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.
1000	Kim Huynh and I attended weekly construction meeting.
1100	Returned from weekly construction meeting.
	<u>New Leachate Evaporation Pond (NLEP)</u>  <u>Geosynthetics Installation</u>  NWL continues to install the Geocell system along the southern side slope of the NLEP. The geocell installed today was visually observed to be constructed in accordance with the project requirements.
	<u>Cell 1 Construction</u>  GBI continues to expose the Phase II / Cell 1 (Cells 1C & 1D) tie-in and field-adjust the Cell 1 subbase grades to tie to the existing Phase II subbase.  NWL has begun to cut the Phase II existing geomembrane along the edges of the existing anchor trench. The existing geosynthetics consists of 60 mil HDPE geomembrane overlying GCL (bentonite layer with geomembrane carrier, carrier side down) overlying subbase. The geomembrane panels are overlapped 6 inches with bentonite in the seams.
	<u>New Infiltration Basin (NIB)</u>  No work in this area today.

Curtis Scott

Printed Name



Signature

cc: Mike Minch



PROJECT: Phase II Lateral Expansion

LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02

DAY/DATE: 30 March 2010

	<u>Existing Leachate Evaporation Pond</u> No work in this area today.
	<u>Geosynthetics Inventory</u> One (1) shipping container arrived on site and 27 rolls of 16 oz/sy nonwoven geotextile was delivered to the site in good condition.
	<u>Phase II Cleanout retrofit</u> GBI subcontractor ITC Water Management is off site today.
1830	I left the site.

Chris Scott  
Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 059**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Wednesday

DATE: DAY: 31 MONTH: March

YEAR: 2010

WEATHER: Sunny and warm during the day.

0630	I arrived on site. Goodfellow Bros. is already on site.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor and an Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p><i>Geosynthetics Installation</i></p> <p>NWL continues to install the Geocell system along the southern side slope of the NLEP. The Geocell installed today was visually observed to be constructed in accordance with the project requirements.</p>
	<p><u>Cell 1 Construction</u></p> <p>GBI continues to expose the Phase II / Cell 1 (Cell 1C &amp; 1D) tie-in, and field-adjust the Cell 1 subbase grades to tie to the existing Phase II subbase.</p> <p>NWL continues to cut the Phase II existing geomembrane along the edge of the existing anchor trench in order to remove the existing geosynthetics from the anchor trench. The existing geosynthetics consists of 60 mil HDPE geomembrane overlying GCL (bentonite layer with geomembrane carrier, carrier side down) overlying subbase. The geomembrane panels are overlapped 6 inches with bentonite in the seams.</p>
	<p><u>New Infiltration Basin (NIB)</u></p> <p>No work in this area today.</p>
	<p><u>Phase II Cleanout retrofit</u></p> <p>GBI subcontractor ITC Water Management is on site today. The remaining four cleanout risers were modified today for a total of fourteen (14) risers modified to date. All of the cleanouts which required modification (as noted in the Construction Drawings) were completed in accordance with the project requirements.</p>
1830	I left the site

C. Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 060**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Thursday

DATE: DAY: 1 MONTH: April

YEAR: 2010

WEATHER: Sunny and warm during the day.

0630	I arrived on site. Goodfellow Bros. is already on site today.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.  Equipment removed from the site today: Ingersoll-Rand SD122DX rubber tire smooth drum vibratory compactor
	<u>New Leachate Evaporation Pond (NLEP)</u>  <u>Geosynthetics Installation</u>  During construction today, NWL continues to install the Geocell system along the northern side slope of the NLEP. The Geocell installed today was visually observed to be constructed in accordance with the project requirements.
	<u>Cell 1 Construction</u>  GBI continues to expose the Phase II / Cell 1 (Cells 1C & 1D) tie-in and field-adjust the Cell 1 subbase grades to tie to the existing Phase II subbase.  The Cell 1 subbase surface was smooth drum rolled using a HAMM 2420 rubber tire smooth drum vibratory compactor.
	<u>New Infiltration Basin (NIB)</u>  No work in this area today.
1830	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 061**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Friday

DATE: DAY: 2      MONTH: April

YEAR: 2010

WEATHER: Sunny and warm during the day.

0630	Goodfellow Bros. is currently off site today in observation of Good Friday.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u>  <u>Geosynthetics Installation</u> NWL cannot install the Geocell system as material supplies did not arrive for construction today.
	<u>Cell 1 Construction</u>  No work in this area today
	<u>New Infiltration Basin (NIB)</u>  No work in this area today.
1400	I left the site.

\_\_\_\_\_  
s Scott  
Printed Name

  
\_\_\_\_\_  
Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 062**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Saturday

DATE:      DAY: 3      MONTH: April      YEAR: 2010

WEATHER: Sunny and warm during the day

0930	Goodfellow Bros. is currently off site today.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH27B excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u>  <u>Geosynthetics Installation</u>  NWL has completed the majority of the Geocell system installation. The temporary access ramp located along the western side slope still remain to be removed and replaced with the west berm.
	<u>Cell 1 Construction</u>  No work in this area today
	<u>New Infiltration Basin (NIB)</u>  No work in this area today.
1200	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minchi

**DAILY FIELD REPORT**

**Report Sequence No.: 063**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Monday

DATE: DAY: 5      MONTH: April

YEAR: 2010

WEATHER: Sunny and warm during the day.

0600	I arrived on site. Goodfellow Bros. is already on site.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u>  NWL has begun to remove the excess geosynthetic layers from the NLEP perimeter anchor trench. The materials were trimmed back to be a minimum of 1.5 feet from the 6-inch PVC pipe, in accordance with Detail 4, Drawing 11 of the Construction Drawings. GBI is working to backfill the anchor trench as the geosynthetic materials are trimmed to secure the liner system within the anchor trench.
	<u>Cell 1 Construction</u>  Esaki Surveying & Mapping crew and Wagner Surveying are on site to survey the Cell 1 (Cells 1C & 1D) subbase grades.
	<u>New Infiltration Basin (NIB)</u>  No work in this area today.
	<u>Waste Drop-off Area Improvements</u>  GBI has begun to over excavate the existing perimeter curb and gutter transition for the new alignment of concrete. The foundation of the curb and gutter was over excavated 18 inches and replaced with new base course, in accordance with Drawing 25 of the Construction Drawings.  A sample (1 1/2" BC-Curb and Gutter) of the base course was collected and provided to Hirata and Associates for laboratory conformance testing.
1700	I left the site.

Chris Scott

Printed Name

Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 064**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Tuesday

DATE: DAY: 6 MONTH: April

YEAR: 2010

WEATHER: Sunny and warm during the day.

0600	I arrived on site. Goodfellow Bros. is already on site.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u>  NWL has completed the trimming of the excess geosynthetic layers from the NLEP perimeter anchor trench. The materials were trimmed in accordance with Detail 4, Drawing 11 of the Construction Drawings.  GBI continues to backfill the anchor trench as the geosynthetic materials are trimmed to secure the liner system within the anchor trench.  Three 2-inch PVC electrical conduits were installed within the southern anchor trench and then backfilled using clean sand backfill. The pipe was then identified using a "marker" tape.
	<u>Cell 1 Construction</u>  <u>Geosynthetics Installation</u>  NWL has begun to install the subbase geomembrane above the previously approved subbase of Cell 1 (Cells 1C & 1D).  <u>60 mil DST geomembrane:</u>  NWL installed <u>34,224 sq ft</u> of subbase 60 mil HDPE geomembrane during construction today.  Total subbase 60 mil HDPE geomembrane deployed to date is <u>34,224 sq ft</u> .

.s Scott

Printed Name



Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion

LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02

DAY/DATE: 5 April 2010

	<p>Ten subbase 60 mil HDPE geomembrane panels were used today in various widths and lengths for a total of <u>10 subbase panels</u> to date.</p> <p><u>1,324 linear feet</u> (lf) of 80 mil HDPE geomembrane fusion-welded seams were recorded today, for a total of <u>1,324 lf</u>. None of the production seams were air tested today. The production seams not tested are documented and air tests are pending.</p> <p>All trial welds for both fusion and extrusion welders were prepared and tested in the field. The field tensiometer tests results indicate the welders were able to achieve the required seam strengths for the project.</p> <p>Four seam samples (DS-S-1 through DS-S-4) were marked within the welded production seams for destructive seam testing.</p>
	<p><u>New Infiltration Basin (NIB)</u></p> <p>No work in this area today.</p>
	<p><u>Waste Drop off Area Improvements</u></p> <p>GBI has begun to over-excavate the existing perimeter curb and gutter transition for new alignment of concrete. The foundation of the curb and gutter was over-excavated 18 inches and replaced with new base course. Several field density tests using a Troxler portable nuclear moisture/density gauge indicate the base course material was compacted in accordance with the project requirements.</p>
1700	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch



**DAILY FIELD REPORT**

**Report Sequence No.: 065**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

DAY OF WEEK: Wednesday

WEATHER: Sunny and warm during the day.

PROJECT NO.: WG1298      TASK NO.: 02

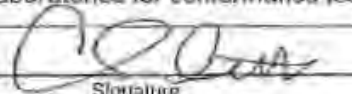
CONTRACTORS: Goodfellow Bros. / Northwest Linings

DATE:    DAY: 7    MONTH: April    YEAR: 2010

0600	I arrived on site. Goodfellow Bros. is already on site.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u>  GBI continues to backfill the NLEP perimeter anchor trench to support the liner system. The backfill material is a clean sand and is being compacted using a walk behind "sled" vibratory compactor.  The contractor has begun to import ¾-inch minus granular operations layer material from the Kauai Aggregate Quarry. The first load of granular operations layer material was driven directly onto the floor of the NLEP. The driver of the haul truck did not understand the directions given by Goodfellow Bros. before entering the construction area. Once the driver realized his mistake, damage to the NLEP containment system had already occurred.  I inspected the damaged area (approximately 10-ft by 24-ft area), and observed that all of the geosynthetic layers were compromised as a result of the haul truck driving on the containment system. Therefore, the damaged layers will require removal and replacement with new materials.  I requested that GBI survey the damaged area which I have identified to document the location. GBI agrees and provides the survey data as follows:  N: 57014.438, E: 1558329.783; N: 57008.394, E: 1558322.061; N: 57032.989, E: 1558314.067; and N: 57026.078, E: 1558306.260.  A sample (NLEP-OPS-001) was collected from the placed ¾-inch minus granular operations layer material and provided to Precision Laboratories for conformance testing.

Chris Scott

Printed Name



Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion  
LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02  
DAY/DATE: 7 April 2010

	<p><u>Call 1 Construction</u></p> <p>Keith Suga (Goodfellow Bros.) has informed me that the Kauai Aggregate Quarry has screened and stockpiled the 3/8-inch minus gravel to be used for the project and would like for Geosyntec to test the material at the quarry for compliance with the project requirements. I went to the Kauai Aggregate Quarry and collected a sample (3/8-Quarry fines). The sample will be delivered to Precision Laboratories for gradation testing.</p> <p><u>Geosynthetics Installation</u></p> <p>NWL has begun to install the subbase 60 mil HDPE geomembrane above the previously approved areas of Cell 1 (Calls 1C &amp; 1D).</p> <p><u>60 mil DST geomembrane:</u></p> <p>NWL installed <u>25,116 sq ft</u> of subbase 60 mil HDPE geomembrane during construction today.</p> <p>Total subbase 60 mil HDPE geomembrane deployed to date is <u>59,340 sq ft</u>.</p> <p>Seven subbase 60-mil HDPE geomembrane panels were used today in various widths and lengths for a total of <u>17 subbase panels</u> to date.</p> <p><u>1,137 linear feet (lf)</u> of subbase 60 mil HDPE geomembrane fusion-welded seams were recorded today, for a total of <u>2,461 lf</u> of subbase fusion-welded seams. All of the production seams were air tested today. The production seam air tests performed today were found meeting the project requirements.</p> <p>All trial welds for both fusion and extrusion welders were prepared and tested in the field. The field tensiometer tests results indicate the welders were able to achieve the required seam strengths for the project.</p> <p>Three seam samples (DS-S-5 through DS-S-7) were marked within the welded production seams for destructive seam testing. The samples were cut from the seams after air tests were completed with passing results; coupons cut from the samples were field tested using a tensiometer. The field tests showed passing results. Therefore, the seam samples were delivered to Precision Laboratories for destructive seam testing.</p> <p><u>Nineteen repairs</u> were installed today in various lengths and widths for a total of <u>19 repairs</u> to date. The repairs have been documented and the non-destructive vacuum box tests show passing results.</p>
	<p><u>New Infiltration Basin (NIB)</u></p> <p>No work in this area today.</p>
	<p><u>Waste Drop off Improvements</u></p> <p>GBI has completed the curb and gutter form work and installed the reinforcing steel in accordance with the Construction Drawings.</p> <p>During construction today, the forms were filled using concrete. The concrete batch was tested in the field for temperature slump. The concrete material was then approved for use. After the concrete material properties were measured in the field and approved, a sample of the concrete was collected and placed into three (3) test cylinders to verify the material strength after 7, 14 and 28 days of curing.</p>
1700	I left the site.

Chris Scott

Printed Name

  
Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 066**

PROJECT: Kekaha Landfill  
 LOCATION: Kekaha, Kauai, Hawaii  
 DESCRIPTION: Phase II Lateral Expansion  
 Cell 1 Base Liner Construction  
 DAY OF WEEK: Thursday  
 WEATHER: Overcast and cloudy with rain during the afternoon.

PROJECT NO.: WG1298  
 TASK NO.: 02  
 CONTRACTORS: Goodfellow Bros. / Northwest Linings  
 DATE: DAY: 8 MONTH: April YEAR: 2010

0600	I arrived on site. Goodfellow Bros. is already on site.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	Equipment on site today: Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u> GBI continues to backfill the NLEP perimeter anchor trench to support the liner system. The backfill material is a clean sand and is being compacted using a walk behind "sled" vibratory compactor.  The contractor continues to import ¾-inch minus granular operations layer material from the Kauai Aggregate Quarry, and stockpiles the material outside of the NLEP.  The contractor is also stockpiling 3-inch minus granular fill on site to be used within the NLEP side slope Geocell. A sample (NLEP GC-001) was collected from the onsite stockpile and delivered to Hirata and Associates for conformance testing.
	<u>Cell 1 Construction</u> Laboratory results for seam samples DS-S-1 through DS-S-7 were received from Precision Laboratory. The tests showed passing results.  <u>Geosynthetics Installation</u> Due to today's rainfall, liner deployment has been suspended.
	<u>New Infiltration Basin (NIB)</u> No work in this area today.
	<u>Waste Drop off Area Improvements</u> No work in this area today.
1700	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 067**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Friday

DATE: DAY: 9      MONTH: April

YEAR: 2010

WEATHER: Sunny and warm during the day

0600	I arrived on site. Goodfellow Bros. is already on site.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>GBI continues to backfill the NLEP perimeter anchor trench to support the liner system. The backfill material is clean sand and is being compacted using a walk behind "sled" vibratory compactor.</p> <p>The contractor continues to import ¾-inch minus granular operations layer material from the Kauai Aggregate Quarry. The material is temporarily stockpiled outside of the NLEP until the contractor can place the material onto the floor of the pond.</p>
	<p><u>Cell 1 Construction</u></p> <p>GBI has excavated a utility force main trench within the Cell 1 (Cells 1C and 1D) perimeter berm, and has begun the process of installing the Cell 1D pipe penetration within the sump.</p> <p>GBI subcontractor ITC Water Management (ITC) has production-welded the gravity flow double wall pipe section, and has fabricated the section of double wall pipe which will extend the gravity flow pipe into forcemain Manhole 14. After the section of pipe was fabricated, ITC pressurized the outer wall of the containment pipe. During the tests visual observation of the pre-fabricated 90-degree elbow identified a leak in the factory joint of containment pipe. The test was terminated until the 90-degree elbow is replaced with a new pre-fabricated pipe section.</p> <p><u>Geosynthetics Installation</u></p> <p>NWL has begun to install the primary 60 mil HDPE geomembrane above the previously installed GCL and</p>

Chris Scott

Printed Name

[Signature]  
Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion

LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02

DAY/DATE: 9 April 2010

	<p>subbase 60 mil HDPE geomembrane within the Cells 1C &amp; 1D area.</p> <p><u>GCL Deployment</u></p> <p>NWL installed approximately <u>25,000 sq ft</u> of GCL above the previously installed subbase 60 mil HDPE geomembrane. The GCL installed today was installed and overlapped in accordance with the project specifications and the design engineer recommendations (23 December 2009 email correspondence from AECOM).</p> <p><u>60 mil DST geomembrane</u></p> <p>NWL installed <u>22,724 sq ft</u> of primary 60 mil HDPE geomembrane during construction today.</p> <p>Total 60 mil HDPE geomembrane (subbase and primary) deployed to date is <u>82,064 sq ft</u>.</p> <p>Six primary 60 mil HDPE geomembrane panels were used today in various widths and lengths for a total of six primary panels.</p> <p><u>786 linear feet</u> (lf) of 60 mil HDPE geomembrane fusion-welded seams were recorded today. All of the production seams were air tested today. The production seam air tests performed today were found meeting the project requirements.</p> <p>All trial welds for both fusion and extrusion welders were prepared and tested in the field. The field tensiometer tests results indicate the welders were able to achieve the required seam strengths for the project.</p> <p>Three seam samples (DS-P-1 through DS-P-3) were marked within the welded production seams for destructive testing. The seam samples are pending air tests results before removal.</p> <p>No repairs were installed today.</p>
	<p><u>New Infiltration Basin (NIB)</u></p> <p>No work in this area today.</p>
	<p><u>Waste Drop off Improvements</u></p> <p>No work in this area today.</p>
1730	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 068**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298 TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Saturday

DATE: DAY: 10 MONTH: April

YEAR: 2010

WEATHER: Sunny and warm during the day.

0600	I arrived on site. A Goodfellow Bros. equipment operator is on site to assist in the importing operation for the materials received from the Kauai Aggregate Quarry.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>No work in this area today.</p>
	<p><u>Cell 1 Construction</u></p> <p><u>Geosynthetics Installation</u></p> <p>No geosynthetics deployment were performed today. NWL performs repairs, patches and tie-in production-seaming for the installed primary 60 mil HDPE geomembrane within Cells 1C &amp; 1D.</p> <p>Total 60 mil HDPE geomembrane (subbase and primary) deployed to date is <u>82,064 sq ft</u>.</p> <p><u>252 linear feet (lf)</u> of extrusion-welded seams within the subbase layer tie-in to the existing Phase II containment system and <u>92 lf</u> of extrusion-welded seams within the primary layer tie-in to the existing Phase II containment system were recorded today.</p> <p>All of the production seams were vacuum box tested today. The extrusion-welded production seams tested today were found meeting the project requirements.</p> <p>The extrusion trial weld was prepared and tested in the field. The field tensiometer tests results indicate the welder was able to achieve the required seam strengths for the project.</p> <p>One seam sample (DS-P-8) was cut from the extrusion-welded production seam. A coupon from the seam</p>

Cris Scott

Printed Name

Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion  
LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02  
DAY/DATE: 10 April 2010

	<p>sample was tested in the field using a tensiometer. The field tests results showed passing results. Therefore the seam sample DS-S-8 will be delivered to Precision Laboratories for conformance testing.</p> <p>Three subbase layer repairs and seven primary layer repairs were installed today. All repairs were vacuum box tested. The repairs constructed today were completed in accordance with the project requirements.</p> <p>During construction today, NWL prepared a trail weld to evaluate the shear and peel strength of the 80 mil HDPE geomembrane extrusion-welded to the 1/2-inch thick HDPE flat stock. The temperature of the hand-held extruder was set to 550 degrees, and the preheat temperature was set to 500 degrees. The 80 mil HDPE geomembrane was leistered to the 1/2-inch thick HDPE plate, and the weld seam was prepared using a hand grinder. After the 80 mil HDPE geomembrane was extrusion-welded to the plate, several sample coupons were cut from the trail weld and tested using a tensiometer. The field shear and peel strength tests showed passing results. Therefore, a trial seam sample will be delivered to Precision Laboratories for conformance testing.</p>
	<p><u>New Infiltration Basin (NIB)</u> No work in this area today.</p>
	<p><u>Waste Drop off Area Improvements</u> No work in this area today.</p>
1400	I left the site.

Chris Scott  
Printed Name

  
Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 069**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298 TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Monday

DATE: DAY: 12 MONTH: April

YEAR: 2010

WEATHER: Sunny and warm during the day.

0600	I arrived on site. Goodfellow Bros. is already on site.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today
	Equipment on site today;  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u>  The contractor continues to import ¾-inch minus granular operations layer material from the Kauai Aggregate Quarry. The material is hauled to the temporary ramp located on the western end of the NLEP and dumped along the side slope. A Caterpillar D6 LGP dozer pushes the dumped material over the floor of the NLEP to construct the 1-ft thick granular operations layer.
	<u>Cell 1 Construction</u>  GBI subcontractor ITC Water Management has repaired the defective 90 degree elbow, and has pressure tested the secondary "containment" component of the pipe section from the Cell 1D sump to Manhole #14. The pressure test was sustained for one hour with no the leakage observed.  A penetration was cut into the existing Manhole #14 and the downstream end of the double-wall gravity flow pipe was installed into the manhole and sealed using an extrusion weld. The end of the primary "carrier" pipe was capped in preparation for the pressure tests.  <u>Geosynthetics Installation</u>  NWL continues to install GCL over the previously installed subbase 60 mil HDPE geomembrane, and has begun to install the primary 60 mil HDPE geomembrane above previously installed GCL within Cell 1 (Cells 1C & 1D).

Chris Scott

Printed Name



Signature

cc: Mike Minch



PROJECT: Phase II Lateral Expansion  
LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02  
DAY/DATE: 12 April 2010

	<p><u>GCL Deployment</u></p> <p>NWL installed approximately <u>30,000 sq ft</u> of GCL today. The GCL installed today with 12-inch overlaps along the width and 6-inch overlaps along the length. Granular bentonite was placed along the width of the seam (butt seam) overlaps, and the super groove factory seam was used along the length of the seam overlaps. The GCL was installed in accordance with the project specifications and the design engineer recommendations (23 December 2009 email correspondence from AECOM).</p> <p><u>60 mil DST HDPE geomembrane:</u></p> <p>NWL installed <u>28,773 sq ft</u> of 60 mil HDPE geomembrane during construction today.</p> <p>Total 60 mil HDPE geomembrane (subbase and primary) deployed to date is <u>110,837 sq ft</u>.</p> <p><u>Seven panels</u> of primary 60 mil HDPE geomembrane were used today in various widths and lengths for a total of <u>seven primary panels</u>.</p> <p><u>1319 linear feet</u> (lf) of fusion-welded seams were recorded today. The production seams welded today were documented and the air tests are pending.</p> <p>All trial welds for both fusion and extrusion welders were prepared and tested in the field. The field tensiometer tests results indicate the welders were able to achieve the required seam strengths for the project.</p> <p>Four seam samples (DS-P-4 through DS-P-7) were marked within the welded production seams for destructive seam testing. The seam samples are pending air tests results before removal.</p> <p>No repairs were installed today.</p>
	<p><u>New Infiltration Basin (NIB)</u></p> <p>No work in this area today.</p>
	<p><u>Waste Drop off Improvements</u></p> <p>No work in this area today.</p>
1730	I left the site.

Chris Scott  
Printed Name:

  
Signature:

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 070**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Tuesday

DATE: DAY: 13 MONTH: April

YEAR: 2010

WEATHER: Sunny and warm during the day.

0600	I arrived on site. Goodfellow Bros. is already on site.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>The contractor continues to import ¾-inch minus granular operations layer material from the Kauai Aggregate Quarry. The material is hauled to the temporary ramp located on the western end of the pond and dumped along the side slope. A Caterpillar D6 LGP dozer pushes the dumped material over the floor of the NLEP to construct the 1-ft thick granular operations layer.</p>
	<p><u>Cell 1 Construction</u></p> <p>GBI subcontractor ITC Water Management has tested the 1 inch void space within pipe penetrations assemblies for the Cell 1C and 1D sumps. The void spaces were tested independently and found to meet the project requirements.</p> <p>The pipe penetration for Cell 1D sump was installed, and the inside wall "carrier" pipe of the double-wall containment pipe, which connects the pipe penetration to Manhole #14, was connected using an electro-fusion coupler.</p> <p>The double-wall inside "carrier" pipe was capped and a test flange was installed at the inlet of the pipe. The pipe assembly was then tested in accordance with Section 01457 of the project specifications. The pressure test was found meeting the project requirements.</p> <p><u>Geosynthetics Installation</u></p> <p>Laboratory results for seam samples DS-S-8, ½"-Plate/5117, and DS-P-1 through DS-P-3 were received from</p>

Chris Scott

Printed Name

Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion  
LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02  
DAY/DATE: 13 April 2010

	<p>Precision Laboratory. All tests showed passing results.</p> <p>No geosynthetics deployment was performed today. NWL concentrated on repairs, patches and tie-in production seaming.</p> <p>Total geomembrane (subbase and primary) deployed to date is <u>110,837 sq ft</u>.</p> <p><u>115 linear feet (lf)</u> of extrusion-welded seams along the primary liner tie-in to existing Phase I containment system were recorded today. All production seams were vacuum box tested today. The extrusion-welded production seams tested today were found meeting the project requirements.</p> <p>The extrusion trial weld was prepared and tested in the field. The field tensiometer tests results indicate the welder was able to achieve the required seam strengths for the project.</p> <p>One seam sample (DS-P-7) cut from the extrusion welded production seam for destructive seam testing. A coupon from the seam sample was tested in the field using a tensiometer. The tests results showed passing results. Therefore, the seam sample DS-P-7 will be delivered to Precision Laboratories for destructive seam testing.</p> <p>Thirteen repairs were installed for the primary 60 mil HDPE geomembrane today. All of the repairs were vacuum box tested. The repairs constructed today were completed in accordance with the project requirements.</p>
	<p><u>New Infiltration Basin (NIB)</u></p> <p>No work in this area today.</p>
	<p><u>Waste Drop off Improvements</u></p> <p>No work in this area today.</p>
1730	I left the site.

Chris Scott  
Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 071**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Wednesday

DATE: DAY: 14 MONTH: April

YEAR: 2010

WEATHER: Sunny and warm during the day.

0600	I arrived on site. Goodfellow Bros. is already on site.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoes, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>The contractor continues to import ¾-inch minus granular operations layer material from the Kauai Aggregate Quarry. The material is hauled to the temporary ramp located on the western end of the pond and dumped along the side slope. A Caterpillar D6 LGP dozer pushes the dumped material over the floor of the NLEP to construct the 1-ft thick granular operations layer.</p>
	<p><u>Cell 1 Construction.</u></p> <p>GBI subcontractor ITC Water Management continues to production weld double-wall pipe to be used for the various containment systems applications. The fusion welds conducted today were visually observed during welding and completed in accordance with the project requirements.</p> <p>GBI has begun to backfill the utility trench within the Cell 1 perimeter berm adjacent to the gravity flow double-wall conveyance pipe. The utility trench was backfilled using onsite sand. The material was placed in uniform lifts approximately 6 to 8 inches loose, moisture conditioned, and then compacted using a walk behind vibratory plate compactor. Several field density tests using a Troxler portable nuclear moisture/density gauge indicate the compaction effort is meeting the project requirements.</p> <p><u>Geosynthetics Installation</u></p> <p>NWL continues to install the subbase containment system within Cells 1C and 1D, and to perform repairs, patches and tie-in production seaming.</p>

Chris Scott

Printed Name



Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion  
LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02  
DAY/DATE: 14 April 2010

	<p><u>GCL Deployment</u></p> <p>No GCL installed today during construction.</p> <p><u>60 mil DST geomembrane:</u></p> <p>NWL installed <u>25,208 sq ft</u> of subbase 60 mil HDPE geomembrane during construction today.</p> <p>Total 60 mil HDPE geomembrane (subbase and primary) deployed to date is <u>135,355 sq ft</u>.</p> <p>Nine subbase geomembrane panels were used today in various widths and lengths.</p> <p><u>23 linear feet (lf)</u> of extrusion-welded seams along the primary liner tie-in to existing Phase II containment system were recorded today. All of the fusion production seams were air tested and all the extrusion production seams were vacuum box tested today. The production seams tested today were found meeting the project requirements.</p> <p>Both fusion and extrusion welded trial seams was prepared and tested in the field. The field tensiometer tests results indicate the welder was able to achieve the required seam strengths for the project.</p> <p>Four seam samples (DS-S-8 through DS-S-11) were cut from the production seams for destructive testing. A coupon from each destructive sample was tested in the field using a tensiometer. The tests showed passing results. Therefore, the seam samples DS-S-8 through DS-S-11 will be delivered to Precision Laboratories for destructive seam testing.</p> <p><u>Eight repairs</u> were performed on the subbase 60 mil HDPE geomembrane today. All of the repairs were vacuum box tested. The repairs constructed today were completed in accordance with the project requirements.</p>
	<p><u>New Infiltration Basin (NIB)</u></p> <p>No work in this area today.</p>
	<p><u>Waste Drop off Improvements</u></p> <p>No work in this area today.</p>
1730	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 072**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298 TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Thursday

DATE: DAY: 15 MONTH: April

YEAR: 2010

WEATHER: Sunny and warm during the day.

0600	I arrived on site. Goodfellow Bros. is already on site.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>The contractor has the majority of the ¾-inch minus granular operation layer stockpiled within the NLEP floor area. Import of the material from the Kauai Aggregate Quarry has been temporarily suspended.</p>
	<p><u>Cell 1 Construction</u></p> <p>GBI subcontractor ITC Water Management (ITC) continues to production weld double-wall pipe to be used for the various containment systems applications. The fusion welds conducted today were visually observed during welding and completed in accordance with the project requirements.</p> <p>ITC has installed the double-wall containment pipe from Cell 1C sump to the Cell 1C temporary wet well location. Although the wet well has not yet been installed, the double-wall pipe has been extended to the design location.</p> <p>The carrier and containment pipes installed from the Cell 1C penetration to the Cell 1C wet well were independently tested and found to meet the project requirements. However, the final weld connecting the double-wall containment pipe to the Cell 1C wet well has not yet been tested. Air pressure tests are pending the installation of the wet well.</p> <p>GBI has grouted the 1-inch void spaces within the Cell 1C and 1D pipe penetration assemblies. The grout was mixed in a wheelbarrow by hand using the following mix: 30 gallons of water, 94 pounds of Portland cement, and 15 pounds of granular bentonite. The mix was poured into the void space until the space was full.</p>

Chris Scott

Printed Name



Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion  
LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02  
DAY/DATE: 15 April 2010

	<p><u>Geosynthetics Installation</u></p> <p>Laboratory results for seam samples DS-P-4 through DS-P-7 were received from Precision Laboratory. All tests showed passing results. NWL continues to install the subbase containment system within Cells 1C and 1D.</p> <p><u>GCL Deployment</u></p> <p>No GCL installed today during construction.</p> <p><u>60 mil DST geomembrane</u></p> <p>NWL installed <u>32,729 sq ft</u> of 60 mil HDPE geomembrane during construction today.</p> <p>Total 60 mil HDPE geomembrane (subbase and primary) deployed to date is <u>168,084 sq ft</u>.</p> <p>Ten subbase 60 mil HDPE geomembrane panels were used today in various widths and lengths.</p> <p><u>207 linear feet</u> (lf) of extrusion-welded seams along the primary liner tie-in to existing Phase II containment system were recorded today. All of the fusion production seams were air tested and all the extrusion production seams were vacuum box tested today. The production seams tested today were found meeting the project requirements.</p> <p>Both fusion and extrusion welded trial seams was prepared and tested in the field. The field tensiometer tests results indicate the welder was able to achieve the required seam strengths for the project.</p> <p>Five seam samples (DS-S-12 through DS-S-16) were cut from the production seams. A coupon from each seam sample was tested in the field using a tensiometer. The tests showed passing results. Therefore, the seam samples DS-S-8 through DS-S-11 will be delivered to Precision Laboratories for destructive seam testing.</p> <p>No repairs were performed for the primary 60 mil HDPE geomembrane today. Fourteen repairs on the subbase 60 mil HDPE geomembrane were observed during construction today. All of the repairs were vacuum box tested. The repairs constructed today were completed in accordance with the project requirements.</p>
	<p><u>New Infiltration Basin (NIB)</u></p> <p>No work in this area today.</p>
	<p><u>Waste Drop off Improvements</u></p> <p>No work in this area today.</p>
1730	I left the site.

Chris Scott  
Printed Name

  
Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 073**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Friday

DATE: DAY: 16      MONTH: April

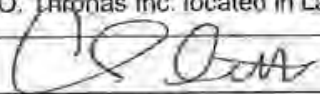
YEAR: 2010

WEATHER: Sunny and warm during the day.

0600	I arrived on site. Goodfellow Bros. is already on site.
1030	I contracted Joel Mondragon (Northwest Linings [NWL] Superintendent) to inform him of failing destructive tests results received today from Precision Laboratories.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>GBI has begun to place 3-inch minus granular fill material into the Geocell on the NLEP side slopes. The material is being hauled to the NLEP from an onsite stockpile using a Caterpillar articulated haul truck. Once the material is hauled to the NLEP, a Hitachi excavator removes the material directly from the haul truck and places the material into the Geocell. Two laborers uniformly grade the granular fill using hand tools.</p>
	<p><u>Cell 1 Construction.</u></p> <p>GBI subcontractor ITC Water Management has installed the double-wall forcemain containment pipe from Manhole #14 to Cell 1C sump. A penetration was cut into the manhole, and the forcemain conveyance pipe was installed so that the discharge end of the pipe extends through the sidewall of the manhole. The forcemain was then fusion-welded around the penetration to provide a seal. A copper wire was installed around the joint before the weld was completed. Once the weld was completed, a non-destructive spark tester was used to verify that the weld provided a positive seal. No leaks were observed during the spark test.</p> <p>Once the forcemain was installed, GBI continues to backfill the utility trench using onsite sand. The backfill material was placed in uniform 6 to 8 inches loose, moisture conditioned using a water truck, and then compacted using a walk behind vibratory compactor. Several field density tests using a Troxler portable nuclear moisture/density gauge indicate the compaction effort meets the project requirements.</p> <p>GBI has backfilled the space beneath the Cell 1C and 1D pipe penetration assemblies using a #4 quarry dust CLSM mix provided by O. Thomas Inc. located in Lawai, HI.</p>

Chris Scott

Printed Name



Signature

cc: Mike Minch



PROJECT: Phase II Lateral Expansion

LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02

DAY/DATE: 16 April 2010

	The backfill material was poured directly into the area beneath the pipe penetrations, after which a vibrator was used to remove any voids within the fill material. A sample of the batch was obtained and three cylinders were cast to verify the CLSM strength after seven days of curing.
1100	NWL arrived on site to evaluate the failing destructive seam sample DS-S-14. The production seam was tracked a minimum of 10 feet before and after the failing destruct sample location. Additional samples of the production seam were cut and tested in the field using a tensiometer. The peel and shear tests results provided by NWL using the field tensiometer showed passing results. Therefore, two additional destructive seam samples (DS-S-17-after and DS-S-18-before) were marked in the production seams tested in the field and delivered to Precision Laboratories for destructive seam testing
	<u>New Infiltration Basin (NIB)</u> No work in this area today.
	<u>Waste Drop off Improvements</u> No work in this area today.
1730	I left the site.

Chris Scott

Printed Name



Signature

cc Mike Minetti

**DAILY FIELD REPORT**

**Report Sequence No.: 074**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Saturday

DATE: DAY: 17      MONTH: April

YEAR: 2010

WEATHER: Sunny and warm during the day.

0600	I arrived on site. Goodfellow Bros. is already on site.
	Northwest Linings (NWL) is not on site today.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u>  GBI continues to place the 3-inch minus granular fill material into the Geocell on the NLEP side slopes. The material is being hauled into the NLEP from an onsite stockpile using a Caterpillar articulated haul truck. Once the material is hauled to the NLEP, a Hitachi excavator removes the material directly from the haul truck and places the material into the Geocell. Three laborers uniformly grade the gravel using hand tools.
	<u>Cell 1 Construction</u>  GBI is working to construct the design grades for the perimeter berm for Cells 1C and 1D. The contractor is placing onsite sand (excavated from the infiltration basin) using a Caterpillar articulated haul truck. The compacted fill (onsite soils) material is then spread in uniform 6- to 8-inch loose lifts using a D6 LGP dozer. Once the lift has been graded over the entire width of the berm, the lift is moisture conditioned using a water truck and then compacted using a HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor. Several field density tests using a Troxler portable nuclear moisture/density gauge indicate the compaction effort meets the project requirements.
	<u>New Infiltration Basin (NIB)</u>  GBI is excavating soil from the NIB to be used as compacted fill (onsite soils) within the Cells 1C and 1D perimeter berm.
	<u>Waste Drop off Improvements</u>  No work in this area today.
1530	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minchi

**DAILY FIELD REPORT**

**Report Sequence No.: 075**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Monday

DATE: DAY: 19      MONTH: April

YEAR: 2010

WEATHER: Sunny and warm during the day.

0600	I arrived on site. Goodfellow Bros. is already on site.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>GBI continues to place the 3-inch minus granular fill into the Geocell within the NLEP side slopes. The material is being hauled into the NLEP from an onsite stockpile using a Caterpillar articulated haul truck. Once the material gets to the NLEP, a Hitachi excavator removes the material directly from the haul truck and places the material into the Geocell. Three laborers uniformly grade the gravel using hand tools.</p>
	<p><u>Cell 1 Construction</u></p> <p>Esaki Surveying &amp; Mapping, Inc. is on site to perform the as built survey of the Cell 1D northern side slope.</p> <p><u>Geosynthetics Installation</u></p> <p>NWL continues to install the primary containment system above the approved subbase layer within Cells 1C and 1D.</p> <p><u>GCL Deployment</u></p> <p>NWL installed approximately 35,000 sq ft of GCL today. The GCL was installed today with 12-inch overlaps along the width and 6-inch overlaps along the length. Granular bentonite was placed along the width of the seam (butt seam) overlaps, and the super groove factory seam was used along the length of the seam overlaps. The GCL was installed in accordance with the project specifications and the design engineer recommendations (23 December 2009 email correspondence from AECOM).</p>

Chris Scott

Printed Name:



Signature:

cc: Mike Minch

PROJECT: Phase II Lateral Expansion  
LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02  
DAY/DATE: 19 April 2010

	<p><u>60 mil DST geomembrane:</u></p> <p>NWL installed <u>34,592 sq ft</u> of double-sided textured HDPE geomembrane during construction today.</p> <p>Total geomembrane (subbase and primary) deployed to date is <u>202,676 sq ft</u>.</p> <p>Eight panels were used today in various widths and lengths.</p> <p>All of the fusion production seams were non-destructive air tested, and the extrusion production seams were vacuum box tested today. The production seams tested today were found meeting the project requirements.</p> <p>Both fusion and extrusion welded trial seams were prepared and tested in the field. The field tensiometer tests results indicate the welder was able to achieve the required seam strengths for the project.</p> <p>Three destructive samples (DS-P-8 through DS-P-10) were cut from the production seams. Coupons from the destructive samples were tested in the field using a tensiometer. The field tests showed passing results. Therefore, the laboratory samples DS-S-8 through DS-P-10 will be delivered to Precision Laboratories for conformance testing.</p> <p>No repairs were installed today.</p>
	<p><u>New Infiltration Basin (NIB)</u></p> <p>No work in this area today.</p>
	<p><u>Waste Drop off Improvements</u></p> <p>No work in this area today.</p>
1730	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 076**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Tuesday

DATE DAY: 20 MONTH: April

YEAR: 2010

WEATHER: Overcast and cloudy in the morning, light showers during the afternoon.

0600	I arrived on site. Goodfellow Bros. is already on site.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.
	I attended weekly construction meeting.
1130	I returned from weekly construction meeting.
	<u>New Leachate Evaporation Pond (NLEP)</u>  GBI has placed the majority of the 3-inch minus granular fill into the Geocell within the NLEP side slopes. The only remaining area to be completed is the west berm area adjacent to the temporary access ramp.  GBI has begun to grade the 3/4-inch minus granular operations layer material to 1-ft thick above the NLEP floor containment system using a Caterpillar LGP D6 dozer with GPS grade control. A labor is working with the operator to ensure no damage occurs to the underlying geosynthetics.
	<u>Cell 1 Construction</u>  <u>Geosynthetics Installation</u>  NWL continues to install the primary containment system above the approved subbase layer within Cells 1C and 1D.  Destructive seam test results from Precision Laboratories for seam sample DS-S-17 indicate the production seam did not meet the minimum project specification for peel adhesion. NWL elected to cap the entire production seam from destructive seam sample DS-S-18 (passing laboratory destructive seam test results) to the end of the production seam at location of destructive seam sample DS-S-16. The entire seam was capped and vacuum box tested during construction today.

Chris Scott  
Printed Name

  
Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion

LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02

DAY/DATE: 20 April 2010

	<p><u>GCL Deployment</u></p> <p>No GCL deployment was performed today.</p> <p><u>60 mil DST geomembrane:</u></p> <p>NWL did not install HDPE geomembrane during construction today. The contractor worked to complete repairs and patches.</p> <p>Total geomembrane (subbase and primary) deployed to date is <u>202,676 sq ft.</u></p> <p><u>161 linear feet (lf)</u> of extrusion-welded seams along the primary tie-in to existing Phase II containment system were recorded today. All of the extrusion production seams were vacuum box tested today. The production seams tested today were found meeting the project requirements.</p> <p>The extrusion welded trial seams was prepared and tested in the field. The field tensiometer tests results indicate the welder was able to achieve the required seam strengths for the project.</p> <p>One destructive seam sample (DS-P-11) was cut from the production seams. A coupon from the seam sample was tested in the field using a tensiometer. The field tests showed passing results. Therefore, the seam sample DS-S-11 will be delivered to Precision Laboratories for conformance testing.</p> <p>Nine primary repairs and eleven subbase repairs were installed today. All repairs installed today were non-destructive vacuum box tested, and no leaks were observed during the test.</p>
	<p><u>New Infiltration Basin (NIB)</u></p> <p>No work in this area today.</p>
	<p><u>Waste Drop off Improvements</u></p> <p>No work in this area today.</p>
1730	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 077**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Wednesday

DATE: DAY: 21 MONTH: April

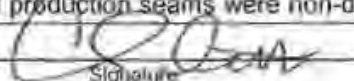
YEAR: 2010

WEATHER: Overcast and cloudy in the morning, light showers during the afternoon.

0600	I arrived on site. Goodfellow Bros. is already on site.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u>  GBI continues to grade the ¾-inch minus granular operations layer material to 1-ft thick above the NLEP containment system using a Caterpillar LGP D6 dozer with GPS grade control. A laborer is working with the operator to ensure no damage occurs to the underlying geosynthetics.
	<u>Cell 1 Construction</u>  <u>Geosynthetics Installation</u>  NWL continues to install the subbase 60 mil HDPE geomembrane above the approved subgrade.  <u>GCL Deployment</u>  No GCL deployment was performed today.  <u>60 mil DST geomembrane:</u>  NWL installed <u>12,719 sq ft.</u> of subbase 60 mil HDPE geomembrane during construction today.  Total geomembrane (subbase and primary) deployed to date is <u>215,395 sq ft.</u>  Twelve subbase 60 mil HDPE geomembrane panels were installed today in various widths and lengths.  All of the fusion welded production seams were non-destructive air tested today. The production seams tested

Chris Scott

Printed Name



Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion

LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02

DAY/DATE: 21 April 2010

	<p>today were found meeting the project requirements.</p> <p>The fusion welded trial seams was prepared and tested in the field. The field tensiometer tests results indicate the welder was able to achieve the required seam strengths for the project.</p> <p>Three destructive seam samples (DS-S-19 through DS-S-21) were cut from the production seams. Coupons from the seam samples were tested in the field using a tensiometer. The field tests showed passing results. Therefore, the seam samples DS-S-19 through DS-S-21 will be delivered to Precision Laboratories for conformance testing.</p> <p>Fifteen repairs on the subbase HDPE geomembrane were observed during construction today. All repairs installed today were non-destructive vacuum box tested, and no leaks were observed during the test.</p>
	<p><u>New Infiltration Basin (NIB)</u></p> <p>No work in this area today.</p>
	<p><u>Waste Drop off Improvements</u></p> <p>No work in this area today.</p>
1730	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Mincks



**DAILY FIELD REPORT**

**Report Sequence No.: 078**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Thursday

DATE: DAY: 22 MONTH: April

YEAR: 2010

WEATHER: Sunny and warm during the afternoon.

0600	I arrived on site. Goodfellow Bros. is already on site.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u>  GBI continues to grade the ¾-inch minus granular operations layer material to 1-ft thick above the NLEP containment system using a Caterpillar LGP D6 dozer with GPS grade control. A laborer is working with the operator to ensure no damage occurs to the underlying geosynthetics.
	<u>Cell 1 Construction</u>  Destructive seam test results for seam samples DS-P-11 and DS-S-19 through DS-S-21 were received from Precision Laboratories. The laboratory test results for seam samples DS-S-20 and DS-P-11 showed failing results.  NWL tracked the production seam located at DS-S-20 a minimum of 10 feet before and after the failing destruct sample location. As for DS-P-11, this destructive seam sample was located at the beginning of the extrusion welded production seam and at the start of the day. Therefore, this destructive seam sample (DS-P-11) was only tracked after the failing sample location.  Additional samples of the production seam were cut and tested in the field using a tensiometer. The field peel and shear tests results provided by NWL using the field tensiometer showed passing results. Therefore, three additional destructive seam samples (DS-S-22-before, DS-S-23-after and DS-P-14-after) were marked in the production seams.  Coupons from the destructive seam samples were cut from the production seam and then tested in the field tested using a tensiometer. The field test data indicate that the seams tested in the field meet the project requirements. The seam samples (DS-S-22-before, DS-S-23-after and DS-P-14-after) were delivered to Precision Laboratories for conformance testing.

Chris Scott

Printed Name

Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion  
LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02  
DAY/DATE: 22 April 2010

	<p><u>Geosynthetics Installation</u></p> <p>NWL continues to install the primary 60 mil HDPE geomembrane and GCL above the approved subbase 60 mil HDPE geomembrane.</p> <p><u>GCL Deployment</u></p> <p>NWL installed approximately <u>25,000 sq ft</u> of GCL today. The GCL were installed today with 12-inch overlaps along the width and 6-inch overlaps along the length. Granular bentonite was placed along the width of the seam (butt seam) overlaps, and the super groove factory seam was used along the length of the seam overlaps. The GCL was installed in accordance with the project specifications and the design engineer recommendations (23 December 2009 email correspondence from AECOM).</p> <p><u>60 mil DST geomembrane:</u></p> <p>NWL installed <u>23,644 sq ft</u> of primary 60 mil HDPE geomembrane during construction today.</p> <p>Total geomembrane (subbase and primary) deployed to date is <u>239,039 sq ft</u>.</p> <p>Six primary 60 mil HDPE geomembrane panels were installed today in various widths and lengths.</p> <p>All of the fusion welded production seams were non-destructive air tested today. The production seams tested today were found meeting the project requirements.</p> <p>The fusion welded trial seams was prepared and tested in the field. The field tensiometer tests results indicate the welder was able to achieve the required seam strengths for the project.</p> <p>Four seam samples (DS-P-12 through DS-S-15) were cut from the production seams. Coupons from the seam samples were tested in the field using a tensiometer. The field tests showed passing results. Therefore, the seam samples DS-P-12 through DS-P-15 will be delivered to Precision Laboratories for conformance testing.</p> <p>Nineteen repairs on the primary 60 mil HDPE geomembrane were observed during construction today. All repairs installed today were non-destructive vacuum box tested, and no leaks were observed during the test.</p>
	<p><u>New Infiltration Basin (NIB)</u></p> <p>No work in this area today.</p>
	<p><u>Waste Drop off Improvements</u></p> <p>No work in this area today.</p>
1730	I left the site.

Chris Scott

Printed Name:



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 079**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Friday

DATE: DAY 23 MONTH: April

YEAR: 2010

WEATHER: Sunny and warm during the afternoon.

0600	I arrived on site. Goodfellow Bros. is already on site.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>GBI has completed the majority of the installation and grading of the 3/4-inch minus granular operations layer material, 1-ft thick above the NLEP floor containment system.</p> <p>Esaki Surveying &amp; Mapping, Inc. and Wagner Surveyors are on site today to survey the top of granular operations layer within the NLEP.</p> <p>GBI subcontractor ITC Water Management is on site to install the 2-inch thick HDPE plate in preparation for the concrete aerator pad construction. The 2-inch HDPE plate is underlain by two layers of 16 oz/sy nonwoven geotextile, and was installed in several pieces and fusion-welded together in-place. A 1/2-inch bevel was cut into the adjoining panels and then butt welded together to provide a continuous 2-inch thick HDPE plate underlying the future concrete aerator pad.</p>
	<p><u>Cell 1 Construction</u></p> <p>Precision Laboratories provided tests results for the destructive seam samples submitted on 22 April 2010. All the destructive seam tests showed passing results.</p> <p><u>Geosynthetics Installation</u></p> <p>NWL continues to install the primary 60 mil HDPE geomembrane and GCL above the approved subbase 60 mil HDPE geomembrane.</p>

Chris Scott

Printed Name



Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion  
LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02  
DAY/DATE: 23 April 2010

	<p><u>GCL Deployment</u></p> <p>NWL installed approximately <u>19,500 sq ft</u> of GCL today. The GCL was installed today with 12-inch overlaps along the width and 6-inch overlaps along the length. Granular bentonite was placed along the width of the seam (butt seam) overlaps, and the super groove factory seam was used along the length of the seam overlaps. The GCL was installed in accordance with the project specifications and the design engineer recommendations (23 December 2009 email correspondence from AECOM).</p> <p><u>60 mil DST geomembrane:</u></p> <p>NWL installed <u>18,814 sq ft</u> of primary 60 mil HDPE geomembrane during construction today.</p> <p>Total geomembrane (subbase and primary) deployed to date is <u>257,853 sq ft</u>.</p> <p>Fourteen primary 60 mil HDPE geomembrane panels were installed today in various widths and lengths.</p> <p>All of the fusion welded production seams were non-destructive air tested today. The production seams tested today were found meeting the project requirements.</p> <p>The fusion welded trial seams was prepared and tested in the field. The field tensiometer tests results indicate the welder was able to achieve the required seam strengths for the project.</p> <p>Three destructive seam samples (DS-P-16 through DS-P-18) were cut from the production seams. Coupons from the seam samples were tested in the field using a tensiometer. The field tests showed passing results. Therefore, the seam samples DS-P-16 through DS-P-18 will be delivered to Precision Laboratories for conformance testing.</p> <p>Sixteen repairs on the primary 60 mil HDPE geomembrane were observed during construction today. All repairs installed today were non-destructive vacuum box tested, and no leaks were observed during the test.</p>
	<p><u>New Infiltration Basin (NIB)</u></p> <p>No work in this area today.</p>
	<p><u>Waste Drop off Improvements</u></p> <p>No work in this area today.</p>
1800	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 080**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Saturday

DATE: DAY: 24      MONTH: April

YEAR: 2010

WEATHER: Sunny and warm during the afternoon.

0600	I arrived on site. Goodfellow Bros. is not on site today.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>GBI subcontractor ITC Water Management is on site to install the 2-inch thick HDPE plate in preparation for the concrete aerator pad construction.</p> <p>The 2-inch HDPE plate is underlain by two layers of 16 oz/sy nonwoven geotextile, and was installed in several pieces and fusion-welded together in-place. A 1/2-inch bevel was cut into the adjoining panels and then butt welded together to provide a continuous 2-inch thick HDPE plate underlying the future concrete aerator pad.</p>
	<p><u>Cell 1 Construction</u></p> <p><u>Geosynthetics Installation</u></p> <p>NWL did not install geosynthetics during construction today. The contractor worked to complete repairs, patches, and production seaming.</p> <p><u>GCL Deployment</u></p> <p>No GCL was installed today.</p> <p><u>60 mil DST geomembrane:</u></p> <p>Total geomembrane (subbase and primary) deployed to date is <u>257,853 sq ft</u>.</p>

Chris Scott

Printed Name:



Signature:

cc: Mike Minch

PROJECT: Phase II Lateral Expansion

LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02

DAY/DATE: 24 April 2010

	<p><u>115 linear feet</u> (lf) of extrusion-welded seams along the primary tie-in to existing Phase II containment system were recorded today. All of the extrusion welded production seams were non destructive vacuum box tested today. The production seams tested today were found meeting the project requirements.</p> <p>The extrusion welded trial seam was prepared and tested in the field. The field tensiometer tests results indicate the welder was able to achieve the required seam strengths for the project.</p> <p>Two repairs on the primary 60 mil HDPE geomembrane were observed during construction today.</p> <p>The subbase and primary 80 mil HDPE geomembrane panels were extrusion welded to the 1/2-inch thick HDPE flatstock in accordance with the project requirements. The extrusion welder used the trial weld parameters previously tested to ensure the project strength requirements were achieved. A copper wire was inserted into the weld during welding to provide a means to "spark test" the weld. The spark tests indicate that the welds were constructed in accordance with the project requirements.</p> <p>All repairs installed today were non-destructive vacuum box tested, and no leaks were observed during the tests.</p> <p>NWL has begun to install the 16 oz/sy nonwoven cushion geotextile above the approved Cell 1 (Cells 1C and 1D) containment system. The panels are installed by hand and then sewn together using a sewing machine. The 16 oz/sy nonwoven geotextile panels installed today were installed in accordance with the project requirements.</p>
	<p><u>New Infiltration Basin (NIB)</u></p> <p>No work in this area today.</p>
	<p><u>Waste Drop off Improvements</u></p> <p>No work in this area today.</p>
1200	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 081**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Monday

DATE: DAY: 26 MONTH: April

YEAR: 2010

WEATHER: Sunny and warm during the afternoon.

0600	I arrived on site. Goodfellow Bros. is already on site.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 844J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u>  GBI subcontractor ITC Water Management (ITC) has completed the installation of the 2-inch HDPE plate, underlain by two layers of 16 oz/sy nonwoven geotextile, in preparation for the concrete aerator pad construction.  The contractor has begun to install the concrete form boards in preparation for the concrete pad construction.
	<u>Cell 1 Construction</u>  NWL has completed installation of the primary 60 mil HDPE geomembrane within approved Cells 1C/1D areas.  NWL continues to install the 16 oz/sy nonwoven cushion geotextile above the approved Cell 1 containment system. The panels are installed by hand and then sewn together using a sewing machine. The 16 oz/sy nonwoven geotextile panels installed today were installed in accordance with the project requirements.  ITC has pressurized the temporary wet well structure, and pressure test results indicate that structure does not leak.
	<u>New Infiltration Basin (NIB)</u>  No work in this area today.
	<u>Waste Drop off Improvements</u>  No work in this area today.
1700	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 082**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Tuesday

DATE: DAY: 27      MONTH: April

YEAR: 2010

WEATHER: Sunny and warm during the afternoon.

0600	I arrived on site. Goodfellow Bros. is already on site.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
0800	Mike Minch (Geosyntec Senior Project Engineer) is on site to attend weekly construction meeting.
	Equipment on site today.  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.
1000	Mike and I attended weekly construction meeting.
1130	Returned from the construction meeting.
	<u>New Leachate Evaporation Pond (NLEP)</u>  The contractor has completed final grading the ¾-inch minus granular operations layer on the NLEP floor. Esaki Surveying & Mapping, Inc. and Wagner Surveying are on site to survey the top of granular operations layer and verify the gravel layer thickness.
	<u>Cell 1 Construction.</u>  NWL has completed the installation of the 16 oz/sy nonwoven cushion geotextile above the approved Cell 1 containment system.  GBI has begun importing the 1 ½-inch minus granular drainage layer materials from the Kauai Aggregate Quarry to the Cell 1C and 1D containment system. The gravel is imported from the quarry using several "end dump" haul trucks. The haul trucks back up to the edge of the installed Cell 1C/1D liner and then dumped directly onto the containment system. The stockpiled 1 ½-inch minus gravel is then pushed into a uniform 3-ft thick lift using a Caterpillar D6 LGP dozer.  GBI subcontractor ITC Water Management is on site to install the 8-inch diameter HDPE perforated leachate

Scott

Printed Name



Signature

cc: Mike Minch



PROJECT: Phase II Lateral Expansion

LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02

DAY/DATE: 27 April 2010

	collection pipe extending from Cell 1D sump approximately 250-ft to the south within the swale.
	<u>New Infiltration Basin (NIB)</u> No work in this area today.
	<u>Waste Drop off Improvements</u> No work in this area today.
1700	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 083**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298 TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Wednesday

DATE: DAY: 28 MONTH: April

YEAR: 2010

WEATHER: Sunny and warm during the afternoon.

0600	I arrived on site. Goodfellow Bros. is already on site. Northwest Linings (NWL) is not on site today.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>The contractor has completed the majority of the ¾-inch minus granular operations layer installation, and the as-built survey of the top of granular operations layer provided by Esaki Surveying &amp; Mapping, Inc. confirms that the granular operations layer thickness meets the project requirements.</p> <p>NWL will be on site in the morning to install the 6 oz/sy nonwoven separator geotextile above the granular operations layer.</p>
	<p><u>Cell 1 Construction</u></p> <p>GBI continues to import the 1 ½-inch minus granular drainage materials for the Cell 1C and 1D containment systems. The gravel is imported from the Kauai Aggregate Quarry using several "end dump" haul trucks. The haul trucks back up to the edge of the installed Cell 1C/1D liner and then dumped directly onto the containment system. The stockpiled 1 ½-inch minus gravel is pushed into a uniform 3-ft thick lift using a Caterpillar D6 LGP dozer.</p> <p>A conformance sample (Cell 1 GD-002) of the placed granular drainage layer material was collected into a 5-gallon bucket and will be delivered to Precision Laboratories for geotechnical testing.</p> <p>GBI subcontractor ITC Water Management is on site to connect the installed forcemain double-wall containment pipe to the newly installed temporary wet well. A section of the forcemain pipe was production-welded together in preparation for installation. The secondary (containment) component of the double-wall pipe was pressure tested, and no leaks were observed. Once the forcemain is connected to the wet well, the inside "carrier" pipe will be tested.</p>

Chris Scott  
Printed Name

  
Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion  
LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02  
DAY/DATE: 28 April 2010

	<p>The contractor continues to place on-site sandy soils to construct the remaining portion of the Cell 1D perimeter berm. The compacted fill material is placed into a Cat. 735 articulated haul truck using a Hitachi 450 LC excavator, and then the haul truck dumps the compacted fill material directly onto the Cell 1D perimeter berm. The lifts are uniformly graded to 8-inch thick loose layers using a Cat. D5 dozer, moisture-conditioned using a water truck, and then compacted using a HAMM 2420 rubber tire smooth drum vibratory compactor. Several field density tests (FDTs) using a Troxler portable nuclear moisture/density gauge indicate the compaction effort was in accordance with the project specifications.</p> <p>A 3-inch thin-wall Shelby tube was advanced into the compacted fill within the nuclear gauge footprint at field density test location FDT-140 using an Army Corps sampler. The sample was extracted by hand, capped at each end, and then labeled TW-007. The sample will be used to compare the in-place moisture and density as measured by the nuclear gauge and by method ASTM D 2937 (Density of Soils by Drive Cylinder Method).</p>
	<p><u>New Infiltration Basin (NIB)</u> No work in this area today.</p>
	<p><u>Waste Drop off Improvements</u> No work in this area today.</p>
1800	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minchi

**DAILY FIELD REPORT**

**Report Sequence No.: 084**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Thursday

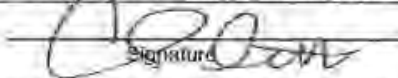
DATE: DAY: 29      MONTH: April

YEAR: 2010

WEATHER: Sunny and warm during the afternoon.

0600	I arrived on site. Goodfellow Bros. is already on site today.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front-end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>NWL has installed the majority of the 6 oz/sy nonwoven separator geotextile above the granular operations layer within the NLEP. The 6 oz/sy nonwoven geotextile installed today was installed in accordance with the project requirements.</p> <p>GBI has installed the NLEP form boards and reinforcing steel within the forms in preparation for the concrete aerator pad installation. The epoxy coated reinforcing rebar was installed in accordance with the project drawings.</p>
	<p><u>Cell 1 Construction</u></p> <p>GBI continues to import the 1 ½-inch minus granular drainage materials for the Cell 1C and 1D containment system. The gravel is imported from the Kauai Aggregate Quarry using several "end dump" haul trucks. The haul trucks back up to the edge of the installed Cell 1C/1D liner and then dumped directly onto the containment system. The stockpiled 1 ½-inch minus gravel is pushed into a uniform 3-ft thick lift using a Caterpillar D6 LGP dozer.</p> <p>GBI subcontractor ITC Water Management has connected both the 12-inch HDPE double-wall gravity flow pipe and the 8-inch double-wall forcemain pipe to the temporary wet well.</p> <p>The 12-inch double-wall gravity flow pipe was previously tested from the Cell 1C pipe penetration to immediately before the temporary wet well structure, and no leaks were observed. However, due to limited accessibility of the temporary wet well, visual observation of the final connection was approved in lieu of air pressure testing. The final connection was visually observed during construction and was approved.</p>

Chris Scott  
Printed Name



cc: Mike Minch

PROJECT: Phase II Lateral Expansion

LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02

DAY/DATE: 29 April 2010

	The 8-in forcemain pipe was connected to the temporary wet well, and the inside "carrier" pipe was pressure tested in accordance with the project requirements. The air pressure test was observed for 1 hour, and no leaks were observed.
	<u>New Infiltration Basin (NIB)</u> No work in this area today.
	<u>Waste Drop off Improvements</u> No work in this area today.
1800	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 085**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Friday

DATE: DAY: 30      MONTH: April      YEAR: 2010

WEATHER: Sunny and warm during the afternoon.

0600	I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>GBI has poured the concrete mix into the previously constructed form boards to construct the concrete aerator pads within the floor of the NLEP. Visual inspection of the epoxy coated reinforcing rebar confirms the steel was installed in accordance with the construction drawings.</p> <p>The concrete mix was tested in the field using a slump cone to verify the material was mixed in accordance with the project specifications. After testing the field tests indicated that the material meets the project requirements. No water was added to the mix at the site.</p> <p>A set of three 4-in diameter by 6-in tall cylinders were cast using the concrete material from each aerator pad location, for a total of two sets of three cylinders. The samples were stored on site for 24 hours until delivery to the Hirata &amp; Associates geotechnical laboratory. The test cylinders will be used to evaluate the concrete break strength after 7, 14 and 28 days of curing.</p>
	<p><u>Cell 1 Construction</u></p> <p>GBI continues to import the 1 1/2-inch minus granular drainage materials for the Cell 1C and 1D containment systems. The gravel is imported from the Kauai Aggregate Quarry using several "end dump" haul trucks. The haul trucks back up to the edge of the installed Cell 1C/1D liner and then dumped directly onto the containment system. The stockpiled 1 1/2-inch minus gravel is pushed into a uniform 3-ft thick lift using a Caterpillar D6 LGP dozer.</p> <p>GBI subcontractor ITC Water Management has connected the Cell 1D cleanout riser located at the inlet of the pipe penetration assembly. The cleanout connection was constructed using HDPE pipe fittings. The cleanout extends from the inlet of the pipe penetration to the crest of the Cell 1D sideslope, and has two flanges as</p>

Scott  
Printed Name

*[Signature]*  
Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion

LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02

DAY/DATE: 30 April 2010

	<p>shown in the construction drawings. The cleanout was installed in accordance to the project requirements.</p> <p>The contractor continues to place on-site sandy soils to construct the remaining portion of the Cell 1D perimeter berm. The compacted fill material is placed into a Cat. 735 articulated haul truck using a Hitachi 450 LC excavator, and then the haul truck dumps the compacted fill material directly onto the Cell 1D perimeter berm. The lifts are uniformly graded to 8-inch thick loose layers using a Cat. D5 dozer, moisture-conditioned using a water truck and then compacted using a HAMM 2420 rubber tire smooth drum vibratory compactor. Several field density tests (FDTs) using a Troxler portable nuclear moisture/density gauge indicate the compaction effort was in accordance with the project specifications.</p>
	<p><u>New Infiltration Basin (NIB)</u></p> <p>No work in this area today.</p>
	<p><u>Waste Drop off Improvements</u></p> <p>No work in this area today.</p>
1800	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Mirich

**DAILY FIELD REPORT**

Report Sequence No.: 086

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Saturday

DATE: DAY: 1 MONTH: May

YEAR: 2010

WEATHER: Sunny and warm during the afternoon.

0600	I arrived on site. Goodfellow Bros. is already on site.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u>  No work in this area today.
	<u>Cell 1 Construction</u>  GBI has temporarily suspended the import of the 1 1/2-inch minus granular drainage materials for the Cell 1C and 1D containment system, and has begun to grade the stockpiled gravel material to a uniform 1-ft thick lift using a Caterpillar D6 LGP dozer. The 1 1/2-inch minus granular drainage layer installed to date was constructed in accordance with the project requirements.
	<u>New Infiltration Basin (NIB)</u>  No work in this area today.
	<u>Waste Drop off Improvements</u>  No work in this area today.
1300	I left the site.

Chris Scott  
Printed Name

  
Signature

cc: Mike Minch



**DAILY FIELD REPORT**

**Report Sequence No.: 087**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Monday

DATE:      DAY: 3      MONTH: May      YEAR: 2010

WEATHER: Sunny and warm during the afternoon.

0600	I arrived on site. Goodfellow Bros. is already on site.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u>  The contractor has removed the form boards around the newly constructed aerator pads within the floor of the NLEP.
	<u>Cell 1 Construction.</u>  GBI continues to import the 1 1/2-inch minus granular drainage materials for the Cell 1C and 1D containment systems. The gravel is imported from the Kauai Aggregate Quarry using several "end dump" haul trucks. The haul trucks back up to the edge of the installed Cell 1C/1D liner and then dumped directly onto a 3-foot thick haul road directly on the containment system. The material is then pushed to a uniform 1-ft thick lift over the entire containment system.  GBI is working to final grade the Cell 1C perimeter berm, and to cut the anchor trench within the area around the newly installed temporary wet well structure.
	<u>New Infiltration Basin (NIB)</u>  No work in this area today.
	<u>Waste Drop off Improvements</u>  No work in this area today.
1600	I left the site.

Chris Scott  
Printed Name

  
Signature

cc: Mike Minch

**DAILY FIELD REPORT**

Report Sequence No.: 088

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Tuesday

DATE: DAY: 4 MONTH: May

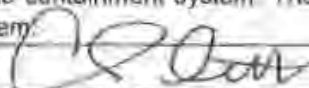
YEAR: 2010

WEATHER: Sunny and warm during the afternoon.

0600	I arrived on site. Goodfellow Bros. is already on site.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.
1000	I attended weekly construction meeting.
3	I returned from weekly construction meeting.
	<u>New Leachate Evaporation Pond (NLEP)</u>  GBI has constructed a test pad within the floor of the NLEP. The test pad was used to evaluate the placement method for the 2-inch thick granular protection layer above the 6 oz/sy nonwoven separator geotextile.  A 2- to 3-inch thick layer of the 3/8-inch minus granular protection layer material was placed on the 6 oz/sy nonwoven geotextile, and then graded by hand using rakes. Once the area was graded, a rubber tire track drive "skid steer" drove on the granular protection layer underlain with 6 oz/sy nonwoven geotextile. No turns or sharp direction changes were observed. The gravel was then carefully removed to expose the underlying 6 oz/sy nonwoven geotextile, and no apparent damage was visually observed. Therefore, per AECOM's response to RFI #14, this placement method is approved.  GBI has begun to install the 3/8-inch minus granular protection layer above the 6 oz/sy nonwoven separator geotextile. A sample (NLEP GP-001) was collected and delivered to Precision Laboratories for conformance testing.
	<u>Cell 1 Construction</u>  GBI continues to import the 1 1/2-inch minus granular drainage materials for the Cell 1C and 1D containment systems. The gravel is imported from the Kauai Aggregate Quarry using several "end dump" haul trucks. The haul trucks back up to the edge of the installed Cell 1C/1D liner and then dumped directly onto a 3-foot thick haul road directly on the containment system. The material is then pushed to a uniform 1-ft thick lift over the entire containment system.

Chris Scott

Printed Name



Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion

LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02

DAY/DATE: 4 May 2010

	GBI is working to final grade the Cell 1C perimeter berm, and to cut the anchor trench within the area around the newly installed temporary wet well structure.
	<u>New Infiltration Basin (NIB)</u> No work in this area today.
	<u>Waste Drop off Improvements</u> No work in this area today.
1600	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 089**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Wednesday

DATE: DAY: 5      MONTH: May

YEAR: 2010

WEATHER: Sunny and warm during the afternoon.

0600	I arrived on site. Goodfellow Bros. is already on site.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D8 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u>  GBI continues to install the 3/8-inch minus granular operations layer above the 5 oz/sy nonwoven separator geotextile. Two track driven "skid steer" loaders are used to place the granular operations layer while several laborers using hand tools uniformly grade the gravel to a minimum 2-inch thick layer above the geotextile.
	<u>Cell 1 Construction</u>  GBI completes final grading of the 1 1/2-inch minus granular drainage layer above the Cell 1D containment system. The granular drainage layer was visually observed to be approximately 1 foot thick. GBI has stockpiled 1 1/2-inch minus granular drainage layer material on the Cell 1C containment system in preparation for placement.  Wagner Surveying and Esaki Surveying & Mapping, Inc. are on site to survey the Cell 1D top of granular drainage layer as well as the as built Cell 1C perimeter berm subbase.
	<u>New Infiltration Basin (NIB)</u>  No work in this area today.
	<u>Waste Drop off Improvements</u>  No work in this area today.
1600	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 090**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Thursday

DATE: DAY: 6      MONTH: May

YEAR: 2010

WEATHER: Sunny and warm during the afternoon.

0600	I arrived on site. Goodfellow Bros. is already on site.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u>  GBI continues to install the 3/8-inch minus granular protection layer above the 6 oz/sy nonwoven separator geotextile. Two track driven "skid steer" loaders are used to place the granular protection layer while several laborers using hand tools uniformly grade the gravel to a minimum 2-inch thick layer above the geotextile.
	<u>Cell 1 Construction.</u>  GBI subcontractor ITC Water Management (ITC) is on site to extend Manhole #14. A section of the HDPE structure was prefabricated and shipped to the site. ITC extrusion welds the manhole extension to the existing structure to complete the manhole above the design grades.  Once the manhole was extended, GBI completed the Cell 1D northeast corner tie-in to the existing Phase II containment system and constructed the perimeter berm along the northern limits of Cell 1D.
	<u>New Infiltration Basin (NIB)</u>  No work in this area today.
	<u>Waste Drop off Improvements</u>  No work in this area today.
1600	I left the site.

Chris Scott  
Printed Name

  
Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 091**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Friday

DATE: DAY: 7 MONTH: May

YEAR: 2010

WEATHER: Sunny and warm during the afternoon.

0600	I arrived on site. Goodfellow Bros. is already on site.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u>  GBI continues to install the 3/8-inch minus granular protection layer above the 6 oz/sy nonwoven separator geotextile. Two track driven "skid steer" loaders are used to place the granular protection layer while several laborers using hand tools uniformly grade the gravel to a 2-inch thick layer above the geotextile.  GBI has connected the 6 oz/sy nonwoven separator geotextile to Aerator Pad 3C using the previously approved stainless steel flat bar (RFI #21) and rubber spacer. The stainless steel flat bar and rubber spacer were secured using stainless steel fasteners.
	<u>Cell 1 Construction:</u>  Esaki Surveying & Mapping, Inc. is on site to provide the as built survey of the Cell 1D subbase grades and perimeter anchor trench.
	<u>New Infiltration Basin (NIB)</u>  No work in this area today.
	<u>Waste Drop off Improvements</u>  No work in this area today.
1600	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 092**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Monday

DATE: DAY: 10 MONTH: May

YEAR: 2010

WEATHER: Sunny and warm during the afternoon.

0600	I arrived on site. Goodfellow Bros. is already on site.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u>  GBI completed the majority of the granular drainage layer installation within the NLEP. In preparation for completion of the granular drainage layer installation at the west end of the NLEP, the contractor has stockpiled granular drainage layer materials within the floor of the NLEP.  GBI has removed all of the gravel from the west end of the NLEP (former temporary access ramp location), and has completed construction of the west berm. The soils used to construct the NLEP west berm subbase were excavated from the exterior south berm side slope of the NLEP, which had been over-built during construction. The material was moisture conditioned using a water truck and then placed in uniform 6- to 8-inch thick lifts. Once the material was graded, compaction effort was applied using a HAMM 2420 rubber tire smooth vibratory compactor. Several field density tests using a Troxler portable nuclear moisture/density gauge indicate the compaction effort meets the project requirements.
	<u>Cell 1 Construction</u>  No work in this area today.
	<u>New Infiltration Basin (NIB)</u>  No work in this area today.
	<u>Waste Drop off Improvements</u>  No work in this area today.
1600	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 093**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298 TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Tuesday

DATE: DAY: 11 MONTH: May

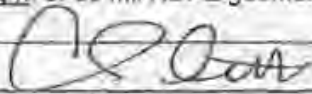
YEAR: 2010

WEATHER: Sunny and warm during the afternoon.

0600	I arrived on site. Goodfellow Bros. is already on site.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH27B excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D8 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>GBI subcontractor ITC Water Management is on site to fabricate the forcemain pipe which will connect the existing leachate collection system to the NLEP. The final connections will not be completed until later in the construction.</p>
	<p><u>Cell 1 Construction</u></p> <p>NWL is on site to install both the secondary and primary liner systems within Cells 1C and 1D.</p> <p><u>GCL Deployment</u></p> <p>NWL installed approximately <u>3,500 sq ft</u> of GCL today. The GCL was installed today with 12-inch overlaps along the width and 6-inch overlaps along the length. Granular bentonite was placed along the width of the seam (butt seam) overlaps, and the super groove factory seam was used along the length of the seam overlaps. The GCL was installed in accordance with the project specifications and the design engineer recommendations (23 December 2009 email correspondence from AECOM).</p> <p><u>Geosynthetics Installation</u></p> <p><u>60 mil DST geomembrane:</u></p> <p>NWL installed <u>13,828 sq ft</u> of 60 mil HDPE geomembrane during construction today.</p>

Chris Scott

Printed Name



Signature

cc: Mike Minch



PROJECT: Phase II Lateral Expansion  
LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02  
DAY/DATE: 11 May 2010

	<p>Total geomembrane (subbase and primary) deployed to date is <u>271,681 sq ft</u>.</p> <p>Sixteen 60 mil HDPE geomembrane panels were installed today in various widths and lengths.</p> <p><u>161 linear feet</u> of extrusion-welded seams were recorded today. All of the extrusion welded production seams were nondestructive vacuum box tested today. The production seams tested today were found meeting the project requirements.</p> <p>During construction today, both extrusion and fusion trial seams were constructed before production welding began, the trial welds were completed in the morning and then again in the afternoon. The field tensiometer tests results indicate the welder was able to achieve the required seam strengths for the project.</p> <p>Four primary geomembrane repairs and twelve secondary geomembrane repairs were observed during construction today. All repairs installed today were non-destructive vacuum box tested and no leaks were observed during the tests.</p> <p>The 80 mil HDPE geomembrane secondary liner system was extrusion welded to the ½ thick HDPE flatstock plate in accordance with the project requirements. During production welding, the welder used the same methods as the previously tested and passing trial plate-to-sheet extrusion weld. A copper wire was inserted into the weld during welding to provide a means to "spark test" the repair. Spark tests did not indicate any leaks.</p> <p>NWL installed the 16 oz/yd nonwoven cushion geotextile above the approved Cell 1 (Cells 1C and 1D) containment system installed today. The panels are installed by hand and then sewn together using a sew machine. The 16 oz/yd nonwoven geotextile panels installed today were installed in accordance with the project requirements.</p>
	<p><u>New Infiltration Basin (NIB)</u></p> <p>No work in this area today.</p>
	<p><u>Waste Drop off Improvements</u></p> <p>No work in this area today.</p>
1830	I left the site.

Chris Scott  
Printed Name

  
Signature

cc: Mike Minch

**DAILY FIELD REPORT**

Report Sequence No.: 094

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298 TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Wednesday

DATE: DAY: 12 MONTH: May

YEAR: 2010

WEATHER: Sunny and warm during the afternoon.

0600	I arrived on site. Goodfellow Bros. is already on site.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 544J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u>  GBI subcontractor ITC Water Management is on site to pressure test the piping section before installation. The 1-hour pressure tests were completed with no leaks observed.
	<u>Cell 1 Construction</u>  NWL has completed the installation of the primary and secondary liner systems within Cells 1C and 1D.  NWL has begun to install the 6 oz/yd nonwoven separator geotextile above the approved 1 1/2-inch minus granular drainage layer. The panels are installed by hand and then sewn together using a sewing machine. The 6 oz/yd nonwoven separator geotextile panels installed today were installed in accordance with the project requirements.
	<u>New Infiltration Basin (NIB)</u>  No work in this area today.
	<u>Waste Drop off Improvements</u>  No work in this area today.
1830	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 095**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Thursday

DATE: DAY: 13      MONTH: May      YEAR: 2010

WEATHER: Sunny and warm during the afternoon.

0600	I arrived on site. Goodfellow Bros. is already on site.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u>  No work in this area today.
	<u>Cell 1 Construction</u>  NWL completes installation of the 16 oz/yd nonwoven cushion geotextile within Cells 1C and 1D, and installs the 6 oz/sy nonwoven separator geotextile above the approved 1 1/2-inch minus granular drainage layer within Cell 1D. The 6 oz/sy and 16 oz/sy nonwoven geotextile panels were installed by hand and then sewn together using a sewing machine. The geotextile panels installed today were installed in accordance with the project requirements.  GBI continues to final grade the 1 1/2-inch minus granular drainage layer within Cell 1C using a Caterpillar D6 LGP dozer with GPS assist.  GBI has begun to install the 3/8-inch minus operations layer gravel above the installed 6 oz/sy nonwoven separator geotextile. The operations layer material is imported from Kauai Aggregates Quarry using "end dump" transfer trucks. The haul trucks back up to the 6 oz/sy nonwoven geotextile and dump the gravel material directly onto the containment system. A Caterpillar D5 dozer with GPS grade control uniformly grades the material to two feet thick above the 6 oz/sy nonwoven geotextile. During placement of the 3/8-inch minus operations layer, a sample (Cell 1-Ops-001) of the material was collected in a plastic bucket and then shipped to Precision Laboratories for conformance testing.
1830	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 096**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298 TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Friday

DATE: DAY: 14 MONTH: May

YEAR: 2010

WEATHER: Sunny and warm during the afternoon.

0600	I arrived on site. Goodfellow Bros. is already on site.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 844J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u>  GBI has removed the temporary access ramp and completed construction of the west berm. Esaki Surveying & Mapping provided the as-built subbase survey of the west berm, and Geosyntec accepted the as-built grades.  NWL has installed all geosynthetic layers on the NLEP western side slope to complete the containment system installation. During completion of the containment system installation, the area of the containment system previously damaged (see daily field report #65, dated 7 April 2010) were removed and replaced with new geosynthetic materials. All geosynthetic layers were constructed in accordance with the project specifications.
	<u>Cell 1 Construction</u>  GBI continues to final grade the 1 1/2-inch minus granular drainage layer within Cell 1C using a Caterpillar D6 LGP dozer with GPS assist.  GBI continues to install the 3/8-inch minus operations layer above the installed 6 oz/sy nonwoven separator geotextile. The operations layer material is imported from Kauai Aggregates Quarry using "end dump" transfer trucks. The haul trucks back up to the 6 oz/sy nonwoven geotextile and dump the gravel material directly onto the containment system. A Caterpillar D5 dozer with GPS grade control uniformly grades the material to two feet thick above the 6 oz/sy nonwoven geotextile.  GBI subcontractor ITC Water Management has connected the 8-inch diameter perforated pipe to the Cell 1C pipe penetration assembly and constructed the Cell 1C cleanout riser to the crest of the embankment. All connections were completed in accordance with the project requirements.
30	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 097**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Saturday

DATE: DAY: 15 MONTH: May

YEAR: 2010

WEATHER: Sunny and warm during the afternoon.

0600	I arrived on site. Goodfellow Bros. is already on site. NWL is not on site today.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>No work in this area today pending destructive seam sample DS-P-13 laboratory test results.</p>
	<p><u>Cell 1 Construction</u></p> <p>GBI has completed final grading of the 1 1/2-inch minus granular drainage layer within Cell 1C. The granular drainage layer was visually observed to be approximately 1 foot thick. Esaki Surveying and Mapping, Inc. and Wagner surveying are on site to survey the top of the 1 1/2-inch minus granular drainage layer above the Cell 1C containment system.</p> <p>GBI continues to install the 3/8-inch minus operations layer gravel above the installed 6 oz/sy nonwoven separator geotextile. The 3/8-inch minus operations layer material is imported from Kauai Aggregates Quarry using "end dump" transfer trucks. The haul trucks back up to the 6 oz/sy nonwoven geotextile and dump the gravel material directly onto the containment system. A Caterpillar D5 dozer with GPS grade control uniformly grades the material to two feet thick above the 6 oz/sy nonwoven geotextile. During placement of the 3/8-inch minus operations layer, a sample (Cell1 Ops-002) of the material was collected in a plastic bucket and then delivered to Precision Laboratories for conformance testing.</p>
1230	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

Report Sequence No.: 098

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Monday

DATE: DAY: 17      MONTH: May

YEAR: 2010

WEATHER: Sunny and warm during the afternoon.

0600	I arrived on site. Goodfellow Bros. is already on site.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.
1000	I attend the weekly construction meeting. Kenny Bergschultz and Jeff Impens of AECOM, and Mike Minch of Geosyntec also onsite to attend the construction meeting. The Draft NLEP CQA report is presented to the County and WMH today for review and comment.
	<u>New Leachate Evaporation Pond (NLEP)</u>  No work in this area today pending destructive sample (DS-P-13) tests results.
	<u>Cell 1 Construction</u>  GBI has completed final grading of the 1 1/2-inch minus granular drainage layer within Cell 1C. The granular drainage layer was visually observed to be approximately 1 foot thick. Esaki Surveying and Mapping and Wagner Surveying are on site to survey the as-built top of the granular drainage layer.  GBI continues to install the 3/8-inch minus operations layer gravel above the installed 6 oz/sy nonwoven separator geotextile. The operations layer material is imported from Kauai Aggregates Quarry using "end dump" transfer trucks. The haul trucks back up to the 6 oz/sy nonwoven geotextile and dump the gravel material directly onto the containment system. A Caterpillar D5 dozer with GPS grade control uniformly grades the material to two feet thick above the 6 oz/sy nonwoven geotextile.
1730	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

Report Sequence No.: 099

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298 TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Tuesday

DATE: DAY: 18 MONTH: May

YEAR: 2010

WEATHER: Sunny and warm during the afternoon.

0600	I arrived on site. Goodfellow Bros. is already on site.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>Test results received from Precision Laboratories for destructive seam sample DS-P-13 are passing.</p> <p>NWL has completed installation of the 16 oz/sy nonwoven cushion geotextile on the NLEP floor, and has installed the Geocell system along the western side slope. Both layers were installed in accordance with the project requirements.</p> <p>GBI has installed the 1-ft thick granular operations layer above the 16 oz/sy nonwoven cushion geotextile. The gravel was installed in accordance with the construction drawings. Esaki Surveying and Mapping will be on site in the morning to survey the top of the granular operations layer.</p>
	<p><u>Cell 1 Construction</u></p> <p>GBI continues to install the 3/8-inch minus operations layer above the installed 6 oz/sy nonwoven separator geotextile. The operations layer material is imported from Kauai Aggregates Quarry using "end dump" transfer trucks. The haul trucks back up to the 6 oz/sy nonwoven geotextile and dump the gravel material directly onto the containment system. A Caterpillar D5 dozer with GPS grade control uniformly grades the material to two feet thick above the 6 oz/sy nonwoven geotextile. During placement of the 3/8-inch minus operations layer, a sample (Cell1 Ops-003) of the material was collected in a plastic bucket and then delivered to Precision Laboratories for conformance testing.</p>
1730	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 100**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Wednesday

DATE: DAY: 19 MONTH: May

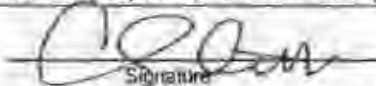
YEAR: 2010

WEATHER: Sunny and warm during the afternoon.

0600	I arrived on site. Goodfellow Bros. is already on site.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 544J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u>  NWL has trimmed the NLEP geosynthetic layers within the anchor trench to provide adequate separation from the Geocell "dead man" pipe. GBI then completes the backfilling of the anchor trench along the western berm.  GBI has installed the 3-inch minus granular fill in the Geocell on the western side slope. The granular fill was placed in accordance with the project requirements.
	<u>Cell 1 Construction</u>  GBI continues to install the 3/8-inch minus operations layer above the installed 6 oz/sy nonwoven separator geotextile within Cells 1C and 1D. The operations layer material is imported from Kauai Aggregates Quarry using "end dump" transfer trucks. The haul trucks back up to the 6 oz/sy nonwoven geotextile and dump the gravel material directly onto the containment system. A Caterpillar D5 dozer with GPS grade control uniformly grades the material to two feet thick above the 6 oz/sy nonwoven geotextile.
	<u>Phase II Containment System Repair</u>  GBI has exposed the existing Phase II liner system which was inadvertently damaged during construction as described in daily field report #15, dated 15 January 2010. NWL repaired the damaged area using the following previously certified and approved materials:  CETCO FWL GCL roll # 201004CV-326, Agru DST 80-mil HDPE geomembrane roll # 7191467-80211, and TNS 16 oz/sy nonwoven cushion geotextile roll # 20201-74353.  An extrusion trial weld was prepared, and three coupons from the trial weld were tested in the field. The test

Chris Scott

Printed Name



Signature

cc: Mike Minch



PROJECT: Phase II Lateral Expansion  
LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02  
DAY/DATE: 19 May 2010

	<p>results summarized below met the project requirements:</p> <p>Welder ID: AM Machine ID: #5117 Barrel Temperature: 800 degrees Pre-heat Temperature: 350 degrees Shear Strength Results: 145 ppi; 146 ppi; and 146 ppi Peel Strength Results: 143ppi; 144 ppi; and 123 ppi</p> <p>A new section of GCL was installed over the damaged area. Granular bentonite was placed along the width (butt) seam. A new 4'x3' patch was extrusion welded to the existing Phase II primary liner to repair the damaged area. Once the weld was allowed to cool, the entire extrusion weld was vacuum box tested, and no leaks were observed.</p> <p>After the repair was vacuum box tested, the 16 oz/sy nonwoven cushion geotextile was installed and heat bonded to the existing cushion geotextile.</p> <p>The area within the existing Phase II containment system was repaired in accordance with the project requirements.</p>
1730	I left the site.

Chris Scott  
Printed Name

  
Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 101**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298 TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Thursday

DATE: DAY: 20 MONTH: May

YEAR: 2010

WEATHER: Sunny and warm during the afternoon.

0600	I arrived on site. Goodfellow Bros. is already on site.
0700	Joel Mondragon (Northwest Linings [NWL] Superintendent) and five (5) technicians are on site today.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>Esaki Surveying and Mapping have surveyed the top of granular operations layer. Geosyntec Consultants reviewed and accepted the survey data.</p> <p>NWL has installed the final section of 6 oz/sy nonwoven separator geotextile above the 1-ft thick granular operations layer within the NLEP floor. The 6 oz/sy separator geotextile was installed in accordance the project requirements.</p>
	<p><u>Cell 1 Construction</u></p> <p>NWL has installed and welded the temporary rain flap to the Cell 1C primary liner and has welded the leading edges of the primary and subbase 60 mil HDPE geomembranes together to encapsulate the sandwiched GCL per RFI #23.</p> <p>GBI has suspended installation of the operations layer today.</p> <p>GBI subcontractor Valley Well Drilling Inc. (located at 91-458 Komohana Street, Kapolei, HI 96707; phone number 808 682-1767) is on site to install the two gas monitoring probes west of the Cell 1 area.</p>
1730	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 102**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Friday

DATE: DAY: 21 MONTH: May

YEAR: 2010

WEATHER: Sunny and warm during the afternoon.

0600	I arrived on site. Goodfellow Bros. is already on site
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>GBI has completed the installation of the 2-inch thick granular protection layer above the 6 oz/sy nonwoven separator geotextile. Visual verification confirms that the granular protection layer thickness meets the project requirement of 2 inches.</p> <p>GBI has completed the installation of the 3-inch minus granular fill material within the Geocell. Several localized areas required additional 3-inch minus gravel to completely cover the geocell system. These areas were addressed and covered during construction today.</p> <p>Today's activities complete the containment system of the NLEP. Other ancillary work including plumbing, electrical, and aerator system installation remain to be completed. At this stage, the CQA report for the NLEP containment system will be submitted to HDOH for approval as the other ancillary work is ongoing.</p>
	<p><u>Cell 1 Construction</u></p> <p>GBI has suspended construction of the operations layer today.</p> <p>Both Esaki Surveying and Mapping and Wagner Surveying are on site to survey completed portions of the Cells 1C and 1D as-built 2-ft thick operations layer.</p> <p>GBI subcontractor Valley Well Drilling Inc. has completed the installation of the gas monitoring probes. However, the protective stove pipes around the gas probes have not yet been installed.</p>
1730	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

Report Sequence No.: 103

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298 TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Monday

DATE: DAY: 24 MONTH: May

YEAR: 2010

WEATHER: Sunny and warm during the afternoon.

0600	I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>No work in this area today.</p>
	<p><u>Cell 1 Construction</u></p> <p>GBI continues to install the 3/8-inch minus operations layer material above the installed 6 oz/sy nonwoven separator geotextile.</p> <p>The operations layer material is imported from Kauai Aggregates Quarry using "end dump" transfer trucks. The haul trucks back up to the 6 oz/sy separator geotextile and dump the gravel material directly onto the containment system. A Caterpillar D5 dozer with GPS grade control uniformly grades the material to 2 feet thick above the 6 oz/sy separator geotextile. During placement of the 3/8-inch minus operations layer material, a sample (Cell 1-Ops-004) of the material was collected in a plastic bucket and then shipped to Precision Laboratories for conformance testing.</p>
1730	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

Report Sequence No.: 104

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Tuesday

DATE: DAY: 25 MONTH: May

YEAR: 2010

WEATHER: Sunny and warm during the afternoon.

0600	I arrived on site. Goodfellow Bros. is already on site.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u>  No work in this area today.
	<u>Cell 1 Construction.</u>  GBI has completed the installation and final grading of the 2-ft thick operations layer within the limits of Cell 1C and 1D. The final as built survey is pending.  During construction today, GBI has begun to construct the temporary termination berm along the southern end of Cell 1C using 3/8-inch minus operations layer material. A D5 dozer constructs the berm in accordance to the detail provided with the approved RFI#23.
1730	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 105**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Wednesday

DATE: DAY: 26      MONTH: May

YEAR: 2010

WEATHER: Sunny and warm during the afternoon.

0600	I arrived on site, Goodfellow Bros. is already on site.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 844J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>No work in this area today.</p>
	<p><u>Cell 1 Construction</u></p> <p>Wagner Surveying and Esaki Surveying and Mapping are on site today to survey the constructed operations layer and the Cell 1C temporary termination berm.</p> <p>GBI has completed the temporary termination berm and has placed the previously installed 60 mil HDPE geomembrane rain flap over the newly constructed termination berm. The geomembrane rain flap was secured in place using sand bags.</p> <p>GBI has begun to install the 1-ft thick layer of general fill soil (onsite soils) along the perimeter of the operations layer within Cell 1C and 1D.</p>
1730	I left the site.

Chris Scott  
Printed Name

  
Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 106**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Thursday

DATE:

DAY: 27

MONTH: May

YEAR: 2010

WEATHER: Sunny and warm during the afternoon.

0530	I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>No work in this area today.</p>
	<p><u>Cell 1 Construction:</u></p> <p>GBI continues to install the 1-ft thick layer of general fill soil along the perimeter of Cell 1C and 1D.</p> <p>The remaining construction activities related to the Cells 1C and 1D construction are primarily outside of the containment system until the NLEP has been approved.</p>
0800	As requested by Jesse Frey (Waste Management) and in consideration of the schedule related to the approval of the NLEP, I have temporarily left the site. I will return to continue CQA monitoring once construction activities which requires CQA monitoring starts up again.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 107**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Friday

DATE: DAY: 4      MONTH: June

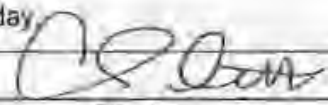
YEAR: 2010

WEATHER: Sunny and warm during the day

0600	I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (28,450 lb) rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>GBI had previously used a Caterpillar rubber track "skid steer" loader to final grade the 1-ft thick granular operations layer and 2-inch thick granular protection layer within a limited area along the western end of the NLEP. Once final grading in the floor was completed, GBI had removed the equipment by driving the skid steer over the completed southern side slope. In an effort to minimize damage to the underlying geosynthetics and Geocell, an excavator using a wire cable assisted the skid steer as it traversed the side slope.</p> <p>During the removal of the skid steer equipment, CQA monitoring was not available to observe the construction activities. Therefore; visual inspection of the geosynthetic materials potentially impacted by the equipment removal was advised by Geosyntec Consultants.</p> <p>The following inspection activities within the removal area was performed:</p> <ul style="list-style-type: none"> <li>a) identified the area where the equipment was removed;</li> <li>b) marked out the ramp area using marker paint;</li> <li>c) removed the 3-inch minus granular fill from the Geocell along the entire width in two locations (top and bottom of the ramp) by hand;</li> <li>d) inspected all of the exposed geosynthetic components, including the 16 oz/sy nonwoven cushion geotextile, Geocell, nylon tendons; and attachment clips; and</li> <li>e) replaced the 3-inch minus granular fill in the Geocell.</li> </ul> <p>During inspection of the ramp, no damage was observed to the 16 oz/sy nonwoven cushion geotextile or Geocell and Geocell components.</p>
	<p><u>Cell 1 Construction.</u></p> <p>No work in this area today.</p>

Chris Scott

Printed Name



Signature

cc: Mike Minch



PROJECT: Phase II Lateral Expansion

LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02

DAY/DATE: 4 June 2010

	<p><u>Recycle Improvement Area</u></p> <p>GBI has begun to over-excavate the subgrade within the limited area of the public drop-off/recycling area to receive new asphalt. The subgrade was uniformly graded before placing 1½-inch minus base course underlain using a layer of Mirafi non-woven geotextile. The 1½-inch base course material was compacted using a HAMM rubber tire vibratory compactor.</p>
1700	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 108**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Monday

DATE: DAY: 7 MONTH: June

YEAR: 2010

WEATHER: Sunny and warm during the day

0600	I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>Goodfellow Bros subcontractor ITC Water Management is on site working to fabricate various HDPE pipe fitting and connections to connect the existing leachate conveyance system to the NLEP.</p>
	<p><u>Cell 1 Construction</u></p> <p>GBI has installed the 9-inch thick layer of 1½-inch minus base course underlain using Mirafi non-woven geotextile. The 1½-inch minus base course was uniformly graded along the top of the Cells 1C/1D perimeter berm. Once the 1½-inch minus base course was graded, a Hamm rubber tire vibratory compactor applied compaction effort. Several field density tests using the Troxler portable nuclear moisture/density gauge indicate the compaction effort meets the project requirements.</p>
	<p><u>Recycle Improvement Area</u></p> <p>GBI has removed 18 inches of subgrade beneath the the public drop off/recycling area which is to receive new asphalt. GBI has installed 1½-inch minus base course underlain using non-woven geotextile. The 1½-inch base course was uniformly graded within the limits of the sawcut asphalt, moisture conditioned, and then compacted using a Hamm rubber tire vibratory compactor. Several field density tests indicate the compaction effort meets the project requirements.</p>
1700	I left the site.

Chris Scott  
Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 109**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298 TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Tuesday

DATE: DAY: 8 MONTH: June YEAR: 2010

WEATHER: Sunny and warm during the day

0600	I arrived on site. Goodfellow Bros, is already on site.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 544J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.
1000	I attended weekly construction meeting.
1100	Returned from weekly construction meeting.
	<u>New Leachate Evaporation Pond (NLEP)</u>  GBI's subcontractor ITC Water Management has bolted all of the various pipe joints and connections together in preparation for air pressure testing. All of the prefabricated pipe joints were tested in accordance with the project requirements. Visual inspection during the 1-hour air test indicate that the prefabricated fittings meet the design requirements for the project. ITCI Water Management will provide the final air pressure test reports.
	<u>Cell 1 Construction</u>  GBI has received the new Wet Well #3 on site. The Wet Well was staged in preparation for pressure testing.
	<u>Recycle Improvement Area</u>  GBI has removed 18 inches of subgrade beneath the public drop off/recycling area which is to receive new asphalt. GBI has installed 1½-inch minus base course underlain using a non woven geotextile. The 1½-inch minus base course was uniformly graded within the limits of the sawcut asphalt, moisture conditioned, and then compacted using a Hamm rubber tire vibratory compactor. Several field density tests indicate the compaction effort meets the project requirements.
1700	I left the site.

Chris Scott  
Printed Name

  
Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 110**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Wednesday

DATE:    DAY: 9    MONTH: June    YEAR: 2010

WEATHER: Sunny and warm during the day

0600	I arrived on site. Goodfellow Bros. is already on site.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u>  During construction today GB1 excavated above the existing leachate collection forcemain piping and installed two (2) trench boxes around the tie-in location identified on Sheet 2 of the Construction Drawings.
	<u>Cell 1 Construction</u>  No work in this area today.
	<u>Recycle Improvement Area</u>  No work in this area today.
1700	I left the site.

Chris Scott  
Printed Name

  
Signature

cc: Mike Minch

**DAILY FIELD REPORT**

Report Sequence No.: 111

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Thursday

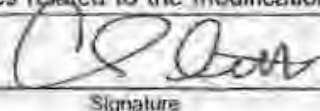
DATE: DAY: 10      MONTH: June

YEAR: 2010

WEATHER: Sunny and warm during the day

0600	I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site today:</p> <p>Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.</p>
	<p><u>New Leachate Evaporation Pond (NLEP)</u></p> <p>During construction today GBI subcontractor ITC Water Management (ITC) is on site to complete the construction activities required to terminate the flow of leachate to the existing leachate evaporation pond, and to connect the existing leachate conveyance system to the NLEP.</p> <p>ITC has contracted a vacuum truck to pump out the residual liquid from the leachate conveyance system. The vacuum pump truck connected to a cleanout riser and evacuated the leachate conveyance system. Once the majority of the system was dry, a hole was cut into the top of the HDPE forcemain pipe and additional pumping continued until all liquid was removed.</p> <p>After confirming that no residual liquid was left standing in the leachate forcemain piping, ITC installed the HDPE cross-over piping system (previously pressure tested) as shown on Drawing 20 of the Construction Drawings. The cross-over connections were constructed using electro-fusion couplers. Once these connections were completed the second phase of work began to complete the leachate conveyance system transition.</p> <p>ITC cut the existing forcemain pipe as shown on Detail 5, Drawing 19 of the Construction Drawings, and installed two (2) check valves and one factory-manufactured HDPE "T" section. The piping system was connected using electro-fusion couplers.</p> <p>Once the HDPE "T" section and check valves were installed, ITC installed the new totalizing flow meter and discharge pipe into the NLEP. The discharge end of the forcemain pipe was placed above an HDPE rub sheet which was installed down the length of the NLEP side slope and onto the NLEP floor.</p> <p>All construction activities related to the modification of the existing leachate conveyance system were visually</p>

Chris Scott  
Printed Name



Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion  
LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02  
DAY/DATE: 10 June 2010

	observed during construction today.
	<u>Cell 1 Construction</u> During construction today GBI abandoned the existing forcemain pipe leading to the existing leachate evaporation pond, as described in RFI #7. Visual observation during construction verified that both ends of the pipe were plugged using a lean concrete mix in accordance with the project requirements (response to RFI #7).
	<u>Existing Leachate Evaporation Pond</u> During construction today GBI began the process of removing the existing leachate evaporation pond containment system components. As the pond was empty of liquid at the time of demolition, no de-watering was required. During demolition, the following components of the existing pond containment system was visually observed: <u>Pond side slopes (from top to bottom):</u> <ul style="list-style-type: none"><li>• 2 to 3 inches of shotcrete encapsulated in a woven geotextile blanket;</li><li>• cushion nonwoven geotextile;</li><li>• double-sided textured (DST) HDPE geomembrane; and</li><li>• Gundseal-type Geosynthetic Clay Liner (GCL) with geomembrane backing</li></ul> <u>Pond floor (from top to bottom):</u> <ul style="list-style-type: none"><li>• 2 to 3 inches of shotcrete encapsulated in a woven geotextile blanket;</li><li>• cushion nonwoven geotextile;</li><li>• smooth HDPE geomembrane;</li><li>• DST HDPE geomembrane; and</li><li>• Gundseal-type GCL with geomembrane backing</li></ul> During demolition of the existing pond floor and sideslope containment system, no reinforced concrete or concrete was visually observed as shown on Drawing 10, of the Construction Drawings.
	<u>Recycle Improvement Area</u> No work in this area today.
1700	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

Report Sequence No.: 112

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Monday

DATE: DAY: 14      MONTH: June

YEAR: 2010

WEATHER: Sunny and warm during the day

0800	I arrived on site. Goodfellow Bros. is already on site.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u>  No work in this area today.
	<u>Cell 1 Construction</u>  Goodfellow Bros. subcontractor ITC Water Management (ITC) is on site to install flanges and fittings to pressure test the interstitial space of Wet Well #3. Preliminary tests indicate that the interstitial space does not hold the required minimum pressure to certify that the system does not leak. ITC continues to inspect all welds and fittings for leaks.  During construction today all flanges and fitting were installed on the Cell 1C and 1D cleanout riser pipes in accordance with the project drawings.
	<u>Existing Leachate Evaporation Pond</u>  Goodfellow Bros. continues the process of removing the existing leachate pond containment system components. A Hitachi 450 LC excavator excavates the components from the pond subgrade and loads the various layer into a Caterpillar 740 articulated haul truck. The haul truck transports the debris to the active face of the Phase II landfill for disposal, as directed by the County of Kauai.
	<u>Recycle Improvement Area</u>  No work in this area today.
1700	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 113**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Tuesday

DATE: DAY: 15 MONTH: June

YEAR: 2010

WEATHER: Sunny and warm during the day

0600	I arrived on site. Goodfellow Bros. is already on site
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.
1000	I attended weekly construction meeting.
1100	Returned from construction meeting.
	<u>New Leachate Evaporation Pond (NLEP)</u>  GBI's subcontractor Bill's Electric has completed the installation of the electrical conduit and wiring to the new flow meter. The site is verifying the accuracy of the flow meter to ensure proper operation.
	<u>Cell 1 Construction</u>  Goodfellow Bros. subcontractor ITC Water Management is on site to complete pressure testing the interstitial space of Wet Well #3. During inspection of the Wet Well #3 flange welds under pressure, a leak was observed in the factory weld of the dual containment pipe which penetrates into the wet well structure. The weld was repaired and the pressure test was initiated. After 1 hour of testing (in accordance with the project requirements) the test results indicate that the interstitial space does not leak.
	<u>Existing Leachate Evaporation Pond</u>  Goodfellow Bros. continues the process of removing the existing leachate pond containment system components. A Hitachi 450 LC excavator excavates the components from the pond subgrade and loads the various layer into a Caterpillar 740 articulated haul truck. The haul truck transports the debris to the active face of the Phase II landfill for disposal as directed by the County of Kauai.
	<u>Recycle Improvement Area</u>  No work in this area today.
1700	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch





Kekaha Landfill  
Kekaha, Kauai, Hawaii

**DAILY FIELD REPORT**

**Report Sequence No.: 114**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Wednesday

DATE: DAY: 16      MONTH: June

YEAR: 2010

WEATHER: Sunny and warm during the day

0600	I arrived on site. Goodfellow Bros. is already on site. Kim Huynh (Geosyntec) is on site to sample the subsurface soils below the existing leachate evaporation pond containment system.
	Equipment on site today: Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u> No work in this area today.
	<u>Cell 1 Construction</u> No work in this area today.
	<u>Recycle Improvement Area</u> No work in this area today.

Chris Scott

Printed Name

Signature

cc: Mike Minch

PROJECT: Phase II Lateral Expansion  
LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02  
DAY/DATE: 16 June 2010

	<p><u>Existing Leachate Evaporation Pond</u></p> <p>During construction today, Goodfellow Bros. completes the process of removing the existing leachate pond containment system components in its entirety. A Hitachi 450 LC excavator excavates the containment system components from the pond subgrade and loads the various layer into two (2) Caterpillar articulated haul trucks. The haul truck transports the debris to the active face of the Phase II landfill for disposal, as directed by the County of Kauai.</p> <p>During excavation, several laborers hand pick the various loose pieces of the containment system (i.e., pieces of geomembrane, GCL, geotextile and broken sections of grout mattress). Once the small pieces were removed, a Caterpillar 140H motor grader uniformly grades the floor and discards the upper 6-inches of loose debris.</p> <p>Kim Huynh and I, with assistance from Clyde (Goodfellow Bros. grade setter), laid out the grid pattern of subgrade soil sampling locations within the existing pond using a hand-held GPS. The grid pattern was developed using the Visual Sampling Plan (VSP) software to establish a Multi-increment sampling (MIS) strategy for the pond. Once the grid was field located, all of the samples were collected in accordance with "Attachment 6: Sub-Surface sampling Strategy" provided by the County of Kauai and previously submitted to HDOH.</p> <p>A total of three (3) composite soil samples were collected (primary, duplicate, and triplicate), then placed into zip lock bags and stored in a cooler with ice packs, and delivered via Aloha Air Cargo to TestAmerica Laboratory in Aiea, Honolulu.</p>
1700	I left the site.

Chris Scott  
Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 114A**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Wednesday

DATE: DAY: 16      MONTH: June

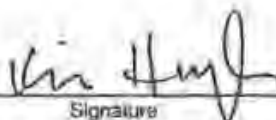
YEAR: 2010

WEATHER: Sunny and warm during the day

0700	I arrived on site. Chris Scott (Geosyntec) and Goodfellow Bros. (GBI) is already on site.
	<p><u>Existing Leachate Evaporation Pond</u></p> <p>I work with Chris and the GBI grade setter to collect soil confirmation samples from the existing leachate evaporation pond subgrade. The grid of primary, duplicate, and triplicate sample locations are located using a hand-held GPS and staked with colored wire flags (the locations were previously developed using the Visual Sampling Plan software which established a Multi-increment sampling strategy for the pond). There were 50 locations for each of the primary, duplicate, and triplicate samples, for a total of 150 sample locations. I then collect the samples using a metal sampling tube, approximately 1-inch in diameter. The samples were collected in accordance with "Attachment 6: Sub-Surface sampling Strategy" provided by the County of Kauai and previously submitted to HDOH. The soil samples were composited into the respective primary, duplicate, and triplicate samples, then placed into zip lock bags and stored in a cooler with ice packs, and delivered via Aloha Air Cargo to TestAmerica Laboratory in Aiea, Honolulu.</p>
1700	I left the site.

Kim Huynh

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

Report Sequence No.: 115

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Thursday

DATE: DAY: 17 MONTH: June

YEAR: 2010

WEATHER: Sunny and warm during the day

0600	I arrived on site. Goodfellow Bros. is already on site.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u>  No work in this area today.
	<u>Cell 1 Construction</u>  Goodfellow Bros. subcontractor ITC Water Management (ITC) is on site to install flanges and fittings to pressure test the void spaces of pipe penetration assemblies for Cells 1A and 1B. ITC installed all test fittings and a 0-14 psi gauge to test the 1-inch void space within the Cell 1A pipe penetration assembly. After 1 hour of testing (in accordance with the project requirements) the test results indicate that pipe penetration assembly for Cell 1A does not leak.  During inspection of the pipe penetration assembly for Cell 1B under pressure, a leak was observed in the factory weld of the pipe penetration assembly. Therefore the pipe penetration assembly for Cell 1B was rejected until a passing test is achieved. Goodfellow Bros. was contacted and informed of the deficient condition. It is my understanding that NWL will repair the Cell 1B assembly.
	<u>Existing Leachate Evaporation Pond</u>  No work in this area today.
	<u>Recycle Improvement Area</u>  No work in this area today.
1700	I left the site.

Cnris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 116**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Friday

DATE DAY: 18 MONTH: June

YEAR: 2010

WEATHER: Sunny and warm during the day

0600	I arrived on site. Goodfellow Bros. is already on site.
	Equipment on site today:  Hitachi 450 LC excavator, Hitachi BH278 excavator, Caterpillar 140H motor grader, Deere 644J front end loader, Komatsu backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, and an HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor.
	<u>New Leachate Evaporation Pond (NLEP)</u>  No work in this area today.
	<u>Cell 1 Construction</u>  No work in this area today.
	<u>Existing Leachate Evaporation Pond</u>  No work in this area today.
	<u>Recycle Improvement Area</u>  Goodfellow Bros. subcontractor Grace Pacific is on site to install the asphalt paving within the public drop off/recycling improvement area. The asphalt paving within the improvement area was placed using an asphalt spreader and then smooth drum rolled using a roller.
1700	I left the site.

Chris Scott  
Printed Name

  
Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 117**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO: WG1298      TASK NO: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Thursday

DATE: DAY: 1      MONTH: July      YEAR: 2010

WEATHER: Sunny and warm 84 degrees

0600	I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site today:</p> <p>Hitachi 225 excavator, Deer 644J front end loader, Caterpillar backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor, Bomag BW219PDH pad-footed Compactor, Skytrack hi-lift forklift, Water Truck, and a skid steer.</p>
	<p><u>Existing Leachate Evaporation Pond</u></p> <p>Today HDOH issued their approval regarding the analytical results for the subgrade soil below the former leachate evaporation pond containment system. The remaining existing subgrade soil can remain in place. This concludes the field sampling and testing portion of the existing leachate evaporation pond subgrade soil evaluation.</p>
	<p><u>Cell 1 Construction</u></p> <p>I went with Keith Suga (GBI) to the Kauai Aggregates quarry and met with Scott Pingrey. GBI proposes a quarry fines material for the upper 6 inches of subbase material. I took two 5-gallon buckets of the quarry fines (Sample SB-005) to send to Precision Laboratory for a modified Proctor, sieve, and interface testing (Interfaces 6C, 6D, and 12B). I take the samples for USDA inspection and ship via FedEx overnight to Precision.</p> <p>ITC Water Management (ITC) is onsite to connect the gravity flow line to Wet Well #3. ITC cuts the elbow out of the gravity line at the connection to the temporary wet well. All pipes are dry and no liquid is observed. The gravity line at the base of the temporary wet well is cut and capped with a piece of plywood. ITC welded up the dual containment HPDE pipe which will connect to Wet Well #3. ITC pressure tests the dual containment pipe for 1 hour and the results conform with the specifications. The final connections of this pipe segment will be completed tomorrow and will be visually inspected.</p> <p>GBI resumes work in the Cells 1A and 1B area. A water truck moisture conditions the surface and a Hamm 2420 rubber tire smooth drum vibratory roller begins proof-rolling the surface. The Cat. D6 and D5 dozers are used to cul ramps into the existing pond area in preparation for import earthfill material. Portions of the surface remain soft and rolling will continue tomorrow.</p>
*800	I left the site.

Mike Minch

Printed Name



Signature

cc: Hari Sharma

**DAILY FIELD REPORT**

**Report Sequence No.: 118**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Friday

DATE:      DAY: 2      MONTH: July      YEAR: 2010

WEATHER: Sunny and warm, 79 degrees

0645	I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site today:</p> <p>Hitachi 225 excavator, Deer 644J front end loader, Caterpillar backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) rubber tire smooth drum vibratory compactor, Bomag BW219PDH pad-footed Compactor, Skytrack hi-lift forklift, Water Truck, and a skid steer.</p>
	<p><u>Cell 1 Construction</u></p> <p>ITC Water Management (ITC) is onsite to connect the dual containment gravity line running to Wet Well #3. ITC removes the temporary caps and gauges and performs the final welds to the existing gravity line and the stub-out on Wet Well #3. Both welds were visually observed to be in compliance with the project specifications.</p> <p>After completion of the pipe, the pipe trench was backfilled by GBI using onsite soils and a vibratory plate attachment on the Hitachi Excavator is used provide compactive effort. Around Wet Well #3 where access is limited, a walk-behind vibratory plate compactor is used. Field density testing using a portable nuclear density gauge confirm that the backfill meet the compaction requirements. GBI works to grade a small ramp through this area using a Cat D6 dozer in preparation for hauling import earthfill soil on Tuesday. An exit ramp is graded at the southwest corner of Cell 1A at the location of the second gate through the western fence.</p> <p>GBI continues moisture conditioning the existing ground surface of Cells 1A and 1B with a water truck and rolling using a Hamm 2420 rubber tire smooth drum vibratory roller. The surface is visually confirmed to be firm with minimal deflection. Per Section 02330 of the specification, this area is ready to receive fill.</p>
1600	I left the site.

Mike Minch

Printed Name



Signature

cc: Hari Sharma

**DAILY FIELD REPORT**

**Report Sequence No.: 119**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Tuesday

DATE: DAY: 6 MONTH: July

YEAR: 2010

WEATHER: Partly sunny throughout day, 79 degrees

0615	I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site today:</p> <p>Hitachi 225 excavator, Deer 644J front end loader, Caterpillar backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) smooth drum vibratory compactor, Bomag BW219PDH pad-footed Compactor, Skytrack hi-lift forklift, Water Truck, and a Deere skid steer.</p>
	<p><u>Cell 1 Construction</u></p> <p>ITC Water Management is onsite to weld the dual containment gravity line which will run from the Cell 1A sump to Wet Well #3.</p> <p>GBI begins importing quarry fines from the Kauai Aggregates quarry using nine 20-CY end-dump trucks. Each truck completes a round trip in about 1 hour. A total of 90 loads are delivered and placed throughout the day. GBI spreads the initial lift using a Caterpillar D5 to about 6 inches (compacted to 4 inches), and the water truck moisture conditions the material. A Hamm 2420 smooth drum roller vibratory compactor compacts the first lift over the whole floor of Cells 1A and 1B. Generally, after three passes with the vibratory roller, field density tests confirm that the backfill meet the minimum compaction requirement of 95% relative compaction. Areas where 95% relative compaction is not achieved are re-rolled and then retested until passing results are achieved. I obtain Compacted Fill (offsites soils) sample SB008 for conformance testing and drop the sample at Hirata and Associates in Lihue and request a modified Proctor and sieve analysis. At the end of the day, GBI begins the second lift and uses the Bomag pad-footed compactor to assist with compactive effort. The pad-foot compactor does not effectively compact this cohesionless material.</p>
1715	I left the site.

Mike Minch

Printed Name



Signature

cc: Hari Sharma



**DAILY FIELD REPORT**

Report Sequence No.: 120

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Wednesday

DATE: DAY: 7      MONTH: July

YEAR: 2010

WEATHER: Partly sunny throughout day, some light drizzle, 75 degrees

0630	I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site today:</p> <p>Hitachi 225 excavator, Deere 644J front end loader, Caterpillar backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) smooth drum vibratory compactor, Bomag smooth drum vibratory compactor, Skytrack hi-lift forklift, Water Truck, and a Deere skid steer.</p>
	<p><u>Cell 1 Construction</u></p> <p>ITC Water Management is onsite to continue welding the dual containment gravity line which will run from the Cell 1A sump to Wet Well #3. A cap is welded to the southern end, and a flange with valves, a pressure gauge, and a thermometer are welded on the northern end for pressure testing tomorrow.</p> <p>GBI continues importing quarry fines from the Kauai Aggregates quarry using 15 20-CY end-dump trucks. Each truck completes a round trip in about 1 hour. Approximately 135 loads are delivered and placed throughout the day. GBI spreads the second lift using a Caterpillar D5 to about 8-inches (compacted to 6-inches) and the water truck moisture conditions the material. The Bomag pad-foot compactor is replaced with a Bomag smooth drum vibratory roller. Both the Hamm and Bomag smooth drum rollers compact the second lift over the whole floor of Cells 1A and 1B. Generally, after three to four passes with the vibratory roller, field density tests confirm that the compacted fill meet the minimum compaction requirements of 95% relative compaction. Areas where 95% relative compaction is not achieved are re-rolled and then retested until passing results are achieved. By the end of the day, GBI has begun placing, spreading, and compacting the northern end of the third lift.</p>
1600	I left the site.

Mike Minch

Printed Name



Signature

cc: Hari Sharma

**DAILY FIELD REPORT**

Report Sequence No.: 121

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Thursday

DATE: DAY: 8 MONTH: July

YEAR: 2010

WEATHER: Partly cloudy throughout day, breezy 81 degrees

0630	I arrived on site. Goodfellow Bros. is already on site.
	<p>Equipment on site today:</p> <p>Hitachi 225 excavator, Deere 644J front end loader, Caterpillar backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D8 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) smooth drum vibratory compactor, Bomag smooth drum vibratory compactor, Skytrack hi-lift forklift, Water Truck, and a Deere skid steer.</p>
	<p><u>Cell 1 Construction</u></p> <p>ITC Water Management (ITC) is onsite to pressure test the final dual containment gravity line which will run from the Cell 1A sump to Wet Well #3. Both inner and outer pipes are pressurized to 10 psi, and are observed to maintain the pressure for at least one hour per the specifications. The pipe is laid in the trench and the final connection to the wet well will be made tomorrow and will be visually observed.</p> <p>ITC grinds out the previously discovered cracked weld in the Cell 1B pipe penetration assembly and extrusion welds a repair. ITC pressurizes the assembly to 2 psi and a very small leak is discovered in the plate corner under the pipe. Since this leak is inaccessible with ITC's large extrusion welder, they will ship a smaller Leister gun to the site from the Big Island to make the repair.</p> <p>GBI continues importing quarry fines from the Kauai Aggregates quarry using 16 20-CY end-dump trucks. Each truck completes a round trip in about 1 hour. A total of 145 loads are delivered and placed throughout the day. GBI spreads the third lift using a Caterpillar D5 to about 8-inches (compacted to 6-inches) and the water truck moisture conditions the material. Both the Hamm and Bomag smooth drum rollers compact the third lift over the whole floor of Cells 1A and 1B. Generally, after three to four passes with the vibratory roller, field density tests confirm that the compacted fill meet the minimum compaction requirements of 95% relative compaction. Areas where 95% relative compaction is not achieved are re-rolled and then retested until passing results are achieved. By the end of the day, GBI has begun placing, spreading, and compacting the northern end of the fourth lift.</p> <p>Towards the end of the day some of the loads of quarry fines appear to have a higher fines content than earlier in the day. I discuss with Keith and we will meet at the quarry in the morning to investigate.</p>
1700	I left the site.

Mike Minch

Printed Name:



Signature

cc: Hari Sharma

**DAILY FIELD REPORT**

Report Sequence No.: 122

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298 TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Friday

DATE: DAY: 9 MONTH: July

YEAR: 2010

WEATHER: Partly cloudy throughout day, breezy 83 degrees

0615	I meet Keith Suga of GBI at the Kauai Aggregates Quarry to look at the earthfill borrow sources. GBI is using a Hitachi excavator to load the trucks. As the stockpile is getting smaller, GBI is using a dozer to push the quarry fines toward the excavator for loading. It appears that the increase in fines seen yesterday afternoon was the result of the dozer picking up some of the underlying soil while pushing the quarry fines. GBI agrees to change the operation to minimize pushing and, when pushing is needed, to limit the depth of the dozer's cut to minimize introduction of fines into the sand.
0715	I arrive onsite. GBI is already onsite.
	<p>Equipment on site today:</p> <p>Hitachi 225 excavator, Deere 644J front end loader, Caterpillar backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) smooth drum vibratory compactor, Bomag smooth drum vibratory compactor, Skytrack hi-lift forklift, Water Truck, and a Deere skid steer.</p>
	<p><u>Cell 1 Construction</u></p> <p>GBI continues importing quarry fines from the Kauai Aggregates Quarry using 17 20-CY end-dump trucks. Each truck completes a round trip in about 1 hour. A total of 150 loads are delivered and placed throughout the day. GBI spreads the fourth lift using a Caterpillar D5 dozer to about 8-inches (compacted to 6-inches) and the water truck moisture conditions the material. Both the Hamm and Bomag smooth drum rollers compact the fourth lift over the whole floor of Cells 1A and 1B. Generally, after three to four passes with the vibratory roller, field density tests confirm that the compacted fill meet the minimum compaction requirements of 95% relative compaction. Areas where 95% relative compaction is not achieved are re-rolled and then retested until passing results are achieved. By the end of the day, GBI has begun placing, spreading, and compacting the northern end of the fifth lift. I take one additional conformance sample of the quarry fines (SB007).</p> <p>ITC Water Management (ITC) is onsite to make the final butt-fusion weld to connect the 12x8 dual containment pipe to Wet Well #3. I visually observed the completion of this weld per the project requirements.</p> <p>After completion of the final dual containment pipe weld, the pipe trench was backfilled by GBI using onsite sand and a vibratory plate attachment on the Hitachi excavator was used provide compactive effort. Around Wet Well #3 where access is limited, a walk-behind vibratory plate compactor is used. Field density testing using a portable nuclear density gauge confirm that the backfill meet the compaction requirements.</p>

Mike Minch

Printed Name



Signature

cc: Hari Sharma

PROJECT: Phase II Lateral Expansion

LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02

DAY/DATE: 9 July 2010

	ITC grinds out the small leak discovered yesterday in the Cell 1B pipe penetration assembly. ITC heats HDPE welding rod and manually works to repair the leak. ITC pressurizes the assembly to 1.5 psi and discovers another very small leak which is repaired in the same manner. This process is repeated three more times. A final test confirms the assembly will hold 1.5 psi for 1 hour.
1545	I left the site and return to the quarry with Keith. Based on the remaining material in the existing stockpile, GBI will need to haul from another source to complete the earthfill in Cells 1A and 1B. I took a sample of the nearby 1.5-inch minus pile (SB008) as a candidate for earthfill (below the upper 6-inch final subbase layer). Keith reports that Hirata has run a gradation, compaction curve, and CBR on this material for GBI and he will provide Geosyntec with the submittal for its use.
1700	I left the quarry

Mike Minch

Printed Name



Signature

cc: Hari Sharma

**DAILY FIELD REPORT**

**Report Sequence No.: 123**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Saturday

DATE: DAY: 10 MONTH: July

YEAR: 2010

WEATHER: Partly cloudy throughout day, 87 degrees

0630	I arrive at the Hirata lab in Lihue to drop off samples SB007 and SB008 for conformance testing. I discuss the testing requirements and schedule with Tony Frey of Hirata. He will ship these samples out today for testing.
0815	I arrive onsite. GBI is already onsite.
	<p>Equipment on site today:</p> <p>Hilachi 225 excavator, Deer 644J front end loader, Caterpillar backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer, Caterpillar D5 dozer with GPS grade control, HAMM 2420 (26,450 lb) smooth drum vibratory compactor, Bomag smooth drum vibratory compactor, Skytrack hi-lift forklift, Water Truck, and a Deere skid steer.</p> <p><u>Cell 1 Construction</u></p> <p>GBI continues importing quarry fines from the Kauai Aggregates Quarry using 18 20-CY end-dump trucks. Each truck completes a round trip in about 1 hour. Approximately 90 loads of quarry fines are delivered and placed throughout the day. GBI spreads the fifth lift using a Caterpillar D5 dozer to about 8-inches (compacted to 6-inches) and the water truck moisture conditions the material. At this point, the general earthfill elevation has been established in the sumps. From this point onward, the filling will progress to form the sloped floor grades rather than in even lifts over the whole floor. Both the Hamm and Bomag smooth drum rollers compact the fifth lift over the whole floor of Cells 1A and 1B. Generally, after three to four passes with the vibratory roller, field density tests confirm that the backfill meet the minimum compaction requirements of 95% relative compaction. Areas where 95% relative compaction is not achieved are re-rolled and then retested until passing results are achieved.</p> <p>By 1300, GBI has exhausted the quarry fines stockpile and begins hauling the 1.5"-minus material. GBI begins to place, spread, and compact the 1.5"-minus material in the far southern end of the fifth lift and starts on the northern end of the sixth lift in a similar manner. I monitor the placement of the fill, however, prior to receipt of the compaction curve from Hirata, the relative compaction cannot be calculated. GBI will await receipt of the lab results prior to covering the first lift of 1.5-inch material to allow for compaction testing.</p> <p>GBI uses the Cat D6 LGP to flatten the existing western berm and place the final lift of onsite sand fill over the buried dual containment pipe. The Bomag smooth drum roller is used to compact the final lift and provide a driving surface for haul trucks. Field density tests confirm that the backfill meet the minimum 95% relative compaction requirement. GBI anticipates starting to haul material to the berm beginning on Tuesday.</p>
1500	I left the site

Mike Minch

Printed Name



Signature

cc: Hari Sharma

**DAILY FIELD REPORT**

**Report Sequence No.: 124**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Monday

DATE: DAY: 12 MONTH: July

YEAR: 2010

WEATHER: Sunny am 84 degrees, overcast pm 74 degrees

0645	I arrive onsite. GBI is already onsite.
	<p>Equipment on site today:</p> <p>Hitachi 225 excavator, Deer 644J front end loader, Caterpillar backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motorgrader, HAMM 2420 (26,450 lb) smooth drum vibratory compactor, Bomag smooth drum vibratory compactor, Skytrack hi-lift forklift, Water Truck, and a Deere skid steer.</p>
	<p><u>Cell 1 Construction</u></p> <p>GBI is not importing soil today. GBI works to grade the low spots of Cell 1A/1B floor using the Caterpillar D5 and D6 LGP dozers with GPS grade control. The trimmings from the cutting operation are used as fill for the ridges within the floor. Generally, after three to four passes with the vibratory roller, field density tests confirm that the fill material meets the minimum requirement of 95% relative compaction. I also take density readings on the floor area which was filled with 1.5'-minus fill yesterday. We are awaiting the compaction curve to compute the relative compaction.</p> <p>GBI levels out the remainder of the Cell 1A/1B western berm and southern berm using the Caterpillar 140H motorgrader in preparation for hauling import soil tomorrow.</p> <p>We receive the interface shear strength results from Precision for the proposed SB005 material. Each interface meets or exceeds the minimum requirements.</p>
	<p><u>NLEP Construction</u></p> <p>Ron's Electric is onsite working on the wiring and panels for the cut-off switches for the leachate pond aerators. They pull wire from the main panel to the eastern aerator cut-off switch box and work on the main panel today.</p>
1730	I left the site.

Mike Minch

Printed Name



Signature

cc: Han Sharma

**DAILY FIELD REPORT**

Report Sequence No.: 125

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Tuesday

DATE: DAY: 13 MONTH July

YEAR: 2010

WEATHER: Cloudy am, 76 degrees some rain

0645	I arrive onsite. GBI is already onsite.
	<p>Equipment on site today:</p> <p>Hitachi 225 excavator, Deere 644J front end loader, Caterpillar backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motorgrader, HAMM 2420 (26,450 lb) smooth drum vibratory compactor, Bomag smooth drum vibratory compactor, Skytrack hi-lift forklift, Water Truck, and a Deere skid steer.</p>
	<p><u>Cell 1 Construction</u></p> <p>GBI resumes importing 1.5"-minus earthfill from the Kauai Aggregates Quarry using 15 20-CY end-dump trucks. Each truck completes a round trip in about 1 hour. A total of about 140 loads are delivered and placed throughout the day. GBI spreads the soil on the Cell 1A/1B floor and berms using the Caterpillar D5 and D6 dozers to about 8 inches (compacted to 6 inches), and the water truck moisture conditions the material. Both the Hamm and Bomag smooth drum rollers compact the soil. Generally, after three to four passes with the vibratory roller, field density tests confirm that the backfill meet the minimum requirement of 95% relative compaction. Areas where 95% relative compaction is not achieved are re-rolled and then retested until passing results are achieved.</p>
	<p><u>NLEP Construction</u></p> <p>Ron's Electric is onsite working on the wiring and panels for the cut-off switches for the leachate pond aerators.</p>
1730	I left the site.

Mike Minch

Printed Name



Signature

cc: Hari Sharma

**DAILY FIELD REPORT**

**Report Sequence No.: 126**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Wednesday

DATE: DAY: 14      MONTH: July

YEAR: 2010

WEATHER: Partly cloudy 80 degrees

0700	I arrive onsite. GBI is already onsite.
	<p>Equipment on site today:</p> <p>Hitachi 225 excavator, Deere 644J front end loader, Caterpillar backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motorgrader, HAMM 2420 (26,450 lb) smooth drum vibratory compactor, Bomag smooth drum vibratory compactor, Skytrack hi-lift forklift, Water Truck, and a Deere skid steer.</p>
	<p><u>Cell 1 Construction</u></p> <p>GBI continues importing 1.5"-minus earthfill from the Kauai Aggregates Quarry using 12 20-CY end-dump trucks. Each truck completes a round trip in about 1 hour. A total of about 110 loads are delivered and placed throughout the day. GBI spreads the soil on the floor and berms using the Caterpillar D5 dozer to about 8 inches (compacted to 6 inches), and the water truck moisture conditions the material.</p> <p>At 1215 AECOM approves the rock dust import material for the final subbase compacted fill lift (RFI #30). GBI begins to also haul rock dust material. The rock dust material is used on the inboard side of the berms where it will be in contact with the liner, and the 1.5"-minus material is used everywhere else. Both the Hamm and Bomag smooth drum rollers compact the soil. Generally, after three to four passes with the vibratory roller, field density tests confirm that the compacted backfill meets the minimum requirement of 95% relative compaction. Areas where 95% relative compaction is not achieved are re-rolled and then retested until passing results are achieved.</p>
1730	I left the site.

Mike Minch

Printed Name



Signature

cc: Hari Sharma



**DAILY FIELD REPORT**

Report Sequence No.: 127

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Thursday

DATE: DAY: 15 MONTH: July

YEAR: 2010

WEATHER: Partly cloudy 81 degrees

0700	I arrive at Hirata Labs in Lihue to deliver the rock dust material check-point sample SB009, and then proceed to the Kauai Aggregates Quarry. Visually there appears to be sufficient material in the two stockpiles (1.5"-minus and rock dust) to complete the Cell 1A/1B fill operations.
0900	I arrive onsite. GBI is already onsite.
	<p>Equipment on site today:</p> <p>Hitachi 225 excavator, Deere 644J front end loader, Caterpillar backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motorgrader, HAMM 2420 (26,450 lb) smooth drum vibratory compactor, Bomag smooth drum vibratory compactor, Skytrack hi-lift forklift, Water Truck, and a Deere skid steer.</p>
	<p><u>Cell 1 Construction</u></p> <p>GBI continues importing 1.5"-minus earthfill and rock dust material from the Kauai Aggregates Quarry using 12 20-CY end-dump trucks. Each truck completes a round trip in about 1 hour. A total of about 110 loads are delivered and placed throughout the day. GBI spreads the soil on the Cell 1A/1B floor and berms using the Caterpillar D5 dozer to about 8 inches (compacted to 6 inches), and the water truck moisture conditions the material. The rock dust material is used on the inboard side of the berms and a small area of the floor around the Cell 1A pipe penetration where it will be in contact with the liner, and the 1.5"-minus material is used everywhere else. Both the Hamm and Bomag smooth drum rollers compact the soil. Generally, after three to four passes with the vibratory roller, field density tests confirm that the compacted backfill meet the minimum requirement of 95% relative compaction. Areas where 95% relative compaction is not achieved are re-rolled and then retested until passing results are achieved. GBI uses the Caterpillar 140H motorgrader to trim the berm slopes as they progress.</p> <p>At the southeast corner of Cell 1A where the southern perimeter berm connects to existing Phase II, the future top of berm road will end at the existing cleanout and new gas probe GP-II-6. A design change or field-fill will be required to connect the new perimeter road to the existing road. I notify Jesse Frey (WM) of this condition via e-mail.</p>
1715	I left the site.

Mike Minch

Printed Name



Signature

cc: Hari Sharma

**DAILY FIELD REPORT**

**Report Sequence No.: 128**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Friday

DATE: DAY 16 MONTH: July

YEAR: 2010

WEATHER: Sunny, 82 degrees

0700	I arrive onsite. GBI is already onsite.
	<p>Equipment on site today:</p> <p>Hitachi 225 excavator, Deere 644J front end loader, Caterpillar backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motorgrader, HAMM 2420 (26,450 lb) smooth drum vibratory compactor, Bomag smooth drum vibratory compactor, Skytrack hi-lift forklift, Water Truck, and a Deere skid steer.</p>
	<p><u>Cell 1 Construction</u></p> <p>GBI continues importing 1.5"-minus earthfill and rock dust material from the Kauai Aggregates Quarry using 10 20-CY end-dump trucks. Each truck completes a round trip in about 1 hour. A total of about 90 loads are delivered and placed throughout the day. GBI spreads the import soils on the Cell 1A/1B floor and berms using the Caterpillar D5 dozer to about 8 inches (compacted to 6 inches), and the water truck moisture conditions the materials. The rock dust material is used on the inboard side of the berms where it will be in contact with the liner, and the 1.5"-minus material is used everywhere else. Both the Hamm and Bomag smooth drum rollers compact the third lift over the whole floor of Cells 1A and 1B. Generally, after three to four passes with the vibratory roller, field density tests confirm that the compacted backfill meet the minimum requirement of 95% relative compaction. Areas where 95% relative compaction is not achieved are re-rolled and then retested until passing results are achieved.</p> <p>I take a sample of onsite sand (SB010) to Hirata Labs and request a compaction curve and sieve analysis. Hirata requests additional material to ship to their Oahu lab. I obtain an additional bag for delivery tomorrow.</p> <p>ITC Water Management is onsite to weld and pressure test a 120-ft long section of 12x8 dual containment HDPE pipe. During the first test, a leak is discovered at the temporary end cap. The cap was repaired and pipe retested. The test results meet the project requirements. This section of pipe will be used to connect the two remaining LCRS pipe penetrations to the existing sub-outs.</p>
1500	Chris Scott of Geosyntec arrives onsite. I show Chris around the project and we discuss the work completed to date and the outstanding tasks. Chris will resume the CQA monitoring tomorrow.
1730	Chris and I left the site.

Mike Minch

Printed Name



Signature

cc: Hari Sharma

**DAILY FIELD REPORT**

Report Sequence No.: 129

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Saturday

DATE: DAY: 17 MONTH: July

YEAR: 2010

WEATHER: Sunny and warm 86 degrees

0700	I arrive onsite. GBI is already onsite.
	<p>Equipment on site today:</p> <p>Hitachi 225 excavator, Deere 644J front end loader, Caterpillar backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motorgrader, HAMM 2420 (26,450 lb) smooth drum vibratory compactor, Bomag smooth drum vibratory compactor, Skytrack hi-lift forklift, Water Truck, and a Deere skid steer.</p>
	<p><u>Cell 1 Construction</u></p> <p>GBI has suspended importing 1.5"-minus earthfill and rock dust material from the Kauai Aggregates Quarry.</p> <p>GBI continues to spread the soil on the Cells 1A/1B floor and berms using the Caterpillar D5 dozer to about 8 inches (compacted to 6 inches), and the water truck moisture conditions the material. The rock dust material is used on the inboard side of the berms where it will be in contact with the liner, and the 1.5"-minus material is used everywhere else. Both the Hamm and Bomag smooth drum rollers compact the third lift over the whole floor of Cells 1A and 1B. Generally, after three to four passes with the vibratory roller, field density tests confirm that the backfill meet the minimum compaction requirements of 95% relative compaction. Areas where 95% relative compaction is not achieved are re-rolled and then retested until passing results are achieved.</p> <p>ITC Water Management is onsite, and with the assistance of GBI, is working to install the LCRS pipe penetrations for Cells 1A and 1B. The LCRS pipe penetrations were installed using a fusion weld to connect the double-wall pipe to the existing stub out and an electro-fusion coupler at the pipe penetration assembly. A layer of 16 oz/yd<sup>2</sup> cushion geotextile was placed beneath the pipe penetration assembly and above the prepared subgrade in accordance with RFI #19.</p> <p>Both pipe penetrations for Cells 1A and 1B were installed. GBI plans to backfill around the pipe penetrations using lean concrete slurry on Monday.</p>
1500	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 130**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Monday

DATE: DAY: 19      MONTH: July

YEAR: 2010

WEATHER: Sunny and warm 86 degrees

0700	I arrive onsite. GBI is already onsite.
	<p>Equipment on site today:</p> <p>Hitachi 225 excavator, Deere 644J front end loader, Caterpillar backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motorgrader, HAMM 2420 (26,450 lb) smooth drum vibratory compactor, Bomag smooth drum vibratory compactor, Skytrack hi-lift forklift, Water Truck, and a Deere skid steer.</p>
	<p><u>Cell 1 Construction</u></p> <p>GBI continues importing 1.5"-minus earthfill and rock dust from the Kauai Aggregates Quarry using ten 20-C, end-dump trucks. Each truck completes a round trip in about 1 hour. A total of about 90 loads are delivered and placed throughout the day. GBI spreads the soil on the Cells 1A/1B berms using the Caterpillar D5 dozer to about 8 inches (compacted to 6 inches) and the water truck moisture conditions the material. The rock dust is used on the inboard side of the berms where it will be in contact with the liner and the 1.5"-minus material everywhere else. Both the Hamm and Bomag smooth drum rollers compact the third lift over the whole floor of Cells 1A and 1B. Generally, after three to four passes with the vibratory roller, field density tests confirm that the backfill meet the minimum compaction requirements of 95% relative compaction. Areas where 95% is not achieved are re-rolled and then retested until passing results are achieved.</p> <p>GBI has installed the bentonite/cement grout within the 1-inch void spaces of the Cell 1A and 1B pipe penetration assemblies. The grout was mixed by hand, then poured into the void space until the mixture freely flowed from the vent hole.</p> <p>GBI has imported Controlled Low Strength Material (CLSM) from the O. Thomas plant. The CLSM was used to backfill under the pipe penetrations, within the buttress berm, for both Cell 1A and Cell 1B. The CLSM was agitated during placement using a vibratory wand to remove the air voids during placement.</p> <p>A Hirata Geotechnical field technician was on site to cast the concrete cylinders to verify the strength of the CLSM. The cylinders will be tests after 7 and 28 days of curing and the strength tests results will be evaluated for compliance.</p>
1500	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minchi

**DAILY FIELD REPORT**

**Report Sequence No.: 131**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Tuesday

DATE: DAY: 20      MONTH: July

YEAR: 2010

WEATHER: Sunny and warm 83 degrees

0700	I arrive onsite. GBI is already onsite.
	<p>Equipment on site today:</p> <p>Hitachi 225 excavator, Deer 644J front end loader, Caterpillar backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motorgrader, HAMM 2420 (26,450 lb) smooth drum vibratory compactor, Bomag smooth drum vibratory compactor, Skytrack hi-lift forklift, Water Truck, and a Deere skid steer.</p>
0800	I attended the weekly construction meeting.
1100	I returned from the weekly construction meeting.
	<p><u>Cell 1 Construction</u></p> <p>GBI continues importing 1.5"-minus earthfill and rock dust from the Kauai Aggregates Quarry using ten 20-CY end-dump trucks. Each truck completes a round trip in about 1 hour. A total of about 90 loads are delivered and placed throughout the day. GBI spreads the soil on the Cells 1A/1B berms using the Caterpillar D5 dozer to about 8 inches (compacted to 6 inches) and the water truck moisture conditions the material. The rock dust is used on the inboard side of the berms where it will be in contact with the liner and the 1.5"-minus material everywhere else. Both the Hamm and Bomag smooth drum rollers compact the lift over the whole floor of Cells 1A and 1B. Generally, after three to four passes with the vibratory roller, field density tests confirm that the backfill meet the minimum compaction requirements of 95% relative compaction. Areas where 95% is not achieved are re-rolled and then retested until passing results are achieved.</p>
	<p><u>Kauai Aggregate Quarry</u></p> <p>Keith Suga (GBI) informed me that the Kauai Aggregates Quarry has produced a sufficient stockpile of 1/2-inch minus drainage gravel, and has been stockpiled at the quarry and dedicated for the Cells 1A/1B granular drainage layer. Keith requested that Geosyntec evaluate this stockpile to verify that the material meets the project requirements. I went to the Kauai Aggregate Quarry and collected two samples (Cell 1 DG003 and Cell 1 DG004) from the stockpiled materials. The samples were delivered to Precision Lab for testing.</p>
1500	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

Report Sequence No.: 132

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298 TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Wednesday

DATE: DAY: 21 MONTH: July YEAR: 2010

WEATHER: Sunny and warm 83 degrees

0700	I arrive onsite. GBI is already onsite.
	<p>Equipment on site today:</p> <p>Hitachi 225 excavator, Deere 644J front end loader, Caterpillar backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motorgrader, HAMM 2420 (26,450 lb) smooth drum vibratory compactor, Bomag smooth drum vibratory compactor, Skytrack hi-lift forklift, Water Truck, and a Deere skid steer.</p>
	<p><u>Cell 1 Construction</u></p> <p>GBI continues importing 1.5"-minus earthfill and rock dust from the Kauai Aggregates Quarry using 20-CY end-dump trucks. Each truck completes a round trip in about 1 hour. A total of about 10 loads are delivered and placed throughout the day. GBI spreads the soil on the Cells 1A/1B berms using the Caterpillar D5 dozer to about 8 inches (compacted to 6 inches) and the water truck moisture conditions the material. The rock dust is used on the inboard side of the berms where it will be in contact with the liner and the 1.5"-minus material everywhere else. Both the Hamm and Bomag smooth drum rollers compact the lift over the whole floor of Cells 1A and 1B. Generally, after three to four passes with the vibratory roller, field density tests confirm that the backfill meet the minimum compaction requirements of 95% relative compaction. Areas where 95% is not achieved are re-rolled and then retested until passing results are achieved.</p> <p>GBI has hauled a sufficient quantity of offsite import material from the quarry to obtain the design grades. Therefore, the trucking has been suspended.</p>
1700	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 133**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Thursday

DATE: DAY: 22      MONTH: July

YEAR: 2010

WEATHER: Sunny and warm 83 degrees

0700	I arrive onsite. GBI is already onsite.
	<p>Equipment on site today:</p> <p>Hilachi 225 excavator, Deere 644J front end loader, Caterpillar backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motorgrader, HAMM 2420 (26,450 lb) smooth drum vibratory compactor, Bomag smooth drum vibratory compactor, Skytrack hi-lift forklift, Water Truck, and a Deere skid steer.</p>
	<p><u>Cell 1 Construction</u></p> <p>GBI has suspended the import of offsite material and is working to final grade the Cells 1A and 1B berms.</p> <p>GBI spreads the material cut from the over-built outside slopes of the berms to areas requiring fill to achieve final grades. The majority of the material is being placed within close proximity to the Cell 1B pipe penetration. This area was left low to provide access for the trucking operations. The material is cut from the outside slope using a Caterpillar motorgrader and then pushed on the berms using the Caterpillar D5 dozer to about 8 inches loose (compacted to 6 inches). Once the material has been placed, a water truck moisture conditions the material. GBI continues to use the rock dust on the inboard side of the berms where it will be in contact with the liner and the 1.5"-minus material everywhere else. Both the Hamm and Bomag smooth drum rollers compact the lift over the whole floor of Cells 1A and 1B. Generally, after three to four passes with the vibratory roller, field density tests confirm that the backfill meet the minimum compaction requirements of 95% relative compaction. Areas where 95% is not achieved are re-rolled and then retested until passing results are achieved.</p>
1700	I left the site.

**Chris Scott**

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

Report Sequence No.: 134

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Friday

DATE: DAY: 23 MONTH: July

YEAR: 2010

WEATHER: Sunny and warm 83 degrees

0700	I arrive onsite. GBI is already onsite.
	<p>Equipment on site today:</p> <p>Hitachi 450 excavator, Hitachi 225 excavator, Deere 644J front end loader, Caterpillar backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motorgrader, HAMM 2420 (26,450 lb) smooth drum vibratory compactor, Bomag smooth drum vibratory compactor, Skytrack hi-lift forklift, Water Truck, and a Deere skid steer.</p>
	<p><u>Cell 1 Construction</u></p> <p>Keith Suga (GBI) has informed me that the survey data provided by Esaki Surveying &amp; Mapping, Inc. has identified that the Cell 1B pipe penetration which was installed on 17 July 2010, does not meet the design grades and that the pipe penetration needs to be removed so that the subgrade can be adjusted to meet the design.</p> <p>During construction today GBI carefully excavated around the pipe penetration and double-wall carrier pipe which connects the pipe penetration to Wet Well #3. The double-wall carrier pipe and the pipe penetration assembly were carefully removed. The floor and side slope grades were corrected and the pipe penetration was re-installed. Visual observation during the entire construction activities indicates that the pipe penetration was not damaged during the repair.</p> <p>GBI has begun to place onsite sand material within the final 6 inches of the Cell 1A and 1B floor subgrade. A Hitachi 450 excavator loads a Caterpillar 750 articulated haul truck which dumps the material directly onto the floor of Cells 1A and 1B, then a D5 dozer uniformly grades the final lift. No compaction effort was applied today until the material is graded and moisture conditioned.</p>
1730	I left the site.

Chris Scott  
Printed Name

  
Signature

cc: Mike Minch



**DAILY FIELD REPORT**

Report Sequence No.: 135

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Saturday

DATE: DAY: 24 MONTH: July

YEAR: 2010

WEATHER: Sunny and warm 83 degrees

0630	I arrive onsite. GBI is already onsite.
	<p>Equipment on site today:</p> <p>Hitachi 450 excavator, Hitachi 225 excavator, Deere 644J front end loader, Caterpillar backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motorgrader, HAMM 2420 (26,450 lb) smooth drum vibratory compactor, Bomag smooth drum vibratory compactor, Skytrack hi-lift forklift, Water Truck, and a Deere skid steer.</p>
	<p><u>Cell 1 Construction</u></p> <p>GBI continues to place and compact onsite sand within the final 6 inches of the Cell 1A and 1B floor. A Hitachi 450 excavator loads a Caterpillar 750 articulated haul truck which dumps the material on the floor of the cell, and then a Cat. D5 dozer uniformly grades the final lift.</p> <p>The Cat. D5 dozer spreads the lift to about 8-inches loose (compacted to 6-inches) and the water truck moisture conditions the material. Once the material has been placed, a Bomag smooth drum roller compact the sand. Generally, after three to four passes with the vibratory roller, field density tests confirm that the backfill meet the minimum compaction requirements of 95% relative compaction. Areas where 95% is not achieved are re-rolled and then retested until passing results are achieved.</p> <p>GBI has removed the Cell 1C and 1D temporary wet well from the berm and prepares the area to received fill.</p>
1730	I left the site.

Cris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 136**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Monday

DATE: DAY: 26 MONTH: July

YEAR: 2010

WEATHER: Sunny and warm 88 degrees

0630	I arrive onsite. GBI is already onsite.
	<p>Equipment on site today:</p> <p>Hitachi 450 excavator, Hitachi 225 excavator, Deer 644J front end loader, Caterpillar backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, HAMM 2420 (26,450 lb) smooth drum vibratory compactor, Bomag smooth drum vibratory compactor, Skytrack hi-lift forklift, Water Truck, and a Deere skid steer.</p>
	<p><u>Cell 1 Construction</u></p> <p>GBI has completed the placement and compaction of the 6-inch thick final subbase compacted fill over the Cell 1 floor and has begun the final grading.</p> <p>ITCI Water Management is on site to construct and test the double-wall force main piping from the temporary wet well stub-out (temporary wet well previously removed) and connect to the newly installed Wet Well #3. The carrier pipe section and the containment pipe were tested today and no leaks were observed after the 1 hour test was completed.</p> <p>GBI has begun to expose the existing Phase II liner tie-in. A Hitachi excavator is working to expose the liner while a GBI laborer spots the operator to minimize damaged to the containment system.</p> <p>GBI has imported Controlled Low Strength Material (CLSM) from the O Thronas concrete plant this afternoon. The CLSM was used to backfill below the Cell 1B pipe penetration assembly. Before the material was used, a sample of the batch was tested in the field by a Hirtala field technician, and a set of three cylinders was cast in place.</p>
1730	I left the site.

**Chris Scott**

Printed Name



Signature

cc: **Mike Minch**

**DAILY FIELD REPORT**

**Report Sequence No.: 137**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Tuesday

DATE: DAY: 27 MONTH: July

YEAR: 2010

WEATHER: Sunny and warm 88 degrees

0630	I arrive onsite. GBI is already onsite.
	<p>Equipment on site today:</p> <p>Hitachi 450 excavator, Hitachi 225 excavator, Deere 644J front end loader, Caterpillar backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, HAMM 2420 (26,450 lb) smooth drum vibratory compactor, Bomag smooth drum vibratory compactor, Skytrack hi-lift forklift, Water Truck, and a Deere skid steer.</p>
1000	I attended weekly construction meeting.
1100	Returned from weekly construction meeting.
	<p><u>Cell 1 Construction</u></p> <p>GBI continues to final grade the Cell1A and 1B design subbase grades.</p> <p>GBI continues to expose the Phase II liner tie-in using a Hitachi excavator while a laborer spots the operator to minimize damage to the existing liner system.</p> <p><u>Survey:</u> Wagner Surveying and Esaki Surveying &amp; Mapping, Inc. are on site to survey the completed subgrade to date.</p>
1730	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 138**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Wednesday

DATE: DAY: 28 MONTH: July

YEAR: 2010

WEATHER: Sunny and warm 86 degrees

0630	I arrive onsite. GBI is already onsite.
0700	Northwest Linings & Geotextile Products, Inc. (Joel Mondragon and technicians) are onsite to install the liner system for Cells 1A and 1B.  Doug Hamilton (Geosyntec CQA Monitor) is on site to observe the geosynthetics liner installation.
	Equipment on site today:  Hitachi 450 excavator, Hitachi 225 excavator, Deere 644J front end loader, Caterpillar backhoe, Caterpillar 7... articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, HAMM 2420 (28,450 lb) smooth drum vibratory compactor, Bomag smooth drum vibratory compactor, Skytrack hi-lift forklift, Water Truck, and a Deere skid steer.
	<u>Cell 1 Construction</u>  GBI has completed the Cells 1A and 1B subgrade grading and smooth drum rolled the entire surface area in preparation to receive geomembrane. The subgrade condition was prepared in accordance with the project requirements.  <u>Survey:</u> Wagner Surveying and Esaki Surveying & Mapping, Inc. are on site to provide the final as built survey.
1730	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 139**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Thursday

DATE: DAY: 29      MONTH: July

YEAR: 2010

WEATHER: Sunny and warm 88 degrees

0630	I arrive onsite. GBI is already onsite.
0700	Northwest Linings & Geotextile Products, Inc. (NWL) (Joel Mondragon and technicians) are onsite to install the liner system for Cells 1A and 1B.  Doug Hamilton (Geosyntec CQA Monitor) is on site to observe the geosynthetics liner installation.
	Equipment on site today:  Hitachi 450 excavator, Hitachi 225 excavator, Deere B44J front end loader, Caterpillar backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, HAMM 2420 (26,450 lb) smooth drum vibratory compactor, Bomag smooth drum vibratory compactor, Skytrack hi-lift forklift, Water Truck, and a Deere skid steer.
	<u>Cell 1 Construction</u>  NWL has begun to deploy the subbase geomembrane above the approved subgrade within Cells 1A and 1B. Doug provides CQA during the geosynthetics installation.
	<u>Infiltration Ditch</u>  GBI has begun to lay out the alignment of the infiltration ditch along the access road to the site. The ditch alignment is obstructed with several existing utilities within the vicinity of the infiltration ditch. GBI is working to expose some of the utilities to evaluate the relocation cost.
1730	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch



Kekaha Landfill  
Kekaha, Kauai, Hawaii

**DAILY FIELD REPORT**

**Report Sequence No.: 139A**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Thursday

DATE: DAY: 29      MONTH: July

YEAR: 2010

WEATHER: Sunny and warm 87 degrees

0630	I arrived onsite to monitor CQA activities. GBI is already onsite.
0700	I reviewed the field documents and EHS plan. Met with Keith Suga of Goodfellow Brothers.
0800	Chris Scott (Geosyntec) and I walked the site and met with Joel Mondragon (NWL) and Jeff of GBI.
	<u>Cell 1 Construction</u>  GBI is excavating the west anchor trench.  ITC Water Management is installing the last section of the forcemain between Cells 1C and 1B.
1500	I left the site.

Douglas W. Hamilton

Printed Name:

Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 140**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Friday

DATE: DAY: 30 MONTH: July

YEAR: 2010

WEATHER: Sunny and warm 88 degrees

0630	I arrive onsite. GBI is already onsite.
0700	Northwest Linings & Geotextile Products, Inc. (NWL) (Joel Mondragon and technicians) are onsite to install the geosynthetic containment system for Cells 1A and 1B.  Doug Hamilton (Geosyntec CQA Monitor) is on site to observe the geosynthetics liner installation.
	Equipment on site today:  Hitachi 450 excavator, Hitachi 225 excavator, Deer 644J front end loader, Caterpillar backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, HAMM 2420 (26,450 lb) smooth drum vibratory compactor, Bomag smooth drum vibratory compactor, Skytrack hi-lift forklift, Water Truck, and a Deere skid steer.
	<u>Cell 1 Construction</u>  NWL continues to deploy the subbase geomembrane above the approved subgrade within Cells 1A and 1B.
1200	I left the site to pick up Mike Minch (Geosyntec) from the airport.
1400	Returned to the site with Mike.
	<u>Infiltration ditch</u>  GBI continues to expose some of the utilities along the alignment of designed infiltration ditch to evaluate the relocation cost.
1730	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 140A**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Friday

DATE: DAY: 30      MONTH: July

YEAR: 2010

WEATHER: Sunny and warm, 87 degrees

0630	I arrived on site to monitor CQA activities. GBI is already on site.
0700	Northwest Linings & Geotextile Products, Inc. (NWL) on site.
0840	Wagner and Esaki surveyors on site to verify grades at Cells 1A and 1B.
	<p><u>Cell 1 Construction</u></p> <p>GBI completed installing the magnetic tape above the force main at Cell 1B and backfilled as well as excavating the west anchor trench.</p> <p>NWL began deploying, fusion welding and air pressure testing the subbase 60 mil textured HDI geomembrane within Cells 1A and 1B.</p> <p>NWL had two fusion welders operational for the day after passing trial seam testing in accordance with Section 02072, page 9 of the technical specifications dated July 2009.</p> <p>46,000 ft<sup>2</sup> of subbase 60 mil textured HDPE geomembrane and 750 ft<sup>2</sup> of Geosynthetic Clay Liner (GCL) were deployed today. 2080 linear feet of fusion welding were completed for the day. Five destructive seam samples were marked (DS S-24 through S-28).</p> <p>NWL began packing up their equipment at 1600.</p>
1615	I left the site.

Douglas W. Hamilton

Printed Name

  
Signature

cc: Mike Minch



**DAILY FIELD REPORT**

**Report Sequence No.: 141**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Saturday

DATE: DAY: 31      MONTH: July

YEAR: 2010

WEATHER: Cloudy/Light Wind, 76-80 degrees

0645	I arrived on site to monitor CQA activities. GBI is not on site today.
	<p>Equipment on site today:</p> <p>Hitachi 450 excavator, Hitachi 225 excavator, Deere 644J front end loader, Caterpillar 735 articulated haul truck, Caterpillar D6R LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, Bomag smooth drum vibratory compactor, Skytrack hi-lift forklift, Water Truck, and a John Deere skid steer.</p>
0900	Northwest Linings (NWL) on site.
	<p><u>Cell 1 Construction</u></p> <p>NWL continued deploying, fusion welding and air pressure testing the subbase 60 mil textured HDPE geomembrane within Cells 1 A and 1B.</p> <p>NWL had two fusion welders and one extrusion welder operational for the day after passing trial seam testing in accordance with Section 02072, page 9 of the technical specifications dated July 2009.</p> <p>51,750 ft<sup>2</sup> of subbase 60 mil textured HDPE geomembrane and 750 ft<sup>2</sup> of Geosynthetic Clay Liner (GCL) were deployed today. 2400 linear feet of fusion welding were completed today. Five destructive seam samples were marked (DS S-29 through S-33). The penetration flatstock at the Cell 1B sump was extrusion welded to the subbase geomembrane today.</p> <p>NWL began packing up their equipment at 1230.</p>
1230	I left the site.

Douglas W. Hamilton

Printed Name

Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 142**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Monday

DATE: DAY: 2 MONTH: August

YEAR: 2010

WEATHER: Cloudy/Light to Moderate Wind, 76-85 degrees

0645	I arrived onsite to monitor construction activities.
	<p>Equipment on site today:</p> <p>Hitachi 450 excavator, Hitachi 225 excavator, Deere 644J front end loader, Caterpillar 735 articulated haul truck, Caterpillar D6R LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, Bomag smooth drum vibratory compactor, Skytrack hi-lift forklift, Water Truck, and a John Deere skid steer.</p>
0700	Goodfellow Bros. and Northwest Linings (NWL) are on site.
	<p><u>Cell 1 Construction</u></p> <p>GBI is relocating the rolls of the geosynthetics from the administration building to the south end of Cell 1A.</p> <p>NWL continued deploying, fusion welding and air pressure testing the subbase 60 mil textured HDPE geomembrane at the south end of Cells 1A and 1B. The penetration flatstock at the Cell 1A sump was extrusion welded to the subbase geomembrane today.</p> <p>Destructive seam samples DS S-24 through S-30 were shipped to Precision Lab via Fed Ex priority overnight. Destructive seam sample DS S-31 failed during the field testing and will be tracked.</p> <p>NWL had two fusion welders and one extrusion welder operational for the day after passing trial seam testing in accordance with the Section 02072, page 9 of the technical specifications dated July 2009.</p> <p>28,750 ft<sup>2</sup> of subbase 60 mil textured HDPE geomembrane and 0 ft<sup>2</sup> of Geosynthetic Clay Liner (GCL) were deployed today. 1250 linear feet of fusion welding were completed today. Three destructive seam samples were marked (DS S-34 through S-36).</p> <p>NWL began packing up their equipment at 1700.</p>
1700	I departed the site.

Douglas W. Hamilton

Printed Name

  
Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 143**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298 TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Tuesday

DATE: DAY: 3 MONTH: August YEAR: 2010

WEATHER: Partly Cloudy/Light Wind, 76-86 degrees

0645	I arrived on site to monitor construction activities.
	<p>Equipment on site today:</p> <p>Hitachi 450 excavator, Hitachi 225 excavator, Deere 644J front end loader, Caterpillar 735 articulated haul truck, Caterpillar D6R LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, Bomag smooth drum vibratory compactor, Skytrack hi-lift forklift, Water Truck, and a John Deere skid steer.</p>
700	Goodfellow Bros. and Northwest Linings (NWL) are on site.
	<p><u>Cell 1 Construction</u></p> <p>GBI is relocating rolls of the geosynthetics from the administration building to the south end of Cell 1A.</p> <p>NWL continued deploying, fusion welding and air pressure testing the subbase 60 mil textured HDPE geomembrane at the south end of Cells 1 A and 1B.</p> <p>Test results for destructive seam samples DS S-24 through S-25 and DS S-27 through DS S-30 were received and met the project requirements. DS S-26 showed failing lab test results, and will be tracked. Destructive seam sample DS S-26 and S-31 are being tracked and failed seam areas are being capped.</p> <p>NWL had one fusion welder and two extrusion welders operational for the day after passing trial seam testing in accordance with Section 02072, page 9 of the technical specifications dated July 2009.</p> <p>14,835 ft<sup>2</sup> of subbase 60 mil textured HDPE geomembrane and 0 ft<sup>2</sup> of Geosynthetic Clay Liner (GCL) were deployed today. 645 linear feet of fusion welding were completed today. Two destructive seam samples were marked (DS S-37 and S-38).</p> <p>NWL extrusion welded the Cells 1A and 1B subbase liner to the existing Phase II geomembrane. Two destructive seam samples were marked on the tie-in seam (DS S-40 and DS S-42).</p> <p>NWL began packing up their equipment at 1715. I departed the site.</p>

Douglas W. Hamilton

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 144**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Wednesday

DATE:      DAY: 4      MONTH: August

YEAR: 2010

WEATHER: Sunny and warm, 88 degrees

0630	I arrive onsite. GBI is already onsite.
0700	Northwest Linings (Joel Mondragon and technicians) is onsite.
	Equipment on site today:  Hitachi 450 excavator, Hitachi 225 excavator, Deer 644J front end loader, Caterpillar backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, HAMM 2420 (26,450 lb) smooth drum vibratory compactor, Bomag smooth drum vibratory compactor, Skytrack hi-lift forklift, Water Truck, an Deere skid steer.
	<u>Cell 1 Construction</u>  NWL continues to install the geosynthetic containment system within Cells 1A and 1B.
1730	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 144A**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298 TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Wednesday

DATE: DAY: 4 MONTH: August

YEAR: 2010

WEATHER: Partly Cloudy/Light Wind, 76-86 degrees

0645	I arrived on site to monitor construction activities.
0700	Goodfellow Bros. and Northwest Lining (NWL) on site.
	<p><u>Cell 1 Construction</u></p> <p>GBI is utilizing the Hitachi 450 excavator and Caterpillar D6R LGP dozer as a block and tackle to assist NWL in the deployment of the Geosynthetic Clay Liner (GCL) and primary 60 mil HDPE geomembrane at Cell 1B.</p> <p>NWL began deploying, fusion welding and air pressure testing the primary 60 mil textured HDPE geomembrane within Cell 1B.</p> <p>NWL had one fusion welder and one extrusion welders operational for the day after passing trial seam testing in accordance with Section 02072, page 9 of the technical specifications dated July 2009.</p> <p>23,000 ft<sup>2</sup> of primary 60 mil textured HDPE geomembrane and 22,500 ft<sup>2</sup> of GCL were deployed today. 1000 linear feet of fusion welding were completed today. Two destructive seam samples were marked (DS P-22 and P-23). Previously marked destructive seam samples DS S-32 through S-42 were removed and shipped to the Precision Lab via Fed Ex.</p> <p>NWL extrusion welded all repairs on the subbase liner at the south end of Cell 1A and the primary liner within Cell 1B.</p> <p>NWL began packing up their equipment at 1630. I departed the site.</p>

Douglas W. Hamilton

Printed Name

  
Signature

cc: Mike Minch

**DAILY FIELD REPORT**

Report Sequence No.: 145

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Thursday

DATE: DAY: 5 MONTH: August

YEAR: 2010

WEATHER: Sunny and warm 88 degrees

0630	I arrive onsite. GBI is already onsite.
0700	Northwest Linings (Joel Mondragon and technicians) are onsite.
	Equipment on site today:  Hitachi 450 excavator, Hitachi 225 excavator, Deere 644J front end loader, Caterpillar backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, HAMM 2420 (26,450 lb) smooth drum vibratory compactor, Bomag smooth drum vibratory compactor, Skytrack hi-lift forklift, Water Truck, and Deere skid steer.
	<u>Cell 1 Construction</u>  NWL continues to install the geosynthetic containment system within Cells 1A and 1B.
1730	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 145A**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Thursday

DATE: DAY: 5      MONTH: August      YEAR: 2010

WEATHER: Partly Cloudy/Light Wind, 75-86 degrees

0645	I arrived on site to monitor construction activities.
0700	Goodfellow Bros and Northwest Lining (NWL) on site.
	<p><u>Cell 1 Construction</u></p> <p>GBI is utilizing the Hitachi 450 excavator and Caterpillar D6R LGP dozer as a block and tackle to assist NWL in the deployment of the Geosynthetic Clay Liner (GCL) and primary 60 mil HDPE geomembrane at Cell 1B.</p> <p>NWL continues deploying, fusion welding and air pressure testing the primary 60 mil textured HDPE geomembrane at Cell 1B.</p> <p>Destructive seam samples DS S-32 through S-42 which were shipped to the Precision Lab via Fed Ex yesterday have been delayed due to mechanical failures by Fed Ex. I was informed by Fed Ex that the samples would not be delivered to the lab until 8-06-2010. I informed NWL of the situation and explained that destructive seam sample DS S-39 located on seam S-67/S-68 can be capped, and that GCL and primary geomembrane can be deployed over seam S-69/S-71. Deployment of GCL and primary geomembrane can't continue passed seam S-69/71 until results are received from the lab on sample DS S-39.</p> <p>NWL had one fusion welder and one extrusion welder operational for the day after passing trial seam testing in accordance with Section 02072, page 9 of the technical specifications dated July 2009.</p> <p>11,500 ft<sup>2</sup> of primary 60 mil textured HDPE geomembrane and 11,250 ft<sup>2</sup> of GCL were deployed today. 523 linear feet (LF) of fusion welding were completed today. Two destructive seam samples were marked (DS P-24 and P-25). 46 LF of subbase tie-in and 92 LF of primary tie-in were extrusion welded today.</p> <p>NWL began packing up their equipment at 1445. I departed the site at 1500.</p>

Douglas W. Hamilton

Printed Name

  
Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 146**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Friday

DATE: DAY: 6      MONTH: August      YEAR: 2010

WEATHER: Sunny and warm, 88 degrees

0630	I arrive onsite. GBI is already onsite.
0700	Northwest Linings (Joel Mondragon and technicians) are onsite.
	Equipment on site today:  Hitachi 450 excavator, Hitachi 225 excavator, Deere 644J front end loader, Caterpillar backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, HAMM 2420 (26,450 lb) smooth drum vibratory compactor, Bomag smooth drum vibratory compactor, Skytrack hi-lift forklift, Water Truck, and Deere skid steer.
	<u>Cell 1 Construction</u>  NWL continues to install the geosynthetic containment system within Cells 1A and 1B.
1730	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch



**DAILY FIELD REPORT**

Report Sequence No.: 146A

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Friday

DATE: DAY: 6 MONTH: August

YEAR: 2010

WEATHER: Clear to Partly Cloudy/Light Wind 77-86 degrees/Light Rain

0645	I arrived onsite to monitor construction activities.
0700	Goodfellow Bros. and Northwest Lining (NWL) on site.
	<p><u>Cell 1 Construction</u></p> <p>GBI is utilizing the Hitachi 450 excavator and Caterpillar D6R LGP dozer as a block and tackle to assist NWL in the deployment of the Geosynthetic Clay Liner (GCL) and primary 60 mil HDPE geomembrane at Cell 1B.</p> <p>NWL continues deploying, fusion welding and air pressure testing the primary 60 mil textured HDPE geomembrane within Cell 1B. Extrusion welding of the liner tie-in, liner repair patches, and the penetration flatstock at the Cell 1B sump were also performed.</p> <p>Laboratory test results for destructive seam samples DS S-33 through S-42, DS P-22, and DS P-23 were received and met the project requirements. I informed NWL of the results.</p> <p>Destructive seam samples DS P-24 and P-25 were sent to Precision Lab via Fed Ex for Monday delivery.</p> <p>NWL had one fusion welder and one extrusion welder operational for the day after passing trial seam testing in accordance with Section 02072, page 9 of the technical specifications dated July 2009.</p> <p>34,500 ft<sup>2</sup> of primary 60 mil textured HDPE geomembrane and 33,750 ft<sup>2</sup> of GCL were deployed today. 1592 linear feet (LF) of fusion welding were completed for the day. Three destructive seam samples were marked (DS P-26 through P-28). 46 LF of primary tie-in were extrusion welded.</p> <p>NWL began packing up their equipment at 1630. I departed the site at 1630.</p>

Douglas W. Hamilton

Printed Name

Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 147**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

DAY OF WEEK: Saturday

WEATHER: Sunny and warm 88 degrees

PROJECT NO.: WG1298    TASK NO.: 02

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DATE: DAY: 7    MONTH: August    YEAR: 2010

0630	I arrive onsite. GBI is already onsite.
0700	Northwest Linings (Joel Mondragon and technicians) are onsite.
	Equipment on site today:  Hitachi 450 excavator, Hitachi 225 excavator, Deere 644J front end loader, Caterpillar backhoe, Caterpillar 735 articulated haul truck, Caterpillar 740 articulated haul truck, Caterpillar D6 LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, HAMM 2420 (26,450 lb) smooth drum vibratory compactor, Bomag smooth drum vibratory compactor, Skytrack hi-lift forklift, Water Truck, and Deere skid steer.
	<u>Cell 1 Construction</u>  NWL has begun to deploy 16 oz/sy nonwoven cushion geotextile above the approved containment system. No geomembrane deployment today.
1200	I left the site.

Chris Scott

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

Report Sequence No.: 147A

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Saturday

DATE: DAY: 7      MONTH: August      YEAR: 2010

WEATHER: Partly Cloudy/Light Wind, 75-86 degrees

0650	I arrived onsite to monitor construction activities.
0700	Goodfellow Bros. and Northwest Linings (NWL) on site.
	<p><u>Cell 1 Construction</u></p> <p>NWL began deploying and sewing the 16 oz/sy non-woven cushion geotextile at the north end of Cell 1B. Extrusion welding and vacuum testing have been performed on all repairs and along the existing cell tie-in. Testing was performed in accordance with Section 02072 of the technical specifications.</p> <p>Destructive seam samples DS S-26 through S-30 were tested in the field with passing results.</p> <p>NWL had one extrusion welder operational for the day after passing trial seam testing in accordance with Section 02072, page 9 of the technical specifications dated July 2009.</p> <p>26,250 ft<sup>2</sup> of 16 oz/sy non-woven cushion geotextile was deployed today. Two destructive seam samples were marked (DS P-29 and P-30). 138 linear feet of primary liner tie-in were extrusion welded.</p> <p>NWL began packing up their equipment at 1230. I departed the site at 1230.</p>

Douglas W. Hamilton

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 148**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Monday

DATE: DAY: 8

MONTH: August

YEAR: 2010

WEATHER: Partly Cloudy/Light to Moderate Wind, 75-87 degrees

0650	I arrived onsite to monitor construction activities.
	<p>Equipment on site today:</p> <p>Hitachi 450 excavator, Hitachi 225 excavator, Deere 644J front end loader, Caterpillar 735 articulated haul truck, Caterpillar D6R LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, Skytrak hi-lift forklift, Water Truck, and a John Deere skid steer.</p>
0700	Goodfellow Bros. (GBI) and Northwest Linings (NWL) on site.
	<p><u>Cell 1 Construction</u></p> <p>NWL began deploying and fusion welding the primary 60 and 80 mil textured HDPE geomembrane in Cell 1A.</p> <p>GBI receives loads of the granular drainage layer material from the Kauai Aggregate Quarry, and utilizing the Caterpillar D5 dozer to grade the material in a 3-ft lift at Cell 1B.</p> <p>ITC Water Management is on site pre-welding the HDPE collection pipe.</p> <p>Destructive seam samples DS P-26 through P-30 are shipped to Precision Lab for testing. Test results for destructive seam samples DS P-24 and P-25 were received and the results met the project requirements. I informed NWL of the results.</p> <p>NWL had one fusion welder operational for the day after passing trial seam testing in accordance with section 02072 page 9 of the technical specifications dated July 2008.</p> <p>28,750 ft<sup>2</sup> of primary 60 and 80 mil textured HDPE geomembrane and 30,000 ft<sup>2</sup> of GCL were deployed today. Three destructive seam samples were marked (DS P-31 and P-33).</p> <p>NWL began packing up their equipment at 1630. I departed the site at 1630.</p>

Douglas W. Hamilton

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 149**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Tuesday

DATE: DAY: 10 MONTH: August

YEAR: 2010

WEATHER: Partly Cloudy/Light to Moderate Wind, 75-87 degrees

0650	I arrived onsite to monitor construction activities.
	<p>Equipment on site today:</p> <p>Hitachi 450 excavator, Hitachi 225 excavator, Deere 644J front end loader, Caterpillar 735 articulated haul truck, Caterpillar D6R LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, Skytrak hi-lift forklift, Water Truck, and a John Deere skid steer.</p>
0700	Goodfellow Bros. and Northwest Linings (NWL) on site.
	<p><u>New Leachate Evaporation Pond</u></p> <p>The aerator posts were installed in the new leachate evaporation pond.</p>
	<p><u>Cell 1 Construction</u></p> <p>GBI is utilizing the Cat. D6 LGP dozer to grade the granular drainage material to a 1-ft layer within Cell 1B.</p> <p>ITC Water Management is on site installing the perforated HDPE collection pipe in Cell 1B.</p> <p>Lab test results for destructive seam samples DS P-26 through P-30 were received and met the project requirements. I informed NWL of the results. Destructive seam samples DS P-31 through P-33 were shipped to Precision Lab via Fed Ex.</p> <p>In the morning, NWL deploy and sew the 16 oz/sy non-woven cushion geotextile at Cell 1B. In the afternoon, NWL deploys, fusion welds, and air pressure tests the primary 60 mil textured HDPE geomembrane within Cell 1A. The GCL was deployed ahead of the primary geomembrane deployment.</p> <p>NWL had one fusion welder and one extrusion welder operational for the day after passing trial seam testing in accordance with section 02072 page 9 of the technical specifications dated July 2009.</p> <p>11,500 ft<sup>2</sup> of primary 60 mil textured HDPE geomembrane, 11,250 ft<sup>2</sup> of GCL, and 45,000 ft<sup>2</sup> of 16 oz/sy non-woven cushion geotextile were deployed today. 96 linear feet of existing liner tie-in were extrusion welded. All repairs were extrusion welded.</p> <p>NWL began packing up their equipment at 1630. I departed the site at 1630.</p>

Douglas W. Hamilton

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

Report Sequence No.: 150

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Wednesday

DATE: DAY: 11 MONTH: August

YEAR: 2010

WEATHER: Partly Cloudy/Light to Strong Wind, 75-87 degrees

0650	I arrived onsite to monitor construction activities.
	<p>Equipment on site today:</p> <p>Hitachi 450 excavator, Hitachi 225 excavator, Deere 644J front end loader, Caterpillar D6R LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, Skytrak hi-lift forklift, Water Truck, and a John Deere skid steer.</p>
0700	Goodfellow Bros. and Northwest Linings (NWL) on site.
	<p><u>Cell 1 Construction</u></p> <p>The 1.5" granular drainage material is being delivered to the site from the Kauai Aggregate Quarry. 1654 cy of the 1.5" granular drainage material was delivered to the site for the day. Goodfellows is utilizing the Cat. D6 LGP dozer to grade the drainage aggregate material in a 1ft lift at Cell 1B.</p> <p>ITC Water Management is on site connecting the perforated HDPE collection pipe to the pipe penetration assembly, and installing the clean out riser pipe in Cell 1B.</p> <p>Lab test results for destructive seam samples DS P-31 through P-33 were received and met the project requirements. I informed NWL of the results. Destructive seam samples DS P-34 through P-38 were marked on the geomembrane.</p> <p>NWL began deploying and fusion welding the primary 60 mil textured HDPE geomembrane in Cell 1A. The GCL was deployed in front of the primary geomembrane deployment. NWL had one fusion welder operational for the day after passing trial seam testing in accordance with section 02072 page 9 of the technical specifications dated July 2009.</p> <p>29,500 ft<sup>2</sup> of primary 60 mil textured HDPE geomembrane and 32,850 ft<sup>2</sup> of GCL were deployed today.</p> <p>GCL and 60 mil textured HDPE geomembrane (primary and subbase) deployment has been completed for Cells 1A and 1B.</p> <p>NWL began packing up their equipment at 1630. I departed the site at 1645.</p>

Douglas W. Hamilton

Printed Name

Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 151**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Thursday

DATE: DAY: 12      MONTH: August

YEAR: 2010

WEATHER: Cloudy, light to strong winds, some light rain, 75-87 degrees

0650	I arrived onsite to monitor construction. Light rain impacted the site but not effecting activities.
	<p>Equipment on site today:</p> <p>Hitachi 450 excavator, Hitachi 225 excavator, Deer 644J front end loader, Caterpillar D6R LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, Skytrak hi-lift forklift, Water Truck, and a John Deere skid steer.</p>
0700	<p>Goodfellow Bros. and Northwest Linings (NWL) on site.</p> <p><u>Cell 1 Construction</u></p> <p>GBI is utilizing the Cat. D6 LGP dozer to grade the granular drainage material to a 1ft layer within Cell 1B.</p> <p>ITC Water Management (ITC) is on site installing the perforated HDPE collection pipe in Cell 1A. The pressure test of the dual contained forcemain between Cell 1A and the wet well was also performed by ITC with passing results.</p> <p>Destructive seam samples DS P-34 through P-38 were shipped to Precision Lab via Fed Ex.</p> <p>NWL began deploying and sewing the 16 oz/sy non-woven cushion geotextile in Cell 1A. Extrusion welding and vacuum testing was performed on all repairs and the existing cell tie in seam before deployment of the geotextile. NWL had one extrusion welder operational for the day after passing trial seam testing in accordance with section 02072 of the technical specifications.</p> <p>21,000 ft<sup>2</sup> of 16 oz/sy non-woven cushion geotextile was deployed today. 194 linear feet of the existing cell liner tie-in was extrusion welded and vacuum tested.</p> <p>NWL began packing up their equipment at 1300. I departed the site at 1630.</p>

Douglas W. Hamilton

Printed Name

  
Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 152**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO. 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Friday

DATE: DAY: 13 MONTH: August

YEAR: 2010

WEATHER: Cloudy/Light to Moderate Wind, 75-87 degrees

0650	I arrived onsite to monitor construction activities.
	<p>Equipment on site today:</p> <p>Hitachi 450 excavator, Hitachi 225 excavator, Deer 644J front end loader, Caterpillar D6R LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, Skytrak hi-lift forklift, Water Truck, and a John Deere skid steer.</p>
0700	Goodfellow Bros. (GBI) on site. Northwest Linings (NWL) on site at 0900.
	<p><u>Cell 1 Construction</u></p> <p>GBI receives truck loads of 1.5"-minus granular drainage layer material delivered from the Kauai Aggregate Quarry. A total of 983 cy of 1.5"-minus material was delivered to the site today. GBI utilizes the Cat. D6R LGP dozer to grade the granular drainage material to a 1" thick layer within Cells 1A and 1B.</p> <p>ITC Water Management is on site fusing the HDPE collection pipe to the pipe penetration assembly and the cleanout pipe at Cell 1A.</p> <p>NWL began deploying and sewing the 16 oz/sy non-woven cushion geotextile in Cell 1A. Lab test results for destructive seam samples DS P-34 through P-38 were received and met the project requirements. I informed NWL of the results.</p> <p>43,000 ft<sup>2</sup> of 16 oz/sy non-woven cushion geotextile was deployed today.</p> <p>Keith Suga (GBI) and I went to the Kauai Aggregate Quarry to take samples of the 3/8"-minus material which will be proposed for the operations layer within Cells 1A and 1B. Two samples were collected and will be shipped to Precision Lab on Monday.</p> <p>I completed work for the day at 1600.</p>

Douglas W. Hamilton

Printed Name

Signature

cc: Mike Minch



**DAILY FIELD REPORT**

**Report Sequence No.: 153**

PROJECT: Kekaha Landfill  
 LOCATION: Kekaha, Kauai, Hawaii  
 DESCRIPTION: Phase II Lateral Expansion  
 Cell 1 Base Liner Construction  
 DAY OF WEEK: Monday  
 WEATHER: Cloudy With Rain Showers/Light Wind, 75-87 degrees

PROJECT NO.: WG1298  
 TASK NO.: 02  
 CONTRACTORS: Goodfellow Bros. / Northwest Linings  
 DATE: DAY: 16 MONTH: August YEAR: 2010

1000	I arrived onsite to monitor construction activities. This morning, I delivered two operations layer material samples to the airport Fed Ex after being approved by the USDA agent for delivery to the Precision Lab.
	Equipment on site today:  Hitachi 450 excavator, Hitachi 225 excavator, Deer 644J front end loader, Caterpillar D6R LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, Skytrak hi-lift forklift, Water Truck, and a John Deere skid steer.
1700	Goodfellow Bros. on site. Northwest Linings (3 technicians) remained on Kauai to install the 6 oz/sy non-woven separator geotextile after completion of the installation of 1.5"-minus granular drainage layer.
	<u>Cell 1 Construction</u>  GBI receives truck loads of 1.5"-minus granular drainage layer material from the Kauai Aggregate Quarry. A total of 316 cy of the 1.5"-minus material was delivered to the site today. Goodfellows is utilizing the Cat. D6R LGP dozer to grade the granular drainage layer material to a 1ft thick layer within Cell 1A. The John Deere skid steer is being utilized to assist laborers in removing the granular drainage layer material from the crest of the Cells 1A and 1B west slope.  I completed work for the day at 1600.

Douglas W. Hamilton  
Printed Name

  
Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 154**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Tuesday

DATE: DAY: 17      MONTH: August

YEAR: 2010

WEATHER: Partly Cloudy With afternoon Rain/Light Wind, 76-85 degrees

0700	I arrived onsite to monitor CQA activities.
	<p>Equipment on site today:</p> <p>Hitachi 450 excavator, Takeuchi TB135 excavator, Deer 644J front end loader, Caterpillar D6R LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, Skytrak hi-lift forklift, Water Truck, and a John Deere skid steer.</p>
0700	Goodfellow Bros. on site. Northwest Linings (3 technicians) remained in Kauai HI to install the 6 oz/sy non-woven filter geotextile after completion of the installation of the 1.5"-minus granular drainage layer.
	<p><u>Cell 1 Construction</u></p> <p>Goodfellows is utilizing the Cat. D6 LGP dozer to grade the 1.5"-minus granular drainage material to a 1' thick layer within Cell 1A.</p> <p>The Takeuchi TB135 excavator is being utilized to assist laborers in removing the 1.5"-minus granular drainage material from the crest of the Cells 1A and 1B west slope. The John Deere skid steer is grading the 1.5"-minus granular drainage layer material at the toe of the west slope.</p> <p>Goodfellows is utilizing the Takeuchi excavator to begin backfilling the west anchor trench in 1' thick lifts. They are utilizing the water truck to moisture condition the material before utilizing a hand tamper to compact the material.</p> <p>I attended the weekly progress meeting with WM, GBI and County of Kauai.</p> <p>Esaki Surveying and Mapping, Inc. are on site to survey the completed portions (graded to design) of the top of the 1.5"-minus granular drainage layer.</p> <p>I completed work for the day at 1600.</p>

Douglas W. Hamilton

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

Report Sequence No.: 155

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298 TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Wednesday

DATE: DAY: 18 MONTH: August

YEAR: 2010

WEATHER: Partly Cloudy/Light Wind, 76-85 degrees

0700	I arrived onsite to monitor construction activities.
	<p>Equipment on site today:</p> <p>Hitachi 450 excavator, Takeuchi TB135 excavator, Deer 644J front end loader, Caterpillar D6R LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, Skytrak hi-lift forklift, Water Truck, and a John Deere skid steer.</p>
0700	Goodfellow Bros. on site. Northwest Linings (3 technicians) remained on Kauai to install the 6 oz/sy non-woven filter geotextile after completion of the installation of 1.5"-minus granular drainage layer.
	<p><u>Cell 1 Construction</u></p> <p>GBI receives truck loads of 1.5"-minus granular drainage material from the Kauai Aggregate Quarry. A total of 109.6 cy of 1.5"-minus material was delivered to the site today. Goodfellows is utilizing the Cat. D6R LGP dozer to grade the 1.5" granular drainage material to a 1ft thick layer within Cell 1A.</p> <p>GBI utilizes the HITACHI 450 excavator to expose the southern edge of the existing Cell 1C 6 oz/sy non-woven separator geotextile so for tie-in to Cell 1B.</p> <p>GBI is utilizing the Takeuchi excavator to backfill the west anchor trench in 1ft lifts. They are utilizing the water truck to moisture condition the material before utilizing a hand tamper to compact the material.</p> <p>I performed a standard count on Nuclear moisture/density gauge 20877. Density Standard 2137, Moisture Standard 596. I then perform field moisture/density tests on the compacted fill material in the west anchor trench. All tests met Section 02058 (Anchor Trench) page 2 sections 3.03D of the project specification dated July 2009.</p> <p>Wagner Engineering Services, Inc. on site to survey the top of the 1.5" granular drainage layer which have been completed to design grade.</p> <p>I completed work for the day at 1600.</p>

Douglas W. Hamilton

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 156**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298 TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Thursday

DATE: DAY: 19 MONTH: August

YEAR: 2010

WEATHER: Partly Cloudy/Light Wind 75-85 degrees

0700	I arrived onsite to monitor construction activities.
	Equipment on site today:  Hitachi 450 excavator, Takeuchi TB135 excavator, Deere 644J front end loader, Caterpillar D6R LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, Skytrak hi-lift forklift, Water Truck, and a John Deere skid steer.
0700	Goodfellow Bros. on site. Northwest Linings (3 technicians) on site.
	<u>Cell 1 Construction</u>  GBI received truck loads of 1.5"-minus granular drainage material from the Kauai Aggregate Quarry. A total of 82.29 cy of 1.5"-minus material was delivered to the site today. Goodfellows is utilizing the Cat. D6 LGP dozer to grade the granular drainage material to a 1' thick layer within Cell 1A.  GBI is utilizing the Takeuchi excavator to remove excess granular drainage material from the crest of the south slope.  I went to the Kauai Aggregate Quarry to take a sample of the 3/4"-minus operations layer soil. The sample collected will be shipped to Precision Lab on Monday.  NWL began deploying and sewing the 6 oz/sy non-woven separator geotextile in Cell 1B. 84,375 ft <sup>2</sup> of 6 oz/sy non-woven separator geotextile was deployed today.  I completed work for the day at 1600.

Douglas W. Hamilton

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 157**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Saturday

DATE: DAY: 21      MONTH: August

YEAR: 2010

WEATHER: Partly Cloudy/Light Wind, 75-85 degrees

0700	I arrived onsite to monitor construction activities.
	<p>Equipment on site today:</p> <p>Hitachi 450 excavator, Takeuchi TB135 excavator, Deere 644J front end loader, Caterpillar D6R LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, Skytrak hi-lift forklift, Water Truck, and a John Deere skid steer.</p>
0700	Goodfellow Bros. on site. Northwest Linings (3 technicians) on site.
	<p><u>Cell 1 Construction</u></p> <p>NWL continues deploying and sewing the 6 oz/sy non-woven separator geotextile in Cell 1B.</p> <p>Goodfellows has three operators on site assisting NWL with deployment of the 6 oz/sy nonwoven geotextile. A skid steer is being used for deployment.</p> <p>68,000 ft<sup>2</sup> of 6 oz/sy non-woven separator geotextile was deployed today. By the end of the day the 6 oz/sy non-woven separator geotextile deployment is complete.</p> <p>I completed work for the day at 1200.</p>

Douglas W. Hamilton

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 158**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Monday

DATE: DAY: 23 MONTH: August

YEAR: 2010

WEATHER: Partly Cloudy/Light Wind, 77-85 degrees

1000	I arrived onsite to monitor construction activities. This morning, I delivered a sample of the 3/8 inch-minus operations layer material to Fed Ex for delivery to Precision Lab.
	<p>Equipment on site today:</p> <p>Hitachi 450 excavator, Takeuchi TB135 excavator, Deere 644J front end loader, Caterpillar D6R LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, Skytrak hi-lift forklift, Water Truck, and a John Deere skid steer.</p>
0700	Goodfellow Bros. on site.
	<p><u>Cell 1 Construction</u></p> <p>GBI is utilizing the Takeuchi excavator to begin excavating for the concrete slab pour in the valve box area across from the new leachate evaporation pond.</p> <p>GBI is utilizing the John Deere skid steer to backfill the west and south anchor trenches. The contractor is also utilizing the water truck to moisture condition the material before utilizing a hand tamper to compact the material.</p> <p>I performed a standard count on Nuclear moisture/density gauge 20877: Density Standard 2185 and 2149, Moisture Standard 592 and 593.</p> <p>I began performing field moisture/density tests on the compacted fill material in the south and west anchor trenches. All tests met project specifications as stated in Section 02058 (Anchor Trench) Parts 3.03D of the project specification dated July 2009.</p> <p>GBI operators departed the site at 1530.</p> <p>I completed work for the day at 1600.</p>

Douglas W. Hamilton  
Printed Name

Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 159**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Tuesday

DATE: DAY: 24      MONTH: August

YEAR: 2010

WEATHER: Partly Cloudy/Light to Strong Wind, 76-85 degrees

0700	I arrived onsite to monitor construction activities.
	<p>Equipment on site today:</p> <p>Takeuchi TB135 excavator, Deer 644J front end loader, Caterpillar D6R LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, Skytrak hi-lift forklift, Water Truck, and a John Deere skid steer.</p>
0700	Goodfellow Bros. on site.
	<p><u>Geosynthetics</u></p> <p>The following geosynthetic materials were removed from the site:</p> <ul style="list-style-type: none"> <li>• 60 mil Textured HDPE Geomembrane rolls 801613 (240'), 801615, 801620, 801726, 801730, 801731, 801736, 802467, and 802472; and</li> <li>• Geosynthetic Clay Liner rolls ending in 278, 281, 304, 331, 340, 349, 350, 362, 404, 407, 491, and 508.</li> </ul>
	<p><u>Cell 1 Construction</u></p> <p>Goodfellows is utilizing the Cat. D5N dozer to cut the infiltration trench.</p> <p>The valve box area across from the new leachate evaporation pond is being prepared for the forming of the concrete slab.</p> <p>I attended a weekly progress meeting with WM, GBI and the County of Kauai.</p> <p>Wagner Engineering Services, Inc. on site to survey the Leachate/ Gas System Improvements.</p> <p>I completed work for the day at 1600.</p>

Douglas W. Hamilton

Printed Name

  
Signature

cc: Mike Minch

**DAILY FIELD REPORT**

Report Sequence No.: 160

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Wednesday

DATE: DAY: 25 MONTH: August

YEAR: 2010

WEATHER: Partly Cloudy/Light to Moderate Wind 76-85 degrees

0700	I arrived onsite to monitor construction activities.
	<p>Equipment on site today:</p> <p>Takeuchi TB135 excavator, Deer 644J front end loader, Caterpillar D6R LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, Skytrak hi-lift forklift, Water Truck, and a John Deere skid steer.</p>
0700	Goodfellow Bros. on site.
	<p><u>Cell 1 Construction</u></p> <p>Goodfellows is utilizing the Cat. 140H motor grader to cut the infiltration ditch. The non-woven geotextile was installed at the drain portion of the infiltration ditch.</p> <p>The slab for the concrete valve box across from the new leachate evaporation pond was poured. A Hirata &amp; Associates technician is on site to collect samples from the concrete.</p> <p>GBI is installing the mounting brackets inside the Leachate Force Main Wet Well #3.</p> <p>Esaki Surveying &amp; Mapping, Inc. on site to reshoot two survey points for the top of the 1.5"-minus granular drainage layer which were previously out of tolerance but subsequently fixed. They also surveyed the outside crest of the south and west berms.</p> <p>I completed work for the day at 1500.</p>

Douglas W. Hamilton

Printed Name



Signature

cc: Mike Minch



**DAILY FIELD REPORT**

**Report Sequence No.: 161**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Thursday

DATE: DAY: 26 MONTH: August

YEAR: 2010

WEATHER: Partly Cloudy/Light Wind, 76-85 degrees

0700	I arrived onsite to monitor construction activities.
	<p>Equipment on site today:</p> <p>Takeuchi TB135 excavator, Deere 644J front end loader, Caterpillar D6R LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, Skytrak hi-lift forklift, Water Truck, and a John Deere skid steer, BOMAG BW177DH-3 smooth drum vibratory roller.</p>
0700	Goodfellow Bros. on site.
	<p><u>Cell 1 Construction</u></p> <p>GBI is utilizing the Cat. 140H motor grader to fine grade the infiltration ditch and the top of the operations layer in Cells 1C and 1D.</p> <p>The Cat. D5N dozer is grading the SW corner of the infiltration basin.</p> <p>GBI is installing the mounting brackets, pumps and check valves inside the Leachate Force Main Wet Well #3.</p> <p>GBI received a Bomag BW177DH-3 smooth drum vibratory roller.</p> <p>I went to the Kauai Aggregate Quarry and collected a sample (OPS-007A) of the 3/8"-minus operations layer material which will be sent to Precision Lab for conformance testing.</p> <p>I completed work for the day at 1300.</p>

Douglas W. Hamilton

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

Report Sequence No.: 162

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Friday

DATE: DAY: 27 MONTH: August


YEAR: 2010

WEATHER: Partly Cloudy/Light Wind, 77-85 degrees

1000	I arrived onsite to monitor construction activities after going to Fed Ex.
	Equipment on site today:  Takeuchi TB135 excavator, Deer 644J front end loader, Caterpillar D6R LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, Skytrak hi-lift forklift, Water Truck, and a John Deere skid steer, BOMAG BW177DH-3 smooth drum vibratory roller.
0700	Goodfellow Bros. on site.
	<u>Cell 1 Construction</u>  GBI is utilizing the Cat. D5N dozer to grade the northwest corner of the infiltration basin.  GBI received 10 cy of concrete and poured it over a 20-ft section of the infiltration ditch and placed the rip rap within the poured concrete (see Drawing 3 of the Construction Drawings).  I went to Fed Ex and dropped off sample OPS-007A of the 3/8"-minus operations layer material.  I completed work for the day at 1300.

Douglas W. Hamilton

Printed Name

  
Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 163**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Monday

DATE: DAY: 30      MONTH: August

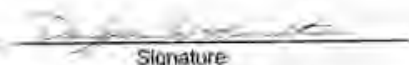
YEAR: 2010

WEATHER: Partly Cloudy/Light Wind, 74-85 degrees

0700	I arrived onsite to monitor construction activities.
	<p>Equipment on site today:</p> <p>Takeuchi TB135 excavator, Deere 644J front end loader, Caterpillar D6R LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, Skytrak hi-lift forklift, Water Truck, and a John Deere skid steer, BOMAG BW177DH-3 smooth drum vibratory roller.</p>
0700	Goodfellow Bros. on site.
	<p><u>Cell 1 Construction</u></p> <p>GBI receives loads of the 3/8"-minus operations layer material from the Kauai Aggregate Quarry for Cells 1A and 1B. A total of 1563.5 cy of the 3/8"-minus operations layer material was delivered to the site today. GBI is utilizing the Cat. D5N dozer to grade the 3/8"-minus operations layer material in Cell 1A.</p> <p>GBI received 10 cy of concrete and poured it in the infiltration ditch apron and placed the rip rap within the poured concrete. The concrete and rip rap placement at the apron is now complete.</p> <p>The end plates and bolts are installed at the cleanout pipes located at Cell 1A and 1B.</p> <p>I completed work for the day at 1600.</p>

Douglas W. Hamilton

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 164**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Tuesday

DATE: DAY: 31      MONTH: August

YEAR: 2010

WEATHER: Partly Cloudy/Light Wind, 74-85 degrees

0700	I arrived onsite to monitor construction activities.
	<p>Equipment on site today:</p> <p>Takeuchi TB135 excavator, Deer 644J front end loader, Caterpillar D6R LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, Skytrak hi-lift forklift, Water Truck, and a John Deere skid steer, BOMAG BW177DH-3 smooth drum vibratory roller.</p>
0700	Goodfellow Bros. on site.
	<p><u>Cell 1 Construction</u></p> <p>GBI receives loads of the 3/8" operations layer drainage aggregate from the Kauai Aggregate Quarry for Cells 1A and 1B. A total of 1611.7 cy of the 3/8"-minus operations layer material was delivered to the site today. GBI is utilizing the Cat. D5N dozer to grade the 3/8"-minus operations layer material in Cell 1A.</p> <p>GBI is utilizing the John Deere 644J front end loader to bring loads of the general fill material to the crest of the Cell 1B west slope. The blade on the Takeuchi TB135 excavator is being utilized to grade the general fill material.</p> <p>I attended a weekly progress meeting with WM and Goodfellow Bros.</p> <p>I collected a sample (OPS-008) from the 3/8"-minus operations layer material at the Kauai Aggregate Quarry. The sample will be shipped to Precision Lab tomorrow.</p> <p>I completed work for the day at 1600.</p>

Douglas W. Hamilton

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 165**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Wednesday

DATE:

DAY: 1

MONTH: September

YEAR: 2010

WEATHER: Partly Cloudy/Light Wind, 82-85 degrees

1000	I arrived onsite to monitor construction activities after delivering sample OPS-008 (3/8"-minus operations layer material) to Fed Ex for shipment to Precision Lab
	<p>Equipment on site today:</p> <p>Takeuchi TB135 excavator, Deere 644J front end loader, Caterpillar D6R LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, Skytrak hi-lift forklift, Water Truck, and a John Deere skid steer, BOMAG BW177DH-3 smooth drum vibratory roller.</p>
1700	Goodfellow Bros. on site.
	<p><u>Cell 1 Construction</u></p> <p>GBI receives loads of the 3/8"-minus operations layer material from Kauai Aggregate Quarry for Cells 1A and 1B. A total of 1763.5 cy of the 3/8"-minus operations layer material was delivered to the site today. GBI is utilizing the Cat. D5N dozer to grade the 3/8"-minus operations layer material in Cell 1B.</p> <p>GBI is utilizing the John Deere 644J front end loader to load the general fill material from the infiltration basin into one tandem dump truck. The truck is hauling the material to the south side of the Cell 1A south slope.</p> <p>I completed work for the day at 1600.</p>

Douglas W. Hamilton  
Printed Name

  
Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 166**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298      TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Thursday

DATE: DAY: 2      MONTH: September      YEAR: 2010

WEATHER: Partly Cloudy with Light Rain/Light Wind, 72-85 degrees

0700	I arrived onsite to monitor construction activities.
	<p>Equipment on site today:</p> <p>Takeuchi TB135 excavator, Deer 644J front end loader, Caterpillar D6R LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, Skytrak hi-lift forklift, Water Truck, and a John Deere skid steer, BOMAG BW177DH-3 smooth drum vibratory roller.</p>
0700	Goodfellow Bros. on site.
	<p><u>Cell 1 Construction</u></p> <p>GBI receives loads of the 3/8"-minus operations layer material from the Kauai Aggregate Quarry for Cell 1A. A total of 1784.8 cy of the 3/8"-minus operations layer material was delivered to the site today. GBI is utilizing the Cat. D5N dozer to grade the 3/8"-minus operations layer material in Cell 1A.</p> <p>GBI is utilizing the John Deere 644J front end loader to bring loads of the general fill material to the crest of the Cells 1A and 1B west slope. The blade on the Takeuchi TB135 excavator is being utilized to grade the general fill material.</p> <p>I completed work for the day at 1600</p>

Douglas W. Hamilton

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 167**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Friday

DATE: DAY: 3 MONTH: September

YEAR: 2010

WEATHER: Partly Cloudy with Light Rain/Moderate Wind, 76-85 degrees

0700	I arrived onsite to monitor construction activities.
	<p>Equipment on site today:</p> <p>Takeuchi TB135 excavator, Deere 644J front end loader, Caterpillar D6R LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, Skytrak hi-lift forklift, Water Truck, and a John Deere skid steer, BOMAG BW177DH-3 smooth drum vibratory roller.</p>
0700	Goodfellow Bros. on site.
	<p><u>Cell 1 Construction</u></p> <p>GBI receives loads of the 3/8"-minus operations layer material from the Kauai Aggregate Quarry for Cell 1A. A total of 1471 cy of the 3/8"-minus operations layer material was delivered to the site today. GBI is utilizing the Cat. D5N dozer to grade the 3/8"-minus operations layer material in Cell 1A.</p> <p>GBI is utilizing the John Deere 644J front end loader to bring loads of the crushed aggregate base course material to the crest of the Cells 1A and 1B west slope. The blade on the Takeuchi TB135 excavator is being utilized to grade the crushed aggregate base course material to construct the perimeter access road. The separator geotextile was installed before the base course was placed. The Bomag BW177DH-3 smooth drum vibratory roller is being utilized to compact the crushed aggregate base course material.</p> <p>Goodfellows installed the pumps and floats at Wet Well #3.</p> <p>Ron's Electric Inc. is on site to begin installing the control box at Cell 1.</p> <p>I completed work for the day at 1600.</p>

Douglas W. Hamilton  
Printed Name

[Signature]  
Signature

cc: Mike Minch

**DAILY FIELD REPORT**

Report Sequence No.: 168

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros.

DAY OF WEEK: Tuesday

DATE: DAY: 7 MONTH: September

YEAR: 2010

WEATHER: Partly Cloudy W/ Light Rain/Moderate Wind, 76-85 degrees

0700	I arrived onsite to monitor construction activities.
	<p>Equipment on site today:</p> <p>HITACHI 450LC excavator, Takeuchi TB135 excavator, Deere 644J front end loader, Caterpillar D6R LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, Water Truck, and a John Deere skid steer, BOMAG BW177DH-3 smooth drum vibratory roller.</p>
0700	Goodfellow Bros. on site.
	<p><u>Cell 1 Construction</u></p> <p>GBI is utilizing the Cat. D5N dozer to grade the 3/8" operations layer in Cell 1A. The Cat. 140H motorgrader is being utilized to fine grade the operations layer in Cells 1A and 1B.</p> <p>GBI is utilizing the John Deere 644J front end loader to bring loads of the general fill material to the crest of the Cell 1A west slope. The blade on the Takeuchi TB135 excavator is being utilized to grade the crushed aggregate base course material.</p> <p>GBI began utilizing the HITACHI 450LC excavator to excavate for the culvert at the west end of the infiltration basin. The culvert trench was excavated to elevation 7.50 ft, and 3 ft of drainage aggregate was placed with the two 12-inch CMPs in the trench. The CMPs were installed on the aggregate, and then aggregate was placed to one foot above the pipes. A geotextile layer was installed above the aggregate, and then a one foot layer of general fill was placed. A second geotextile layer was installed, and then two layers of the crushed aggregate base course material were placed. The general fill and the two lifts of the crushed aggregate base course materials were moisture conditioned and compacted utilizing the Bomag BW177DH-3 smooth drum vibratory roller. A technician from Hirata &amp; Associates, Inc. performed field moisture/density tests using a nuclear moisture-density gauge on the general fill layer and the first lift of the crushed aggregate base course material with passing results. The top lift of the crushed aggregate base course will be tested before re-paving is performed.</p> <p>Ron's Electric Inc. on site to begin installing the control box at Cell 1.</p> <p>Wellington fence company is on site to install the fence around the New Leachate Evaporation Pond.</p>

Douglas W. Hamilton

Printed Name



Signature

cc: Mike Minch



PROJECT: Phase II Lateral Expansion

LOCATION: Kekaha Landfill

PROJECT NO.: WG1298 / 02

DAY/DATE: 7 September 2010

<p>Esaki Surveying &amp; Mapping, Inc. is on site to verify thickness of the operations layer in Cells 1A and 1B.</p> <p>GBI receives loads of the 3/8" operations layer material for Cell 1A from the Kauai Aggregate Quarry. A total of 547.1 cy of the 3/8" operations layer material was delivered to the site today.</p> <p>A total of 60 cy of the crushed aggregate base course material was delivered last week.</p> <p>I went to the Kauai Aggregate Quarry to collect sample OPS-008A from the operations layer material stockpile for lab conformance testing.</p> <p>I completed work for the day at 2015.</p>
--

Douglas W. Hamilton

Printed Name

Signature

cc: Mike Minch

**DAILY FIELD REPORT**

Report Sequence No.: 169

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298 TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros. / Northwest Linings

DAY OF WEEK: Wednesday

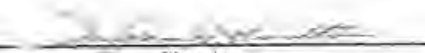
DATE: DAY: 8 MONTH: September YEAR: 2010

WEATHER: Partly Cloudy W/ Light Wind, 76-88 degrees

1000	I arrived onsite to monitor construction activities after delivering sample OPS-008A to Fed Ex for delivery to Precision Lab.
	<p>Equipment on site today:</p> <p>HITACHI 450LC excavator, Takeuchi TB135 excavator, Deer 644J front end loader, Caterpillar D6R LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, Water Truck, and a John Deere skid steer, BOMAG BW177DH-3 smooth drum vibratory roller.</p>
0700	Goodfellow Bros. on site.
	<p><u>Cell 1 Construction</u></p> <p>GBI receives loads of the 3/8" operations layer material for Cell 1A. A total of 61.3 cy of 3/8" operations layer material was delivered to the site today. Goodfellows is utilizing the Cat. 140H motorgrader to fine grade the operations layer in Cells 1A and 1B.</p> <p>GBI is utilizing the John Deere 644J front end loader to bring loads of the general fill material to the crest of the Cell 1A west slope. The blade on the Takeuchi TB135 excavator is being utilized to grade the general fill material.</p> <p>Esaki Surveying &amp; Mapping, Inc. and Wagner Engineering Services Inc. on site to survey the top of 3/8" operations layer.</p> <p>Wellington fence company is on site to install the fence around the New Leachate Evaporation Pond.</p> <p>Goodfellows is receiving and stockpiling loads of the crushed aggregate base course. A total of 60 cy of the crushed aggregate base course was delivered to the site.</p> <p>I completed work for the day at 1600.</p>

Douglas W. Hamilton

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 170**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros.

DAY OF WEEK: Thursday

DATE: DAY: 8 MONTH: September

YEAR: 2010

WEATHER: Partly Cloudy W/ Light Wind, 75-86 degrees

1000	I arrived onsite to monitor construction activities.
	<p>Equipment on site today:</p> <p>HITACHI 450LC excavator, Takeuchi TB135 excavator, Deere 644J front end loader, Caterpillar D6R LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, Water Truck, and a John Deere skid steer, BOMAG BW177DH-3 smooth drum vibratory roller.</p>
0700	Goodfellow Bros. on site.
	<p><u>Cell 1 Construction</u></p> <p>GBI is utilizing the Cat. 140H motorgrader to fine grade the operations layer in Cells 1A and 1B.</p> <p>GBI is utilizing the John Deere 644J front end loader to bring loads of the general fill and crushed aggregate base course materials to the crest of the Cell 1A west slope. The blade on the Takeuchi TB135 excavator is being utilized to grade the general fill and crushed aggregate base course materials.</p> <p>Ron's Electric Inc. is on site to install power to the Cell 1 control box.</p> <p>Wellington fence company is on site to install the fence around the New Leachate Evaporation Pond.</p> <p>The pre-cast concrete valve box was delivered to the site and set in place.</p> <p>GBI is installing the Elasto-Deck BT (manufactured by Pacific Polymers International) and SWELLSEAL-MASTIC WA (manufactured by de neef conchem) at the openings in the concrete valve box and around the base to the floor. The brick and mortar was then placed in the openings.</p> <p>GBI is receiving and stockpiling loads of the crushed aggregate base course.</p> <p>I completed work for the day at 1530.</p>

Douglas W. Hamilton

Printed Name

Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 171**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros.

DAY OF WEEK: Friday

DATE: DAY: 10 MONTH: September

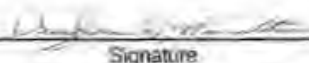
YEAR: 2010

WEATHER: Partly Cloudy W/ Light Wind, 75-86 degrees

1000	I arrived onsite to monitor construction activities.
	<p>Equipment on site today:</p> <p>HITACHI 450LC excavator, Takeuchi TB135 excavator, Deer 644J front end loader, Caterpillar D6R LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, Water Truck, and a John Deere skid steer, BOMAG BW177DH-3 smooth drum vibratory roller.</p>
0700	Goodfellow Bros. on site.
	<p><u>Cell 1 Construction</u></p> <p>GBI is utilizing the John Deere 644J front end loader to bring loads of the crushed aggregate base course material to the crest of the Cell 1A south slope. The blade on the Takeuchi TB135 excavator is being utilized to grade the crushed aggregate base course material.</p> <p>Ron's Electric Inc. is on site to install power to the Cell 1 control box.</p> <p>Wellington fence company is on site to install the fence around the Leachate Evaporation Pond.</p> <p>Pacific Concrete Cutting &amp; Coring on site to shave the top of the pre-cast concrete valve box. The 4" concrete floor was also poured above the water stop.</p> <p>The new fire hydrant was installed at the new location between the scale house and the New Leachate Evaporation Pond (NLEP).</p> <p>GBI turned on the aerators at the NLEP to make sure that they worked. The floats will be tested next week.</p> <p>GBI is receiving loads of the 3/8" operations layer material. A total of 20 cy of the 3/8" operations layer material was delivered to the site.</p> <p>I completed work for the day at 1530.</p>

Douglas W. Hamilton

Printed Name



Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 172**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros.

DAY OF WEEK: Monday

DATE: DAY: 13 MONTH: September

YEAR: 2010

WEATHER: Partly Cloudy W/ Light to Strong Wind. 75-85 degrees

0900	I arrived onsite to monitor construction activities.
	<p>Equipment on site today:</p> <p>HITACHI 450LC excavator, Takeuchi TB135 excavator, Deer 644J front end loader, Caterpillar D6R LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, Water Truck, and a John Deere skid steer, BOMAG BW177DH-3 smooth drum vibratory roller, Caterpillar 735 articulating dump truck.</p>
0700	Goodfellow Bros. on site.
	<p><u>Cell 1 Construction</u></p> <p>GBI is utilizing the Cat. D5N dozer to grade the bottom of the infiltration basin.</p> <p>Ron's Electric Inc. is on site to install power to the Cell 1 control box, the float levels at Wet Well #3, and the aerators in the New Leachate Evaporation Pond.</p> <p>Wellington fence company is on site to do fence repairs around the site.</p> <p>The concrete valve box was placed and the steps were installed inside.</p> <p>Hirata &amp; Associates on site to perform field moisture/density tests on the final lift on the base course over the NW culverts and the perimeter access road around Cells 1A and 1B. All field density test results met project specifications.</p> <p>I completed work for the day at 1400.</p>

Douglas W. Hamilton

Printed Name

[Signature]  
Signature

cc: Mike Minch

**DAILY FIELD REPORT**

Report Sequence No.: 173

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros.

DAY OF WEEK: Tuesday

DATE: DAY: 14 MONTH: September

YEAR: 2010

WEATHER: Partly Cloudy with Light Wind, 75-88 degrees

0900	I arrived onsite to monitor construction activities.
	<p>Equipment on site today:</p> <p>HITACHI 450LC excavator, Takeuchi TB135 excavator, Deere 644J front end loader, Caterpillar D6R LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, Water Truck, and a John Deere skid steer, BOMAG BW177DH-3 smooth drum vibratory roller, Caterpillar 735 articulating dump truck.</p>
0700	Goodfellow Bros. on site.
	<p><u>Cell 1 Construction</u></p> <p>Goodfellows is utilizing the John Deere 644J front end loader to spread the general fill and the Cat. D5N dozer to grade the bottom of the infiltration basin..</p> <p>Ron's Electric Inc. is on site to install power to the Cell 1 control box, the float levels at Wet Well #3, and the aerators in the New Leachate Evaporation Pond.</p> <p>Goodfellows is paving the entrance road above the NW culverts and above the forcemain piping between the new concrete valve box and the infiltration ditch.</p> <p>I attended the weekly meeting with WM and AECOM.</p> <p>I departed the site for the day at 1230.</p>

Douglas W. Hamilton  
Printed Name

  
Signature

cc: Mike Minch

**DAILY FIELD REPORT**

**Report Sequence No.: 174**

PROJECT: Kekaha Landfill

LOCATION: Kekaha, Kauai, Hawaii

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion  
Cell 1 Base Liner Construction

CONTRACTORS: Goodfellow Bros.

DAY OF WEEK: Wednesday

DATE:

DAY: 15

MONTH: September

YEAR: 2010

WEATHER: Partly Cloudy W/ Light Wind, 75-86 degrees

0900	I arrived onsite to monitor CQA activities.
	<p>Equipment on site today:</p> <p>HITACHI 450LC excavator, Takeuchi TB135 excavator, Deer 644J front end loader, Caterpillar D6R LGP dozer with GPS grade control, Caterpillar D5 dozer with GPS grade control, Caterpillar 140H Motor grader, Water Truck, and a John Deere skid steer, BOMAG BW177DH-3 smooth drum vibratory roller, Caterpillar 735 articulating dump truck.</p>
0700	Goodfellow Bros. on site.
	<p><u>Cell 1 Construction</u></p> <p>GBI is utilizing the Cat. D5N dozer to grade the bottom of the infiltration basin.</p> <p>Ron's Electric Inc. is on site to install power to the Cell 1 control box, the float levels at Wet Well #3, and the aerators in the New Leachate Evaporation Pond.</p> <p>I departed the site for the day at 0900. I am demobilizing from the project today.</p>

Douglas W. Hamilton

Printed Name

Signature

cc: Mike Minch



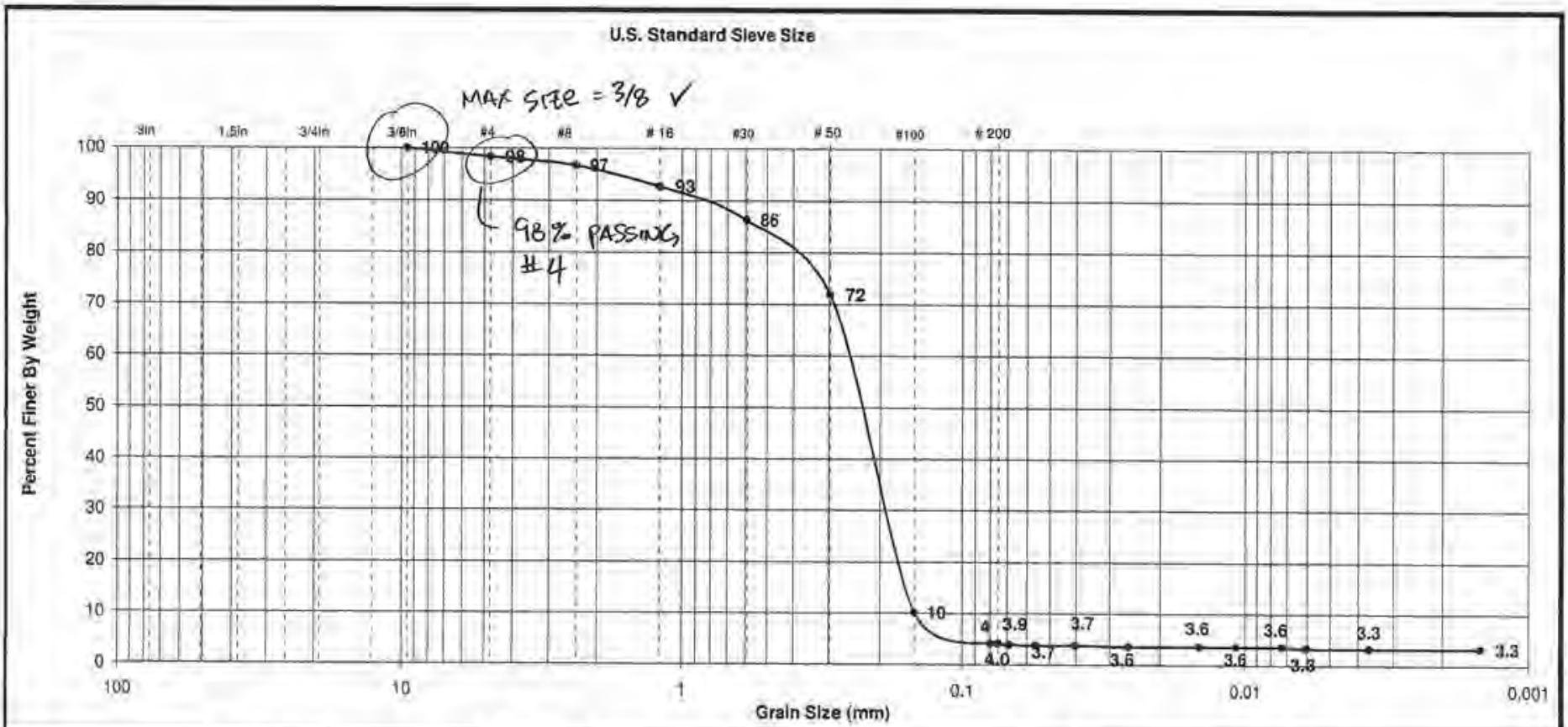


## **Appendix F**

### **Soil Conformance Testing: Laboratory Test Results**

<b>Appendix F-1</b>	<b>Compacted Fill Materials Test Results</b>
<b>Appendix F-2</b>	<b>Granular Drainage Layer Test Results</b>
<b>Appendix F-3</b>	<b>Operations Layer Test Results</b>
<b>Appendix F-4</b>	<b>CLSM and Concrete Test Results</b>
<b>Appendix F-5</b>	<b>Base Course (MDOF Area) Test Results</b>

**Appendix F-1**  
**Compacted Fill Materials Test Results**



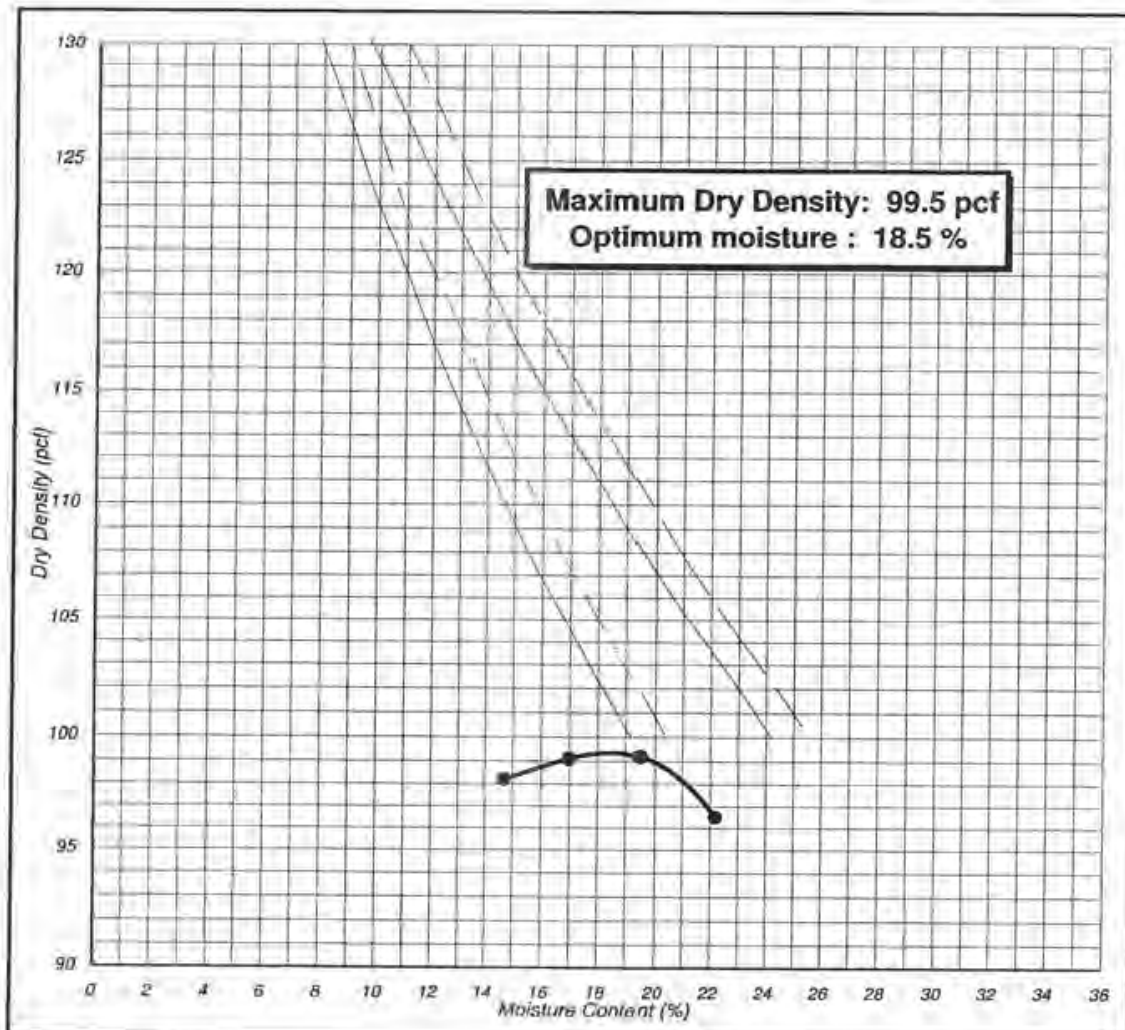
Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	Test Moist. (%)	Permeability, K (cm/sec)	LL	PL	PI	Unified Soil Class.	Description
SB001 Subbase						N/A	NP		SP ✓	Sand

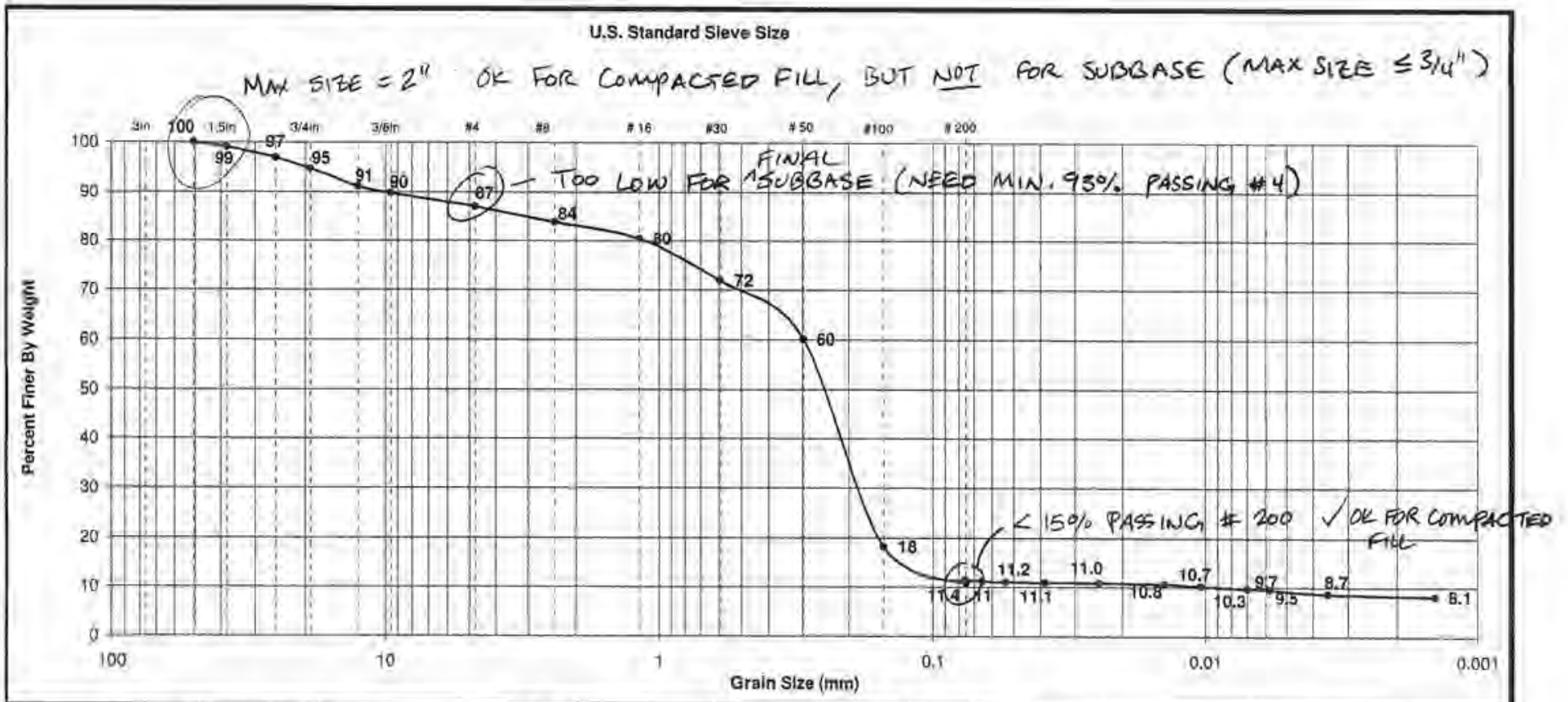
MAXIMUM DENSITY TEST ASTM D 1557

Job Name Precision Geosynthetic Lab # G100020  
 Job No. 2001-068  
 Boring/Sample No. SB 001  
 Description: Yellowish Brown, F.M. Sand w. trace Silt

Date: 1/20/2010  
 By: SE

Mold Volume (cf):	0.0333	Hammer (lbs):	10.0	Blows:	25	Layers:	5
Specimen	A	B	C	D	E		
Total Wet Weight (grs)	3586	3570	3520	3600			
Weight of Mold (grs)	1794	1817	1817	1817			
Wet Weight of Soil (grs)	1792	1753	1703	1783			
Wet Density (pcf)	118.5	115.9	112.6	117.9			
Moisture Can No.							
Dry Weight							
Moisture Content (%)	19.5	17.0	14.7	22.2			
Dry Density (pcf)	99.2	99.1	98.2	96.5			





Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	Test Moist. (%)	Permeability, K (cm/sec)	LL	PL	PI	Unified Soil Class.	Description
SB002 Subbase						N/A	NP	N/A	✓ GM	} SP, SP-SM FOR SUBBASE } OK FOR COMPACTED FILL
From POND EXCAVATION										

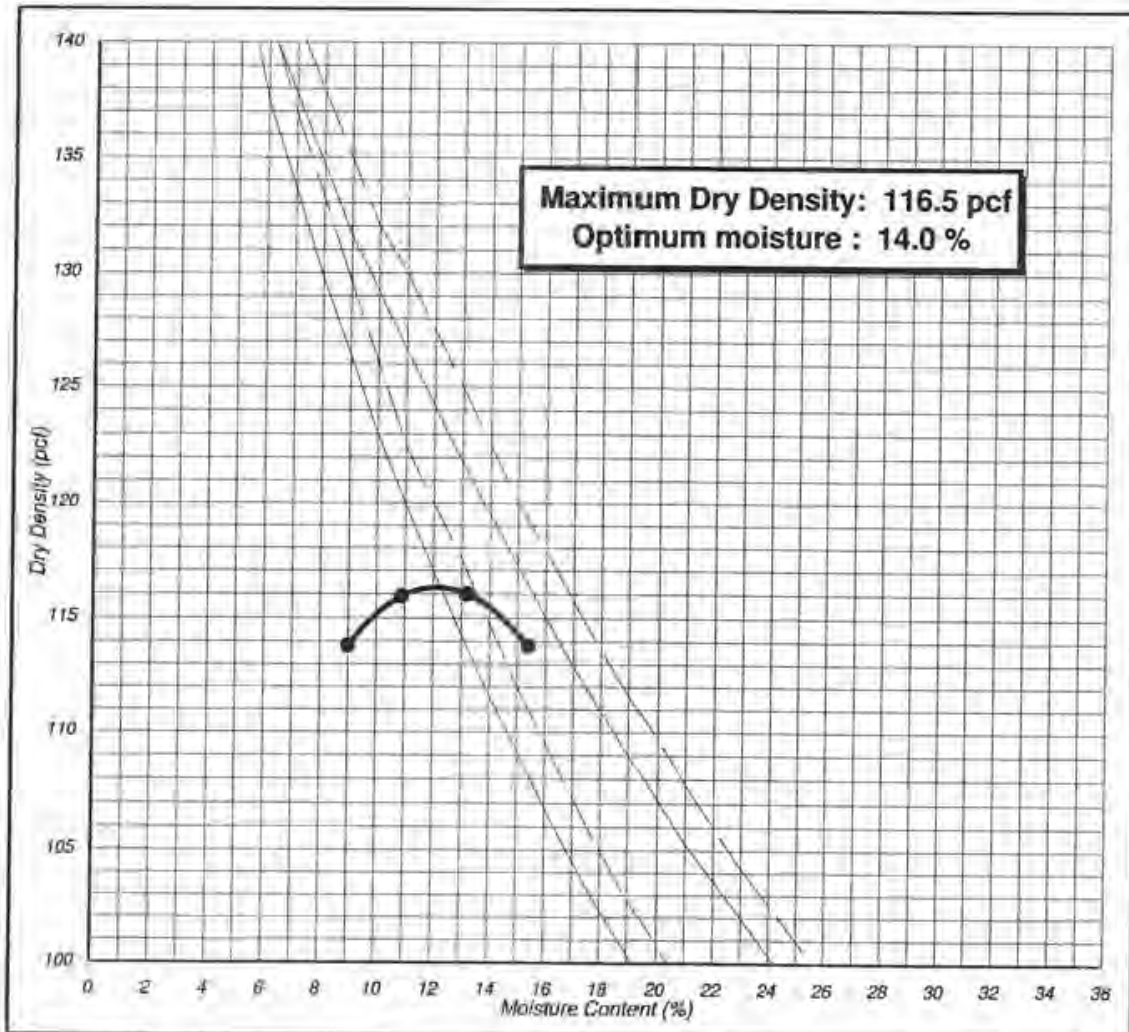
\* DOES NOT MEET SUBBASE; <sup>FOR</sup> OK ^ COMPACTED FILL

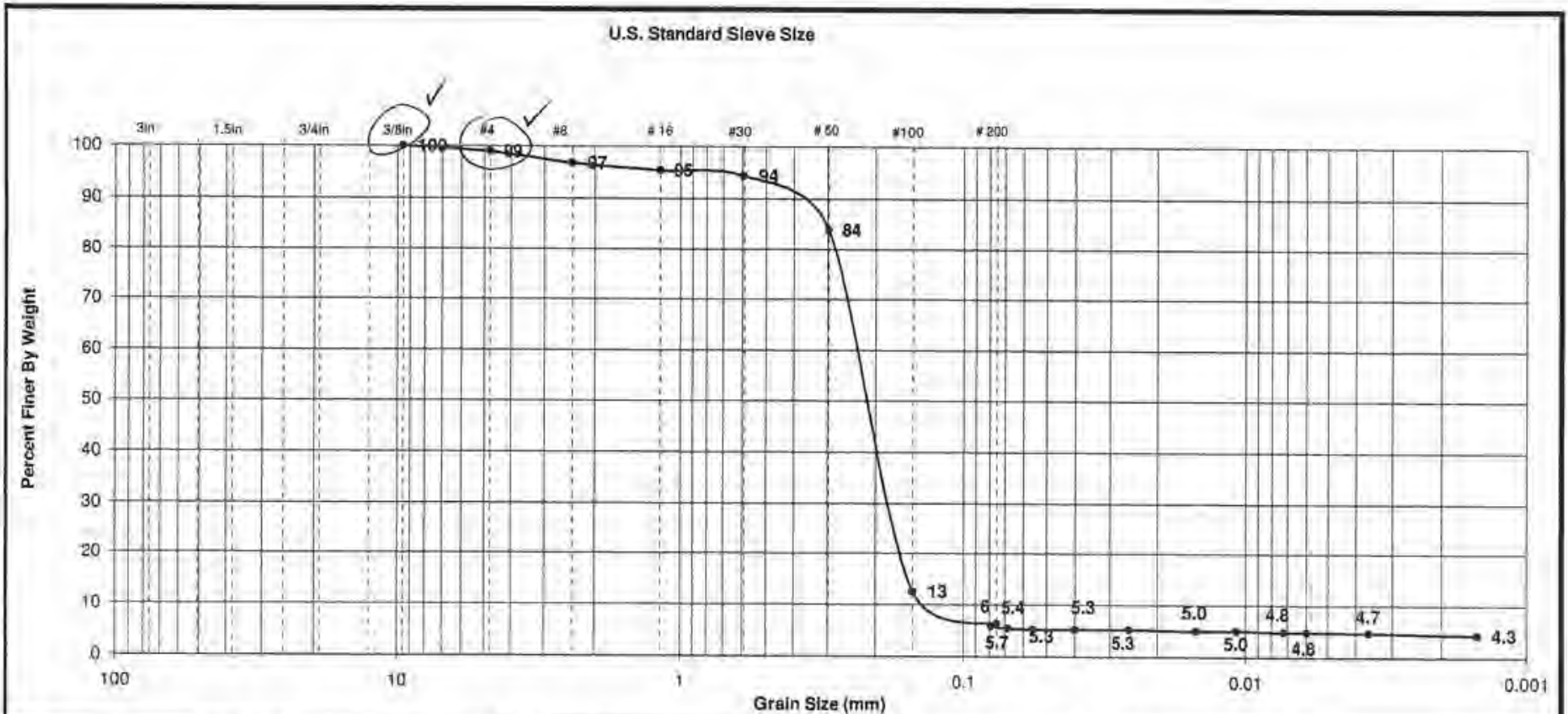
MAXIMUM DENSITY TEST ASTM D1557

Job Name Percision Goesynthetic # 6100020  
 Job No. 2001-068  
 Boring/Sample No. SB 002  
 Description: Reddish Brown, F.C. Silty Sand

Date: 1/20/2010  
 By: SE

Method:	C	Mold Volume (cf):	0.0750	Blows:	56	Layers:	5
Specimen	A	B	C	D	E		
Total Wet Weight (lbs)	7363	7457	7458	7210			
Weight of Mold (lbs)	2990	2990	2990	2990			
Wet Weight of Soil (lbs)	4373	4467	4468	4220			
Wet Density (pcf)	128.5	131.3	131.3	124.0			
Moisture Can No.							
Dry Weight							
Moisture Content (%)	10.9	13.2	15.4	9.0			
Dry Density (pcf)	115.9	116.0	113.8	113.8			





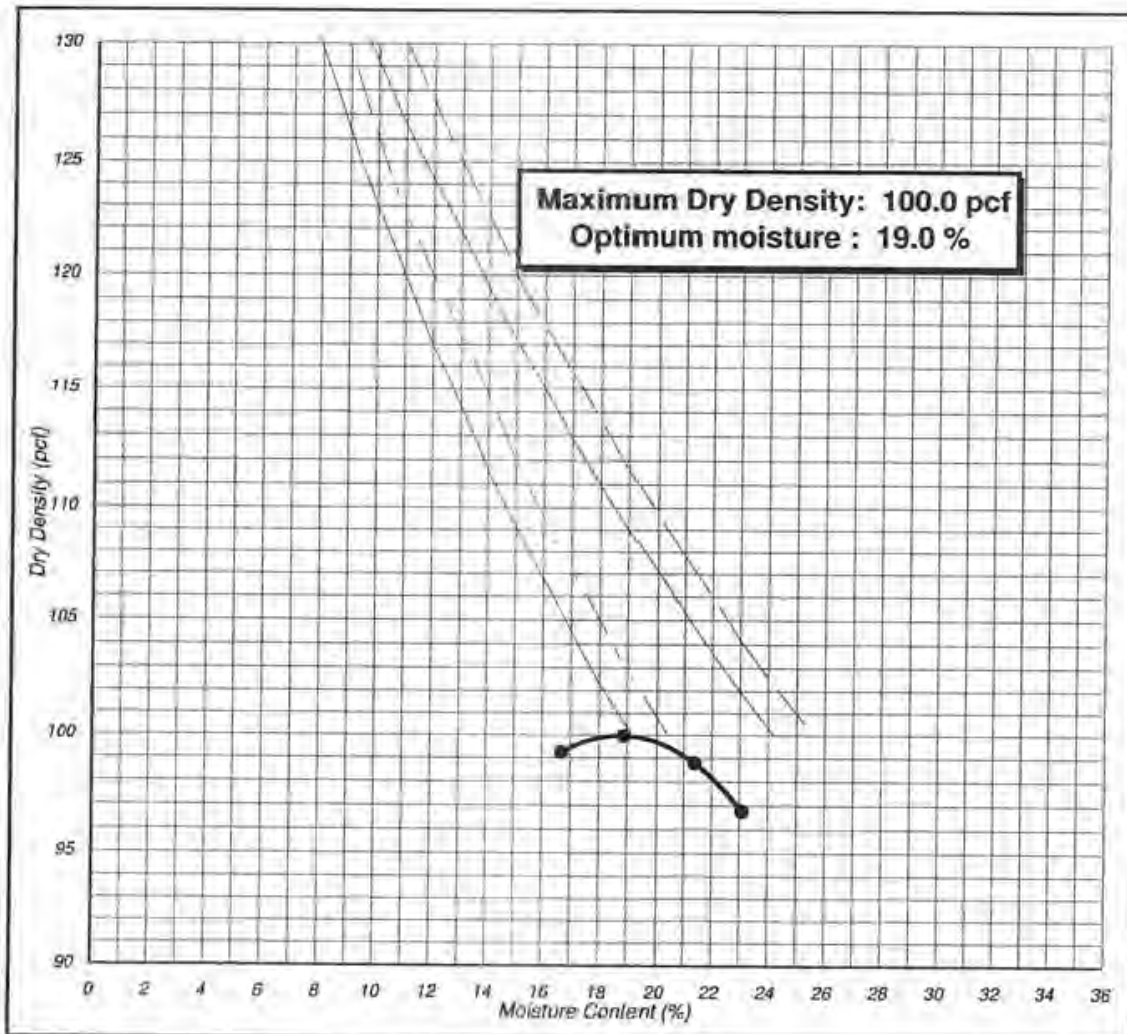
Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	Test Moist. (%)	Permeability, K (cm/sec)	LL	PL	PI	Unified Soil Class.	Description
SB003 Subbase										Sand

MAXIMUM DENSITY TEST ASTM D 1557

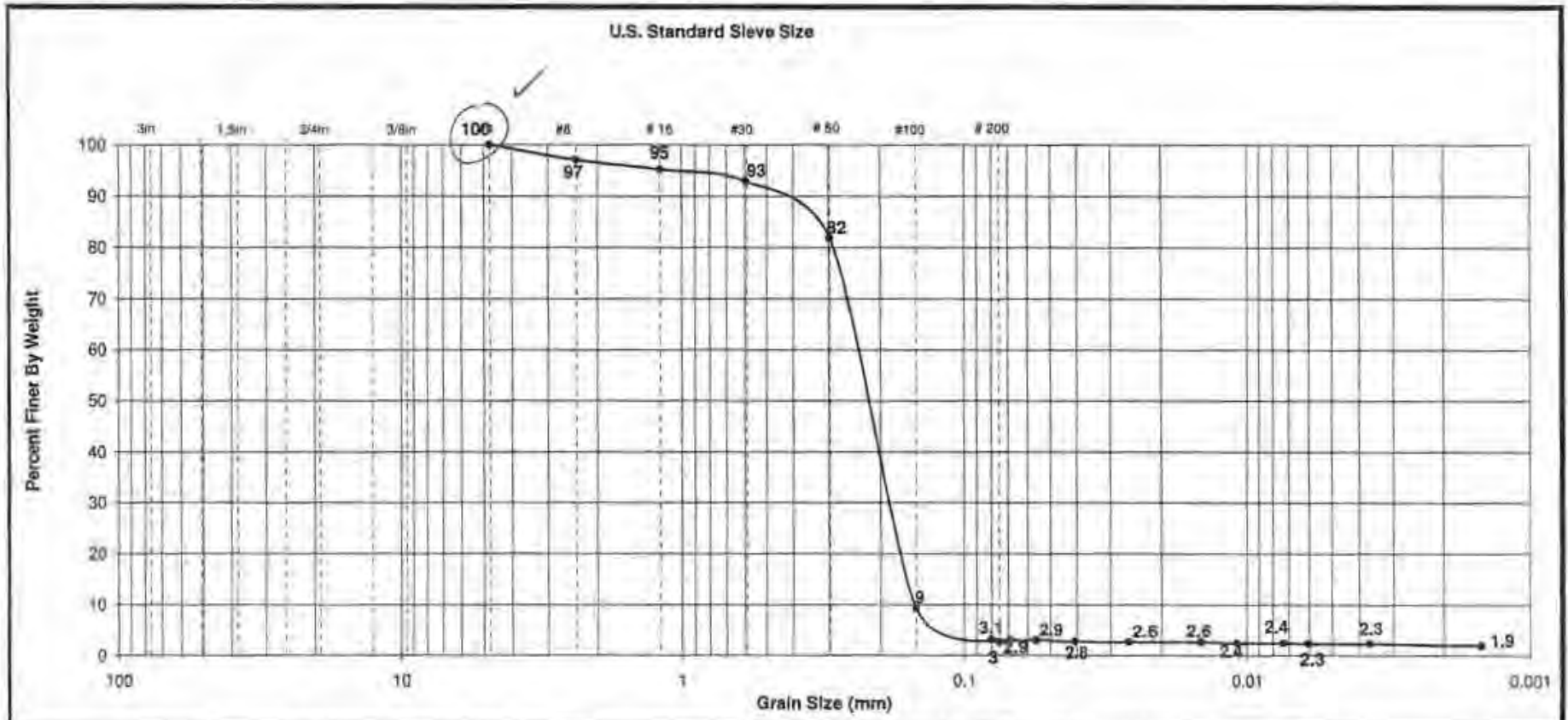
Job Name Precision Geosynthetic Lab. # G100020  
 Job No. 2001-068  
 Boring/Sample No. SB 003 Subbase  
 Description: Yellowish Orange Brown, F.M. Sand w. trace Silt

Date: 1/28/2010  
 By: SE

Mold Volume (cf):	0.0333	Hammer (lbs):	10.0	Blows:	25	Layers:	5
Specimen	A	B	C	D	E		
Total Wet Weight (grs)	3606	3590	3544	3594			
Weight of Mold (grs)	1793	1793	1793	1793			
Wet Weight of Soil (grs)	1813	1797	1751	1801			
Wet Density (pcf)	119.9	118.8	115.8	119.1			
Moisture Can No.							
Dry Weight							
Moisture Content (%)	21.4	18.9	16.7	23.1			
Dry Density (pcf)	98.8	100.0	99.2	96.8			







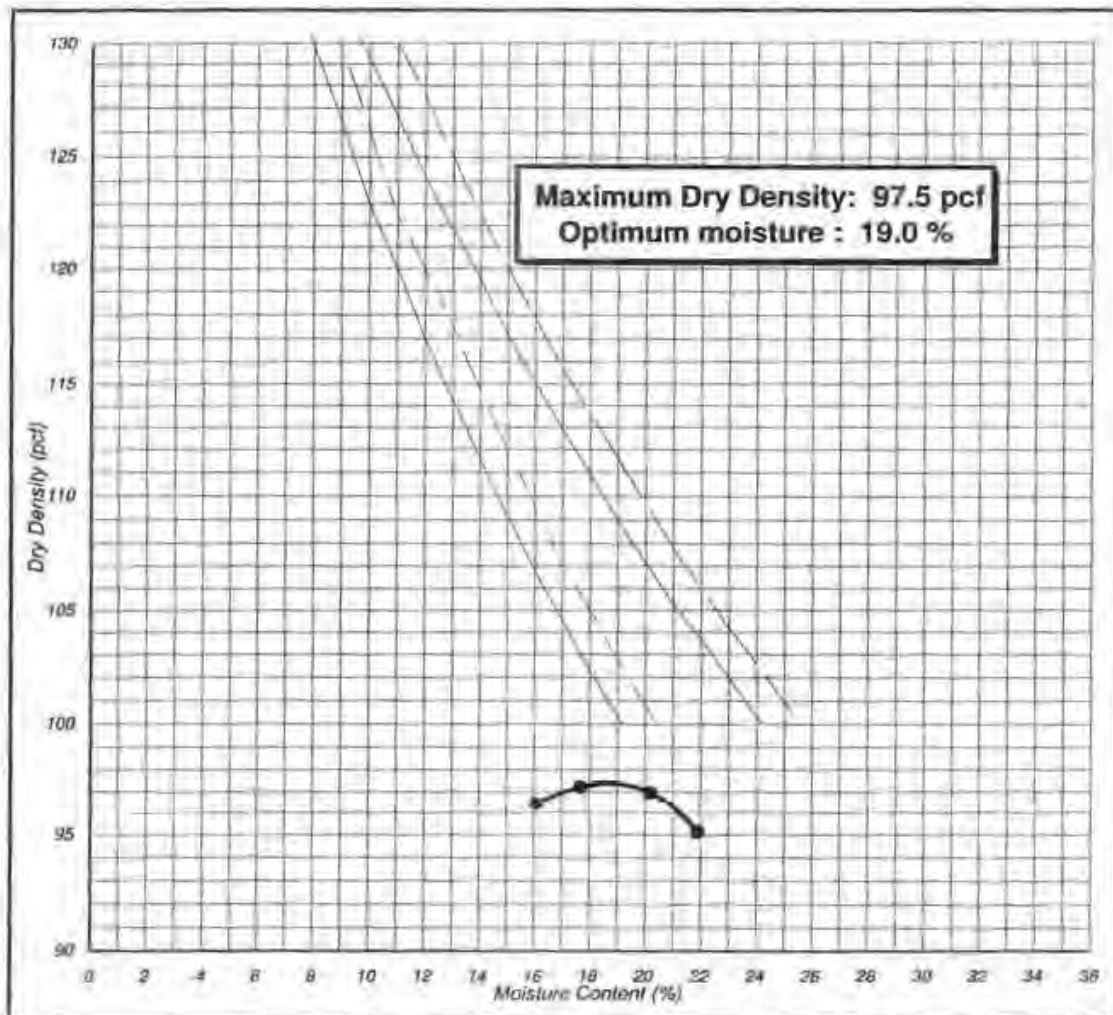
Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	Test Moist. (%)	Permeability, K (cm/sec)	LL	PL	PI	Unified Soil Class.	Description
SB004 Subbase									SM	Sand

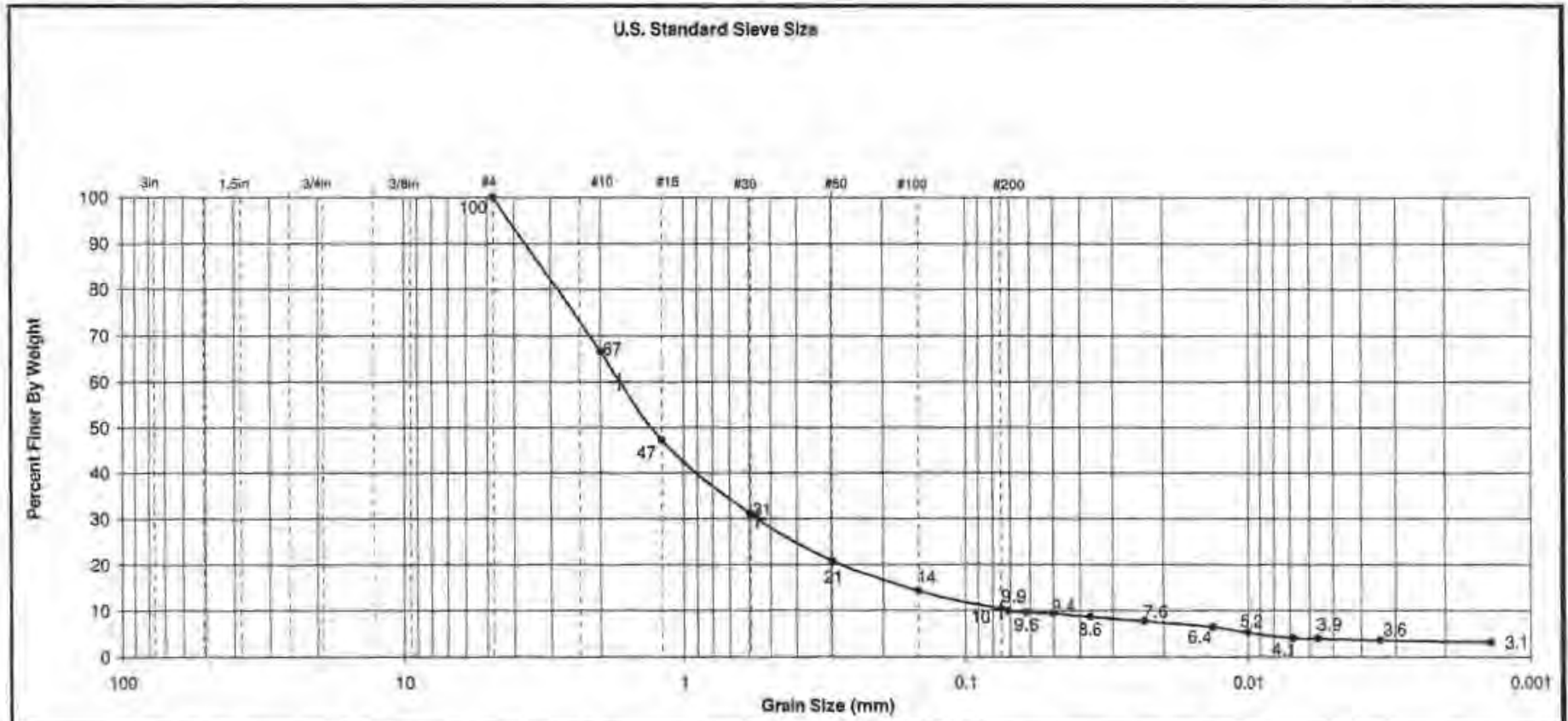
MAXIMUM DENSITY TEST ASTM D 1557

Job Name Precision Geosynthetic Lab. # G100020  
 Job No. 2001-068  
 Boring/Sample No. SB 004 Subbase  
 Description: Yellowish Orange Brown, F.M. Sand w. trace Silt

Date: 2/16/2010  
 By: LD

Mold Volume (cf):	0.0333	Hammer (lbs):	10.0	Blows:	25	Layers:	5
Specimen	A	B	C	D	E		
Total Wet Weight (grs)	3554	3522	3545	3485			
Weight of Mold (grs)	1792	1792	1792	1792			
Wet Weight of Soil (grs)	1762	1730	1753	1693			
Wet Density (pcf)	116.5	114.4	115.9	112.0			
Moisture Can No.							
Dry Weight							
Moisture Content (%)	20.2	17.7	21.9	16.1			
Dry Density (pcf)	97.0	97.2	95.1	96.4			





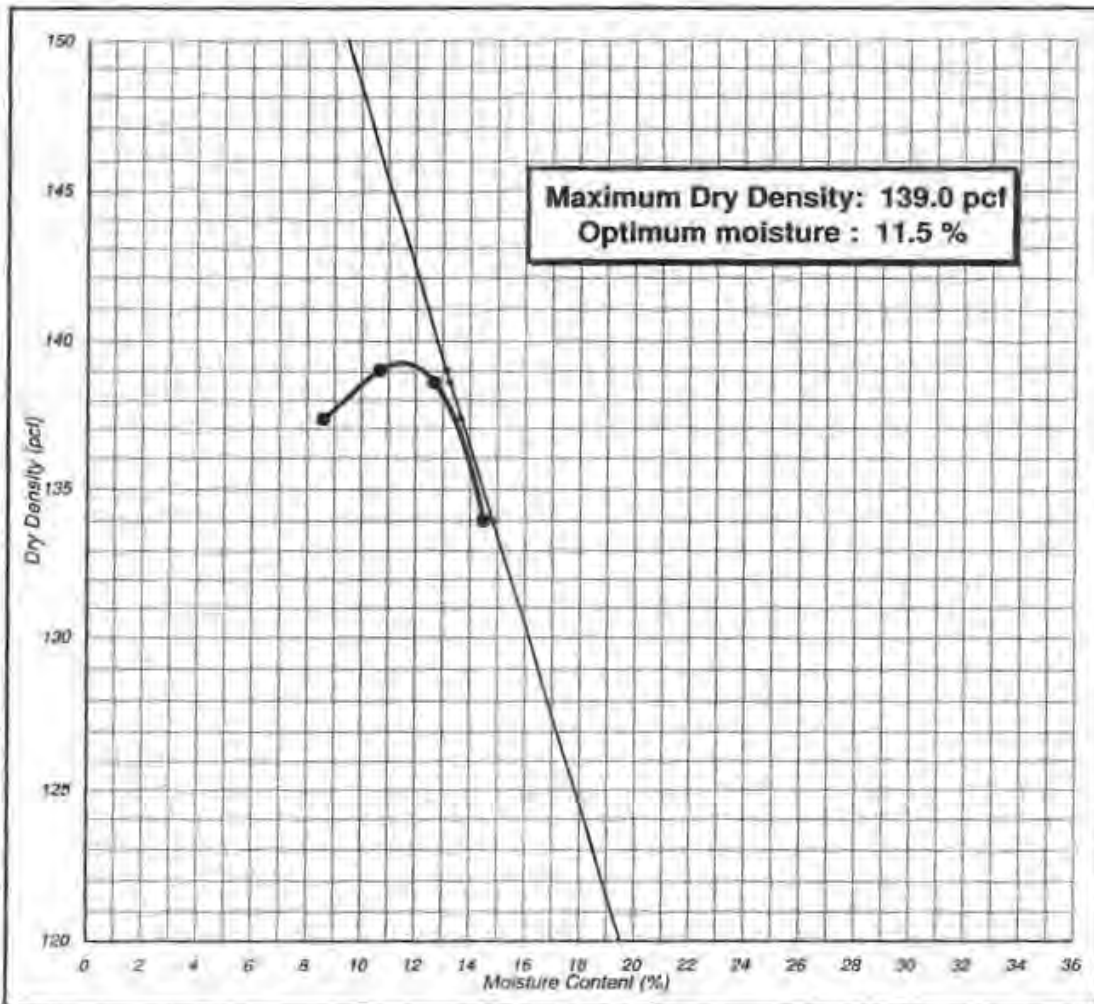
Sample	Max. Dry Density (pcf)	Opt. Water Content (%)	Expansion Index	Test W.C. (%)	Final W. C. (%)	Resistivity (ohm-cm)	pH	SO <sub>4</sub> (ppm)	Chloride Content (ppm)	Unified Soil Class.	Classification
<del># 87907</del>										SW-SM	Well graded sand with Silt
SB005											

MAXIMUM DENSITY TEST ASTM D1557

Job Name Precision Geosynthetic Lab. # G100772  
 Job No. 2001-068  
 Boring/Sample No. #67967 SB006  
 Description: Gray, F.C. Sand w. Sill

Date: 7/7/2010  
 By: LD

Method:	A	Mold Volume (cf):	0.0333	Blows:	25	Layers:	5
Specimen	A	B	C	D	E		
Total Wet Weight (grs)	4115	4150	4043	4108			
Weight of Mold (grs)	1788	1788	1788	1788			
Wet Weight of Soil (grs)	2327	2362	2255	2320			
Wet Density (pcf)	153.9	156.2	149.1	153.4			
Moisture Can No.							
Dry Weight							
Moisture Content (%)	10.7	12.7	8.6	14.5			
Dry Density (pcf)	139.0	138.6	137.3	134.0			



MAXIMUM DENSITY TEST ASTM D1557

(SB005)

3.15

13.13756	13.27137	13.69202	14.81835	14.84299
139.0	138.8	137.3	134.0	



Hiron & Associates, Inc.

Geotechnical  
Engineering

Hiron & Associates, Inc.

20100 Kapaeha Dr.  
New Hanover, NC  
28404-1007  
Tel: 888-346-0787  
Fax: 888-400-0000

# MEMORANDUM

June 16, 2010  
W.O. 10-4907.1

TO: Mr. Keith Suga  
Goodfellow Brothers Inc.  
via email: Keiths@goodfellowbros.com

FROM: David Kitamura 

RE: Laboratory Test Results for Bag #11  
Kekaha Landfill: Phase II Lateral Expansion  
Kekaha, Kauai, Hawaii

As requested, laboratory testing was performed on the Thronas quarry rock dust material for the above referenced project. The bulk soil sample was provided by Geosyntec field personnel for laboratory testing, consisting of a maximum density (modified Proctor), Atterberg Limits, California Bearing Ratio and sieve analysis tests. This memo presents the results for the maximum density, Atterberg Limits and sieve analysis tests, summarized below and the Proctor curve is on the next page. Results for the California Bearing Ratio will be ready on 6/18/10.

## Test

Modified Proctor (ASTM D1557)

Atterberg Limits (ASTM D4318)

Sieve Analysis (ASTM C136)

## Result

Maximum density = 143.0 pcf  
Optimum moisture = 9.0%

Non-plastic

<u>Sieve Size</u>	<u>Percent finer (%)</u>
#4	85.6
#10	61.2
#20	40.3
#40	30.1
#100	21.8
#200	18.8

Feel free to call us if you have any questions.

W4907memorandum011ProctorBag11.wpd



Hirata & Associates

Geotechnical  
Engineering

Hirata & Associates, Inc.

97-1433 Kaneohe Dr.  
Aiea, HI 96701  
Tel: 808-486-0700  
Fax: 808-486-0800

## MEMORANDUM

July 12, 2010  
W.D. 10-4907.0

**TO:** Mr. Mike Minch  
Geosyntec Consultants Inc.  
via email: [mminch@geosyntec.com](mailto:mminch@geosyntec.com)

**FROM:** David Kitamura

**RE:** Laboratory Test Results for Bag #14  
Kekaha Landfill: Phase II Lateral Expansion  
Kekaha, Kauai, Hawaii

As requested, laboratory testing was performed on the Kauai Aggregates (Thronas Quarry) 1 1/2" minus material for the above referenced project. Geosyntec provided us with a bulk soil sample of the material for laboratory testing, consisting of a Modified Proctor test in general accordance with ASTM D 1557. This memo presents the results for the modified Proctor test, summarized below and the modified Proctor Curve is attached.

Test

Modified Proctor Test (ASTM D1557)

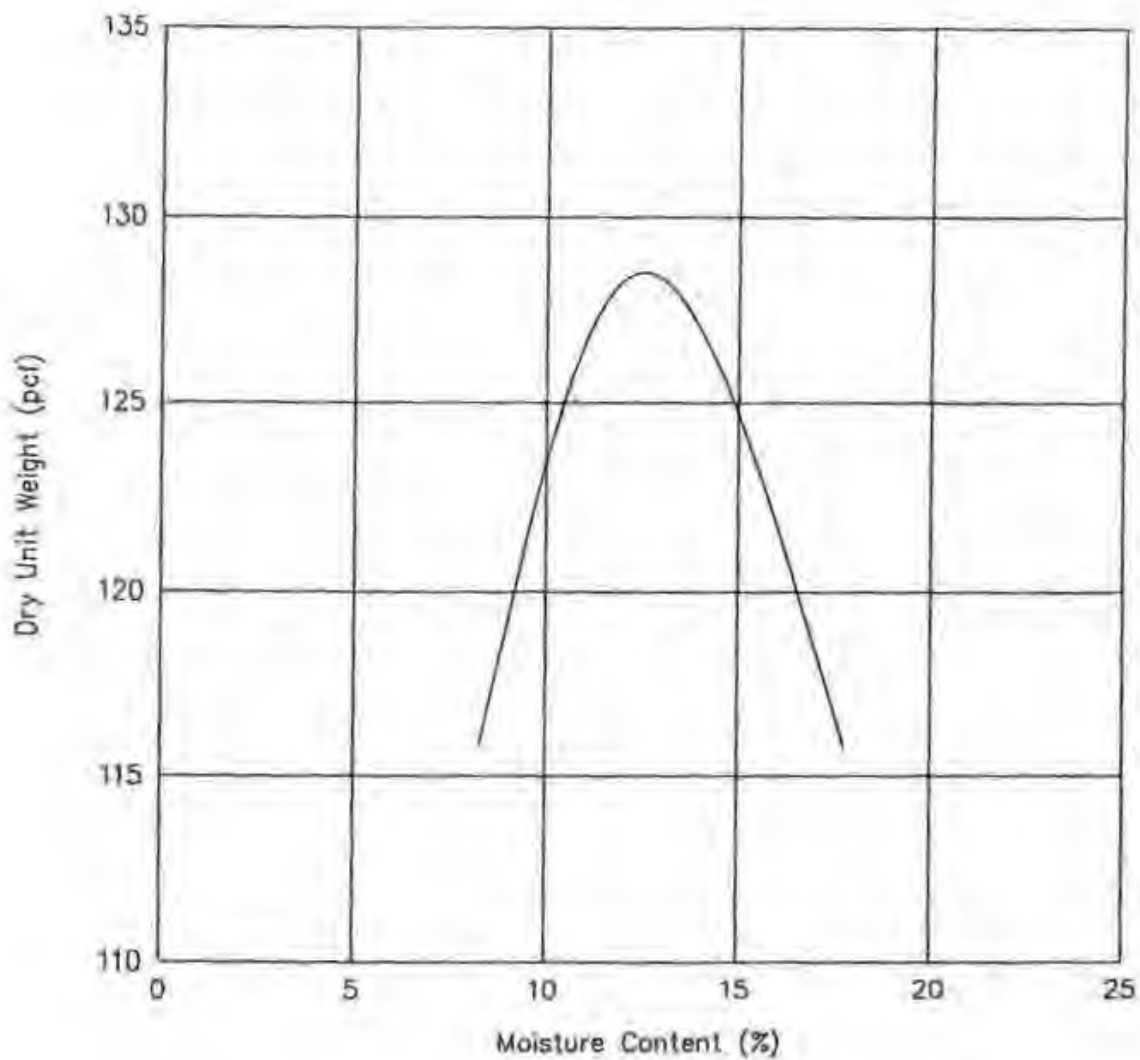
Result

Maximum Dry Density: 128.5 pcf  
Optimum Moisture Content: 12.5%

Feel free to call us if you have any questions.

M907memorandum017ProctorBag14A.wpd

cc: Goodfellow Brothers, Inc. (Attn: Keith Suga) email: [keiths@goodfellowbros.com](mailto:keiths@goodfellowbros.com)



Soil Data

Bag No.: 14  
 Location: Thronas quarry  
 Description: Reddish brown sandy gravel with silt (1 1/2" minus)

Test Results

Maximum Dry Density: 128.5 pcf  
 Optimum Moisture Content: 12.5%

W.O. 4907.0

Kekaha Landfill Expansion

Hirata & Associates, Inc.

**MODIFIED PROCTOR CURVE**

Plate A





Hiras & Associates

Geotechnical  
Engineering

Hiras & Associates, Inc.

99-1444 Kaha Pl  
Aiea, HI 96701  
Tel: 808-486-0787  
Fax: 808-486-0870

## MEMORANDUM

July 10, 2010  
W.O. 10-4907.0

TO: Mr. Mike Minch  
Geosyntec Consultants Inc.  
via email: [mminch@geosyntec.com](mailto:mminch@geosyntec.com)

FROM: David Kitamura 

RE: Laboratory Test Results for Rock Dust Material (our Bag #15) (SB0016)  
Kekaha Landfill: Phase II Lateral Expansion  
Kekaha, Kauai, Hawaii

As requested, laboratory testing was performed on the Rock Dust material for the above referenced project. Geosyntec personnel provided us with a bulk soil sample from Kauai Aggregates (Thronas) Quarry for a sieve analysis test. This memo presents the results for the sieve analysis. Based on our sieve analysis test results, the material was classified as well-graded sand with silt, and a corresponding Unified Soil Classification System symbol of SW-SM. The sieve analysis test results are summarized below.

<u>Test</u>	<u>Result</u>	
Sieve Analysis (ASTM C136)	<u>Sieve size</u>	<u>Percent finer (%)</u>
	1/2"	100.0
	#4	76.0
	#10	44.8
	#20	26.3
	#100	13.3
	#200	10.8

Feel free to call us if you have any questions.

DMK:4907-0m.016

cc: Goodfellow Brothers, Inc. (Attn: Keith Suga) email: [keiths@goodfellowbros.com](mailto:keiths@goodfellowbros.com)



Hirata & Associates

Geotechnical  
Engineering

Hirata & Associates, Inc.

29-1333 Koahe Pl  
Aiea, HI 96701  
tel 808.486.3478  
fax 808.486.0800

## MEMORANDUM

July 13, 2010  
W.O. 10-4907.0

**TO:** Mr. Mike Minch  
Geosyntec Consultants Inc.  
via email: [mminch@geosyntec.com](mailto:mminch@geosyntec.com)

**FROM:** David Kitamura

**RE:** Laboratory Test Results for our Bag #15 (SB006)  
Kekaha Landfill: Phase II Lateral Expansion  
Kekaha, Kauai, Hawaii

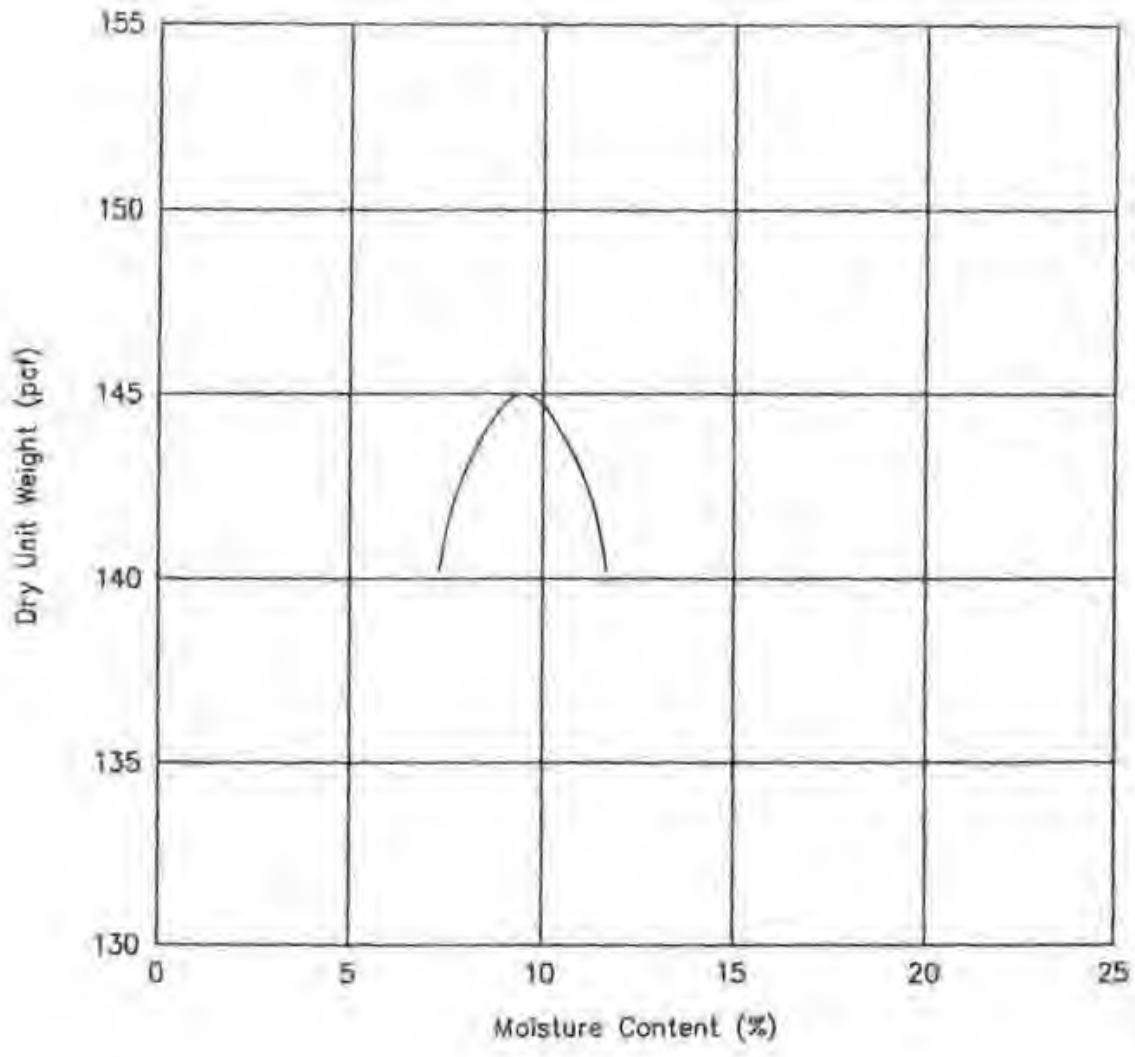
As requested, laboratory testing was performed on the Thronas Quarry quarry fines material for the above referenced project. Geosyntec provided us with a bulk soil sample of the material for laboratory testing, consisting of a Modified Proctor test in general accordance with ASTM D 1557. This memo presents the results for the modified Proctor test, summarized below and the modified Proctor Curve is attached.

<u>Test</u>	<u>Result</u>
Modified Proctor Test (ASTM D1557)	Maximum Dry Density: 145.0 pcf Optimum Moisture Content: 9.5%

Feel free to call us if you have any questions.

W907memorandum018ProctorBag15.wpd

cc: Goodfellow Brothers, Inc. (Attn: Keith Suga) email: [keith@goodfellowbros.com](mailto:keith@goodfellowbros.com)



Soil Data

Bag No.: 15 (SB006)  
 Location: Thrones Quarry  
 Description: Brownish gray sandy gravels (quarry fines)

Test Results

Maximum Dry Density: 145.0 pcf  
 Optimum Moisture Content: 9.5%

W.O. 4907.0	Kekaha Landfill Expansion
Hirata & Associates, Inc.	<p style="text-align: center;"><b>MODIFIED PROCTOR CURVE</b></p> <p style="text-align: right;">Plate A</p>



Hines & Associates

Geotechnical  
Engineering

Hines & Associates, Inc.

99-1433 Kaha Pl  
Aiea, HI 96701  
tel 808.486.0767  
fax 808.486.0870

## MEMORANDUM

July 15, 2010  
W.O. 10-4907.0

**TO:** Mr. Mike Minch  
Geosyntec Consultants Inc.  
via email: [mminch@geosyntec.com](mailto:mminch@geosyntec.com)

**FROM:** David Kitamura

**RE:** Laboratory Test Results for our Bag #16 (SB007 2<sup>nd</sup> sample)  
Kekaha Landfill, Phase II Lateral Expansion  
Kekaha, Kauai, Hawaii

As requested, laboratory testing was performed on Kauai Aggregates' (Thronas Quarry) rock dust material for the above referenced project. Geosyntec Consultants personnel provided us with the bulk soil sample for laboratory modified Proctor (ASTM D 1557) and sieve analysis (ASTM C 136) tests. As approved, a modified Proctor check point was performed in lieu of a full modified Proctor test. The check point performed generally match Bag #15 (SB006), which had a maximum density of 145.0 and an optimum moisture content of 9.5%.

Based on the sieve analysis test results and the Unified Soil Classification System (USCS), the material was classified as well graded sand with silt and gravel, corresponding to a USCS symbol of SW-SM. Test results are presented below:

<u>Test</u>	<u>Result</u>
Modified Proctor Test (ASTM D1557)	Maximum Dry Density: 145.6 pcf Optimum Moisture Content: 8.8%

<u>Sieve Analysis (ASTM C136)</u>	<u>Sieve Size</u>	<u>Percent finer (%)</u>
	1/2"	100.0
	#4	81.1
	#10	55.4
	#20	37.5
	#100	20.5
	#200	11.8

Feel free to call us if you have any questions.

14907memorandum019Bag16.wpd

cc: Goodfellow Brothers, Inc. (Attn: Keith Suga) email: [keith@goodfellowbros.com](mailto:keith@goodfellowbros.com)



Hiras & Associates, Inc.

Professional  
Engineering

Hiras & Associates, Inc.

99-000 South St.  
Awaolu Place  
of the 4th floor  
Lanikai, HI 96763

# MEMORANDUM

July 15, 2010  
W.O. 10-4907.0

**TO:** Mr. Mike Minch  
Geosyntec Consultants Inc  
via email: [mminch@geosyntec.com](mailto:mminch@geosyntec.com)

**FROM:** David Kitamura

**RE:** Laboratory Test Results for our Bag #17 (S8008 2<sup>nd</sup> sample)  
Kekaha Landfill: Phase II Lateral Expansion  
Kekaha, Kauai, Hawaii

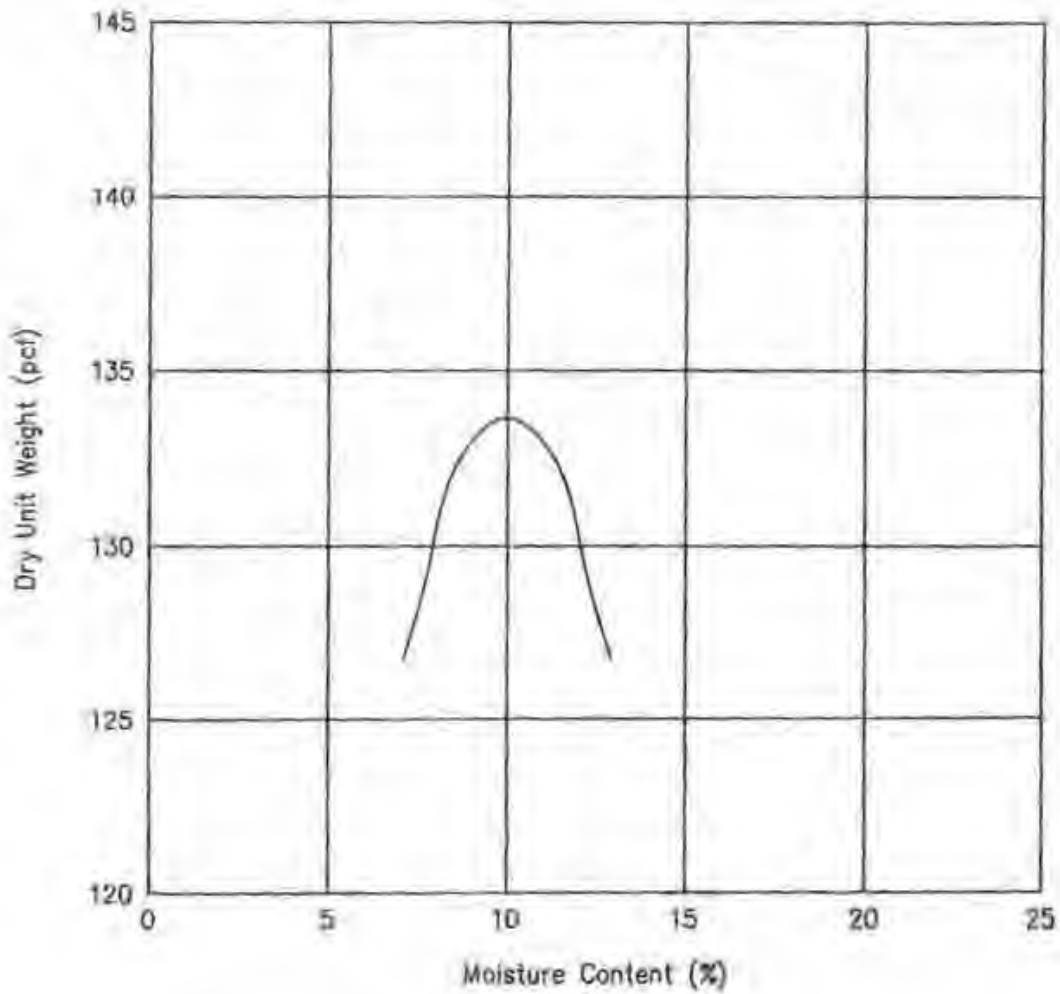
As requested, laboratory testing was performed on Kaula Aggregates' (Thronas Quarry) 1 1/2" minus material for the above referenced project. Geosyntec provided us with a bulk soil sample of the material for laboratory testing, consisting of a Modified Proctor test in general accordance with ASTM D 1557 and a sieve analysis test in general accordance with ASTM C136. This memo presents the results for the modified Proctor test, and sieve analysis test, summarized below and the modified Proctor Curve is attached. Based on the sieve analysis results the soil sample was classified as GW-GM, well graded gravel with silt and sand, using the Unified Soil Classification System (ASTM D2487).

<u>Test</u>	<u>Result</u>														
Modified Proctor Test (ASTM D1557)	Maximum Dry Density: 134.0 pcf Optimum Moisture Content: 10.0%														
Sieve Analysis (ASTM C136)	<table border="0"> <thead> <tr> <th><u>Sieve Size</u></th> <th><u>Percent finer (%)</u></th> </tr> </thead> <tbody> <tr> <td>1 1/2"</td> <td>100.0</td> </tr> <tr> <td>3/4"</td> <td>80.5</td> </tr> <tr> <td>#4</td> <td>36.0</td> </tr> <tr> <td>#10</td> <td>25.5</td> </tr> <tr> <td>#100</td> <td>9.6</td> </tr> <tr> <td>#200</td> <td>6.9</td> </tr> </tbody> </table>	<u>Sieve Size</u>	<u>Percent finer (%)</u>	1 1/2"	100.0	3/4"	80.5	#4	36.0	#10	25.5	#100	9.6	#200	6.9
<u>Sieve Size</u>	<u>Percent finer (%)</u>														
1 1/2"	100.0														
3/4"	80.5														
#4	36.0														
#10	25.5														
#100	9.6														
#200	6.9														

Feel free to call us if you have any questions.

W907memorandum020Bag17.wpd

cc: Goodfellow Brothers, Inc. (Attn: Keith Suga) email: [keith@goodfellowbros.com](mailto:keith@goodfellowbros.com)



Soil Data

Bag No.: 17 (SB008 2nd sample)  
 Location: Thronos Quarry  
 Description: Reddish brown sandy gravel w/silt (1 1/2" minus)

Test Results

Maximum Dry Density: 134.0 pcf  
 Optimum Moisture Content: 10.0%

W.O. 4907.0

Kekaha Landfill Expansion

Hirata & Associates, Inc.

**MODIFIED PROCTOR CURVE**

Plate A



Hirata & Associates

Chartered Surveyors  
Professional Engineers

Hirata & Associates, Inc.

79-1433 Kalia Pl  
Aiea HI 96701  
tel 808.486.0787  
fax 808.486.0870

## MEMORANDUM

July 19, 2010  
W.O. 10-4907.0

**TO:** Mr. Mike Minch  
Geosyntec Consultants Inc.  
via email: [mminch@geosyntec.com](mailto:mminch@geosyntec.com)

**FROM:** David Kitamura

**RE:** Laboratory Test Results for our Bag #18 (SB009)  
Kekaha Landfill: Phase II Lateral Expansion  
Kekaha, Kauai, Hawaii

As requested, laboratory testing was performed on Kauai Aggregates' (Thronas Quarry) rock dust material for the above referenced project. Geosyntec provided us with a bulk soil sample of the material for laboratory testing, consisting of a Modified Proctor test in general accordance with ASTM D 1557 and a sieve analysis test in general accordance with ASTM C136. This memo presents the results for the modified Proctor test, and sieve analysis test, summarized below and the modified Proctor Curve is attached. Based on the sieve analysis results the soil sample was classified as SW-SM, well graded sand with silt and gravel, using the Unified Soil Classification System (ASTM D2487).

### Test

Modified Proctor Test (ASTM D1557)

### Result

Maximum Dry Density: 141.0 pcf  
Optimum Moisture Content: 10.5%

Sieve Analysis (ASTM C136)

<u>Sieve Size</u>	<u>Percent finer (%)</u>
1/2"	100.0
#4	98.96
#10	66.02
#20	39.28
#100	14.92
#200	10.18

Feel free to call us if you have any questions.

W907memorandum022Bag18.wpd

cc: Goodfellow Brothers, Inc. (Attn: Keith Suga) email: [keiths@goodfellowbros.com](mailto:keiths@goodfellowbros.com)



Hirata & Associates

Geotechnical  
Engineering

Hirata & Associates, Inc.

29-1435 Koahe Pl  
Aiea, HI 96701  
tel: 808.486.0787  
fax: 808.486.0870

## MEMORANDUM

July 21, 2010  
W.O. 10-4907.0

TO: Mr. Mike Minch  
Geosyntec Consultants Inc.  
via email: [mminch@geosyntec.com](mailto:mminch@geosyntec.com)

FROM: David Kitamura 

RE: Laboratory Test Results for our Bag #19 (SB010)  
Kekaha Landfill: Phase II Lateral Expansion  
Kekaha, Kauai, Hawaii

As requested, laboratory testing was performed on onsite mixed material for the above referenced project. Geosyntec provided us with a bulk soil sample of the material for laboratory testing, consisting of a Modified Proctor test in general accordance with ASTM D 1557 and a sieve analysis test in general accordance with ASTM C136. This memo presents the results for the modified Proctor test, and sieve analysis test, summarized below and the modified Proctor Curve is attached. Based on the sieve analysis results the soil sample was classified as SP, poorly graded sand, using the Unified Soil Classification System (ASTM D2487).

### Test

Modified Proctor Test (ASTM D1557)

### Result

Maximum Dry Density: 106.5 pcf  
Optimum Moisture Content: 17.5%

Sieve Analysis (ASTM C136)

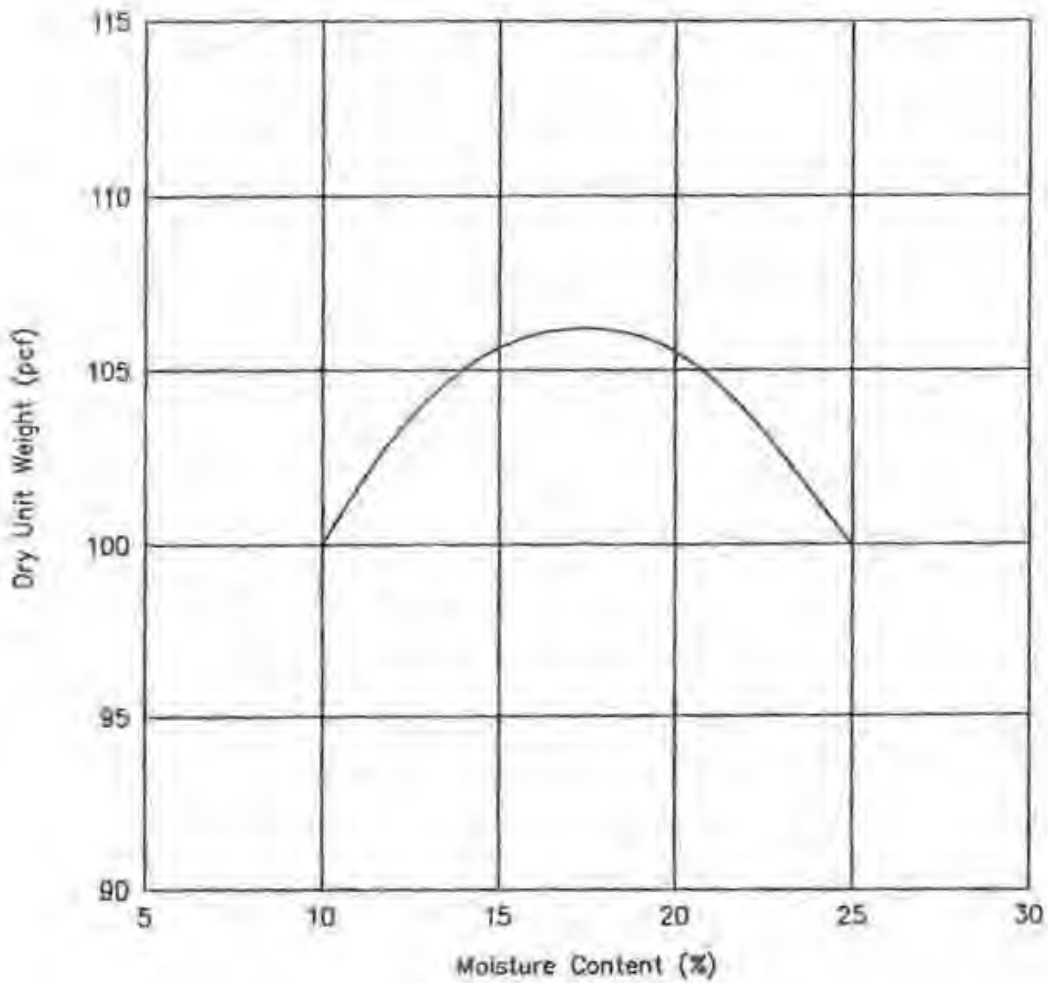
<u>Sieve Size</u>	<u>Percent finer (%)</u>
3/8"	96.5
#4	92.58
#10	88.15
#20	80.42
#100	7.09
#200	4.14

Feel free to call us if you have any questions.

W907memorandum023Bag19.wpd

cc: Goodfellow Brothers, Inc. (Attn: Keith Suga) email: [kelths@goodfellowbros.com](mailto:kelths@goodfellowbros.com)





Soil Data

Bag No.: 19 (SB010)  
 Location: Onsite Mix  
 Description: Tannish brown silty sand with gravel

Test Results

Maximum Dry Density: 106.5 pcf  
 Optimum Moisture Content: 17.5%

W.O. 4907.0

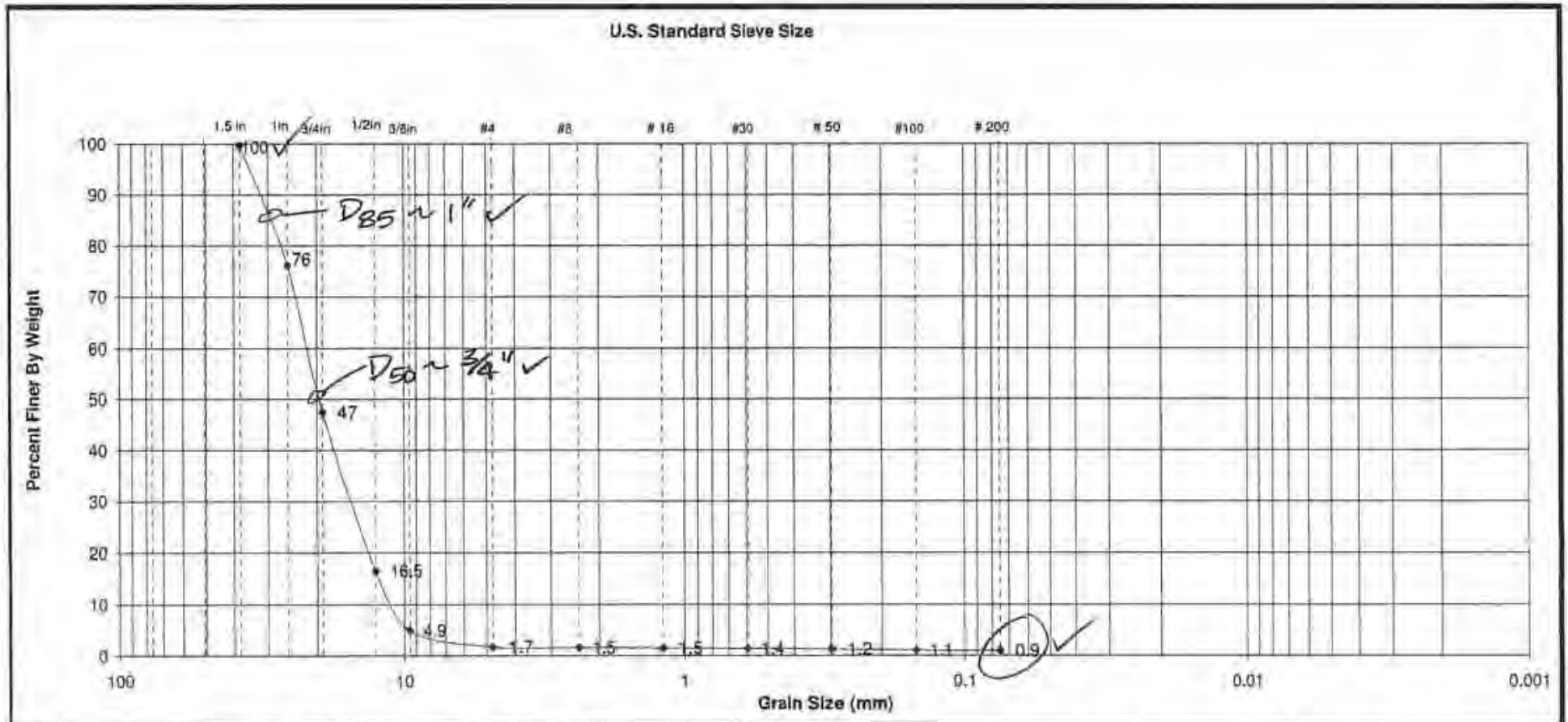
Kekaha Landfill Expansion

Hirata & Associates, Inc.

**MODIFIED PROCTOR CURVE**

Plate A

**Appendix F-2**  
**Granular Drainage Layer Test Results**



Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	Test Moist. (%)	Permeability, K (cm/sec)	LL	PL	PI	Unified Soil Class.	Description
Cell1 GD-001										

# CONSTANT-HEAD PRESSURE PERMEABILITY TESTS

## ASTM D 2434

PROJECT Precision Lab # G100308-B

Date 4/22/2010

Job No 2001-068

By LD

Sample			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k (cm/sec)
2520	Tare			11:32:00		11:32:10	2850	1.2E+00
7000	Init. Wet wt			11:34:00		11:34:10	2813	1.1E+00
	Sat. Wt.	7158		11:40:00		11:40:10	2819	1.1E+00
	Trimmed Wt.	7158		11:45:00		11:45:10	2833	1.1E+00
0.4	% water	3.9						
87.3	Dry Density pcf	87.3						
			PSI	0.4	Total (Ave.)		11315	1.1E+00

Sample			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k
	Tare							
	Init. Wet wt							
	Sat. Wt.							
	Trimmed Wt.							
	% water							
	Dry Density							
			PSI		Total (Ave.)			

Sample			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k
	Tare							
	Init. Wet wt							
	Sat. Wt.							
	Trimmed Wt.							
	% water							
	Dry Density							
			PSI		Total (Ave.)			

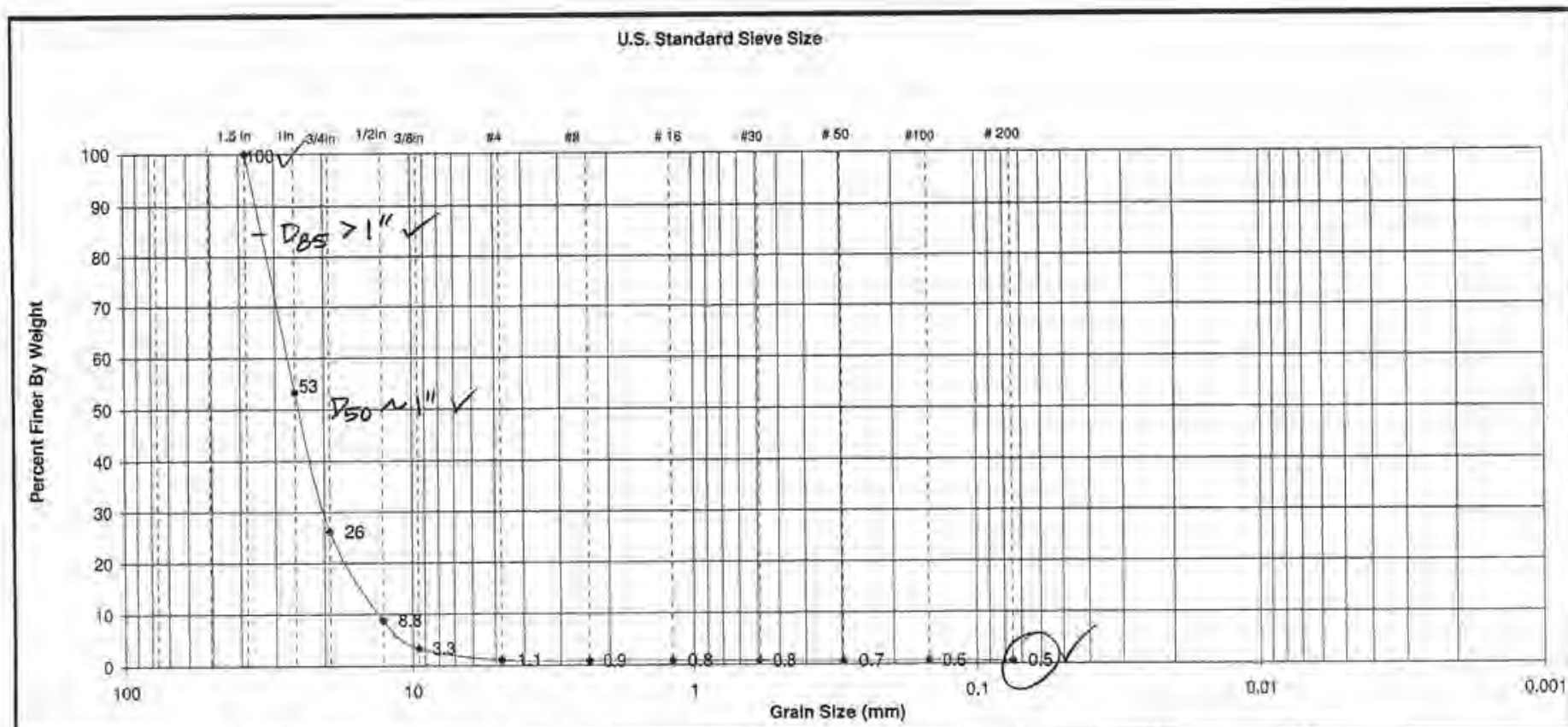
K = coefficient of permeability (cm/sec)

L = sample height = 19.05 cm

A = area of sample = 167.445 cm<sup>2</sup>

H = Hydrostatic head (cm of H<sub>2</sub>O)    1 psi = 70.43 cm

$$K = QL / Aht$$



Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	Test Moist. (%)	Permeability, K (cm/sec)	LL	PL	PI	Unified Soil Class.	Description
Cell1 GD-002										

## CONSTANT-HEAD PRESSURE PERMEABILITY TESTS ASTM D 2434

PROJECT Precision Lab # G100411

Date 5/3/2010

Job No 2001-068

By LD

Sample Cell1 GD-002			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k (cm/sec)
2540	Tare			11:02:00		11:02:10	3230	1.5E+00
6440	Init. Wet wt			11:04:00		11:04:10	3245	1.5E+00
	Sat. Wt.	6580		11:10:00		11:10:10	3238	1.5E+00
	Trimmed Wt.	6580		11:15:00		11:15:10	3260	1.5E+00
1.5	% water	5.1						
86.8	Dry Density pcf	86.8						
			PSI	0.3	Total (Ave.)		12973	1.5E+00

Sample			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k
	Tare							
	Init. Wet wt							
	Sat. Wt.							
	Trimmed Wt.							
	% water							
	Dry Density							
			PSI		Total (Ave.)			

Sample			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k
	Tare							
	Init. Wet wt							
	Sat. Wt.							
	Trimmed Wt.							
	% water							
	Dry Density							
			PSI		Total (Ave.)			

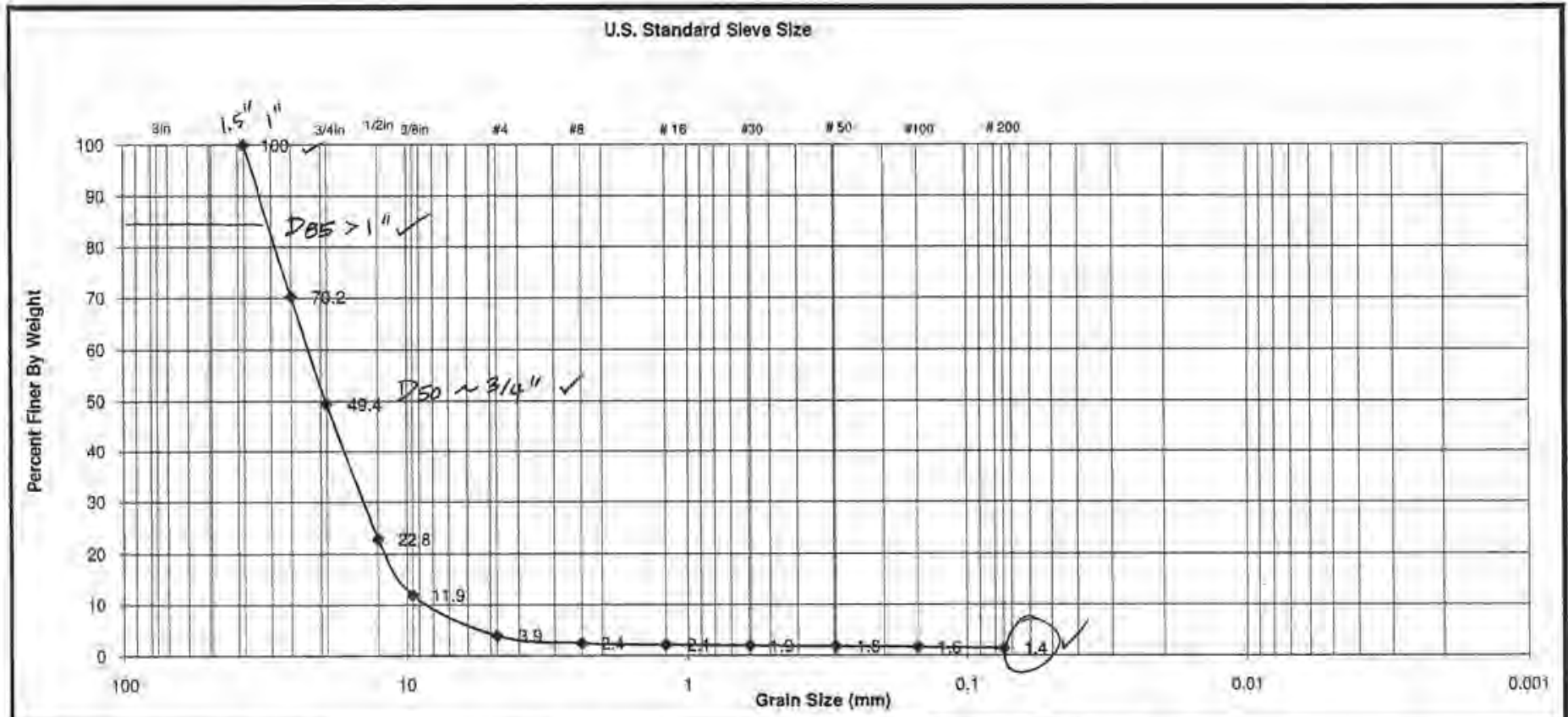
K = coefficient of permeability (cm/sec)

L = sample height = 16.51 cm

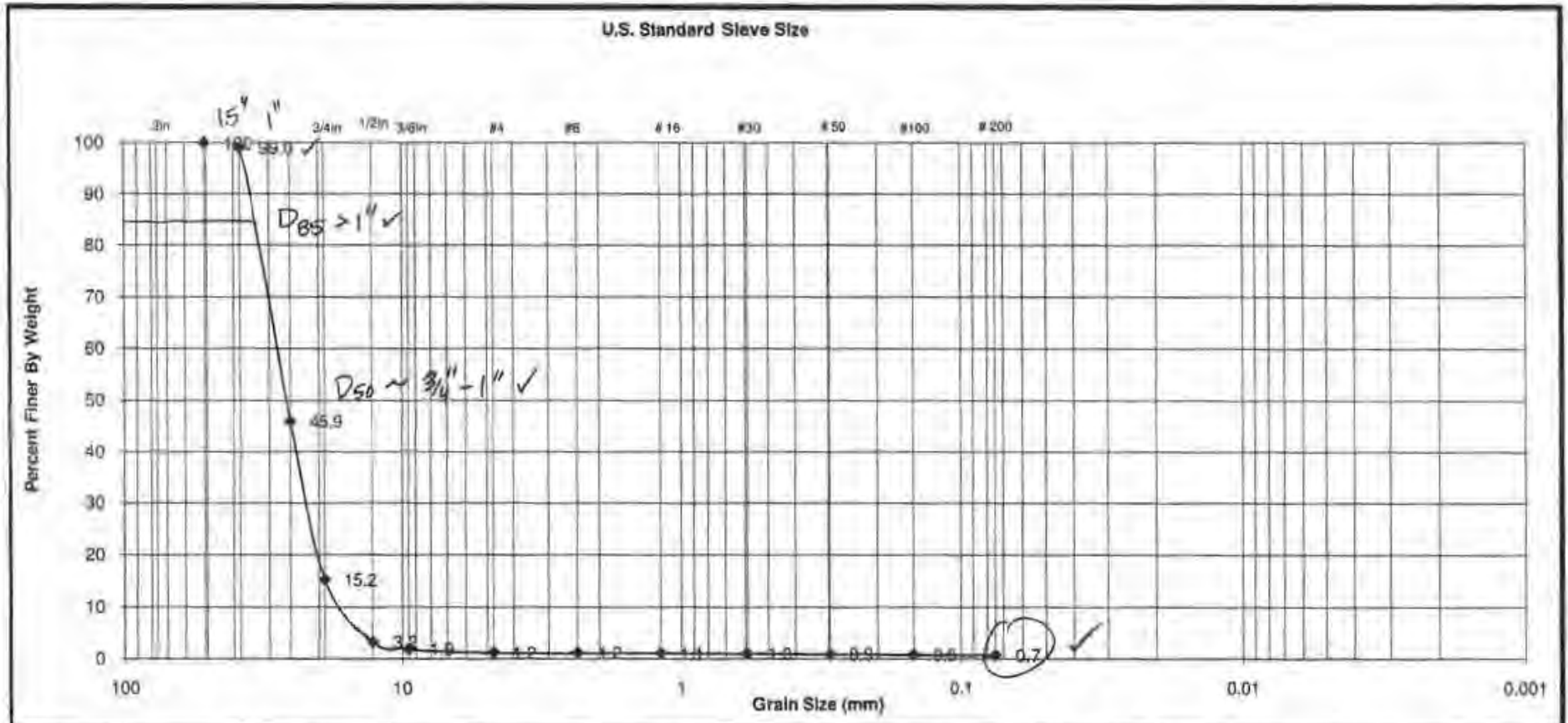
A = area of sample = 167.445 cm<sup>2</sup>

H = Hydrostatic head (cm of H<sub>2</sub>O)     1 psi = 70.43 cm

$$K = QL / AhI$$



Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	Test Moist. (%)	Permeability, K (cm/sec)	LL	PL	FI	Unified Soil Class.	Description
Cell 1 GD 003										



Boring / Sample No.	Initial Dry Density (pcf)	Initial Molst. (%)	Test Dry Density (pcf)	Test Molst. (%)	Permeability, K (cm/sec)	LL	PL	PI	Unified Soil Class.	Description
Cell 1 GD 004										



## CONSTANT-HEAD PRESSURE PERMEABILITY TESTS ASTM D 2434

PROJECT Precision Lab # G100872

Date 7/28/2010

Job No 2001-068

By LD

Sample Cell1 GD-003			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k (cm/sec)
2544	Tare			15:05:00		15:05:05	2230	1.8E+00
6823	Init. Wet wt.			15:25:00		15:25:05	2236	1.8E+00
	Sat. Wt.	6915		15:38:00		15:38:05	2241	1.8E+00
	Trimmed Wt.	6915		15:58:00		15:58:05	2219	1.8E+00
1.5	% water	3.7						
94.7	Dry Density pcf	94.7						
			PSI	0.3	Total (Ave.)		8926	1.8E+00

Sample Cell1 GD-004			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k
2544	Tare			17:22:00		17:22:05	3580	2.8E+00
6020	Init. Wet wt.			17:38:00		17:38:05	3572	2.8E+00
	Sat. Wt.	6117		17:42:00		17:42:05	3596	2.8E+00
	Trimmed Wt.	6117		17:56:00		17:56:05	3588	2.8E+00
1.1	% water	3.9						
77.2	Dry Density pcf	77.2						
			PSI	0.3	Total (Ave.)		14336	2.8E+00

Sample			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k
	Tare							
	Init. Wet wt.							
	Sat. Wt.							
	Trimmed Wt.							
	% water							
	Dry Density							
			PSI		Total (Ave.)			

K = coefficient of permeability (cm/sec)

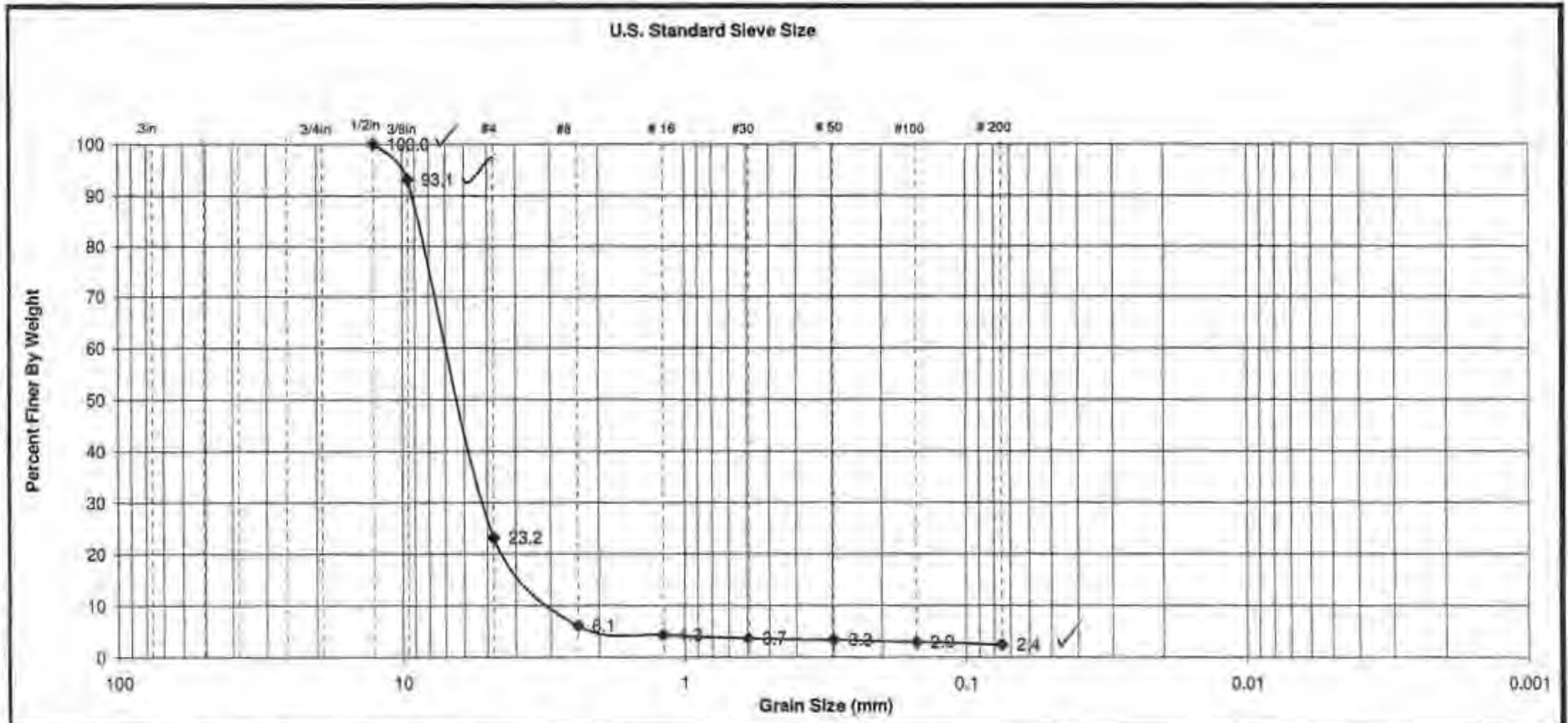
L = sample height = 15.24 cm

A = area of sample = 182.322 cm<sup>2</sup>

H = Hydrostatic head (cm of H<sub>2</sub>O)     1 psi = 70.43 cm

$$K = QL / Aht$$

**Appendix F-3**  
**Operations Layer Test Results**



Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	Test Moist. (%)	Permeability, K (cm/sec)	LL	PL	PI	Unified Soil Class.	Description
Cell 1 OPS-001										

# CONSTANT-HEAD PRESSURE PERMEABILITY TESTS ASTM D 2434

PROJECT Precision Lab # G100493

Date 5/17/2010

Job No 2001-068

By LD

Sample			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k (cm/sec)
2530	Tare			12:15:00		12:15:15	1680	2.9E-01
6260	Init. Wet wt			12:18:00		12:18:15	1622	2.8E-01
	Sat. Wt.	6460		12:20:00		12:20:15	1636	2.8E-01
	Trimmed Wt.	6460		12:23:00		12:23:15	1649	2.8E-01
3.2	% water	8.7						
101.8	Dry Density pcf	101.8						
			PSI	0.4	Total (Ave.)		6587	2.8E-01

Sample			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k
	Tare							
	Init. Wet wt							
	Sat. Wt.							
	Trimmed Wt.							
	% water							
	Dry Density							
			PSI		Total (Ave.)			

Sample			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k
	Tare							
	Init. Wet wt							
	Sat. Wt.							
	Trimmed Wt.							
	% water							
	Dry Density							
			PSI		Total (Ave.)			

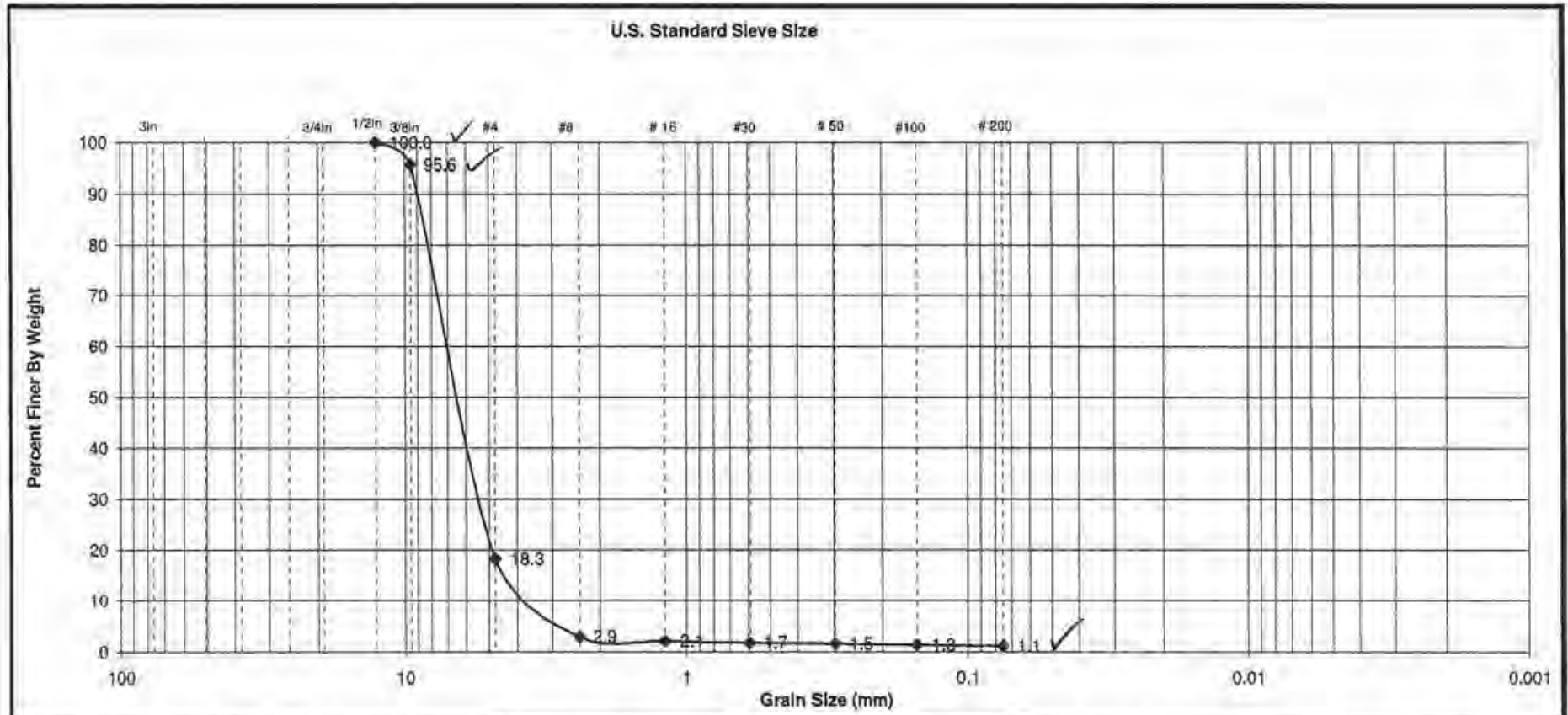
K = coefficient of permeability (cm/sec)

L = sample height = 12.70 cm

A = area of sample = 174.507 cm<sup>2</sup>

H = Hydrostatic head (cm of H<sub>2</sub>O)    1 psi = 70.43 cm

$$K = QL / Aht$$



Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	Test Moist. (%)	Permeability, K (cm/sec)	LL	PL	PI	Unified Soil Class.	Description
Cell 1 OPS-002										

## CONSTANT-HEAD PRESSURE PERMEABILITY TESTS ASTM D 2434

PROJECT Precision Lab # G100513

Date 5/17/2010

Job No 2001-068

By LD

Sample Cell 1 OPS-002			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k (cm/sec)
2540	Tare			12:25:00		12:25:15	1980	4.5E-01
5760	Init. Wet wt			12:27:00		12:27:15	1996	4.6E-01
	Sat. Wt.	5820		12:31:00		12:31:15	1998	4.6E-01
	Trimmed Wt.	5820		12:35:00		12:35:15	2010	4.6E-01
3.6	% water	5.5						
87.6	Dry Density pcf	87.6						
			PSI	0.3	Total (Ave.)		7984	4.6E-01

Sample			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k
	Tare							
	Init. Wet wt							
	Sat. Wt.							
	Trimmed Wt.							
	% water							
	Dry Density							
			PSI		Total (Ave.)			

Sample			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k
	Tare							
	Init. Wet wt							
	Sat. Wt.							
	Trimmed Wt.							
	% water							
	Dry Density							
			PSI		Total (Ave.)			

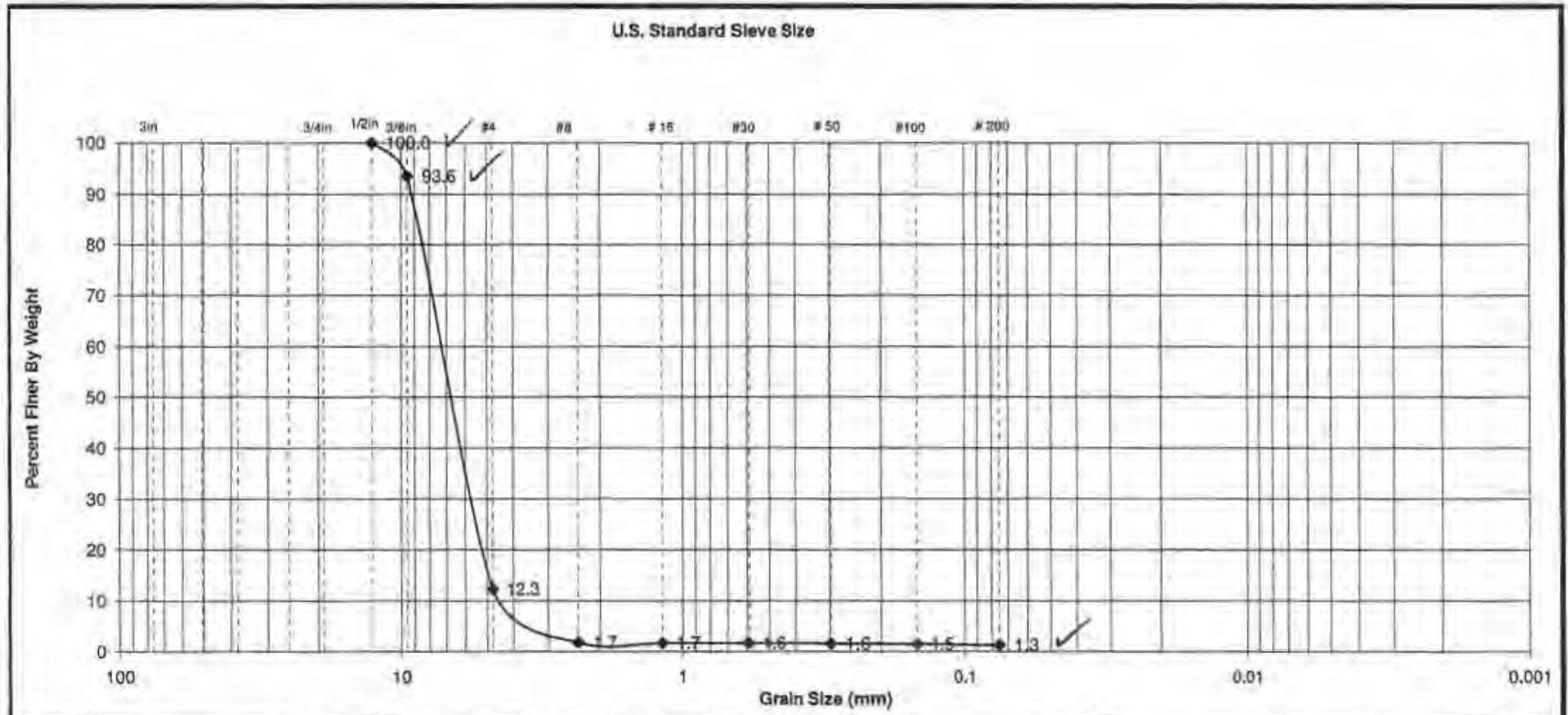
K = coefficient of permeability (cm/sec)

L = sample height = 12.70 cm

A = area of sample = 174.507 cm<sup>2</sup>

H = Hydrostatic head (cm of H<sub>2</sub>O) 1 psi = 70.43 cm

$$K = QL / AhI$$



Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	Test Moist. (%)	Permeability, K (cm/sec)	LL	PL	PI	Unified Soil Class.	Description
Cell 1 OPS-003										

# CONSTANT-HEAD PRESSURE PERMEABILITY TESTS

## ASTM D 2434

PROJECT Precision Lab # G100517

Date 5/17/2010

Job No 2001-068

By LD

Sample Cell 1 OPS-003			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k (cm/sec)
2540	Tare			11:03:00		11:03:10	1897	6.5E-01
6000	Init. Wet wt			11:07:00		11:07:10	1856	6.4E-01
	Sat. Wt.	6120		11:09:00		11:09:10	1823	6.2E-01
	Trimmed Wt.	6120		11:13:00		11:13:10	1867	6.4E-01
2.9	% water	6.5						
93.8	Dry Density pcf	93.8						
			PSI	0.3	Total (Ave.)		7443	6.4E-01

Sample			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k
	Tare							
	Init. Wet wt							
	Sat. Wt.							
	Trimmed Wt.							
	% water							
	Dry Density							
			PSI		Total (Ave.)			

Sample			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k
	Tare							
	Init. Wet wt							
	Sat. Wt.							
	Trimmed Wt.							
	% water							
	Dry Density							
			PSI		Total (Ave.)			

K = coefficient of permeability (cm/sec)

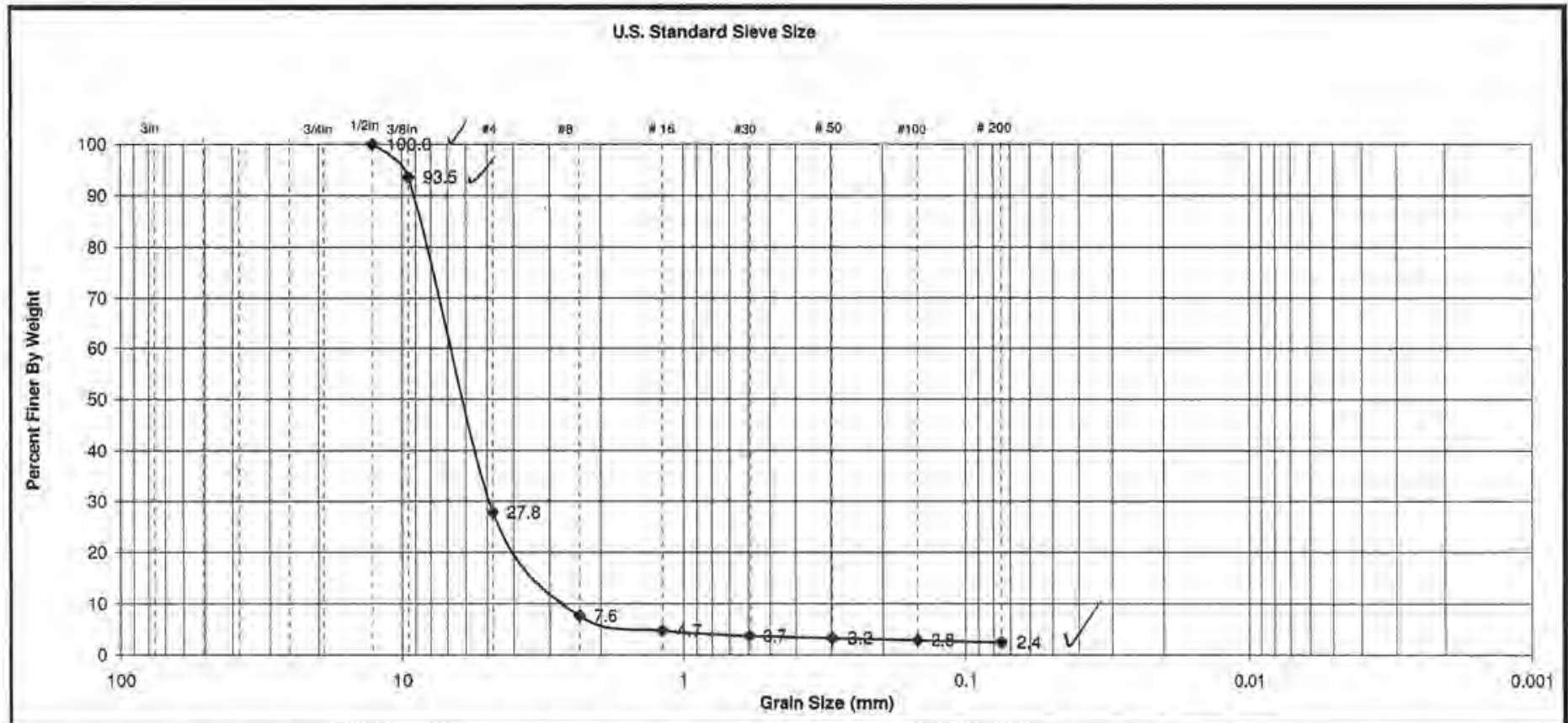
L = sample height = 12.70 cm

A = area of sample = 175.399 cm<sup>2</sup>

H = Hydrostatic head (cm of H<sub>2</sub>O)    1 psi = 70.43 cm

$$K = QL / Aht$$





Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	Test Moist. (%)	Permeability, K (cm/sec)	LL	PL	PI	Unified Soil Class.	Description
Cell 1 OPS-004										

# CONSTANT-HEAD PRESSURE PERMEABILITY TESTS ASTM D 2434

PROJECT Precision Lab # G100551

Date 5/26/2010

Job No 2001-068

By LD

Sample Cell 1 OPS-004			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k (cm/sec)
2540	Tare			10:45:00		10:45:10	1250	4.3E-01
5980	Init. Wet wt			10:48:00		10:48:10	1223	4.2E-01
	Sat. Wt.	6151		10:52:00		10:52:10	1229	4.2E-01
	Trimmed Wt.	6151		10:55:00		10:55:10	1230	4.2E-01
2.1	% water	7.2						
93.9	Dry Density pcf	93.9						
			PSI	0.3	Total (Ave.)		4932	4.2E-01 ✓

Sample			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k
	Tare							
	Init. Wet wt							
	Sat. Wt.							
	Trimmed Wt.							
	% water							
	Dry Density							
			PSI		Total (Ave.)			

Sample			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k
	Tare							
	Init. Wet wt							
	Sat. Wt.							
	Trimmed Wt.							
	% water							
	Dry Density							
			PSI		Total (Ave.)			

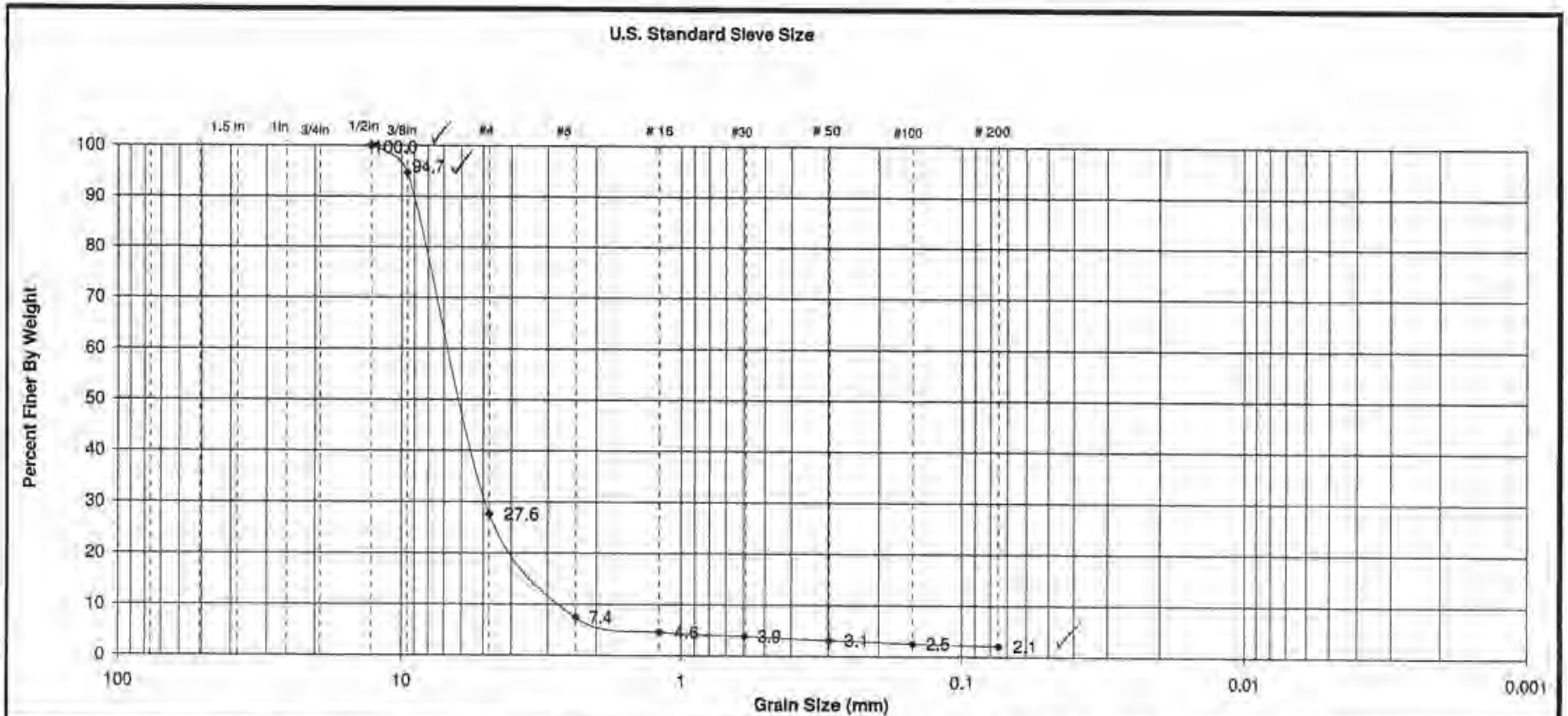
K = coefficient of permeability (cm/sec)

L = sample height = 12.70 cm

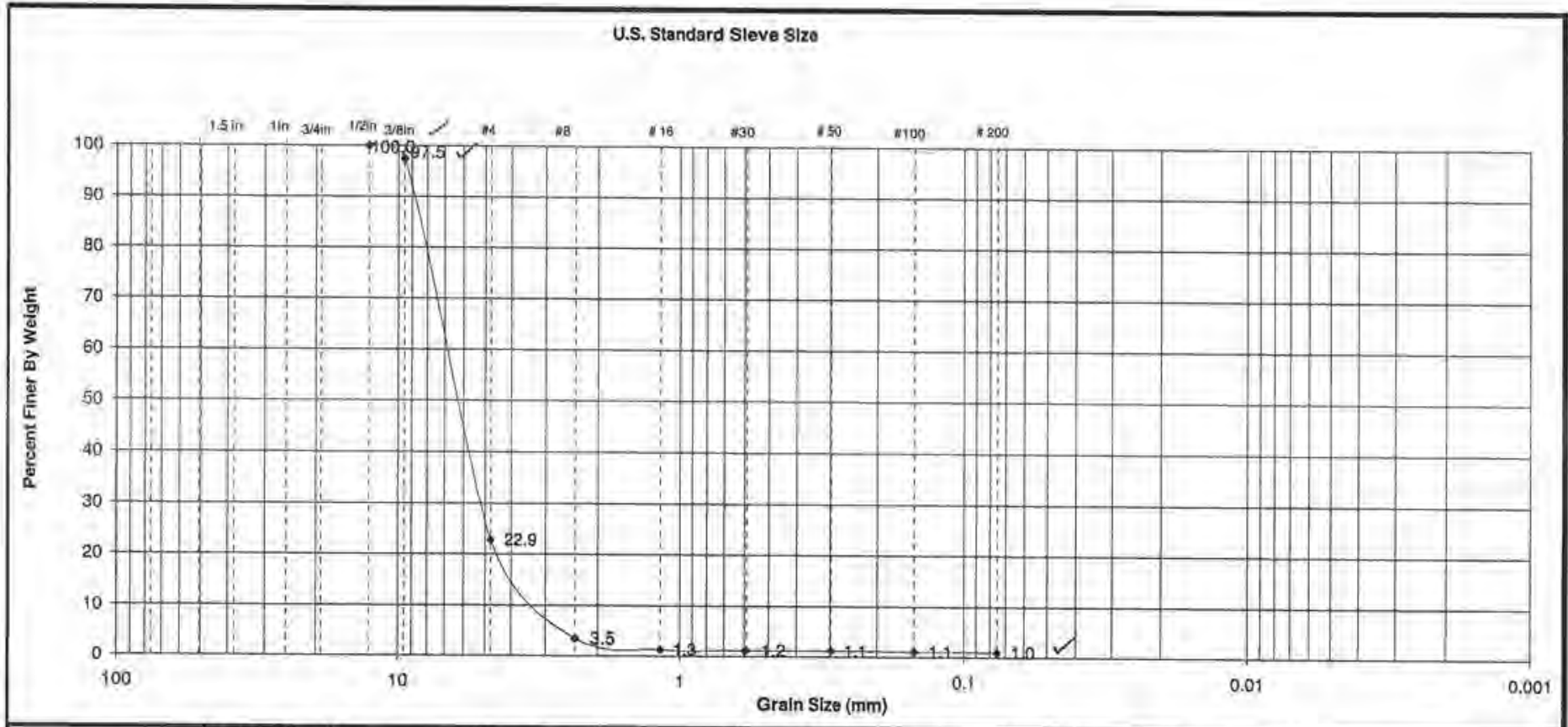
A = area of sample = 175.399 cm<sup>2</sup>

H = Hydrostatic head (cm of H<sub>2</sub>O)    1 psi = 70.43 cm

$$K = QL / Ah\Delta t$$



Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	Test Moist. (%)	Permeability, K (cm/sec)	LL	PL	PI	Unified Soil Class.	Description
Cell1 OPS-005										



Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	Test Moist. (%)	Permeability, K (cm/sec)	LL	PL	PI	Unified Soil Class.	Description
Cell1 OPS-006										

## CONSTANT-HEAD PRESSURE PERMEABILITY TESTS ASTM D 2434

PROJECT Precision Lab # G101050

Date 8/17/2010

Job No 2001-068

By LD

Sample Cell 1 OPS-005			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k (cm/sec)
3173	Tare			0:00:00		0:00:10	300.6	2.0E-01
4778.2	Init. Wet wt			0:00:00		0:00:10	311	2.1E-01
	Sat. Wt.			0:00:00		0:00:10	308	2.1E-01
	Trimmed Wt.			0:00:00		0:00:10	323	2.2E-01
2.8	% water	5.9		0:00:00		0:00:10	334	2.3E-01
103.4	Dry Density pcf	103.4		0:00:00		0:00:10	311	2.1E-01
			PSI 0.3		Total (Ave.)		1887.6	2.1E-01

Sample Cell 1 OPS-006			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k (cm/sec)
3177.6	Tare			0:00:00		0:00:10	385.6	2.6E-01
4724.9	Init. Wet wt			0:00:00		0:00:10	390.6	2.7E-01
	Sat. Wt.			0:00:00		0:00:10	399.2	2.7E-01
	Trimmed Wt.			0:00:00		0:00:10	386.9	2.6E-01
3.2	% water	6.7		0:00:00		0:00:10	394.6	2.7E-01
99.3	Dry Density pcf	99.3		0:00:00		0:00:10	402.1	2.7E-01
			PSI 0.3		Total (Ave.)		2359	2.7E-01

Sample			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k
	Tare							
	Init. Wet wt							
	Sat. Wt.							
	Trimmed Wt.							
	% water							
	Dry Density							
			PSI		Total (Ave.)			

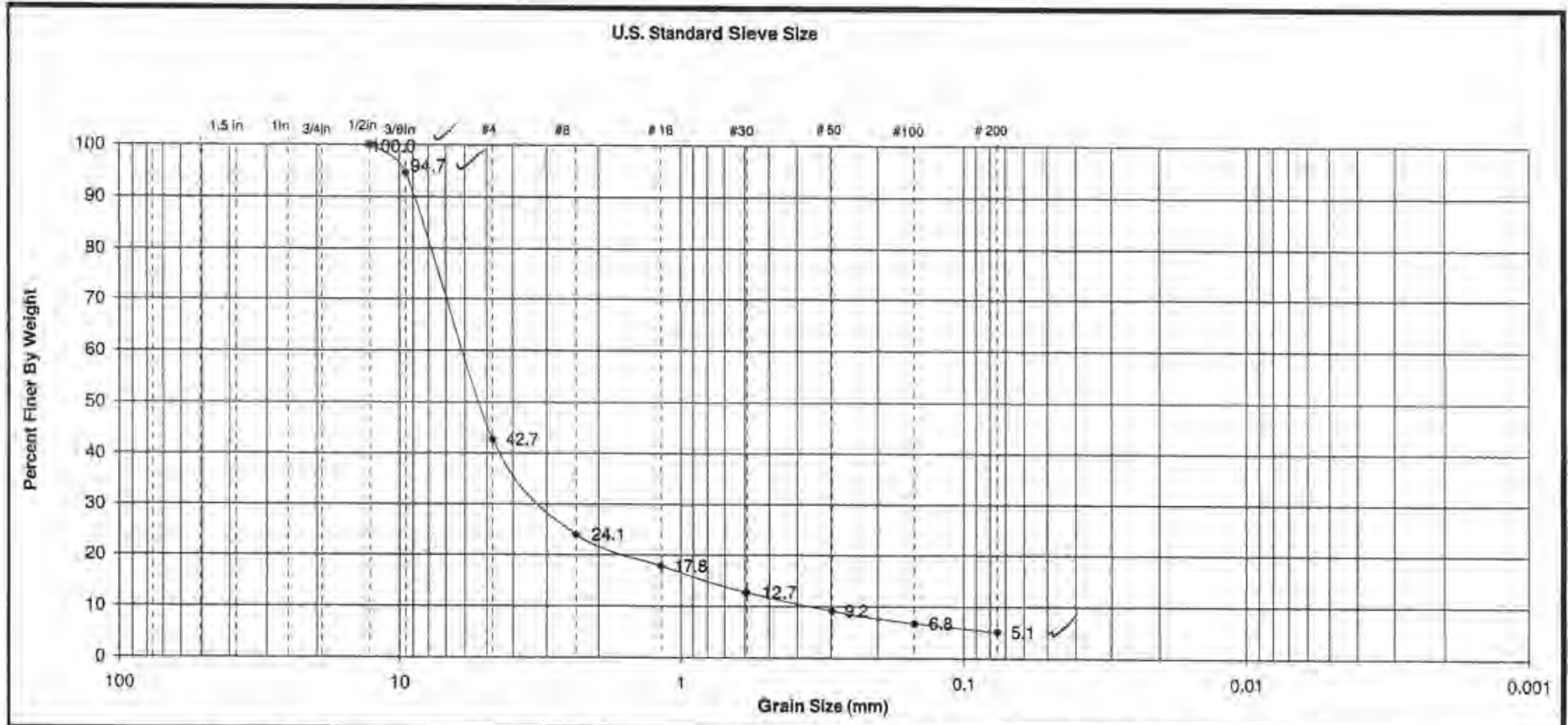
K = coefficient of permeability (cm/sec)

L = sample height = 11.63 cm

A = area of sample = 81.032 cm<sup>2</sup>

H = Hydrostatic head (cm of H<sub>2</sub>O)    1 psi = 70.43 cm

$$K = QL / AhI$$



Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	Test Moist. (%)	Permeability, K (cm/sec)	LL	PL	PI	Unified Soil Class.	Description
Cell1 OPS-007A										

## CONSTANT-HEAD PRESSURE PERMEABILITY TESTS ASTM D 2434

PROJECT Precision Lab # G101157

Date 8/31/2010

Job No 2001-068

By LD

Sample Cell 1 OPS-007A			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k (cm/sec)
3167.2	Tare			0:00:00		0:00:15	83	3.8E-02
4893.6	Init. Wet wt			0:00:00		0:00:15	78.6	3.6E-02
	Sat. Wt.			0:00:00		0:00:15	81	3.7E-02
	Trimmed Wt.			0:00:00		0:00:15	79	3.6E-02
2.2	% water	6.4		0:00:00		0:00:15	83	3.8E-02
111.9	Dry Density pci	111.9		0:00:00		0:00:15	78	3.5E-02
			PSI	0.3	Total (Ave.)		482.6	3.6E-02

✓

Sample			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k
	Tare							
	init. Wet wt							
	Sat. Wt.							
	Trimmed Wt.							
	% water							
	Dry Density							
			PSI		Total (Ave.)			

Sample			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k
	Tare							
	Init. Wet wt							
	Sat. Wt.							
	Trimmed Wt.							
	% water							
	Dry Density							
			PSI		Total (Ave.)			

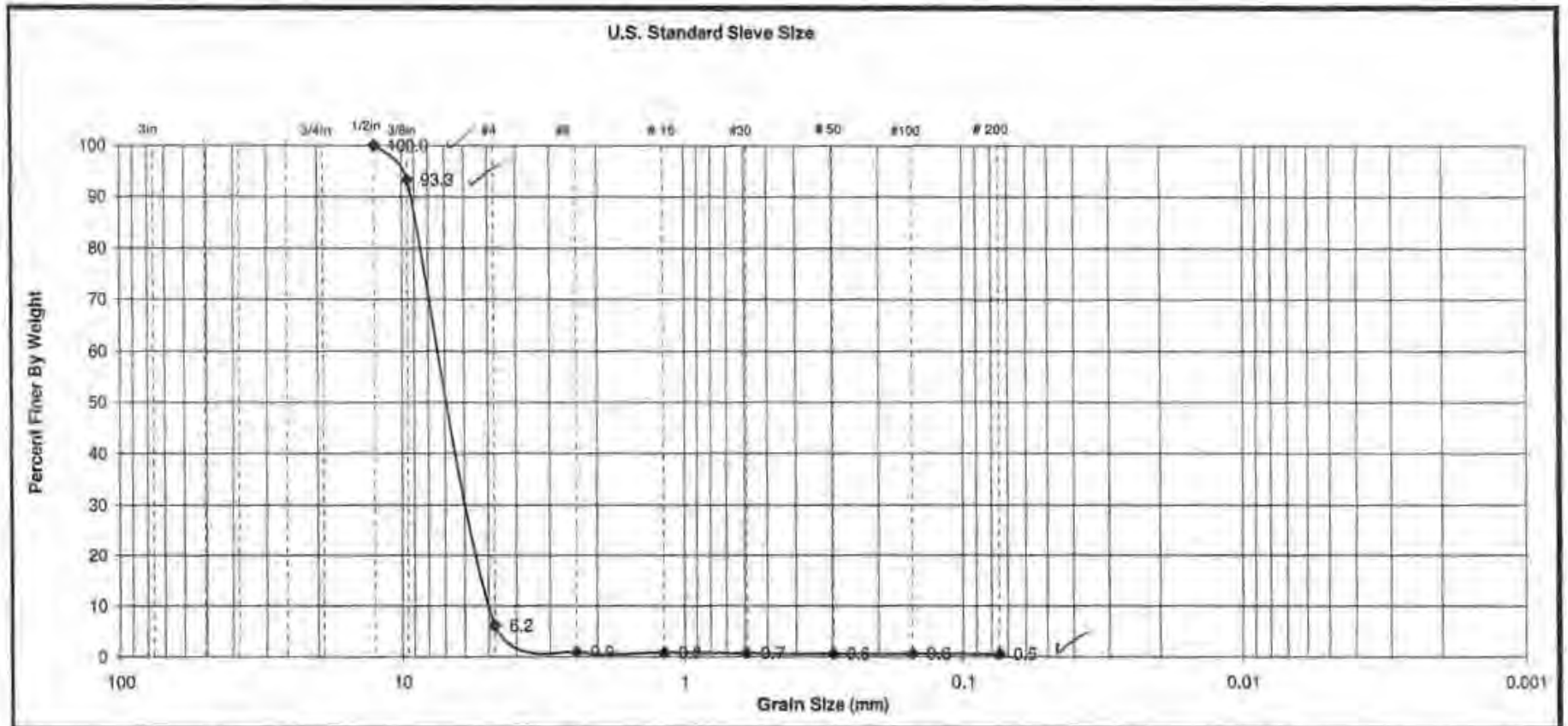
K = coefficient of permeability (cm/sec)

L = sample height = 11.63 cm

A = area of sample = 81.032 cm<sup>2</sup>

H = Hydrostatic head (cm of H<sub>2</sub>O) 1 psi = 70.43 cm

$$K = QL / AhI$$



Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	Test Moist. (%)	Permeability, K (cm/sec)	LL	PL	PI	Unified Soil Class.	Description
Cell 1 OPS-008A										



# CONSTANT-HEAD PRESSURE PERMEABILITY TESTS ASTM D 2434

PROJECT Precision Lab # G101236

Date 9/10/2010

Job No 2001-068

By LD

Sample			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k (cm/sec)
3167.2	Tare			0:00:00		0:00:10	680.4	4.6E-01
4682.9	Init. Wet wt			0:00:00		0:00:10	722	4.9E-01
	Sat. Wt.			0:00:00		0:00:10	719	4.9E-01
	Trimmed Wt.			0:00:00		0:00:10	699	4.7E-01
3.3	% water	5.1		0:00:00		0:00:10	725	4.9E-01
97.2	Dry Density pcf	97.2		0:00:00		0:00:10	731	5.0E-01
			PSI	0.3	Total (Ave.)		4276.4	4.8E-01

Sample			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k
	Tare							
	Init. Wet wt							
	Sat. Wt.							
	Trimmed Wt.							
	% water							
	Dry Density							
			PSI		Total (Ave.)			

Sample			Start		Stop			
As Rec'd		As Tested	Wt.	Time/Day	Wt.	Time/Day	cc	k
	Tare							
	Init. Wet wt							
	Sat. Wt.							
	Trimmed Wt.							
	% water							
	Dry Density							
			PSI		Total (Ave.)			

K = coefficient of permeability (cm/sec).

L = sample height = 11.63 cm

A = area of sample = 81.032 cm<sup>2</sup>

H = Hydrostatic head (cm of H<sub>2</sub>O) | psi = 70.43 cm

$$K = QL / Aht$$

**Appendix F-4**  
**CLSM and Concrete Test Results**



### Concrete Sample & Strength Test Report

Project: Kekaha Landfill W.O.: 4907 Date: 4/16/2010

Sample No.	Sample Made By	Mix Design	Specified Strength (psi)	Aggregate Size	Aggregate Source	Admixture Type	Required Slump	Concrete Ticket No.
2	TN		500		Kauai Aggregates	20 = 0		93150
Time Sampled	Cement Factor	Concrete Supplier	Supplier Location	Air Content	Mix Temperature	Air Temperature	Actual Slump	Concrete Truck No.
12:42 PM		Thronas	Lawai Valley	N/A	73° F	84° F	4½"	1
Concrete Placement Location:		<u>Cell 1 CSLM</u>						
Concrete Sample Location:		<u>Cell 1 CSLM - Around Pipe by Kekaha Landfill entrance</u> <u>CSLM SLURRY FOR PIPE PENETRATION CELLS 10/10</u>						
Notes & Comments:								
Number of Cylinders:		3	1 at 7 days	2 at 28 days	at days	at days	at days	Hold

### Compressive Strength Test Data

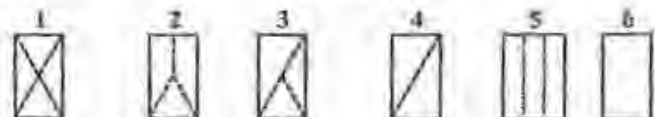
Mold Type: Cylinder

Cylinder No.	Test Age (days)	Test Date	Cure Type	Diameter (inch)	Length (inch)	Maximum Load (lbs)	Strength (psi)	Fracture Type
2-1-1	7	4/23/2010	H <sub>2</sub> O	6"	12"	6,097	216	4
2-1-2	28	5/14/2010	H <sub>2</sub> O	6"	12"	14,957	529	5
2-1-3	28	5/14/2010	H <sub>2</sub> O	6"	12"	15,434	546	4

Comments / Special Instructions:

Lab Technician: Tin Muegele

Fracture Type





HIRATA & ASSOCIATES, INC.

99-1433 Koahe Place  
Aiea, Hawaii 96701  
Ph: 808-486-0787 Fax: 808-486-0870  
Email: mail@hirata-hawaii.com

### CONSTRUCTION SERVICES FIELD REPORT


Page 1 of 2

#### PROJECT/SITE VISIT INFORMATION:

Project: <b>Kekaha Landfill Expansion</b>		W.O.: <b>4804.0</b>	Date: <b>August 16, 2010</b>
Site Visit Requested By: <b>Unlimited Construction</b>		Personnel Present at Site: <b>Off Site Concrete Breaks</b>	Weather: <b>N/A</b>
Purpose of Site Visit: <input type="checkbox"/> Density Testing <input type="checkbox"/> Observe Fill <input type="checkbox"/> Footing Excavation <input checked="" type="checkbox"/> Other: <b>CCT - Breaks</b>			

Break 2 compressive strength test cylinders at 28 days, from Pour #4 . See attached Concrete Sample & Strength Test Report for break data.

All and/or recommendations provided in this report have not been reviewed by supervisory staff and may be subject to revisions or additions. If contents of this report are changed, a revised copy will be either provided to your field personnel or sent to your office.

Prepared By: <b>Anthony Frey</b>	Reviewed By: 	Copy To: <b>S. Ramaraju - Unlimited Construction</b>
-------------------------------------	---	---



### Concrete Sample & Strength Test Report

Project: Kekaha Landfill W.O.: 4907 Date: 7/19/2010

Sample No.	Sample Made By	Mix Design	Specified Strength (psi)	Aggregate Size	Aggregate Source	Admixture Type	Required Slump	Concrete Ticket No.
4	TN		500		Kauai Aggregates	20 = 0		93150
Time Sampled	Cement Factor	Concrete Supplier	Supplier Location	Air Content	Mix Temperature	Air Temperature	Actual Slump	Concrete Truck No.
12:42 PM		Tironus	Lawai Valley	N/A	73° F	84° F	4 1/2"	1

Concrete Placement Location: Penetration Pipes A & B

Concrete Sample Location: ~~Penetration Pipe B~~ PIPE PENETRATION CELL 1A - CLSM SLURRY

Notes & Comments:

Number of Cylinders: 3 | 1 at 7 days | 2 at 28 days | at days | at days | Hold

### Compressive Strength Test Data

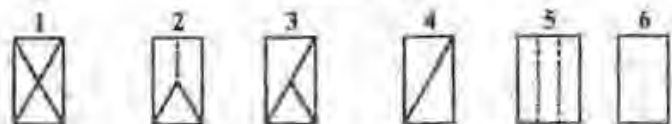
Mold Type: Cylinder

Cylinder No.	Test Age (days)	Test Date	Cure Type	Diameter (inch)	Length (inch)	Maximum Load (lbs)	Strength (psi)	Fracture Type
4-1-1	7	7/26/2010	H <sup>2</sup> O	6"	12"	9,012	319	4
4-1-2	28	8/16/2010	H <sup>2</sup> O	6"	12"	15,556	551	4
4-1-3	28	8/16/2010	H <sup>2</sup> O	6"	12"	15,235	539	4

Comments / Special Instructions: Contact K. Suga of GBI with 28 day break results.

Lab Technician:  
Tim Naegele

#### Fracture Type





HIRATA & ASSOCIATES, INC.

99-1433 Kalia Place  
Aiea, Hawaii 96701  
PH: 808-486-0287 Fax: 808-486-0979  
Email: mail@hirata-associates.com

### CONSTRUCTION SERVICES FIELD REPORT

Page 1 of 2

#### PROJECT/SITE VISIT INFORMATION:

Project: Kekaha Landfill Expansion		W.O. 4907.0	Date: August 23, 2010
Site Visit Requested By: Geosyntec	Personnel Present at Site: Off Site Concrete Breaks		Weather: N/A
Purpose of Site Visit: <input type="checkbox"/> Density Testing <input type="checkbox"/> Observe Fill <input type="checkbox"/> Footing Excavation <input checked="" type="checkbox"/> Other: CCT - Breaks			

Break 2 compressive strength test cylinders at 28 days, from Pour # 5. See attached Concrete Sample & Strength Test Report for break data.

its and/or recommendations provided in this report have not been reviewed by supervisory staff and may be subject to revisions or additions. If contents of this report are changed, a revised copy will be either provided to your field personnel or sent to your office.

Prepared By: Anthony Frey	Reviewed By:	Copy To: C. Scott - Geosyntec
------------------------------	--------------	----------------------------------



### Concrete Sample & Strength Test Report

Project: Kekaha Landfill Expansion W.O.: 4907.0 Date: 7/26/2010

Sample No.	Sample Made By	Mix Design	Specified Strength (psi)	Aggregate Size	Aggregate Source	Admixture Type	Required Slump	Concrete Ticket No.
5	ATF		500	Rock Dust	Kauai Aggregates	20 = 0		94067
Time Sampled	Cement Factor	Concrete Supplier	Supplier Location	Air Content	Mix Temperature	Air Temperature	Actual Slump	Concrete Truck No.
1:14 PM		Throuas	Lawai Valley	N/A	73° F	85° F	3 1/2"	1

Concrete Placement Location: Penetration Pipe B

Concrete Sample Location: Penetration Pipe B - CLSM SLURRY

Notes & Comments:

Number of Cylinders: 3 | 1 at 7 days | 2 at 28 days | at days | at days | Hold

### Compressive Strength Test Data

Mold Type: Cylinder

Cylinder No.	Test Age (days)	Test Date	Cure Type	Diameter (inch)	Length (inch)	Maximum Load (lbs)	Strength (psi)	Fracture Type
5-1-1	7	8/2/2010	H <sub>2</sub> O	6"	12"	8,780	311	4
5-1-2	28	8/23/2010	H <sub>2</sub> O	6"	12"	17,607	623	4
5-1-3	28	8/23/2010	H <sub>2</sub> O	6"	12"	17,939	635	4

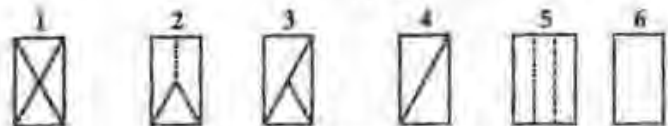
Comments / Special Instructions:

Lab Technician:

Anthony Frey

ATF

Fracture Type





### Concrete Sample & Strength Test Report

Project: Kekaha Landfill Expansion

W.O.: 4907.0

Date: 4/7/2010

Sample No.	Sample Made By	Mix Design	Specified Strength (psi)	Aggregate Size	Aggregate Source	Admixture Type	Required Slump	Concrete Ticket No.
1	TN				Kauai Aggregates	20 = 168		93077
Time Sampled	Cement Factor	Concrete Supplier	Supplier Location	Air Content	Mix Temperature	Air Temperature	Actual Slump	Concrete Truck No.
8:41 AM		Thronas	Lawai Valley	N/A	82° F	74° F	7"	1
<b>Concrete Placement Location:</b> <u>Curb and gutter by the recycling bins</u>								
<b>Concrete Sample Location:</b> <u>South side of curbing pour.</u>								
<b>Notes &amp; Comments:</b> _____								
<b>Number of Cylinders:</b> 3   1 at 7 days   1 at 14 days   1 at 28 days   at days   Hold								

### Compressive Strength Test Data

Mold Type: Cylinder

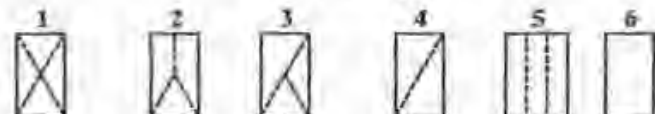
Cylinder No.	Test Age (days)	Test Date	Cure Type	Diameter (inch)	Length (inch)	Maximum Load (lbs)	Strength (psi)	Fracture Type
1-1-1	7	4/14/2010	H <sup>2</sup> O	6"	12"	68702	2431	4
1-1-2	28	5/5/2010	H <sup>2</sup> O	6"	12"	97,621	3454	4
1-1-3	28	5/5/2010	H <sup>2</sup> O	6"	12"	105,095	3719	4

Comments / Special Instructions: \_\_\_\_\_

Lab Technician:

Tim Naegle

Fracture Type







### Concrete Sample & Strength Test Report

Project: Kekaha Landfill W.O.: 4907.0 Date: 7/19/2010

Sample No.	Sample Made By	Mix Design	Specified Strength (psi)	Aggregate Size	Aggregate Source	Admixture Type	Required Slump	Concrete Ticket No.
7	TN	3F40A	4,000		Glover Quarry		3" + 1"	33005913
Time Sampled	Cement Factor	Concrete Supplier	Supplier Location	Air Content	Mix Temperature	Air Temperature	Actual Slump	Concrete Truck No.
1:44 PM		Glover - Honsador	Halfway Bridge	N/A	89°	87°	3"	1
Concrete Placement Location: <u>Valve Slab</u>								
Concrete Sample Location: <u>Valve Slab</u>								
Notes & Comments: _____								
Number of Cylinders: 4   1 at 7 days   2 at 28 days   at days   at days   Hold 1								

### Compressive Strength Test Data

Mold Type: Cylinder

Cylinder No.	Test Age (days)	Test Date	Cure Type	Diameter (inch)	Length (inch)	Maximum Load (lbs)	Strength (psi)	Fracture Type
7-1-1	7	9/1/2010	H <sub>2</sub> O	6"	12"	121,591	4303	4
7-1-2	28	9/22/2010	H <sub>2</sub> O	6"	12"	158,804	5619	4
7-1-3	28	9/22/2010	H <sub>2</sub> O	6"	12"	158,032	5592	4
7-1-4	Hold	—	H <sub>2</sub> O	6"	12"	—	—	—

Comments / Special Instructions: \_\_\_\_\_

Lab Technician:  
Tim Naegle

Fracture Type





### Concrete Sample & Strength Test Report

Project: Kekaha Landfill Expansion W.O.: 4907.0 Date: 8/10/2010

Sample No.	Sample Made By	Mix Design	Specified Strength (psi)	Aggregate Size	Aggregate Source	Admixture Type	Required Slump	Concrete Ticket No.
6	ATF			Rock Dust	Glover Quarry			
Time Sampled	Cement Factor	Concrete Supplier	Supplier Location	Air Content	Mix Temperature	Air Temperature	Actual Slump	Concrete Truck No.
2:08 PM		Glover - Honsador	Halfway Bridge	N/A	87°	81°	5"	1

Concrete Placement Location: 6" Galvanized Steel Bollards - AT NLEP

Concrete Sample Location: 6" Galvanized Steel Bollard, South side of detention pond.

Notes & Comments: \_\_\_\_\_

N	er of Cylinders:	3	1	at	7	days	2	at	28	days	at	days	at	days	Hold
---	------------------	---	---	----	---	------	---	----	----	------	----	------	----	------	------

### Compressive Strength Test Data

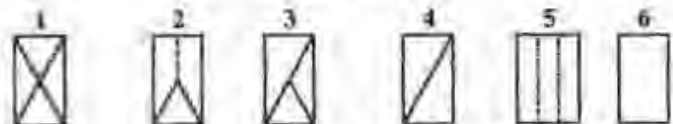
Mold Type: Cylinder

Cylinder No.	Test Age (days)	Test Date	Cure Type	Diameter (inch)	Length (inch)	Maximum Load (lbs)	Strength (psi)	Fracture Type
6	7	8/17/2010	H <sub>2</sub> O	6"	12"	68,139	2411	4
6	28	9/7/2010	H <sub>2</sub> O	6"	12"	101,575	3594	4
6	28	9/7/2010	H <sub>2</sub> O	6"	12"	104,863	3711	4

Comments / Special Instructions: \_\_\_\_\_

L. Technician: Anthony Frey

Fracture Type



**Appendix F-5**  
**Base Course (MDOF Area) Test Results**



Hayes & Associates

Geotechnical  
Engineering

Hayes & Associates, Inc.


79-1453 Kooloa Dr.  
Aiea, HI 96701  
tel: 808.485.0700  
fax: 808.485.0800

## MEMORANDUM

April 9, 2010  
W.O. 10-4907-0

H-Bag 7

TO: Mr. Chris Scott  
Geosyntec Consultants Inc.  
via email: [cscott@geosyntec.com](mailto:cscott@geosyntec.com)

FROM: David Kitamura 

RE: Laboratory Test Results for Base Course Material (Bag #7)  
Kekaha Landfill: Phase II Lateral Expansion  
Kekaha, Kauai, Hawaii

As requested, laboratory testing was performed on the base course material for the above referenced project. Geosyntec provided us with a bulk soil sample from the Goodfellow Brothers Kalaheo crusher stockpile for laboratory testing, consisting of a maximum density test (modified Proctor). This memo presents the results for the maximum density test, summarized below and presented in the graph on the next page.

Test

Modified Proctor (ASTM D1557)

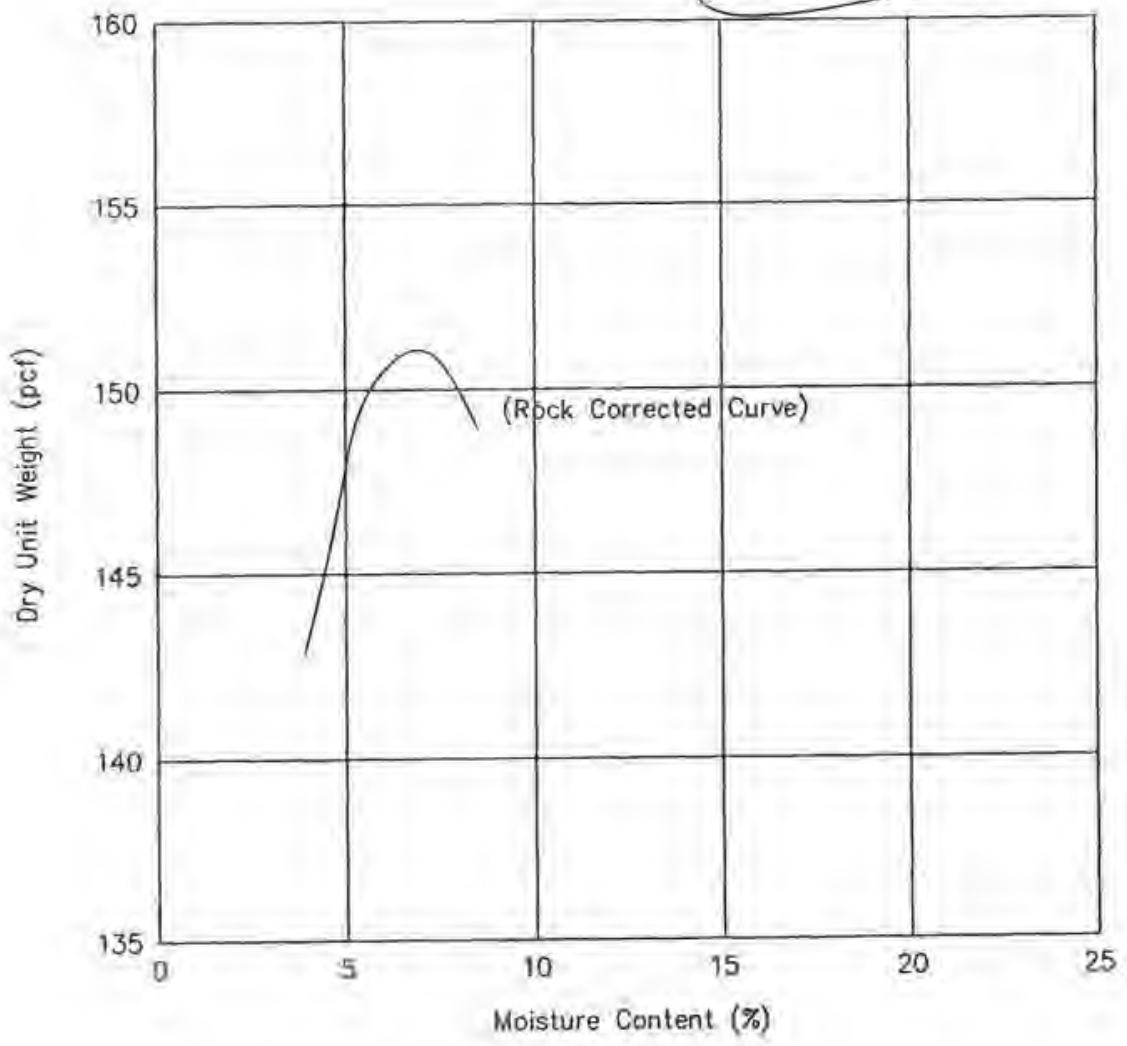
Result

Maximum density = 151.0 pcf  
Optimum moisture = 6.7%

Feel free to call us if you have any questions.

W:\07\memorandum\007Proctor\Bag7.wpd

H-Bag 7



Soil Data

Bag No.: 7  
Location: Goodfellow Kalaheo Crusher - Base Course  
Description: Well graded gravel with sand

Test Results

Maximum Dry Density: 151.0 pcf (Corrected)  
Optimum Moisture Content: 6.7% (Corrected)

W.O. 4907.0	Kekaha Landfill Expansion
Hirata & Associates, Inc.	<b>MODIFIED PROCTOR CURVE</b> Plate A



# **Appendix G**

## **Nuclear Density and Moisture Test Results**

<b>Appendix G-1</b>	<b>Cell 1 Test Results</b>
<b>Appendix G-2</b>	<b>12" CMP Backfill Test Results</b>
<b>Appendix G-3</b>	<b>MDOF Area Test Results</b>

**SUMMARY OF FIELD DENSITY TEST**

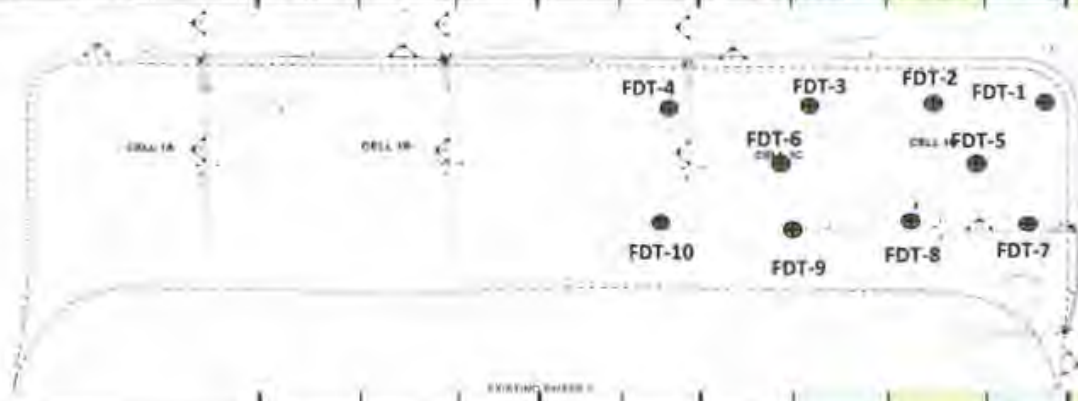
**PROJECT:** Kekaha Landfill  
**LOCATION:** Kekaha, Hawaii  
**CONTRACTOR:** Goodfellow Bros. Construction

**PROJECT NO.:** WG1298  
**TASK NO.:** 02  
**DATE:** 4-Feb-10

**SPECIFICATION REQUIREMENTS**

**SOURCE:** Onsite soil (NLEP - Excavation)  
**% COMPACTION:** 95% **MOISTURE RANGE:** +/- 2%  
**NUCLEAR GAUGE TYPE:** Troxler 3440 A **NUCLEAR GAUGE SERIAL NO.:** 20877

DATE OF TEST (day/mo)	TEST NO.	TEST LOCATION	LAB RESULTS			TYPE OF TEST		FIELD TEST RESULTS				PERCENT COMPACT (%)	PASS/ FAIL	RETEST NO.	QA ID
			SAMPLE NO.	MAX UNIT WT (pcf)	O.M.C. (%)	ASTM D-2922	ASTM D-1556	DEPTH/ ELEV (ft)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	F.M.C. (%)				
04/Feb	FDT-1	Cell 1D Subbase El: 7.4 msl	SB003	100	19.0			0.5	121.0	103.2	17.6	103	Pass		CAS
04/Feb	TW-001	Thin wall Shelby tube collected @ FDT-1	SB003	100	19.0			0.5	120.4	101.7	18.4	102	Pass		CAS
04/Feb	FDT-2	Cell 1D Subbase El: 7.6 msl	SB003	100	19.0			0.5	121.6	103.2	17.8	103	Pass		CAS
04/Feb	FDT-3	Cell 1C Subbase El: 7.6 ms	SB003	100	19.0			0.5	123.2	103.7	18.8	104	Pass		CAS
04/Feb	FDT-4	Cell 1C Subbase El: 7.8 ms	SB003	100	19.0			0.5	119.7	98.8	21.2	99	Pass		CAS
04/Feb	FDT-5	Cell 1D Subbase El: 7.8 msl	SB003	100	19.0			0.5	116.2	97.7	18.9	98	Pass		CAS
04/Feb	FDT-6	Cell 1C Subbase El: 7.8 msl	SB003	100	19.0			0.5	121.1	101.0	19.9	101	Pass		CAS
04/Feb	FDT-7	Cell 1D Subbase El: 7.6 msl	SB003	100	19.0			0.5	116.8	96.9	18.1	99	Pass		CAS
04/Feb	FDT-8	Cell 1D Subbase El: 7.6 msl	SB003	100	19.0			0.5	119.0	100.1	18.9	100	Pass		CAS
04/Feb	FDT-9	Cell 1C Subbase El: 7.6 msl	SB003	100	19.0			0.5	119.0	101.2	17.6	101	Pass		CAS
04/Feb	FDT-10	Cell 1C Subbase El: 7.6 msl	SB003	100	19.0			0.5	117.5	99.6	18.0	100	Pass		CAS





**SUMMARY OF FIELD DENSITY TEST**

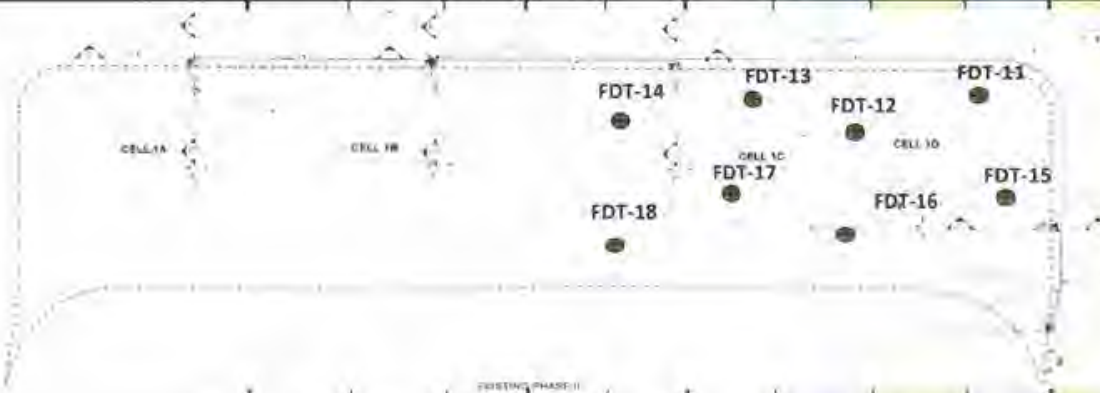
PROJECT: Kekaha Landfill  
 LOCATION: Kekaha, Hawaii  
 CONTRACTOR: Goodfellow Bros. Construction

PROJECT NO.: WG1298  
 TASK NO.: 02  
 DATE: 5-Feb-10

**SPECIFICATION REQUIREMENTS**

SOURCE: Onsite soil (NLEP - Excavation)  
 % COMPACTION: 95% MOISTURE RANGE: +/- 2%  
 NUCLEAR GAUGE TYPE: Troxler 3440 A NUCLEAR GAUGE SERIAL NO.: 20877

DATE OF TEST (day/mo)	TEST NO.	TEST LOCATION	LAB RESULTS			TYPE OF TEST		FIELD TEST RESULTS				PERCENT COMPACT (%)	PASS/FAIL	RETEST NO.	QA ID
			SAMPLE NO.	MAX UNIT WT (pcf)	O.M.C. (%)	ASTM D-2922	ASTM D-1556	DEPTH/ELEV (ft)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	F.M.C. (%)				
05/Feb	FDT-11	Cell 1D Subbase El: 8.0 msl	SB003	100	19.0			0.5	117.4	99.4	18.1	99	Pass		CAS
05/Feb	FDT-12	Cell 1D Subbase El: 8.9 msl	SB003	100	19.0			0.5	120.9	101.1	19.6	101	Pass		CAS
05/Feb	FDT-13	Cell 1C Subbase El: 8.5 msl	SB003	100	19.0			0.5	123.1	103.6	18.9	104	Pass		CAS
05/Feb	FDT-14	Cell 1C Subbase El: 8.5 msl	SB003	100	19.0			0.5	118.3	100.7	17.5	101	Pass		CAS
05/Feb	FDT-15	Cell 1D Subbase El: 9.0 msl	SB003	100	19.0			0.5	121.6	102.3	18.8	102	Pass		CAS
05/Feb	FDT-16	Cell 1D Subbase El: 9.5 msl	SB003	100	19.0			0.5	120.6	102.6	17.5	103	Pass		CAS
05/Feb	FDT-17	Cell 1C Subbase El: 9.0 msl	SB003	100	19.0			0.5	122.3	102.7	19.1	103	Pass		CAS
05/Feb	FDT-18	Cell 1C Subbase El: 9.5 msl	SB003	100	19.0			0.5	119.5	102.0	17.1	102	Pass		CAS



**SUMMARY OF FIELD DENSITY TEST**

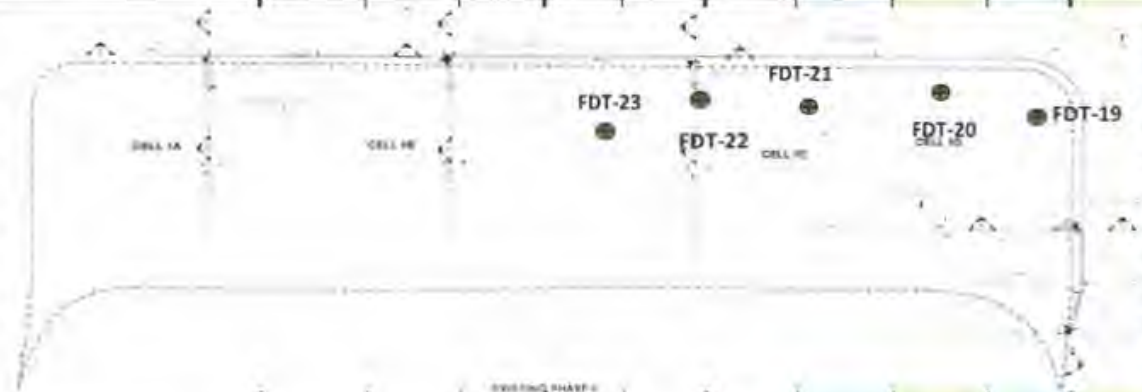
**PROJECT:** Kekaha Landfill  
**LOCATION:** Kekaha, Hawaii  
**CONTRACTOR:** Goodfellow Bros. Construction

**PROJECT NO.:** WG1298  
**TASK NO.:** 02  
**DATE:** 5-Feb-10

**SPECIFICATION REQUIREMENTS**

**SOURCE:** Onsite soil (NLEP - Excavation)  
**% COMPACTION:** 95% **MOISTURE RANGE:** +/- 2%  
**NUCLEAR GAUGE TYPE:** Troxler 3440 A **NUCLEAR GAUGE SERIAL NO.:** 20877

DATE OF TEST (day/mo)	TEST NO.	TEST LOCATION	LAB RESULTS			TYPE OF TEST		FIELD TEST RESULTS				PERCENT COMPACT (%)	PASS/ FAIL	RETEST NO.	QA ID
			SAMPLE NO.	MAX UNIT WT (pcf)	O.M.C. (%)	ASTM D-2922	ASTM D-1556	DEPTH/ ELEV (ft)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	F.M.C. (%)				
05/Feb	FDT-19	Cell 1D Subbase El: 9.0 msl	SB003	100	19.0			0.5	118.1	100.9	17.1	101	Pass		CAS
05/Feb	FDT-20	Cell 1D Subbase El: 9.5 msl	SB003	100	19.0			0.5	119.0	101.2	17.6	101	Pass		CAS
05/Feb	FDT-21	Cell 1C Subbase El: 9.5 msl	SB003	100	19.0			0.5	116.3	98.0	18.7	98	Pass		CAS
05/Feb	FDT-22	Cell 1C Subbase El: 9.5 msl	SB003	100	19.0			0.5	120.5	101.2	19.1	101	Pass		CAS
05/Feb	FDT-23	Cell 1D Subbase El: 9.5 msl	SB003	100	19.0			0.5	117.9	99.5	18.5	100	Pass		CAS



**SUMMARY OF FIELD DENSITY TEST**

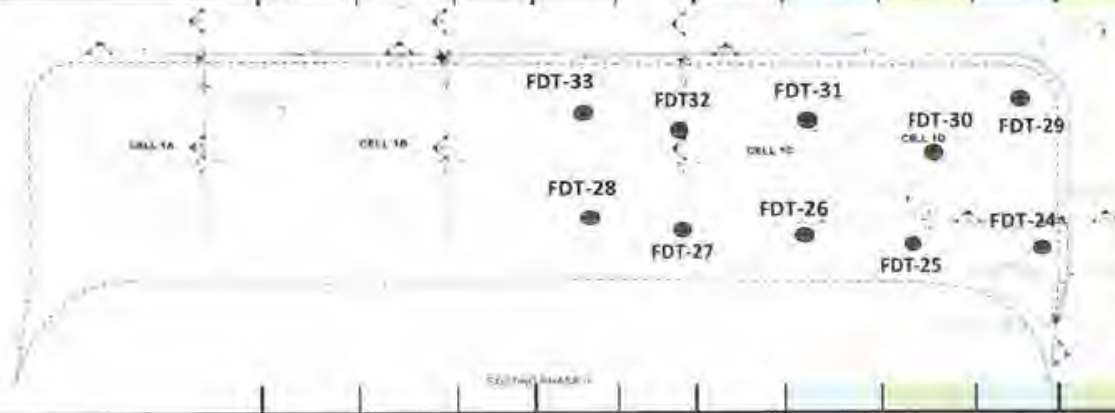
PROJECT: Kekaha Landfill  
 LOCATION: Kekaha, Hawaii  
 CONTRACTOR: Goodfellow Bros. Construction

PROJECT NO.: WG1298  
 TASK NO.: 02  
 DATE: 8-Feb-10

**SPECIFICATION REQUIREMENTS**

SOURCE: Onsite soil (New Infiltration Basin - Excavation)  
 % COMPACTION: 95% MOISTURE RANGE: +/- 2%  
 NUCLEAR GAUGE TYPE: Troxler 3440 A NUCLEAR GAUGE SERIAL NO.: 20877

DATE OF TEST (day/mo)	TEST NO.	TEST LOCATION	LAB RESULTS			TYPE OF TEST		FIELD TEST RESULTS				PERCENT COMPACT (%)	PASS/ FAIL	RETEST NO.	QA ID
			SAMPLE NO.	MAX UNIT WT (pcf)	O.M.C. (%)	ASTM D-2922	ASTM D-1556	DEPTH/ ELEV (ft)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	F.M.C. (%)				
08/Feb	FDT-24	Cell 1D Subbase El: 9.8 msl	SB003	100	19.0			0.5	125.3	105.9	18.5	106	Pass		CAS
08/Feb	FDT-25	Cell 1D Subbase El: 9.9 msl	SB003	100	19.0			0.5	118.4	100.5	17.9	101	Pass		CAS
08/Feb	FDT-26	Cell 1C Subbase El: 10.0 msl	SB003	100	19.0			0.5	117.7	99.5	18.3	100	Pass		CAS
08/Feb	FDT-27	Cell 1C Subbase El: 10.0 msl	SB003	100	19.0			0.5	113.6	96.4	17.9	96	Pass		CAS
08/Feb	FDT-28	Cell 1C Subbase El: 10.0 msl	SB003	100	19.0			0.5	120.3	101.1	19.0	101	Pass		CAS
08/Feb	TW-002	Thin wall Shelby tube collected @ FDT-28	SB003	100	19.0			3"	119.7	100.1	19.5	100	Pass		CAS
08/Feb	FDT-29	Cell 1D Subbase El: 10.5 msl	SB003	100	19.0			0.5	118.4	98.8	18.7	100	Pass		CAS
08/Feb	FDT-30	Cell 1D Subbase El: 10.5 msl	SB003	100	19.0			0.5	114.5	96.5	17.5	97	Pass		CAS
08/Feb	FDT-31	Cell 1C Subbase El: 10.5 msl	SB003	100	19.0			0.5	114.6	96.3	19.0	96	Pass		CAS
08/Feb	FDT-32	Cell 1C Subbase El: 10.5 msl	SB003	100	19.0			0.5	118.0	100.2	17.8	100	Pass		CAS
08/Feb	FDT-33	Cell 1C Subbase El: 10.5 msl	SB003	100	19.0			0.5	119.7	101.4	18.1	101	Pass		CAS



**SUMMARY OF FIELD DENSITY TEST**

PROJECT: Kekaha Landfill  
 LOCATION: Kekaha, Hawaii  
 CONTRACTOR: Goodfellow Bros. Construction

PROJECT NO.: WG1298  
 TASK NO.: 02  
 DATE: 9-Feb-10

**SPECIFICATION REQUIREMENTS**

SOURCE: Onsite soil (New Infiltration Basin - Excavation)  
 % COMPACTION: 95% MOISTURE RANGE: +/- 2%  
 NUCLEAR GAUGE TYPE: Troxler 3440 A NUCLEAR GAUGE SERIAL NO.: 20877

DATE OF TEST (day/mo)	TEST NO.	TEST LOCATION	LAB RESULTS			TYPE OF TEST		FIELD TEST RESULTS				PERCENT COMPACT (%)	PASS/ FAIL	RETEST NO.	QA ID
			SAMPLE NO.	MAX UNIT WT (pcf)	O.M.C (%)	ASTM D-2922	ASTM D-1556	DEPTH/ ELEV (ft)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	F.M.C (%)				
09/Feb	FDT-34	Cell 1D Subbase El: 11.4 msl	SB003	100	19.0			0.5	118.9	101.1	17.6	101	Pass		CAS
09/Feb	FDT-35	Cell 1D Subbase El: 11.9 msl	SB003	100	19.0			0.5	115.8	98.7	17.4	99	Pass		CAS
09/Feb	FDT-36	Cell 1C Subbase El: 11.0 msl	SB003	100	19.0			0.5	124.0	104.3	18.9	104	Pass		CAS
09/Feb	FDT-37	Cell 1C Subbase El: 11.0 msl	SB003	100	19.0			0.5	118.5	99.3	19.4	99	Pass		CAS
09/Feb	FDT-38	Cell 1C Subbase El: 11.0 msl	SB003	100	19.0			0.5	116.9	97.6	19.8	98	Pass		CAS
09/Feb	FDT-39	Cell 1D Subbase El: 11.0 msl	SB003	100	19.0			0.5	117.2	100.1	17.1	100	Pass		CAS

**SUMMARY OF FIELD DENSITY TEST**

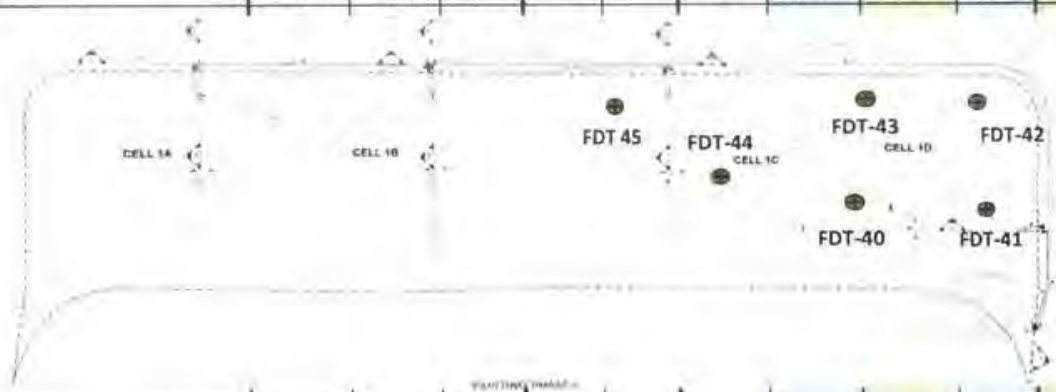
PROJECT: Kekaha Landfill  
 LOCATION: Kekaha, Hawaii  
 CONTRACTOR: Goodfellow Bros. Construction

PROJECT NO.: WG1298  
 TASK NO.: 02  
 DATE: 10-Feb-10

**SPECIFICATION REQUIREMENTS**

SOURCE: Onsite soil (New Infiltration Basin - Excavation)  
 % COMPACTION: 95% MOISTURE RANGE: +/- 2%  
 NUCLEAR GAUGE TYPE: Troxler 3440 A NUCLEAR GAUGE SERIAL NO.: 20877

DATE OF TEST (day/mo)	TEST NO.	TEST LOCATION	LAB RESULTS			TYPE OF TEST		FIELD TEST RESULTS				PERCENT COMPACT (%)	PASS/ FAIL	RETEST NO.	QA ID
			SAMPLE NO.	MAX UNIT WT (pcf)	O.M.C. (%)	ASTM D-2922	ASTM D-1556	DEPTH/ ELEV (ft)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	F.M.C. (%)				
10/Feb	FDT-40	Cell 1D Subbase El: 11.5 msl	SB003	100	19.0			0.5	121.2	102.3	18.5	102	Pass		CAS
10/Feb	FDT-41	Cell 1D Subbase El: 11.5 msl	SB003	100	19.0			0.5	119.8	102.3	17.1	102	Pass		CAS
10/Feb	FDT-42	Cell 1D Subbase El: 12.5 msl	SB003	100	19.0			0.5	122.3	102.2	19.8	102	Pass		CAS
10/Feb	FDT-43	Cell 1D Subbase El: 12.5 msl	SB003	100	19.0			0.5	123.4	103.5	19.2	104	Pass		CAS
10/Feb	FDT-44	Cell 1C Subbase El: 12.5 msl	SB003	100	19.0			0.5	119.5	101.8	17.4	102	Pass		CAS
10/Feb	FDT-45	Cell 1D Subbase El: 12.5 msl	SB003	100	19.0			0.5	121.5	103.8	17.1	104	Pass		CAS



**SUMMARY OF FIELD DENSITY TEST**

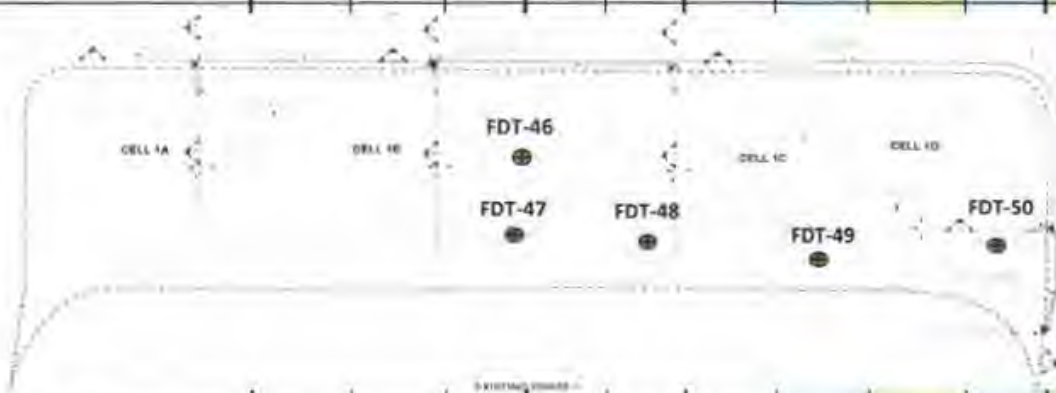
PROJECT: Kekaha Landfill  
 LOCATION: Kekaha, Hawaii  
 CONTRACTOR: Goodfellow Bros. Construction

PROJECT NO.: WG1298  
 TASK NO.: 02  
 DATE: 11-Feb-10

**SPECIFICATION REQUIREMENTS**

SOURCE: Onsite soil (New Infiltration Basin - Excavation)  
 % COMPACTION: 95% MOISTURE RANGE: +/- 2%  
 NUCLEAR GAUGE TYPE: Troxler 3440 A NUCLEAR GAUGE SERIAL NO.: 20877

DATE OF TEST (day/mo)	TEST NO.	TEST LOCATION	LAB RESULTS			TYPE OF TEST		FIELD TEST RESULTS				PERCENT COMPACT (%)	PASS/ FAIL	RETEST NO.	QA ID
			SAMPLE NO.	MAX UNIT WT (pcf)	O.M.C. (%)	ASTM D-2922	ASTM D-1556	DEPTH/ ELEV (ft)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	F.M.C. (%)				
11/Feb	FDT-46	Cell 1D Subbase El: 12.5 msl	SB003	100	19.0			0.5	121.2	99.8	21.4	100	Pass		CAS
11/Feb	FDT-47	Cell 1D Subbase El: 12.5 msl	SB003	100	19.0			0.5	113.3	96.6	17.3	97	Pass		CAS
11/Feb	FDT-48	Cell 1C Subbase El: 12.5 msl	SB003	100	19.0			0.5	120.6	100.7	19.7	101	Pass		CAS
11/Feb	FDT-49	Cell 1D Subbase El: 12.5 msl	SB003	100	19.0			0.5	115.8	98.1	18.1	98	Pass		CAS
11/Feb	FDT-50	Cell 1C Subbase El: 12.5 msl	SB003	100	19.0			0.5	119.2	101.5	17.4	102	Pass		CAS
11/Feb	TW-003	Thin wall Shelby tube collected @ FDT-50	SB003	100	19.0			3"	117.3	100.2	17.0	100	Pass		CAS



**SUMMARY OF FIELD DENSITY TEST**

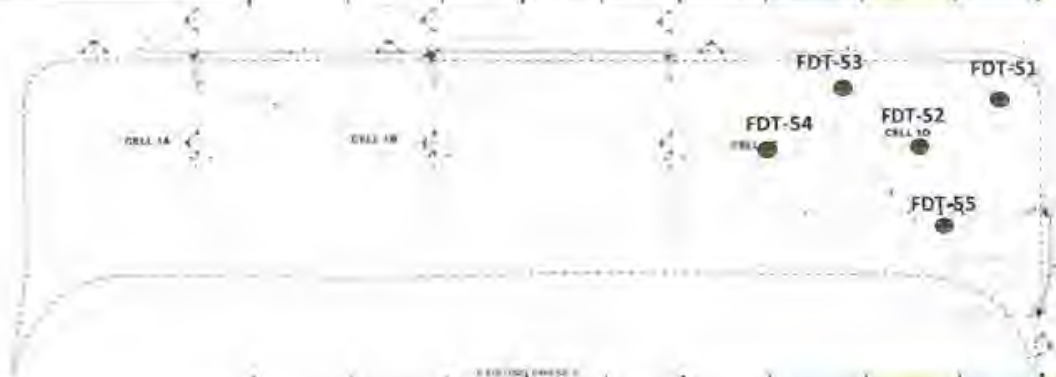
**PROJECT:** Kekaha Landfill  
**LOCATION:** Kekaha, Hawaii  
**CONTRACTOR:** Goodfellow Bros. Construction

**PROJECT NO.:** WG1298  
**TASK NO.:** 02  
**DATE:** 12-Feb-10

**SPECIFICATION REQUIREMENTS**

**SOURCE:** Onsite soil (New Infiltration Basin - Excavation)  
**% COMPACTION:** 95% **MOISTURE RANGE:** +/- 2%  
**NUCLEAR GAUGE TYPE:** Troxler 3440 A **NUCLEAR GAUGE SERIAL NO.:** 20877

DATE OF TEST (day/mo)	TEST NO.	TEST LOCATION	LAB RESULTS			TYPE OF TEST		FIELD TEST RESULTS				PERCENT COMPACT (%)	PASS/ FAIL	RETEST NO.	QA ID
			SAMPLE NO.	MAX UNIT WT (pcf)	O.M.C. (%)	ASTM D-2922	ASTM D-1556	DEPTH/ ELEV (ft)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	F.M.C. (%)				
12/Feb	FDT-51	Cell 1D Subbase El: 13.0 msl	SB003	100	19.0			0.5	119.8	101.2	18.2	101	Pass		CAS
12/Feb	FDT-52	Cell 1D Subbase El: 13.0 msl	SB003	100	19.0			0.5	118.3	99.0	19.5	99	Pass		CAS
12/Feb	FDT-53	Cell 1D Subbase El: 13.0 msl	SB003	100	19.0			0.5	120.4	102.2	17.8	102	Pass		CAS
12/Feb	FDT-54	Cell 1C Subbase El: 13.0 msl	SB003	100	19.0			0.5	115.8	98.7	17.4	99	Pass		CAS
12/Feb	FDT-55	Cell 1D Subbase El: 13.0 msl	SB003	100	19.0			0.5	123.0	103.1	19.3	103	Pass		CAS



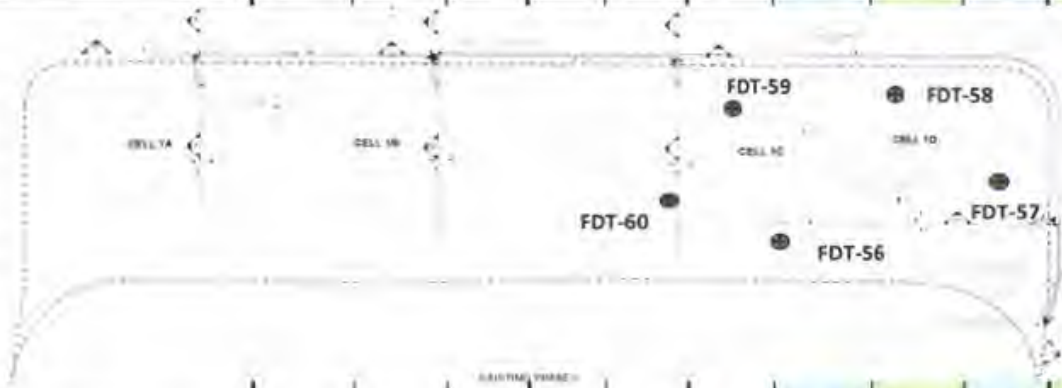
**SUMMARY OF FIELD DENSITY TEST**

PROJECT: Kekaha Landfill PROJECT NO.: WG1298  
 LOCATION: Kekaha, Hawaii TASK NO.: 02  
 CONTRACTOR: Goodfellow Bros. Construction DATE: 22-Feb-10

**SPECIFICATION REQUIREMENTS**

SOURCE: Onsite soil (New Infiltration Basin - Excavation)  
 % COMPACTION: 95% MOISTURE RANGE: +/- 2%  
 NUCLEAR GAUGE TYPE: Troxler 3440 A NUCLEAR GAUGE SERIAL NO.: 20877

DATE OF TEST (day/mo)	TEST NO.	TEST LOCATION	LAB RESULTS			TYPE OF TEST		FIELD TEST RESULTS				PERCENT COMPACT (%)	PASS/ FAIL	RETEST NO.	QA ID
			SAMPLE NO.	MAX UNIT WT (pcf)	O.M.C. (%)	ASTM D-2922	ASTM D-1556	DEPTH/ ELEV (ft)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	F.M.C. (%)				
22/Feb	FDT-56	Cell 1C Subbase El. 13.5 msl	SB003	100	19.0			0.5	119.7	101.2	18.3	101	Pass		CAS
22/Feb	FDT-57	Cell 1C Subbase El. 13.5 msl	SB003	100	19.0			0.5	121.5	103.4	17.6	103	Pass		CAS
22/Feb	FDT-58	Cell 1C Subbase El. 13.5 msl	SB003	100	19.0			0.5	119.1	100.2	18.9	100	Pass		CAS
22/Feb	FDT-59	Cell 1C Subbase El. 13.5 msl	SB003	100	19.0			0.5	124.0	104.1	19.2	104	Pass		CAS
22/Feb	FDT-60	Cell 1C Subbase El. 13.5 msl	SB003	100	19.0			0.5	116.8	99.8	17.1	100	Pass		CAS





**SUMMARY OF FIELD DENSITY TEST**

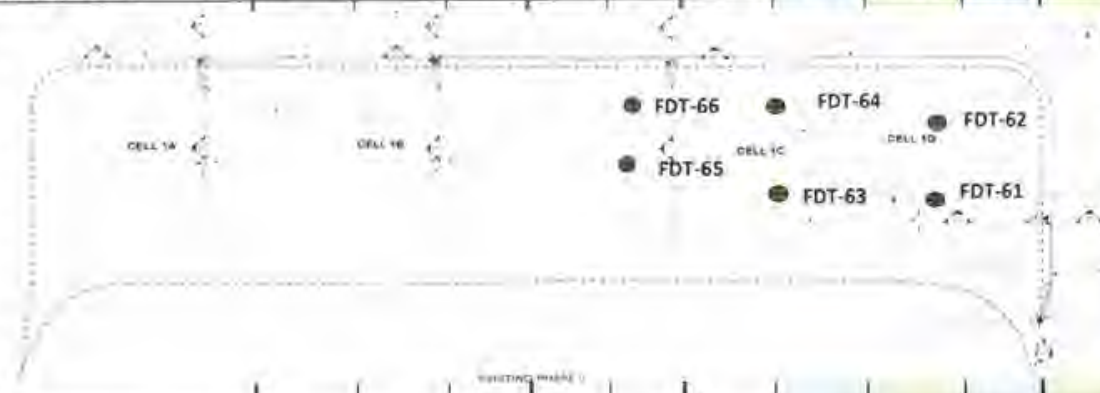
**PROJECT:** Kekaha Landfill  
**LOCATION:** Kekaha, Hawaii  
**CONTRACTOR:** Goodfellow Bros. Construction

**PROJECT NO.:** WG1298  
**TASK NO.:** 02  
**DATE:** 23-Feb-10

**SPECIFICATION REQUIREMENTS**

**SOURCE:** Onsite soil (New Infiltration Basin - Excavation)  
**% COMPACTION:** 95% **MOISTURE RANGE:** +/- 2%  
**NUCLEAR GAUGE TYPE:** Troxler 3440 A **NUCLEAR GAUGE SERIAL NO.:** 20877

DATE OF TEST (day/mo)	TEST NO.	TEST LOCATION	LAB RESULTS			TYPE OF TEST		FIELD TEST RESULTS				PERCENT COMPACT (%)	PASS/FAIL	RETEST NO.	QA ID
			SAMPLE NO.	MAX UNIT WT (pcf)	O.M.C. (%)	ASTM D-2922	ASTM D-1556	DEPTH/ELEV (ft)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	F.M.C. (%)				
23/Feb	FDT-61	Cell 1D Subbase El: 14.0 msl	SB003	100	19.0			0.5	116.4	99.0	17.6	99	Pass		CAS
23/Feb	FDT-62	Cell 1D Subbase El: 14.0 msl	SB003	100	19.0			0.5	119.7	101.1	18.4	101	Pass		CAS
23/Feb	FDT-63	Cell 1D Subbase El: 14.0 msl	SB003	100	19.0			0.5	123.2	103.2	19.4	103	Pass		CAS
23/Feb	FDT-64	Cell 1D Subbase El: 14.0 msl	SB003	100	19.0			0.5	118.4	100.2	18.2	100	Pass		CAS
23/Feb	FDT-65	Cell 1D Subbase El: 14.0 msl	SB003	100	19.0			0.5	119.6	102.3	17.0	102	Pass		CAS
23/Feb	FDT-66	Cell 1D Subbase El: 14.0 msl	SB003	100	19.0			0.5	117.2	100.0	17.2	100	Pass		CAS
23/Feb	TW-004	Thin wall Shelby tube collected @ FDT-66	SB003	100	19.0			0.5	116.6	99.3	16.9	100	Pass		CAS



**SUMMARY OF FIELD DENSITY TEST**

PROJECT: Kekaha Landfill PROJECT NO.: WG1298  
 LOCATION: Kekaha, Hawaii TASK NO.: 02  
 CONTRACTOR: Goodfellow Bros. Construction DATE: 2-Mar-10

**SPECIFICATION REQUIREMENTS**

SOURCE: Onsite soil (New Infiltration Basin - Excavation)  
 % COMPACTION: 95% MOISTURE RANGE: +/- 2%  
 NUCLEAR GAUGE TYPE: Troxler 3440 A NUCLEAR GAUGE SERIAL NO.: 20877

DATE OF TEST (day/mo)	TEST NO.	TEST LOCATION	LAB RESULTS			TYPE OF TEST		FIELD TEST RESULTS				PERCENT COMPACT (%)	PASS/ FAIL	RETEST NO.	QA ID
			SAMPLE NO.	MAX UNIT WT (pcf)	O.M.C. (%)	ASTM D-2922	ASTM D-1556	DEPTH/ELEV (ft)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	F.M.C. (%)				
02/Mar	FDT-67	Cell 1D perimter berm El: 11.6 msl	SB003	100	19.0			0.5	132.0	112.7	17.2	113	Pass		CAS
02/Mar	FDT-68	Cell 1D perimter berm El: 11.6 msl	SB003	100	19.0			0.5	130.3	110.2	18.3	110	Pass		CAS
02/Mar	FDT-69	Cell 1D perimter berm El: 11.6 msl	SB003	100	19.0			0.5	135.4	113.8	19.0	114	Pass		CAS
02/Mar	FDT-70	Cell 1D perimter berm El: 11.6 msl	SB003	100	19.0			0.5	123.4	114.5	17.3	115	Pass		CAS
02/Mar	FDT-71	Cell 1D perimter berm El: 11.6 msl	SB003	100	19.0			0.5	125.3	105.5	18.8	106	Pass		CAS
02/Mar	FDT-72	Cell 1D perimter berm El: 11.6 msl	SB003	100	19.0			0.5	127.5	106.7	19.5	107	Pass		CAS



**SUMMARY OF FIELD DENSITY TEST**

**PROJECT:** Kekaha Landfill  
**LOCATION:** Kekaha, Hawaii  
**CONTRACTOR:** Goodfellow Bros. Construction

**PROJECT NO.:** WG1298  
**TASK NO.:** 02  
**DATE:** 3-Mar-10

**SPECIFICATION REQUIREMENTS**

**SOURCE:** Onsite soil (New Infiltration Basin - Excavation)  
**% COMPACTION:** 95% **MOISTURE RANGE:** +/- 2%  
**NUCLEAR GAUGE TYPE:** Troxler 3440 A **NUCLEAR GAUGE SERIAL NO.:** 20877

DATE OF TEST (day/mo)	TEST NO.	TEST LOCATION	LAB RESULTS			TYPE OF TEST		FIELD TEST RESULTS				PERCENT COMPACT (%)	PASS/ FAIL	RETEST NO.	QA ID
			SAMPLE NO.	MAX UNIT WT (pcf)	O.M.C. (%)	ASTM D-2922	ASTM D-1558	DEPTH/ ELEV (ft)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	F.M.C. (%)				
03/Mar	FDT-73	Cell 1D perimter berm El: 12.0 msl	SB003	100	19.0			0.5	114.4	96.1	19.1	96	Pass		CAS
03/Mar	FDT-74	Cell 1D perimter berm El: 12.0 msl	SB003	100	19.0			0.5	117.1	98.8	18.6	99	Pass		CAS
03/Mar	FDT-75	Cell 1C perimter berm El: 12.0 msl	SB003	100	19.0			0.5	117.7	98.9	19.0	99	Pass		CAS
03/Mar	FDT-76	Cell 1D perimter berm El: 12.6 msl	SB003	100	19.0			0.5	131.0	108.9	20.3	109	Pass		CAS
03/Mar	FDT-77	Cell 1D perimter berm El: 12.6 msl	SB003	100	19.0			0.5	116.6	98.1	18.9	98	Pass		CAS
03/Mar	FDT-78	Cell 1C perimter berm El: 12.6 msl	SB003	100	19.0			0.5	115.5	98.4	17.4	98	Pass		CAS
03/Mar	FDT-79	Cell 1D perimter berm El: 12.0 msl	SB003	100	19.0			0.5	115.9	99.1	17.0	99	Pass		CAS
03/Mar	FDT-80	Cell 1D perimter berm El: 12.0 msl	SB003	100	19.0			0.5	118.3	101.1	17.1	101	Pass		CAS
03/Mar	FDT-81	Cell 1D perimter berm El: 13.0 msl	SB003	100	19.0			0.5	121.1	103.2	17.3	103	Pass		CAS
03/Mar	FDT-82	Cell 1D perimter berm El: 13.0 msl	SB003	100	19.0			0.5	117.3	100.1	17.2	100	Pass		CAS

**SUMMARY OF FIELD DENSITY TEST**

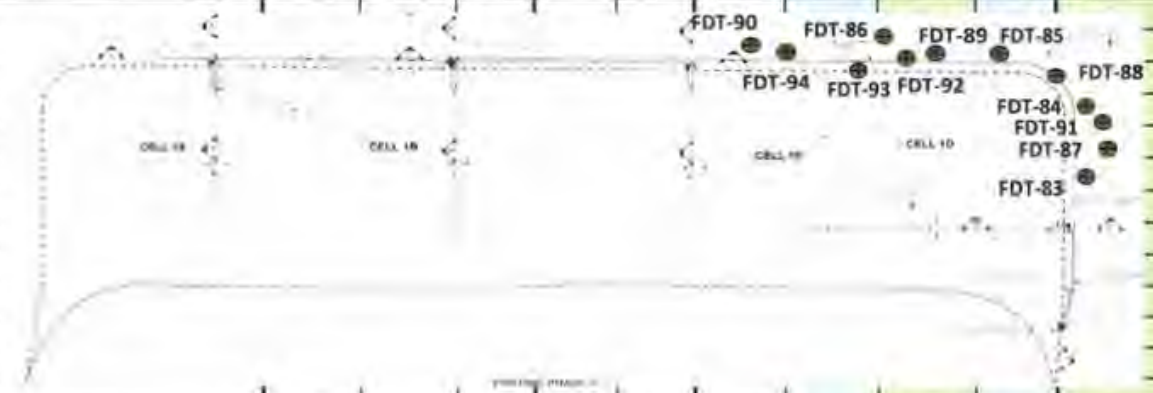
PROJECT: Kekaha Landfill  
 LOCATION: Kekaha, Hawaii  
 CONTRACTOR: Goodfellow Bros. Construction

PROJECT NO.: WG1298  
 TASK NO.: 02  
 DATE: 4-Mar-10

**SPECIFICATION REQUIREMENTS**

SOURCE: Onsite soil (New Infiltration Basin - Excavation)  
 % COMPACTION: 95% MOISTURE RANGE: +/- 2%  
 NUCLEAR GAUGE TYPE: Troxler 3440 A NUCLEAR GAUGE SERIAL NO.: 20877

DATE OF TEST (day/mo)	TEST NO.	TEST LOCATION	LAB RESULTS			TYPE OF TEST		FIELD TEST RESULTS				PERCENT COMPACT (%)	PASS/ FAIL	RETEST NO.	QA ID
			SAMPLE NO.	MAX UNIT WT (pcf)	O.M.C. (%)	ASTM D-2922	ASTM D-1556	DEPTH/ ELEV (ft)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	F.M.C. (%)				
04/Mar	FDT-83	Cell 1D perimeter berm El: 13.6 msl	SB003	100	19.0			0.5	113.1	95.9	18.0	96	Pass		CAS
04/Mar	FDT-84	Cell 1D perimeter berm El: 13.6 msl	SB003	100	19.0			0.5	120.8	101.3	19.3	101	Pass		CAS
04/Mar	FDT-85	Cell 1D perimeter berm El: 13.6 msl	SB003	100	19.0			0.5	116.0	96.5	20.3	97	Pass		CAS
04/Mar	FDT-86	Cell 1C perimeter berm El: 13.6 msl	SB003	100	19.0			0.5	114.4	97.6	17.3	98	Pass		CAS
04/Mar	FDT-87	Cell 1D perimeter berm El: 14.0 msl	SB003	100	19.0			0.5	118.7	100.2	18.5	100	Pass		CAS
04/Mar	FDT-88	Cell 1D perimeter berm El: 14.0 msl	SB003	100	19.0			0.5	125.3	107.2	16.9	107	Pass		CAS
04/Mar	FDT-89	Cell 1D perimeter berm El: 14.0 msl	SB003	100	19.0			0.5	124.0	106.2	16.8	106	Pass		CAS
04/Mar	FDT-90	Cell 1C perimeter berm El: 14.0 msl	SB003	100	19.0			0.5	118.1	99.1	19.2	99	Pass		CAS
04/Mar	FDT-91	Cell 1D perimeter berm El: 14.5 msl	SB003	100	19.0			0.5	121.8	101.4	20.2	101	Pass		CAS
04/Mar	TW-005	Thin wall Shelby tube collected @ FDT-91	SB003	100	19.0			3"				0			CAS
04/Mar	FDT-92	Cell 1D perimeter berm El: 14.6 msl	SB003	100	19.0			0.5	113.2	95.6	18.5	96	Pass		CAS
04/Mar	FDT-93	Cell 1D perimeter berm El: 14.6 msl	SB003	100	19.0			0.5	114.8	97.6	17.7	98	Pass		CAS
04/Mar	FDT-94	Cell 1C perimeter berm El: 14.6 msl	SB003	100	19.0			0.5	118.0	99.2	19.0	99	Pass		CAS



**SUMMARY OF FIELD DENSITY TEST**

PROJECT: Kekaha Landfill PROJECT NO.: WG1298  
 LOCATION: Kekaha, Hawaii TASK NO.: 02  
 CONTRACTOR: Goodfellow Bros. Construction DATE: 5-Mar-10

**SPECIFICATION REQUIREMENTS**

SOURCE: Onsite soil (New Infiltration Basin - Excavation)  
 % COMPACTION: 95% MOISTURE RANGE: +/- 2%  
 NUCLEAR GAUGE TYPE: Troxler 3440 A NUCLEAR GAUGE SERIAL NO.: 20877

DATE OF TEST (day/mo)	TEST NO.	TEST LOCATION	LAB RESULTS			TYPE OF TEST		FIELD TEST RESULTS				PERCENT COMPACT (%)	PASS/ FAIL	RETEST NO.	QA ID
			SAMPLE NO.	MAX UNIT WT (pcf)	O.M.C. (%)	ASTM D-2922	ASTM D-1556	DEPTH/ELEV (ft)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	F.M.C. (%)				
05/Mar	FDT-95	Cell 1D perimter berm El: 15.0 msl	SB003	100	19.0			0.5	120.9	101.0	19.6	101	Pass		CAS
05/Mar	FDT-96	Cell 1D perimter berm El: 15.0 msl	SB003	100	19.0			0.5	118.0	98.3	20.1	98	Pass		CAS
05/Mar	FDT-97	Cell 1D perimter berm El: 15.0 msl	SB003	100	19.0			0.5	118.8	97.9	21.0	98	Pass		CAS
05/Mar	FDT-98	Cell 1C perimter berm El: 15.0 msl	SB003	100	19.0			0.5	117.6	97.1	21.0	97	Pass		CAS
05/Mar	FDT-99	Cell 1D perimter berm El: 15.5 msl	SB003	100	19.0			0.5	116.2	97.2	19.6	97	Pass		CAS
05/Mar	FDT-100	Cell 1D perimter berm El: 15.5 msl	SB003	100	19.0			0.5	117.2	98.2	19.4	98	Pass		CAS
05/Mar	FDT-101	Cell 1D perimter berm El: 15.5 msl	SB003	100	19.0			0.5	116.9	97.9	19.4	98	Pass		CAS
05/Mar	FDT-102	Cell 1C perimter berm El: 15.5 msl	SB003	100	19.0			0.5	126.2	107.6	17.3	108	Pass		CAS
05/Mar	FDT-103	Cell 1D perimter berm El: 16.0 msl	SB003	100	19.0			0.5	119.4	100.5	18.7	101	Pass		CAS
05/Mar	FDT-104	Cell 1D perimter berm El: 16.0 msl	SB003	100	19.0			0.5	116.6	99.7	17.0	100	Pass		CAS
05/Mar	FDT-105	Cell 1D perimter berm El: 16.0 msl	SB003	100	19.0			0.5	116.5	98.7	18.1	99	Pass		CAS
05/Mar	FDT-106	Cell 1C perimter berm El: 16.0 msl	SB003	100	19.0			0.5	118.5	100.1	18.4	100	Pass		CAS

The site map shows four cells labeled CELL 1A, CELL 1B, CELL 1C, and CELL 1D. Test locations are marked with dots and labeled: FDT-95, FDT-96, FDT-97, FDT-98, FDT-99, FDT-100, FDT-101, FDT-102, FDT-103, FDT-104, FDT-105, FDT-106. The locations are distributed across the cells, with FDT-95-98 along the perimeter of Cell 1D, FDT-99-101 along the perimeter of Cell 1D, FDT-102 along the perimeter of Cell 1C, and FDT-103-106 along the perimeter of Cell 1C.

**SUMMARY OF FIELD DENSITY TEST**

PROJECT: Kekaha Landfill  
 LOCATION: Kekaha, Hawaii  
 CONTRACTOR: Goodfellow Bros. Construction

PROJECT NO.: WG1298  
 TASK NO.: 02  
 DATE: 8-Mar-10

**SPECIFICATION REQUIREMENTS**

SOURCE: Onsite soil (New Infiltration Basin - Excavation)  
 % COMPACTION: 95% MOISTURE RANGE: +/- 2%  
 NUCLEAR GAUGE TYPE: Troxler 3440 A NUCLEAR GAUGE SERIAL NO.: 20877

DATE OF TEST (day/mo)	TEST NO.	TEST LOCATION	LAB RESULTS			TYPE OF TEST		FIELD TEST RESULTS				PERCENT COMPACT (%)	PASS/ FAIL	RETEST NO.	QA ID
			SAMPLE NO.	MAX UNIT WT (pcf)	D.M.C. (%)	ASTM D-2922	ASTM D-1556	DEPTH/ ELEV (ft)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	F.M.C. (%)				
08/Mar	FDT-107	Cell 1D perimter berm El: 17.0 msl	SB003	100	19.0			0.5	117.3	97.9	19.8	98	Pass		CAS
08/Mar	FDT-108	Cell 1D perimter berm El: 17.0 msl	SB003	100	19.0			0.5	116.2	97.9	18.7	96	Pass		CAS
08/Mar	FDT-109	Cell 1D perimter berm El: 17.0 msl	SB003	100	19.0			0.5	118.2	98.3	20.2	98	Pass		CAS
08/Mar	FDT-110	Cell 1C perimter berm El: 17.0 msl	SB003	100	19.0			0.5	116.7	99.0	17.9	99	Pass		CAS
08/Mar	FDT-111	Cell 1D perimter berm El: 18.0 msl	SB003	100	19.0			0.5	115.7	97.6	18.6	98	Pass		CAS
08/Mar	FDT-112	Cell 1D perimter berm El: 18.0 msl	SB003	100	19.0			0.5	116.0	98.0	18.4	98	Pass		CAS
08/Mar	FDT-113	Cell 1D perimter berm El: 18.0 msl	SB003	100	19.0			0.5	120.8	101.1	19.3	101	Pass		CAS
08/Mar	FDT-114	Cell 1C perimter berm El: 18.5 msl	SB003	100	19.0			0.5	117.6	97.5	20.7	98	Pass		CAS
08/Mar	TW-006	Thin wall Shelby tube collected @ FDT-114	SB003	100	19.0			3"	117.7	97.9	20.2	96	Pass		CAS
08/Mar	FDT-115	Cell 1D perimter berm El: 18.5 msl	SB003	100	19.0			0.5	115.4	96.0	20.3	96	Pass		CAS

**SUMMARY OF FIELD DENSITY TEST**

PROJECT: Kekaha Landfill PROJECT NO.: WG1298  
 LOCATION: Kekaha, Hawaii TASK NO.: 02  
 CONTRACTOR: Goodfellow Bros. Construction DATE: 15-Apr-10

**SPECIFICATION REQUIREMENTS**

SOURCE: Onsite soil (New Infiltration Basin - Excavation)  
 % COMPACTION: 95% MOISTURE RANGE: +/- 2%  
 NUCLEAR GAUGE TYPE: Troxler 3440 A NUCLEAR GAUGE SERIAL NO.: 20877

DATE OF TEST (day/mo)	TEST NO.	TEST LOCATION	LAB RESULTS			TYPE OF TEST		FIELD TEST RESULTS				PERCENT COMPACT (%)	PASS/FAIL	RETEST NO.	QA ID
			SAMPLE NO.	MAX UNIT WT (pcf)	O.M.C. (%)	ASTM D-2922	ASTM D-1556	DEPTH/ELEV (ft)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	F.M.C. (%)				
14/Apr	FDT-116	Sump 1C gravity flow trench backfill	SB003	100	19.0			0.5	117.9	100.0	17.9	100	Pass		CAS
14/Apr	FDT-117	Sump 1C gravity flow trench backfill	SB003	100	19.0			0.5	118.2	101.0	17.0	101	Pass		CAS
15/Apr	FDT-118	Sump 1C gravity flow trench backfill	SB003	100	19.0			0.5	115.1	97.5	18.1	98	Pass		CAS
15/Apr	FDT-119	Sump 1C gravity flow trench backfill	SB003	100	19.0			0.5	116.3	99.1	17.4	99	Pass		CAS
15/Apr	FDT-120	Sump 1C gravity flow trench backfill	SB003	100	19.0			0.5	114.5	97.1	18.0	97	Pass		CAS





**SUMMARY OF FIELD DENSITY TEST**

PROJECT: Kekaha Landfill  
 LOCATION: Kekaha, Hawaii  
 CONTRACTOR: Goodfellow Bros. Construction

PROJECT NO.: WG1298  
 TASK NO.: 02  
 DATE: 16-Apr-10

**SPECIFICATION REQUIREMENTS**

SOURCE: Onsite soil (New Infiltration Basin - Excavation)  
 % COMPACTION: 95% MOISTURE RANGE: +/- 2%  
 NUCLEAR GAUGE TYPE: Troxler 3440 A NUCLEAR GAUGE SERIAL NO.: 20877

DATE OF TEST (day/mo)	TEST NO.	TEST LOCATION	LAB RESULTS			TYPE OF TEST		FIELD TEST RESULTS				PERCENT COMPACT (%)	PASS/ FAIL	RETEST NO.	QA ID
			SAMPLE NO	MAX UNIT WT (pcf)	O.M.C. (%)	ASTM D-2922	ASTM D-1556	DEPTH/ ELEV (ft)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	F.M.C. (%)				
16/Apr	FDT-121	Sump 1D gravity flow trench backfill	SB003	100	19.0			0.5	114.6	96.0	19.4	96	Pass		CAS
16/Apr	FDT-122	Sump 1D gravity flow trench backfill	SB003	100	19.0			0.5	121.0	101.0	19.9	101	Pass		CAS
16/Apr	FDT-123	Sump 1D gravity flow trench backfill	SB003	100	19.0			0.5	124.4	105.0	18.5	105	Pass		CAS
16/Apr	FDT-124	Sump 1D gravity flow trench backfill	SB003	100	19.0			0.5	118.1	100.0	18.1	100	Pass		CAS





**SUMMARY OF FIELD DENSITY TEST**

PROJECT: Kekaha Landfill  
 LOCATION: Kekaha, Hawaii  
 CONTRACTOR: Goodfellow Bros. Construction

PROJECT NO.: WG1298  
 TASK NO.: 02  
 DATE: 17-Apr-10

**SPECIFICATION REQUIREMENTS**

SOURCE: Onsite soil (New Infiltration Basin - Excavation)

% COMPACTION: 95% MOISTURE RANGE: +/- 2%

NUCLEAR GAUGE TYPE: Troxler 3440 A NUCLEAR GAUGE SERIAL NO.: 20877

DATE OF TEST (day/mo)	TEST NO.	TEST LOCATION	LAB RESULTS			TYPE OF TEST		FIELD TEST RESULTS				PERCENT COMPACT (%)	PASS/FAIL	RETEST NO.	QA ID
			SAMPLE NO.	MAX UNIT WT (pcf)	O.M.C. (%)	ASTM D-2922	ASTM D-1556	DEPTH/ELEV (ft)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	F.M.C. (%)				
17/Apr	FDT-125	Cell 1D perimter berm El: 12.0 msl	SB003	100	19.0			0.5	117.9	99.7	18.3	100	Pass		CAS
17/Apr	FDT-126	Cell 1C perimter berm El: 12.0 msl	SB003	100	19.0			0.5	114.4	97.1	17.9	97	Pass		CAS
17/Apr	FDT-127	Cell 1C perimter berm El: 12.5 msl	SB003	100	19.0			0.5	114.8	96.3	19.3	96	Pass		CAS
17/Apr	FDT-128	Cell 1D perimter berm El: 12.5 msl	SB003	100	19.0			0.5	120.3	101.1	19.0	101	Pass		CAS
17/Apr	FDT-129	Cell 1C perimter berm El: 13.0 msl	SB003	100	19.0			0.5	119.1	100.4	18.7	100	Pass		CAS
17/Apr	FDT-130	Cell 1D perimter berm El: 13.0 msl	SB003	100	19.0			0.5	121.7	103.2	18.1	103	Pass		CAS
17/Apr	FDT-131	Cell 1D perimter berm El: 13.5 msl	SB003	100	19.0			0.5	120.0	100.9	19.0	101	Pass		CAS
17/Apr	FDT-133	Cell 1D perimter berm El: 14 msl	SB003	100	19.0			0.5	120.5	101.3	19.0	101	Pass		CAS
17/Apr	FDT-134	Cell 1D perimter berm El: 14.5 msl	SB003	100	19.0			0.5	114.7	96.5	18.9	97	Pass		CAS
17/Apr	FDT-135	Cell 1D perimter berm El: 15.0 msl	SB003	100	19.0			0.5	114.8	97.4	17.9	97	Pass		CAS



**SUMMARY OF FIELD DENSITY TEST**

PROJECT: Kekaha Landfill  
 LOCATION: Kekaha, Hawaii  
 CONTRACTOR: Goodfellow Bros. Construction

PROJECT NO.: WG1298  
 TASK NO.: 02  
 DATE: 28-Apr-10

**SPECIFICATION REQUIREMENTS**

SOURCE: Onsite soil (New Infiltration Basin - Excavation)  
 % COMPACTION: 95% MOISTURE RANGE: +/- 2%  
 NUCLEAR GAUGE TYPE: Troxler 3440 A NUCLEAR GAUGE SERIAL NO.: 20877

DATE OF TEST (day/mo)	TEST NO.	TEST LOCATION	LAB RESULTS			TYPE OF TEST		FIELD TEST RESULTS				PERCENT COMPACT (%)	PASS/ FAIL	RETEST NO.	QA ID
			SAMPLE NO.	MAX UNIT WT (pcf)	O.M.C. (%)	ASTM D-2922	ASTM D-1556	DEPTH/ ELEV (ft)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	F.M.C. (%)				
28/Apr	FDT-136	Cell 1C perimter berm El: 15.70 msl	SB003	100	19.0			0.5	122.5	102.7	19.3	103	Pass		CAS
28/Apr	FDT-137	Cell 1C perimter berm El: 15.70 msl	SB003	100	19.0			0.5	121.2	102.5	18.2	103	Pass		CAS
28/Apr	FDT-138	Cell 1C perimter berm El: 16.5 msl	SB003	100	19.0			0.5	118.5	101.1	17.3	101	Pass		CAS
28/Apr	FDT-139	Cell 1C perimter berm El: 16.5 msl	SB003	100	19.0			0.5	119.5	100.3	19.2	100	Pass		CAS
28/Apr	FDT-140	Cell 1C perimter berm El: 16.5 msl	SB003	100	19.0			0.5	117.4	98.6	19.1	99	Pass		CAS
28/Apr	TW-007	Thin wall Shelby tube collected @ FDT-140	SB003	100	19.0			0.5	116.7	97.7	19.5	98	Pass		CAS
28/Apr	FDT-141	Cell 1C Anchor trench	SB003	100	19.0			0.5	116.7	99.1	17.8	99	Pass		CAS
28/Apr	FDT-142	Cell 1C Anchor trench	SB003	100	19.0			0.5	119.2	100.1	19.1	100	Pass		CAS
28/Apr	FDT-143	Cell 1D Anchor trench	SB003	100	19.0			0.5	116.5	97.6	19.4	98	Pass		CAS
28/Apr	FDT-144	Cell 1D Anchor trench	SB003	100	19.0			0.5	118.6	100.3	18.3	100	Pass		CAS
28/Apr	FDT-145	Cell 1D Anchor trench	SB003	100	19.0			0.5	122.4	103.1	18.8	103	Pass		CAS
28/Apr	FDT-146	Cell 1D Anchor trench	SB003	100	19.0			0.5	111.7	94.9	17.7	95	Pass		CAS



**SUMMARY OF FIELD DENSITY TEST**

**PROJECT:** Kekaha Landfill  
**LOCATION:** Kekaha, Hawaii  
**CONTRACTOR:** Goodfellow Bros. Construction

**PROJECT NO.:** WG1298  
**TASK NO.:** 02  
**DATE:** 30-Apr-10

**SPECIFICATION REQUIREMENTS**

**SOURCE:** Onsite soil (New Infiltration Basin - Excavation)  
**% COMPACTION:** 95% **MOISTURE RANGE:** +/- 2%  
**NUCLEAR GAUGE TYPE:** Troxler 3440 A **NUCLEAR GAUGE SERIAL NO.:** 20877

DATE OF TEST (day/mo)	TEST NO.	TEST LOCATION	LAB RESULTS			TYPE OF TEST		FIELD TEST RESULTS				PERCENT COMPACT (%)	PASS/FAIL	RETEST NO.	QA ID
			SAMPLE NO.	MAX UNIT WT (pcf)	O.M.C. (%)	ASTM D-2922	ASTM D-1556	DEPTH/ELEV (ft)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	F.M.C. (%)				
30/Apr	FDT-147	Cell 1C perimter berm El: 17.0 msl	SB003	100	19.0			0.5	116.5	99.1	17.6	99	Pass		CAS
30/Apr	FDT-148	Cell 1C perimter berm El: 17.0 msl	SB003	100	19.0			0.5	121.0	102.3	18.3	102	Pass		CAS
30/Apr	FDT-149	Cell 1C perimter berm El: 17.5 msl	SB003	100	19.0			0.5	120.4	101.2	19.0	101	Pass		CAS
30/Apr	FDT-150	Cell 1C perimter berm El: 17.5 msl	SB003	100	19.0			0.5	123.0	103.3	19.1	103	Pass		CAS
30/Apr	FDT-151	Cell 1C perimter berm El: 18.0 msl	SB003	100	19.0			0.5	115.9	98.7	17.5	99	Pass		CAS
30/Apr	FDT-152	Cell 1C perimter berm El: 18.0 msl	SB003	100	19.0			0.5	116.0	97.9	18.5	98	Pass		CAS
30/Apr	FDT-153	Cell 1C perimter berm El: 18.5 msl	SB003	100	19.0			0.5	120.0	100.4	19.6	100	Pass		CAS
30/Apr	FDT-154	Cell 1C perimter berm El: 18.5 msl	SB003	100	19.0			0.5	124.1	105.3	17.9	105	Pass		CAS

**SUMMARY OF FIELD DENSITY TEST**

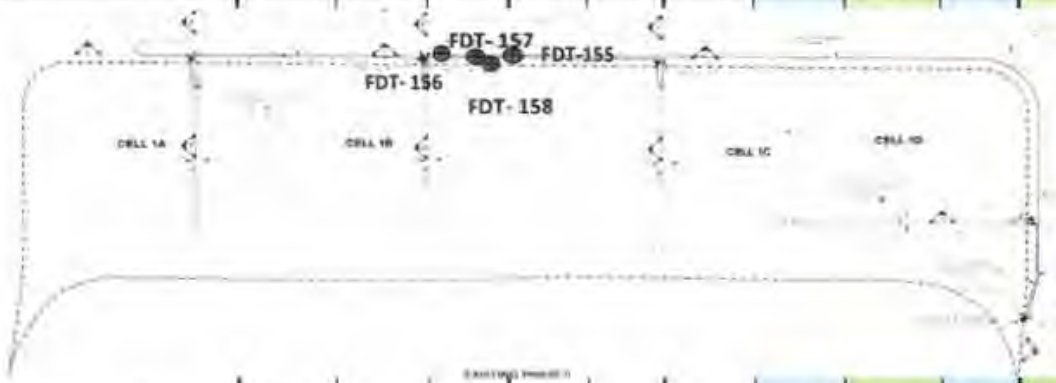
**PROJECT:** Kekaha Landfill  
**LOCATION:** Kekaha, Hawaii  
**CONTRACTOR:** Goodfellow Bros. Construction

**PROJECT NO.:** WG1298  
**TASK NO.:** 02  
**DATE:** 2-Jul-10

**SPECIFICATION REQUIREMENTS**

**SOURCE:** Onsite soil (from Western Berm - spoils from trench excavation)  
**% COMPACTION:** 95% **MOISTURE RANGE:** +/- 2%  
**NUCLEAR GAUGE TYPE:** Troxler 3440 A **NUCLEAR GAUGE SERIAL NO.:** 20877

DATE OF TEST (day/mo)	TEST NO.	TEST LOCATION	LAB RESULTS			TYPE OF TEST		FIELD TEST RESULTS				PERCENT COMPACT (%)	PASS/ FAIL	RETEST NO.	QA ID
			SAMPLE NO.	MAX UNIT WT (pcf)	D.M.C. (%)	ASTM D-6938	ASTM D-1556	DEPTH/ELEV (ft)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	F.M.C. (%)				
02/Jul	FDT-155	Pipe backfill, western berm first lift	SB003	100	19.0	x		0.5	118.2	100.8	17.3	101	Pass		MJM
02/Jul	FDT-156	Pipe backfill, western berm first lift	SB003	100	19.0	x		0.5	124.1	104.8	18.4	105	Pass		MJM
02/Jul	FDT-157	Pipe backfill, western berm second lift	SB003	100	19.0	x		0.5	119.9	101.2	18.5	101	Pass		MJM
02/Jul	FDT-158	Pipe backfill, western berm third lift	SB003	100	19.0	x		0.5	121.8	104.1	17.0	104	Pass		MJM

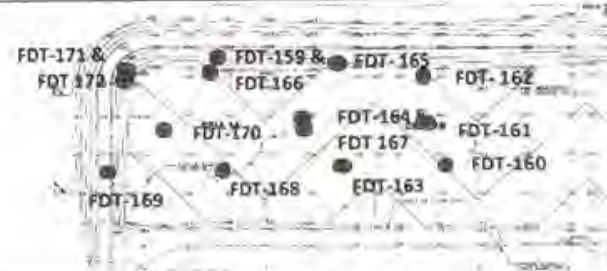


**SUMMARY OF FIELD DENSITY TEST**

PROJECT: Kekaha Landfill PROJECT NO.: WG1298  
 LOCATION: Kekaha, Hawaii TASK NO.: 02  
 CONTRACTOR: Goodfellow Bros. Construction DATE: 6-Jul-10

**SPECIFICATION REQUIREMENTS**

SOURCE: Offsite soil (quarry fines from Kaula Aggregate)  
 % COMPACTION: 95%  
 MOISTURE RANGE: +/- 2%  
 NUCLEAR GAUGE TYPE: Troxler 3440 A  
 NUCLEAR GAUGE SERIAL NO.: 20877



DATE OF TEST (day/mo)	TEST NO	TEST LOCATION	LAB RESULTS			TYPE OF TEST		FIELD TEST RESULTS				PERCENT COMPACT (%)	PASS/ FAIL	RETEST NO.	QA ID
			SAMPLE NO.	MAX UNIT WT (pcf)	O.M.C. (%)	ASTM D-6938	ASTM D-1556	DEPTH/ELEV (in)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	F.M.C. (%)				
06/Jul	FDT-159	Cell 1A/1B floor, first lift	Bag 11	143	9.0	x		2	147.7	134.8	9.7	94	Fail	166	MJM
06/Jul	FDT-160	Cell 1A/1B floor, first lift	Bag 11	143	9.0	x		2	150.4	138.8	7.6	98	Pass		MJM
06/Jul	FDT-161	Cell 1A/1B floor, first lift	Bag 11	143	9.0	x		2	152.2	141.1	7.9	98	Pass		MJM
06/Jul	FDT-162	Cell 1A/1B floor, first lift	Bag 11	143	9.0	x		2	145.5	136.2	6.8	95	Pass		MJM
06/Jul	FDT-163	Cell 1A/1B floor, first lift	Bag 11	143	9.0	x		2	148.8	137.5	8.2	96	Pass		MJM
06/Jul	FDT-164	Cell 1A/1B floor, first lift	Bag 11	143	9.0	x		2	136.4	127.0	7.4	89	Fail	167	MJM
06/Jul	FDT-165	Cell 1A/1B floor, first lift	Bag 11	143	9.0	x		2	152.1	140.4	8.3	98	Pass		MJM
06/Jul	FDT-166	Cell 1A/1B floor, first lift	Bag 11	143	9.0	x		2	151.0	138.5	9.0	97	Pass		MJM
06/Jul	FDT-167	Cell 1A/1B floor, first lift	Bag 11	143	9.0	x		2	147.6	137.4	7.4	96	Pass		MJM
06/Jul	FDT-168	Cell 1A/1B floor, first lift	Bag 11	143	9.0	x		2	152.4	141.1	8.0	99	Pass		MJM
06/Jul	FDT-169	Cell 1A/1B floor, first lift	Bag 11	143	9.0	x		2	148.0	138.1	7.2	97	Pass		MJM
06/Jul	FDT-170	Cell 1A/1B floor, first lift	Bag 11	143	9.0	x		2	147.8	137.7	7.3	96.3	Pass		MJM
08/Jul	FDT-171	Cell 1A/1B floor, first lift	Bag 11	143	9.0	x		2	142.7	132.4	7.8	92.6	Fail	172	MJM
08/Jul	FDT-172	Cell 1A/1B floor, first lift	Bag 11	143	9.0	x		2	150.6	138.8	8.5	97.1	Pass		MJM

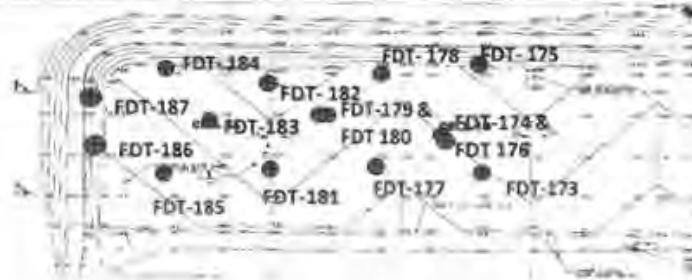
\*Note: The surface of this area had dried between time of placement and time of testing. Therefore, the recorded moisture content is less than specified but this area was approved based on passing relative compaction results.

**SUMMARY OF FIELD DENSITY TEST**

PROJECT: Kekaha Landfill PROJECT NO.: WG1298  
 LOCATION: Kekaha, Hawaii TASK NO.: 02  
 CONTRACTOR: Goodfellow Bros. Construction DATE: 7-Jul-10

**SPECIFICATION REQUIREMENTS**

SOURCE: Offsite soil (quarry fines from Kauai Aggregate)  
 % COMPACTION: 95%  
 MOISTURE RANGE: +/- 2%  
 NUCLEAR GAUGE TYPE: Troxler 3440 A  
 NUCLEAR GAUGE SERIAL NO.: 20877



DATE OF TEST (day/mo)	TEST NO.	TEST LOCATION	LAB RESULTS			TYPE OF TEST		FIELD TEST RESULTS				PERCENT COMPACT (%)	PASS/ FAIL	RETEST NO.	QA ID
			SAMPLE NO.	MAX UNIT WT (pcf)	O.M.C. (%)	ASTM D-6938	ASTM D-1556	DEPTH/ELEV (in)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	F.M.C. (%)				
07/Jul	FDT-173	Cell 1A/1B floor, second lift	Bag 11	143	9.0	x		6	153.5	140.6	9.2	98	Pass		MJM
07/Jul	FDT-174	Cell 1A/1B floor, second lift	Bag 11	143	9.0	x		6	145.0	134.5	7.8	94	Fail	176	MJM
07/Jul	FDT-175	Cell 1A/1B floor, second lift	Bag 11	143	9.0	x		6	146.6	136.6	7.3	96	Pass		MJM
07/Jul	FDT-176	Cell 1A/1B floor, second lift	Bag 11	143	9.0	x		6	147.8	136.0	8.7	95	Pass		MJM
07/Jul	FDT-177	Cell 1A/1B floor, second lift	Bag 11	143	9.0	x		6	147.3	135.8	8.5	95	Pass		MJM
07/Jul	FDT-178	Cell 1A/1B floor, second lift	Bag 11	143	9.0	x		6	151.2	139.4	8.5	97	Pass		MJM
07/Jul	FDT-179	Cell 1A/1B floor, second lift	Bag 11	143	9.0	x		6	145.5	133.0	9.4	93	Fail	180	MJM
07/Jul	FDT-180	Cell 1A/1B floor, second lift	Bag 11	143	9.0	x		6	149.0	136.8	8.9	96	Pass		MJM
07/Jul	FDT-181	Cell 1A/1B floor, second lift	Bag 11	143	9.0	x		6	146.7	139.0	7.0	97	Pass		MJM
07/Jul	FDT-182	Cell 1A/1B floor, second lift	Bag 11	143	9.0	x		6	153.2	142.4	7.6	100	Pass		MJM
07/Jul	FDT-183	Cell 1A/1B floor, second lift	Bag 11	143	9.0	x		6	150.4	140.3	7.2	98	Pass		MJM
07/Jul	FDT-184	Cell 1A/1B floor, second lift	Bag 11	143	9.0	x		6	147.8	136.1	7.0	97	Pass		MJM
07/Jul	FDT-185	Cell 1A/1B floor, second lift	Bag 11	143	9.0	x		6	148.5	137.2	8.2	96	Pass		MJM
07/Jul	FDT-186	Cell 1A/1B floor, second lift	Bag 11	143	9.0	x		6	147.2	137.1	7.4	96	Pass		MJM
07/Jul	FDT-187	Cell 1A/1B floor, second lift	Bag 11	143	9.0	x		6	148.3	136.5	7.1	97	Pass		MJM

**SUMMARY OF FIELD DENSITY TEST**

PROJECT: Kekaha Landfill PROJECT NO.: WG1298  
 LOCATION: Kekaha, Hawaii TASK NO.: 02  
 CONTRACTOR: Goodfellow Bros. Construction DATE: 8-Jul-10

**SPECIFICATION REQUIREMENTS**

SOURCE: Offsite soil (quarry fines from Kauai Aggregate)  
 % COMPACTION: 95%  
 MOISTURE RANGE: +/- 2%  
 NUCLEAR GAUGE TYPE: Troxler 3440 A  
 NUCLEAR GAUGE SERIAL NO.: 20877



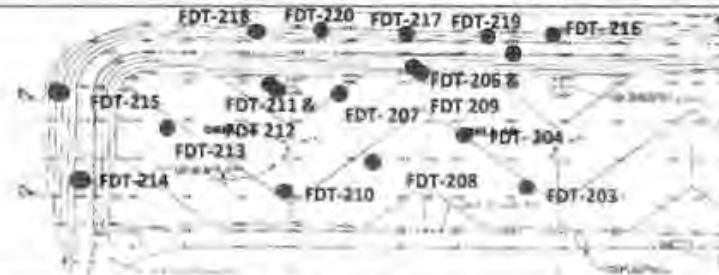
DATE OF TEST (day/mo)	TEST NO.	TEST LOCATION	LAB RESULTS			TYPE OF TEST		FIELD TEST RESULTS				PERCENT COMPACT (%)	PASS/ FAIL	RETEST NO.	QA ID
			SAMPLE NO.	MAX UNIT WT (pcf)	O.M.C. (%)	ASTM D-6938	ASTM D-1556	DEPTH/ELEV (in)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	F.M.C. (%)				
08/Jul	FDT-188	Cell 1A/1B floor, third lift	Bag 11	143	9.0	x		4	152.2	140.9	8.0	99	Pass		MJM
08/Jul	FDT-189	Cell 1A/1B floor, third lift	Bag 11	143	9.0	x		4	153.2	141.3	8.4	99	Pass		MJM
08/Jul	FDT-190	Cell 1A/1B floor, third lift	Bag 11	143	9.0	x		4	148.8	138.8	7.0	97	Pass		MJM
08/Jul	FDT-191	Cell 1A/1B floor, third lift	Bag 11	143	9.0	x		6	144.7	134.8	7.5	94	Fail	192	MJM
08/Jul	FDT-192	Cell 1A/1B floor, third lift	Bag 11	143	9.0	x		6	157.4	144.3	9.1	101	Pass		MJM
08/Jul	FDT-193	Cell 1A/1B floor, third lift	Bag 11	143	9.0	x		6	151.9	139.9	8.6	98	Pass		MJM
08/Jul	FDT-194	Cell 1A/1B floor, third lift	Bag 11	143	9.0	x		6	155.3	143.9	7.9	101	Pass		MJM
08/Jul	FDT-195	Cell 1A/1B floor, third lift	Bag 11	143	9.0	x		6	155.0	144.5	7.3	101	Pass		MJM
08/Jul	FDT-196	Cell 1A/1B floor, third lift	Bag 11	143	9.0	x		4	147.7	137.1	7.7	96	Pass		MJM
08/Jul	FDT-197	Cell 1A/1B floor, third lift	Bag 11	143	9.0	x		4	149.4	139.6	7.0	98	Pass		MJM
08/Jul	FDT-198	Cell 1A/1B floor, third lift	Bag 11	143	9.0	x		6	150.4	137.2	9.6	96	Pass		MJM
08/Jul	FDT-199	Cell 1A/1B floor, third lift	Bag 11	143	9.0	x		6	151.4	138.9	9.0	97	Pass		MJM
08/Jul	FDT-200	Cell 1A/1B floor, third lift	Bag 11	143	9.0	x		4	147.4	137.1	7.5	96	Pass		MJM
08/Jul	FDT-201	Cell 1A/1B floor, third lift	Bag 11	143	9.0	x		4	147.7	137.4	7.5	96	Pass		MJM
08/Jul	FDT-202	Cell 1A/1B floor, third lift	Bag 11	143	9.0	x		4	152.1	141.8	7.4	99	Pass		MJM

**SUMMARY OF FIELD DENSITY TEST**

PROJECT: Kekaha Landfill PROJECT NO.: WG1298  
 LOCATION: Kekaha, Hawaii TASK NO.: 02  
 CONTRACTOR: Goodfellow Bros. Construction DATE: 9-Jul-10

**SPECIFICATION REQUIREMENTS**

SOURCE: Offsite soil (quarry fines from Kauai Aggregate) and onsite sand  
 % COMPACTION: 95%  
 MOISTURE RANGE: +/- 2%  
 NUCLEAR GAUGE TYPE: Troxler 3440 A  
 NUCLEAR GAUGE SERIAL NO.: 20877



DATE OF TEST (day/mo)	TEST NO.	TEST LOCATION	LAB RESULTS			TYPE OF TEST		FIELD TEST RESULTS				PERCENT COMPACT (%)	PASS/FAIL	RETEST NO./NOTE	QA ID
			SAMPLE NO	MAX UNIT WT (pcf)	O.M.C (%)	ASTM D-8938	ASTM D-1556	DEPTH/ELEV (in)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	F.M.C. (%)				
09/Jul	FDT-203	Cell 1A/1B floor, fourth lift	Bag 11	143	9.0	x		4	146.5	139.0	5.4	97	Pass	*	MJM
09/Jul	FDT-204	Cell 1A/1B floor, fourth lift	Bag 11	143	9.0	x		4	150.3	139.7	7.8	96	Pass		MJM
09/Jul	FDT-205	Cell 1A/1B floor, fourth lift	Bag 11	143	9.0	x		4	149.1	137.7	8.3	96	Pass		MJM
09/Jul	FDT-206	Cell 1A/1B floor, fourth lift	Bag 11	143	9.0	x		4	139.5	130.4	7.0	91	Fail	206	MJM
09/Jul	FDT-207	Cell 1A/1B floor, fourth lift	Bag 11	143	9.0	x		4	146.3	137.4	6.5	88	Pass	*	MJM
09/Jul	FDT-208	Cell 1A/1B floor, fourth lift	Bag 11	143	9.0	x		4	148.2	138.2	7.2	97	Pass		MJM
09/Jul	FDT-209	Cell 1A/1B floor, fourth lift	Bag 11	143	9.0	x		4	150.1	138.0	8.8	97	Pass		MJM
09/Jul	FDT-210	Cell 1A/1B floor, fourth lift	Bag 11	143	9.0	x		4	150.1	139.5	7.5	96	Pass		MJM
09/Jul	FDT-211	Cell 1A/1B floor, fourth lift	Bag 11	143	9.0	x		4	146.6	134.5	9.0	94	Fail	212	MJM
09/Jul	FDT-212	Cell 1A/1B floor, fourth lift	Bag 11	143	9.0	x		4	149.2	138.5	7.7	97	Pass		MJM
09/Jul	FDT-213	Cell 1A/1B floor, fourth lift	Bag 11	143	9.0	x		4	148.0	138.2	7.1	97	Pass		MJM
09/Jul	FDT-214	Cell 1A/1B floor, fourth lift	Bag 11	143	9.0	x		4	146.5	135.9	7.0	95	Pass		MJM
09/Jul	FDT-215	Cell 1A/1B floor, fourth lift	Bag 11	143	9.0	x		4	145.3	135.6	7.0	95	Pass		MJM
09/Jul	FDT-216	Pipe backfill, western berm first lift	SB003	100	19.0	x		8	116.5	98.7	18.0	99	Pass		MJM
09/Jul	FDT-217	Pipe backfill, western berm first lift	SB003	100	19.0	x		8	111.4	95.2	17.0	95	Pass		MJM
09/Jul	FDT-218	Pipe backfill, western berm first lift	SB003	100	19.0	x		8	112.3	96.4	16.5	96.4	Pass		
09/Jul	FDT-219	Pipe backfill, western berm second lift	SB003	100	19.0	x		8	115.6	96.7	17.1	98.7	Pass		
09/Jul	FDT-220	Pipe backfill, western berm second lift	SB003	100	19.0	x		8	115.9	97.8	16.5	97.8	Pass		

\*Note: The surface of this area had dried between time of placement and time of testing. Therefore, the recorded moisture content is less than specified but this area was approved based on passing relative compaction results.



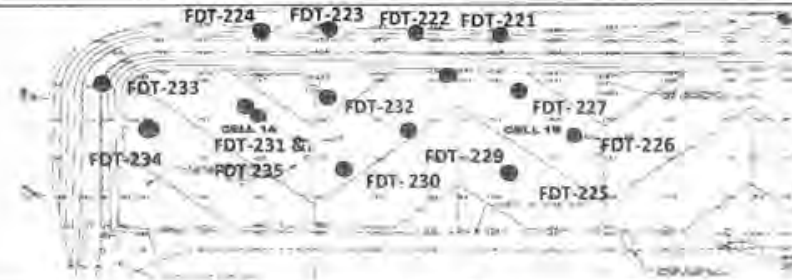
**SUMMARY OF FIELD DENSITY TEST**

**PROJECT:** Kekaha Landfill  
**LOCATION:** Kekaha, Hawaii  
**CONTRACTOR:** Goodfellow Bros. Construction

**PROJECT NO.:** WG1298  
**TASK NO.:** 02  
**DATE:** 10-Jul-10

**SPECIFICATION REQUIREMENTS**

**SOURCE:** Offsite soil (quarry fines from Kauai Aggregate) and onsite sand  
**% COMPACTION:** 95%  
**MOISTURE RANGE:** +/- 2%  
**NUCLEAR GAUGE TYPE:** Troxler 3440 A  
**NUCLEAR GAUGE SERIAL NO.:** 20877



DATE OF TEST (day/mo)	TEST NO.	TEST LOCATION	LAB RESULTS			TYPE OF TEST		FIELD TEST RESULTS				PERCENT COMPACT (%)	PASS/FAIL	RETEST NO./NOTE	QA ID
			SAMPLE NO.	MAX UNIT WT (pcf)	O.M.C. (%)	ASTM D-6938	ASTM D-1556	DEPTH/ELEV (in)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	F.M.C. (%)				
10/Jul	FDT-221	Pipe backfill, western berm third lift	SB003	100	19.0	x		8	115.0	103.8	11.0	104	Pass		MJM
10/Jul	FDT-222	Pipe backfill, western berm third lift	SB003	100	19.0	x		8	112.6	100.1	12.5	100	Pass		MJM
10/Jul	FDT-223	Pipe backfill, western berm third lift	SB003	100	19.0	x		8	113.0	97.8	15.5	98	Pass		MJM
10/Jul	FDT-224	Pipe backfill, western berm third lift	SB003	100	19.0	x		8	112.9	98.7	14.4	99	Pass		MJM
10/Jul	FDT-225	Cell 1A/1B floor, fifth lift	Bag 11	143	9.0	x		4	145.4	135.9	7.0	95	Pass		MJM
10/Jul	FDT-226	Cell 1A/1B floor, fifth lift	Bag 11	143	9.0	x		4	145.8	136.1	7.1	95	Pass		MJM
10/Jul	FDT-227	Cell 1A/1B floor, fifth lift	Bag 11	143	9.0	x		4	152.0	141.3	7.6	99	Pass		MJM
10/Jul	FDT-228	Cell 1A/1B floor, fifth lift	Bag 11	143	9.0	x		4	148.4	137.8	7.7	96	Pass		MJM
10/Jul	FDT-229	Cell 1A/1B floor, fifth lift	Bag 11	143	9.0	x		4	148.4	138.2	7.4	97	Pass		MJM
10/Jul	FDT-230	Cell 1A/1B floor, fifth lift	Bag 11	143	9.0	x		4	147.2	134.2	9.7	94	Fail	235	MJM
10/Jul	FDT-231	Cell 1A/1B floor, fifth lift	Bag 11	143	9.0	x		4	149.2	139.2	7.2	97	Pass		MJM
10/Jul	FDT-232	Cell 1A/1B floor, fifth lift	Bag 11	143	9.0	x		4	147.8	136.1	7.0	97	Pass		MJM
10/Jul	FDT-233	Cell 1A/1B floor, fifth lift	Bag 11	143	9.0	x		4	152.9	140.6	8.6	98	Pass		MJM
10/Jul	FDT-234	Cell 1A/1B floor, fifth lift	Bag 11	143	9.0	x		8	150.0	139.7	7.4	98	Pass		MJM
10/Jul	FDT-235	Cell 1A/1B floor, fifth lift	Bag 11	143	9.0	x		8	147.6	137.8	7.1	96	Pass		MJM

\*Note: The surface of this area had dried between time of placement and time of testing. Therefore, the recorded moisture content is less than specified but this area was approved based on passing relative compaction results.

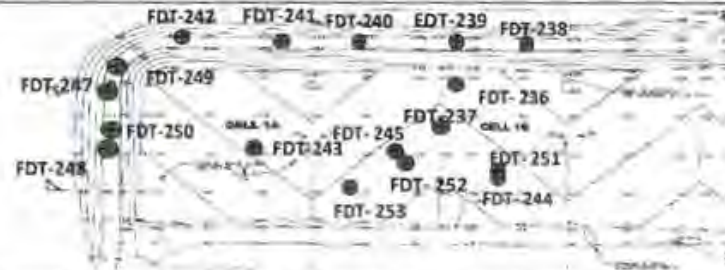
**SUMMARY OF FIELD DENSITY TEST**

PROJECT: Kekaha Landfill  
 LOCATION: Kekaha, Hawaii  
 CONTRACTOR: Goodfellow Bros. Construction

PROJECT NO.: WG1298  
 TASK NO.: 02  
 DATE: 12-Jul-10

**SPECIFICATION REQUIREMENTS**

SOURCE: Offsite quarry fines, offsite 1.5-inch minus, and onsite sand  
 % COMPACTION: 95%  
 MOISTURE RANGE: +/- 2%  
 NUCLEAR GAUGE TYPE: Troxler 3440 A  
 NUCLEAR GAUGE SERIAL NO.: 20877



DATE OF TEST (day/mo)	TEST NO.	TEST LOCATION	LAB RESULTS			TYPE OF TEST		FIELD TEST RESULTS				PERCENT COMPACT (%)	PASS/ FAIL	RETEST NO./ NOTE	QA ID
			SAMPLE NO	MAX UNIT WT (pcf)	O.M.C. (%)	ASTM D-8938	ASTM D-1556	DEPTH/ELEV (in)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	F.M.C. (%)				
12/Jul	FDT-236	Cell 1A/1B floor, sixth lift	Bag 11	143	9.0	x		6	147.3	135.9	8.4	95	Pass		MJM
12/Jul	FDT-237	Cell 1A/1B floor, sixth lift	Bag 11	143	9.0	x		6	149.7	138.4	8.2	97	Pass		MJM
12/Jul	FDT-238	Western berm first lift	SB003	100	9.0	x		8	112.8	97.7	15.5	98	Pass		MJM
12/Jul	FDT-239	Western berm first lift	SB003	100	9.0	x		8	113.3	104.1	8.8	104	Pass		MJM
12/Jul	FDT-240	Western berm first lift	SB003	100	9.0	x		8	108.3	101.3	8.9	101	Pass		MJM
12/Jul	FDT-241	Western berm first lift	SB003	100	9.0	x		8	109.6	100.3	9.3	100	Pass		MJM
12/Jul	FDT-242	Western berm first lift	SB003	100	9.0	x		8	111.1	100.7	10.3	101	Pass		MJM
12/Jul	FDT-243	Cell 1A/1B floor, sixth lift	Bag 11	143	9.0	x		4	155.4	142.4	8.1	100	Pass		MJM
12/Jul	FDT-244	Cell 1A/1B floor, sixth (1.5-inch minus)	Bag 14	128.5	12.5	x		4	130.8	119.6	9.4	93	Fail	251	MJM
12/Jul	FDT-245	Cell 1A/1B floor, sixth (1.5-inch minus)	Bag 14	128.5	12.5	x		4	130.1	118.9	9.4	93	Fail	252	MJM
12/Jul	FDT-246	Cell 1A/1B floor, sixth (1.5-inch minus)	Bag 14	128.5	12.5	x		4	128.9	118.4	8.9	92	Fail	253	MJM
12/Jul	FDT-247	Southern berm, first lift	SB003	100	19.0	x		8	149.2	139.2	7.2	139	Pass		MJM
12/Jul	FDT-248	Southern berm, first lift	SB003	100	19.0	x		8	147.8	138.1	7.0	138	Pass		MJM
12/Jul	FDT 249	Southern berm, second lift	SB003	100	19.0	x		8	111.9	99.8	12.1	100	Pass	*	MJM
12/Jul	FDT-250	Southern berm, second lift	SB003	100	19.0	x		8	116.1	100.5	15.5	101	Pass	*	MJM
12/Jul	FDT-251	Cell 1A/1B floor, sixth lift (1.5-inch minus)	Bag 14	128.5	12.5	x		4	135.0	123.4	9.4	96	Pass		MJM
12/Jul	FDT-252	Cell 1A/1B floor, sixth lift (1.5-inch minus)	Bag 14	128.5	12.5	x		4	139.6	126.3	8.8	100	Pass		MJM
12/Jul	FDT-253	Cell 1A/1B floor, sixth lift (1.5-inch minus)	Bag 14	128.5	12.5	x		4	133.8	121.0	10.6	94	Fail	255	MJM

\*Note: The surface of this area had dried between time of placement and time of testing. Therefore, the recorded moisture content is less than specified but this area was approved based on passing relative compaction results.

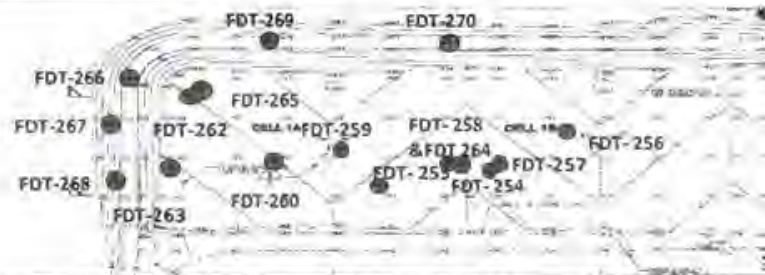
**SUMMARY OF FIELD DENSITY TEST**

PROJECT: Kekaha Landfill  
 LOCATION: Kekaha, Hawaii  
 CONTRACTOR: Goodfellow Bros. Construction

PROJECT NO.: WG1298  
 TASK NO.: 02  
 DATE: 13-Jul-10

**SPECIFICATION REQUIREMENTS**

SOURCE: Offsite 1.5-inch minus, and onsite sand  
 % COMPACTION: 95%  
 MOISTURE RANGE: +/- 2%  
 NUCLEAR GAUGE TYPE: Troxler 3440 A  
 NUCLEAR GAUGE SERIAL #: 20877



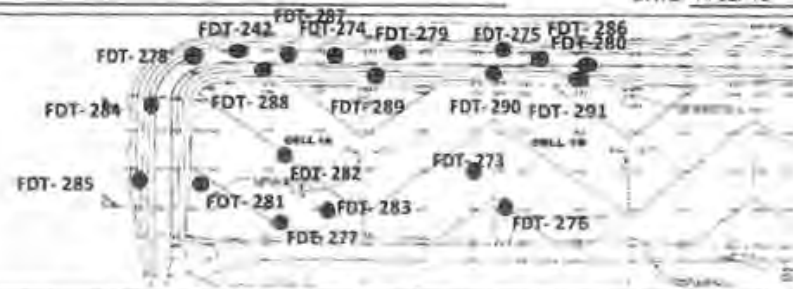
DATE OF TEST (day/mo)	TEST NO.	TEST LOCATION	LAB RESULTS			TYPE OF TEST		FIELD TEST RESULTS				PERCENT COMPACT (%)	PASS/ FAIL	RETEST NO./ NOTE	QA ID
			SAMPLE NO.	MAX UNIT WT (pcf)	O.M.C. (%)	ASTM D-6938	ASTM D-1556	DEPTH/ELEV (in)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	F.M.C. (%)				
13/Jul	FDT-254	Cell 1A/1B floor, seventh lift (1.5-inch minus)	Bag 14	128.5	12.5	x		6	130.5	119.0	9.7	93	Fail	257	MJM
13/Jul	FDT-255	Cell 1A/1B floor, sixth lift (1.5-inch minus)	Bag 14	128.5	12.5	x		6	135.5	125.9	10.0	98	Pass		MJM
13/Jul	FDT-256	Cell 1A/1B floor, sixth lift (1.5-inch minus)	Bag 14	128.5	12.5	x		6	142.8	130.8	9.2	102	Pass		MJM
13/Jul	FDT-257	Cell 1A/1B floor, seventh lift (1.5-inch minus)	Bag 14	128.5	12.5	x		6	139.2	125.9	10.6	98	Pass		MJM
13/Jul	FDT-258	Cell 1A/1B floor, seventh lift (1.5-inch minus)	Bag 14	128.5	12.5	x		6	133.1	118.7	12.1	92	Fail	264	MJM
13/Jul	FDT-259	Cell 1A/1B floor, seventh lift (1.5-inch minus)	Bag 14	128.5	12.5	x		6	137.7	123.9	11.1	96	Pass		MJM
13/Jul	FDT-260	Cell 1A/1B floor, seventh lift (1.5-inch minus)	Bag 14	128.5	12.5	x		6	136.6	122.2	11.8	95	Pass		MJM
13/Jul	FDT-261	Cell 1A/1B floor, seventh lift (1.5-inch minus)	Bag 14	128.5	12.5	x		6	137.8	122.9	12.1	96	Pass		MJM
13/Jul	FDT-262	Cell 1A/1B floor, seventh lift (1.5-inch minus)	Bag 14	128.5	12.5	x		6	124.2	111.7	11.2	87	Fail	265	MJM
13/Jul	FDT-263	Cell 1A/1B floor, seventh lift (1.5-inch minus)	Bag 14	128.5	12.5	x		6	140.9	125.0	12.7	97	Pass		MJM
13/Jul	FDT-264	Cell 1A/1B floor, seventh lift (1.5-inch minus)	Bag 14	128.5	12.5	x		6	139.0	122.9	13.1	95	Pass		MJM
13/Jul	FDT-265	Cell 1A/1B floor, seventh lift (1.5-inch minus)	Bag 14	128.5	12.5	x		6	138.0	124.4	10.9	97	Pass		MJM
13/Jul	FDT-266	Southern Berm, third lift	SB003	100	19.0	x		6	120.7	104.5	15.5	105	Pass		MJM
13/Jul	FDT-267	Southern Berm, third lift	SB004	100	19.0	x		6	117.3	100.1	17.2	100	Pass		MJM
13/Jul	FDT-268	Southern Berm, third lift	SB005	100	19.0	x		6	114.7	99.7	15.0	100	Pass		MJM
13/Jul	FDT-269	Western Berm second lift	Bag 14	128.5	12.5	x		6	123.8	115.4	6.4	91	Fail	274	MJM
13/Jul	FDT-270	Western Berm second lift	Bag 14	128.5	12.5	x		6	127.0	120.0	5.8	93	Fail	275	MJM
13/Jul	FDT-271	Cell 1A/1B floor, seventh lift (1.5-inch minus)	Bag 14	128.5	12.5	x		6	143.8	129.1	11.4	100	Pass		MJM
13/Jul	FDT-272	Cell 1A/1B floor, eighth lift (1.5-inch minus)	Bag 14	128.5	12.5	x			139.3	125.7	10.8	98	Pass		MJM

**SUMMARY OF FIELD DENSITY TEST**

PROJECT: Kekaha Landfill PROJECT NO.: WG1298  
 LOCATION: Kekaha, Hawaii TASK NO.: 02  
 CONTRACTOR: Goodfellow Bros. Construction DATE: 14-Jul-10

**SPECIFICATION REQUIREMENTS**

SOURCE: Offsite 1.5-inch minus, offsite rock dust, and onsite sand  
 % COMPACTION: 95%  
 MOISTURE RANGE: +/- 2%  
 NUCLEAR GAUGE TYPE: Troxler 3440 A  
 NUCLEAR GAUGE SERIAL #: 20677



DATE OF TEST (day/mo)	TEST NO	TEST LOCATION	LAB RESULTS			TYPE OF TEST		FIELD TEST RESULTS				PERCENT COMPACT (%)	PASS/ FAIL	RETEST NO./ NOTE	QA ID
			SAMPLE NO.	MAX UNIT WT (pcf)	O.M.C. (%)	ASTM D-6938	ASTM D-1558	DEPTH/ ELEV (in)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	F.M.C. (%)				
14/Jul	FDT-273	Cell 1A/1B floor, eighth lift (1.5-inch minus)	Bag 14	128.5	12.5	x		6	131.4	123.3	8.8	98	Pass	*	MJM
14/Jul	FDT-274	Western Berm second lift	Bag 14	128.5	12.5	x		6	134.5	125.2	7.4	97	Pass	*	MJM
14/Jul	FDT-275	Western Berm second lift	Bag 14	128.5	12.5	x		6	136.1	127.8	8.5	99	Pass	*	MJM
14/Jul	FDT-276	Cell 1A/1B floor, ninth lift (1.5-inch minus)	Bag 14	128.5	12.5	x		6	139.9	126.5	10.6	98	Pass		MJM
14/Jul	FDT-277	Cell 1A/1B floor, ninth lift (1.5-inch minus)	Bag 14	128.5	12.5	x		6	139.7	124.6	12.1	97	Pass		MJM
14/Jul	FDT-278	Western berm third lift	Bag 14	128.5	12.5	x		6	135.9	122.3	11.1	95	Pass		MJM
14/Jul	FDT-279	Western berm third lift	Bag 14	128.5	12.5	x		6	146.5	131.0	11.8	102	Pass		MJM
14/Jul	FDT-280	Western berm third lift	Bag 14	128.5	12.5	x		6	148.0	132.0	12.1	103	Pass		MJM
14/Jul	FDT-281	Cell 1A/1B floor, ninth lift (1.5-inch minus)	Bag 14	128.5	12.5	x		6	137.3	123.5	11.2	98	Pass		MJM
14/Jul	FDT-282	Cell 1A/1B floor, tenth lift (1.5-inch minus)	Bag 14	128.5	12.5	x		6	140.2	124.4	12.7	97	Pass		MJM
14/Jul	FDT-283	Cell 1A/1B floor, tenth lift (1.5-inch minus)	Bag 14	128.5	12.5	x		6	138.5	122.5	13.1	95	Pass		MJM
14/Jul	FDT-284	Southern Berm, fourth lift	SB005	139.0	11.5	x		6	149.6	134.9	10.9	97	Pass		MJM
14/Jul	FDT-285	Southern Berm, fourth lift	SB003	100.0	19.0	x		6	120.7	104.5	15.5	106	Pass		MJM
14/Jul	FDT-286	Western berm fourth lift	SB003	100.0	19.0	x		6	117.3	100.1	17.2	100	Pass		MJM
14/Jul	FDT-287	Western berm fourth lift	SB003	100.0	19.0	x		6	114.7	99.7	15.0	100	Pass		MJM
14/Jul	FDT-288	Western Berm fifth lift	SB005	139.0	12.5	x		0	149.2	134.1	10.5	96	Pass		MJM
14/Jul	FDT-289	Western Berm fifth lift	SB005	139.0	12.5	x		0	147.3	133.2	10.6	96	Pass		MJM
14/Jul	FDT-290	Western Berm fifth lift	SB005	139.0	12.5	x		0	146.4	131.4	11.4	95	Pass		MJM
14/Jul	FDT-291	Western Berm fifth lift	SB005	139.0	12.5	x		0	146.0	131.6	10.8	95	Pass		MJM

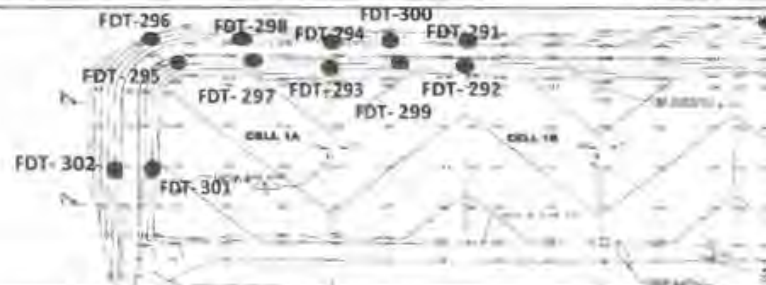
\*Note: The surface of this area had dried between time of placement and time of testing. Therefore, the recorded moisture content is less than specified but this area was approved based on passing relative compaction results

**SUMMARY OF FIELD DENSITY TEST**

PROJECT: Kekaha Landfill PROJECT NO.: WG1298  
 LOCATION: Kekaha, Hawaii TASK NO.: 02  
 CONTRACTOR: Goodfellow Bros. Construction DATE: 15-Jul-10

**SPECIFICATION REQUIREMENTS**

SOURCE: Offsite 1.5-inch minus and offsite rock dust  
 % COMPACTION: 95%  
 MOISTURE RANGE: +/- 2%  
 NUCLEAR GAUGE TYPE: Troxler 3440 A  
 NUCLEAR GAUGE SERIAL #: 20877



DATE OF TEST (day/mo)	TEST NO.	TEST LOCATION	LAB RESULTS			TYPE OF TEST		FIELD TEST RESULTS				PERCENT COMPACT (%)	PASS/ FAIL	RETEST NO / NOTE	QA ID
			SAMPLE NO.	MAX UNIT WT (pcf)	O.M.C. (%)	ASTM D-6936	ASTM D-1556	DEPTH/ ELEV (in)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	F.M.C. (%)				
15/Jul	FDT-291	Western Berm, sixth lift	Bag 14	128.5	12.5	x		6	137.8	128.7	8.6	99	Pass	*	MJM
15/Jul	FDT-292	Western Berm, sixth lift	SB005	139.0	11.5	x		8	149.8	137.2	9.2	99	Pass	*	MJM
15/Jul	FDT-293	Western Berm, sixth lift	SB005	139.0	11.5	x		8	142.3	131.4	8.3	95	Pass	*	MJM
15/Jul	FDT-294	Western Berm, sixth lift	Bag 14	128.5	12.5	x		6	141.6	128.0	10.6	100	Pass		MJM
15/Jul	FDT-295	Western Berm, sixth lift	SB005	139.0	11.5	x		8	148.1	132.1	12.1	95	Pass		MJM
15/Jul	FDT-296	Western Berm, sixth lift	Bag 14	128.5	12.5	x		6	136.1	122.5	11.1	95	Pass		MJM
15/Jul	FDT-297	Western berm seventh lift	SB005	139.0	11.5	x		8	147.8	132.2	11.8	95	Pass		MJM
15/Jul	FDT-298	Western berm seventh lift	Bag 14	128.5	12.5	x		6	143.8	128.3	12.1	100	Pass		MJM
15/Jul	FDT-299	Western berm seventh lift	SB005	139.0	11.5	x		8	148.0	133.1	11.2	96	Pass		MJM
15/Jul	FDT-300	Western berm seventh lift	Bag 14	128.5	12.5	x		6	141.4	125.5	12.7	98	Pass		MJM
15/Jul	FDT-301	Southern Berm, fifth lift	SB005	139.0	11.5	x		8	149.0	131.7	13.1	95	Pass		MJM
15/Jul	FDT-302	Southern Berm, fifth lift	Bag 14	128.5	12.5	x		6	141.5	127.6	10.9	99	Pass		MJM

\*Note: The surface of this area had dried between time of placement and time of testing. Therefore, the recorded moisture content is less than specified but this area was approved based on passing relative compaction results.

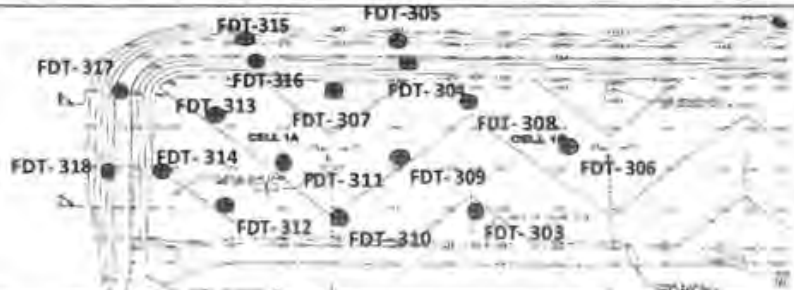
**SUMMARY OF FIELD DENSITY TEST**

**PROJECT:** Kekaha Landfill  
**LOCATION:** Kekaha, Hawaii  
**CONTRACTOR:** Goodfellow Bros. Construction

**PROJECT NO.:** WG1298  
**TASK NO.:** 02  
**DATE:** 16-Jul-10

**SPECIFICATION REQUIREMENTS**

**SOURCE:** Offsite 1.5-inch minus and offsite rock dust  
**% COMPACTION:** 95%  
**MOISTURE RANGE:** +/- 2%  
**NUCLEAR GAUGE TYPE:** Troxler 3440 A  
**NUCLEAR GAUGE SERIAL #:** 20877



DATE OF TEST (day/mo)	TEST NO.	TEST LOCATION	LAB RESULTS			TYPE OF TEST		FIELD TEST RESULTS				PERCENT COMPACT (%)	PASS/ FAIL	RETEST NO./ NOTE	QA ID
			SAMPLE NO.	MAX UNIT WT (pcf)	O.M.C. (%)	ASTM D-6938	ASTM D-1556	DEPTH/ELEV (in)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	F.M.C. (%)				
16/Jul	FDT-303	Cell 1A/1B floor, final lift below 6-in layer	Bag 14	128.5	12.5	x		6	142.0	128.5	10.5	100	Pass		MJM
16/Jul	FDT-304	Western Berm, eighth lift	SB005	139.0	11.5	x		8	146.6	132.9	10.3	96	Pass		MJM
16/Jul	FDT-305	Western Berm, eighth lift	Bag 14	128.5	12.5	x		6	136.6	123.4	10.7	96	Pass		MJM
16/Jul	FDT-306	Cell 1A/1B floor, final lift below 6-in layer	Bag 14	128.5	12.5	x		6	145.1	129.8	11.8	101	Pass		MJM
16/Jul	FDT-307	Cell 1A/1B floor, final lift	SB005	139.0	11.5	x		0	148.1	136.6	8.4	98	Pass		MJM
16/Jul	FDT-308	Cell 1A/1B floor, final lift below 6-in layer	Bag 14	128.5	12.5	x		6	156.3	141.1	10.8	110	Pass		MJM
16/Jul	FDT-309	Cell 1A/1B floor, final lift below 6-in layer	Bag 14	128.5	12.5	x		6	150.1	135.7	10.6	106	Pass		MJM
16/Jul	FDT-310	Cell 1A/1B floor, final lift below 6-in layer	Bag 14	128.5	12.5	x		6	150.5	135.0	11.5	105	Pass		MJM
16/Jul	FDT-311	Cell 1A/1B floor, final lift below 6-in layer	Bag 14	128.5	12.5	x		6	143.1	129.3	10.7	101	Pass		MJM
16/Jul	FDT-312	Cell 1A/1B floor, final lift below 6-in layer	Bag 14	128.5	12.5	x		6	137.0	123.9	10.6	96	Pass		MJM
16/Jul	FDT-313	Cell 1A/1B floor, final lift below 6-in layer	Bag 14	128.5	12.5	x		6	142.9	129.7	10.2	101	Pass		MJM
16/Jul	FDT-314	Cell 1A/1B floor, final lift below 6-in layer	Bag 14	128.5	12.5	x		6	137.9	124.1	11.1	97	Pass		MJM
16/Jul	FDT-315	Western Berm, ninth lift	Bag 14	128.5	12.5	x		6	142.6	128.8	10.6	100	Pass		MJM
16/Jul	FDT-316	Western Berm, ninth lift	SB005	139.0	11.5	x		0	146.3	131.9	10.9	95	Pass		MJM
16/Jul	FDT-317	Western Berm, ninth lift	Bag 14	128.5	12.5	x		6	145.1	131.1	10.7	102	Pass		MJM
16/Jul	FDT-318	Southern Berm, eighth lift	Bag 14	128.5	12.5	x		6	143.1	129.0	10.9	100	Pass		MJM

\*Note: The surface of this area had dried between time of placement and time of testing. Therefore, the recorded moisture content is less than specified but this area was approved based on passing relative compaction results.









**SUMMARY OF FIELD DENSITY TEST**

PROJECT: Kekaha Landfill  
 LOCATION: Kekaha, Hawaii  
 CONTRACTOR: Goodfellow Bros. Construction

PROJECT NO.: WG1298  
 TASK NO.: 02  
 DATE: 24-Jul-10

**SPECIFICATION REQUIREMENTS**

SOURCE: Onsite Sand  
 % COMPACTION: 95%  
 MOISTURE RANGE: +/- 2%  
 NUCLEAR GAUGE TYPE: Troxler 3440 A  
 NUCLEAR GAUGE SERIAL N: 20877



DATE OF TEST (day/mo)	TEST NO.	TEST LOCATION	LAB RESULTS			TYPE OF TEST		FIELD TEST RESULTS				PERCENT COMPACT (%)	PASS/ FAIL	RETEST NO./ NOTE	QA ID
			SAMPLE NO.	MAX UNIT WT (pcf)	O.M.C. (%)	ASTM D-6938	ASTM D-1556	DEPTH/ELEV (in)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	F.M.C. (%)				
24/Jul	FDT-347	Floor, Final Lift On site Sand	SB010	106.5	17.5	x		6	124.3	107.8	15.3	101	Pass		CAS
24/Jul	FDT-348	Floor, Final Lift On site Sand	SB010	106.5	17.5	x		8	122.1	104.3	17.1	98	Pass		CAS
24/Jul	FDT-349	Floor, Final Lift On site Sand	SB010	106.5	17.5	x		6	128.5	111.8	15.0	105	Pass		CAS
24/Jul	FDT-350	Floor, Final Lift On site Sand	SB010	106.5	17.5	x		6	130.1	111.4	16.8	105	Pass		CAS
24/Jul	FDT-351	Floor, Final Lift On site Sand	SB010	106.5	17.5	x		0	123.8	106.5	16.3	100	Pass		CAS
24/Jul	FDT-352	Floor, Final Lift On site Sand	SB010	106.5	17.5	x		6	129.9	112.4	15.6	106	Pass		CAS
24/Jul	FDT-353	Floor, Final Lift On site Sand	SB010	106.5	17.5	x		6	124.5	107.9	15.4	101	Pass		CAS
22/Jul	FDT-354	Floor, Final Lift On site Sand	SB010	106.5	17.5	x		6	121.7	104.3	16.7	98	Pass		CAS
22/Jul	FDT-355	Floor, Final Lift On site Sand	SB010	106.5	17.5	x		6	120.5	103.6	16.4	97	Pass		CAS
22/Jul	FDT-356	Floor, Final Lift On site Sand	SB010	106.5	17.5	x		6	124.3	108.6	14.5	102	Pass	*	CAS

\*Note: The surface of this area had dried between time of placement and time of testing. Therefore, the recorded moisture content is less than specified but this area was approved based on passing relative compaction results.

**FIELD NUCLEAR MOISTURE/DENSITY TEST LOG**

(ASTM D 6938)

PROJECT: Kekaha Landfill

LOCATION Kekaha, HI

PROJECT NO.: WG1298

TASK NO.: 02

DESCRIPTION: Phase II Lateral Expansion

DATE: 18 day Aug month 2010 year

**SPECIFICATION REQUIREMENTS:**

MATERIAL SOURCE: Kauai Quarry

MATERIAL TYPE:  FILL  SUBGRADE  SUBBASE  CLAY  OTHER: \_\_\_\_\_ MAX. LIFT THICKNESS: \_\_\_\_\_ (in.)

MINIMUM COMPACTION: 95 (%)  ASTM D 698  ASTM D 1557 MOISTURE CONTENT RANGE: \_\_\_\_\_ to + \_\_\_\_\_ of OPT

NUCLEAR GAUGE TYPE: 3440 GAUGE SERIAL NO.: 20877 CORRECTION FACTOR: Y= None

TEST NO.	TEST LOCATION	PROBE DEPTH / LIFT NO.	LABORATORY RESULTS			FIELD TEST RESULTS					RE-TEST NO.	RE-TEST	
			SAMPLE NO.	OMC (%)	MAX. DRY UNIT WT. (pcf)	FIELD MOISTURE CONTENT <sup>1</sup> (%)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	PERCENT COMPACT (%)	PASS		FAIL	PASS
1	50 N. of Cell 1B Cleanout	12 // 2	SB016	17.5	106.5	16.4	121.7	104.6	98.2	PASS			
2	50 S. of Cell 1B Cleanout	12 // 2	SB010	17.5	106.5	15.8	123.5	106.7	100.2	PASS			
3	150 S. of Cell 1B Cleanout	12 // 2	BAG 14	12.5	128.5	10.9	137.6	124.0	96.5	PASS			
4	250 S. of Cell 1B Cleanout	12 // 2	BAG 14	12.5	128.5	10.7	136.0	122.8	95.6	PASS			
		//											
		//											
		//											
		//											
		//											
		//											
		//											
		//											
		//											
		//											

NOTES: (1) FIELD MOISTURE CONTENT = GAUGE READING/CORRECTED MOISTURE

COMMENTS: All tests performed at anchor trench.

CHECKED BY: \_\_\_\_\_



**FIELD NUCLEAR MOISTURE/DENSITY TEST LOG**

(ASTM D 6938)

PROJECT: Kekaha Landfill  
 LOCATION Kekaha, HI PROJECT NO.: WG1298 TASK NO.: 02  
 DESCRIPTION: Phase II Lateral Expansion DATE: 23 day Aug month 2010 year

SPECIFICATION REQUIREMENTS: MATERIAL SOURCE: Kauai Quarry  
 MATERIAL TYPE:  FILL  SUBGRADE  SUBBASE  CLAY  OTHER: \_\_\_\_\_ MAX. LIFT THICKNESS: \_\_\_\_\_ (in.)  
 MINIMUM COMPACTION: 95 (%)  ASTM D 698  ASTM D 1557 MOISTURE CONTENT RANGE: - \_\_\_\_\_ to + \_\_\_\_\_ of OPT.  
 NUCLEAR GAUGE TYPE: 3440 GAUGE SERIAL NO.: 20877 CORRECTION FACTOR: Y= None

TEST NO.	TEST LOCATION	PROBE DEPTH / LIFT NO.	LABORATORY RESULTS			FIELD TEST RESULTS					RE-TEST NO.	RE-TEST	
			SAMPLE NO.	OMC (%)	MAX. DRY UNIT WT. (pcf)	FIELD MOISTURE CONTENT <sup>1</sup> (%)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	PERCENT COMPACT. (%)	PASS		FAIL	PASS
5	50 W. of Phase II	12 / 2	<u>SB010</u>	17.5	106.5	18.3	130.7	110.5	103.7	PASS			
6	100 W. of Phase II	12 / 2	<u>SB010</u>	17.5	106.5	16.0	130.5	112.6	103.7	PASS			
7	200 W. of Phase II	12 / 2	<u>BAG 14</u>	12.5	128.5	11.8	138.3	123.7	96.3	PASS			
8	400 S. of Cell 1B Cleanout	12 / 2	<u>BAG 14</u>	12.5	128.5	12.4	142.4	126.7	98.6	PASS			
9	500 S. of Cell 1B Cleanout	12 / 2	<u>BAG 14</u>	12.5	128.5	11.9	142.3	127.2	99.0	PASS			
		///											
		///											
		///											
		///											
		///											
		///											
		///											

NOTES: (1) FIELD MOISTURE CONTENT = GAUGE READING/CORRECTED MOISTURE

COMMENTS: All tests performed at anchor trench.

CHECKED BY: \_\_\_\_\_

**CONSTRUCTION SERVICES FIELD REPORT**Page 1 of 1**PROJECT/SITE VISIT INFORMATION:**

Project: Kekaha Landfill Expansion	W.D.: 4907.0	Date: September 13, 2010
Site Visit Requested By: Geosyntec	Personnel Present at Site: Doug - Geosyntec	Weather: Sunny
Purpose of Site Visit: <input checked="" type="checkbox"/> Density Testing <input type="checkbox"/> Observe Fill <input type="checkbox"/> Finishing Excavation <input type="checkbox"/> Other: _____		

**NUCLEAR GAUGE INFORMATION:**

Gauge Make / Model: X CPN/MC-3 Troika 3440	Gauge No. 10	Xi Ratios (range 0.75 - 1.25) Standard Count	Wet _____ H2O _____
			D5 _____ MS _____

**NOTES / OBSERVATIONS:**

As requested a site visit was made to test the Goodfellow Bros. Inc. basecourse at finish aggregate base elevation. Testing was needed for the perimeter access road of cell #1; and also the drain culvert road crossing near the entrance of the landfill.

Contractor completed compaction prior to this site visit. We observed contractor continuing to moisture condition basecourse with a water wagon. All areas appeared well moisture conditioned and well compacted.

Test results listed below.

Compaction Equipment Used: \_\_\_\_\_

**PROCTOR VALUES USED:**

Sample No.	Soil Description / Source	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
7	Gray sandy gravels with silt / 1 1/2" G.B.I. Kalaheo crusher (H-Bag 7)	151.0	6.7

**COMPACTION TEST RESULTS:**

Test No.	Location	Test Elev.	Dry Density	Moist. Cont.	% Comp.	P-pass P=Fail	Proct. No.	Probe Depth	Remarks
3	Perimeter Rd. 530'N of SW CNR of cell #1	fab	154.4	5.1	100+	P	7	8"	CNR = Corner
4	Perimeter Rd. 480'N of SW CNR of cell #1	fab	152.8	5.2	100+	P	7	8"	
5	Perimeter Rd. 380'N of SW CNR of cell #1	fab	152.8	4.7	100+	P	7	8"	
6	Perimeter Rd. 280'N of SW CNR of cell #1	fab	148.6	5.2	98.4	P	7	8"	
7	Perimeter Rd. 180'N of SW CNR of cell #1	fab	146.5	6.2	97.9	P	7	8"	
8	Perimeter Rd. 80'N of SW CNR of cell #1	fab	143.9	4.6	95.3	P	7	8"	
9	Perimeter Rd. 20'E of SW CNR of cell #1	fab	147.8	5.1	97.9	P	7	8"	
10	Perimeter Rd. 120'E of SW CNR of cell #1	fab	153.0	5.0	100+	P	7	8"	
11	Perimeter Rd. 220'E of SW CNR of cell #1	fab	154.0	4.7	100+	P	7	8"	
12	Perimeter Rd. 265'E of SW CNR of cell #1	fab	150.6	5.6	99.7	P	7	8"	
13	Culvert Rd. crossing near entrance	fab	149.6	5.6	99.1	P	7	8"	

Test results and/or recommendations provided in this report have not been reviewed by supervisory staff and may be subject to revisions or additions. If comments of this report are changed, a revised copy will be either provided to your field personnel or sent to your office.

Prepared By: Lawrence Vidinha III	Reviewed By: <i>DM</i>	Copy To: Doug - Geosyntec
--------------------------------------	---------------------------	------------------------------

**MOISTURE/DENSITY TESTS USING THIN-WALL DRIVE TUBES - ASTM D2937**

**PROJECT:** Kekaha Landfill  
**LOCATION:** Kekaha, Hawaii  
**CONTRACTOR:** Goodfellow Bros. Construction

**PROJECT:** WG1298  
**TASK:** 02  
**DATE:** 21 January 2010

REFERENCE NUMBER	FDT-01	FDT-28	FDT-50	FDT-66	FDT-91	FDT-114
SAMPLE NUMBER	TW-001(Oven)	TW-002(Oven)	TW-003(Oven)	TW-004(Oven)	TW-005(Oven)	TW-006(Oven)
DEPTH OR LIFT NUMBER	3"	3"	3"	3"	3"	3"
DIAMETER (in)	2.82	2.82	2.82	2.82	2.82	2.82
LENGTH (in)	2.73	2.73	2.73	2.73	2.73	2.73
VOLUME (in <sup>3</sup> )	17.05	17.05	17.05	17.05	17.05	17.05
<b>WATER CONTENT DETERMINATION:</b>						
TARE NUMBER:	A72	A72	A72	A72	A72	A72
WET MASS + TARE (g)	407.9	398.5	387.5	397.2	447.6	513.4
DRY MASS + TARE (g)	345.2	334.1	331.6	340.5	371.1	427.7
MASS OF TARE (g)	4.4	4.4	4.4	4.4	4.4	4.4
MASS OF WATER (g)	62.7	64.4	55.7	56.7	76.5	85.7
MASS OF DRY SOIL (g)	340.8	329.7	327.4	336.1	366.7	423.3
WATER CONTENT (%)	18.4%	19.5%	17.0%	16.9%	20.9%	20.2%
<b>UNIT WEIGHT DETERMINATION:</b>						
WET MASS W/TUBE (g)	795.5	801.2	790.4	787.5	805.0	792.2
TUBE MASS (g)	256.5	265.5	265.5	265.5	265.5	265.5
WET UNIT WEIGHT (pcf)	120.4	119.7	117.3	116.6	120.6	117.7
DRY UNIT WEIGHT (pcf)	101.7	100.1	100.2	99.8	99.7	97.9



**MOISTURE/DENSITY TESTS USING THIN-WALL DRIVE TUBES - ASTM D2937**

**PROJECT:** Kekaha Landfill

**PROJECT:** WG1298

**LOCATION:** Kekaha, Hawaii

**TASK:** 02

**CONTRACTOR:** Goodfellow Bros. Construction

**DATE:** 21 January 2010

REFERENCE NUMBER	FDT-140					
SAMPLE NUMBER	TW-007(Oven)					
DEPTH OR LIFT NUMBER	3'					
DIAMETER (in)	2.82					
LENGTH (in)	2.77					
VOLUME (in <sup>3</sup> )	17.30					
<b>WATER CONTENT DETERMINATION:</b>						
TARE NUMBER:	A72					
WET MASS + TARE (g)	404.1					
DRY MASS + TARE (g)	339.0					
MASS OF TARE (g)	4.4					
MASS OF WATER (g)	65.1					
MASS OF DRY SOIL (g)	334.6					
WATER CONTENT (%)	19.5%					
<b>UNIT WEIGHT DETERMINATION:</b>						
WET MASS W/TUBE (g)	795.5					
TUBE MASS (g)	265.5					
WET UNIT WEIGHT (pcf)	116.7					
DRY UNIT WEIGHT (pcf)	97.7					

**LABORATORY DETERMINATION OF MOISTURE CONTENT OF SOIL**

(ASTM D 2216/D4643)

PROJECT: Kekaha Sanitary Landfill Phase II, Cell 1 Expansion  
 LOCATION: Kekaha, Kauai, Hawaii PROJECT NO.: WG1298 TASK NO.: 02  
 DESCRIPTION: Cell 1A/1B Earthfill DATE: 7 day July month 2010 year  
 MATERIAL TYPE: Quarry fines (import compacted fill)

OVEN METHOD (ASTM D2216);

Recommended Mass of Moist Sample Weight

QA ID: M. Minchi

100% PASSING THE NO. 10 (2-mm) SIEVE 20 grams  
 100% PASSING THE NO. 4 (4.75-mm) SIEVE 100 grams  
 100% PASSING THE NO. 3/8-in. (9.5-mm) SIEVE 500 grams  
 100% PASSING THE NO. 3/4-in. (19-mm) SIEVE 2.5 kilograms

A	SAMPLE NUMBER	1	2			
B	TARE NUMBER	A72	A57			
C	WT. OF TARE	4.6	4.5			
D	WT. OF WET SOIL & TARE	274.3	216.6			
E	WT. OF DRY SOIL & TARE	249.6	199.3			
F	WT. OF WATER = D-E		17.3			
G	WT. OF DRY SOIL = E-C		194.8			
H	MOISTURE CONTENT = (F/G) * 100 %		8.9			
I	NUCLEAR DENSITY GAUGE READING:	9.2	8.5			
J	DELTA MOISTURE = H-I %		0.4			
K	FDT NUMBER	FDT 173	FDT 177			



**LABORATORY DETERMINATION OF MOISTURE CONTENT OF SOIL**

(ASTM D 2216/D4643)

PROJECT: Kekaha Sanitary Landfill Phase II, Cell 1 Expansion  
 LOCATION: Kekaha, Kauai, Hawaii PROJECT NO.: WG1298 TASK NO.: 02  
 DESCRIPTION: Cell 1A/1B Earthfill DATE: 8 day July month 2010 year  
 MATERIAL TYPE: Quarry fines (import compacted fill)

OVEN METHOD (ASTM D2216): \_\_\_\_\_ Recommended Mass of Moist Sample Weight QA ID: M. Minch

100% PASSING THE NO. 10 (2-mm) SIEVE 20 grams  
 100% PASSING THE NO. 4 (4.75-mm) SIEVE 100 grams  
 100% PASSING THE NO. 3/8-in. (9.5-mm) SIEVE 500 grams  
 100% PASSING THE NO 3/4-in. (19-mm) SIEVE 2.5 kilograms

	1	2			
A SAMPLE NUMBER:					
B TARE NUMBER:	A57	A22			
C WT. OF TARE	4.5	4.5			
D WT. OF WET SOIL & TARE	214.6	192.6			
E WT. OF DRY SOIL & TARE	195.8	178.8			
F WT. OF WATER = D-E		11.8			
G WT. OF DRY SOIL = E-C		11.3			
H MOISTURE CONTENT = (F/G) * 100 %		10.4			
I NUCLEAR DENSITY GAUGE READING:	9.1	7.7			
J DELTA MOISTURE = H-I %		11.4			
K FDT NUMBER	FDT 192	FDT 196			

**LABORATORY DETERMINATION OF MOISTURE CONTENT OF SOIL**

(ASTM D 2216/D4643)

PROJECT: Kekaha Sanitary Landfill Phase II, Cell 1 Expansion  
 LOCATION: Kekaha, Kauai, Hawaii PROJECT NO.: WG1298 TASK NO.: 02  
 DESCRIPTION: Cell 1A/1B Earthfill DATE: 9 day July month 2010 year  
 MATERIAL TYPE: Quarry fines (import compacted fill)

OVEN METHOD (ASTM D2216):	Recommended Mass of Moist Sample Weight		QA ID:
100% PASSING THE NO. 10 (2-mm) SIEVE	20 grams		<u>M. Minch</u>
100% PASSING THE NO. 4 (4.75-mm) SIEVE	100 grams		
100% PASSING THE NO. 3/8-in. (9.5-mm) SIEVE	500 grams		
100% PASSING THE NO. 3/4-in. (19-mm) SIEVE	2.5 kilograms		
A SAMPLE NUMBER:	<u>1</u>	<u>2</u>	
B TARE NUMBER:	<u>A22</u>	<u>A57</u>	
C WT. OF TARE	<u>4.5</u>	<u>4.4</u>	
D WT. OF WET SOIL & TARE	<u>210.4</u>	<u>190.6</u>	
E WT. OF DRY SOIL & TARE	<u>193.2</u>	<u>174.6</u>	
F WT. OF WATER = D-E	<u>17.2</u>	<u>16.0</u>	
G WT. OF DRY SOIL = E-C	<u>188.7</u>	<u>170.2</u>	
H MOISTURE CONTENT = (F/G) * 100 %	<u>9.1</u>	<u>9.4</u>	
I NUCLEAR DENSITY GAUGE READING:	<u>9.1</u>	<u>9.0</u>	
J DELTA MOISTURE = H-I %	<u>0.0</u>	<u>0.3</u>	
K FDT NUMBER	<u>FDT 209</u>	<u>FDT 211</u>	

**LABORATORY DETERMINATION OF MOISTURE CONTENT OF SOIL**

(ASTM D 2216/D4643)

PROJECT: Kekaha Sanitary Landfill Phase II, Cell 1 Expansion  
 LOCATION: Kekaha, Kauai, Hawaii PROJECT NO.: WG1298 TASK NO.: 02  
 DESCRIPTION: Cell 1A/1B Earthfill DATE: 10 day July month 2010 year  
 MATERIAL TYPE: Quarry fines (import compacted fill)

OVEN METHOD (ASTM D2216): Recommended Mass of Moist Sample Weight QA ID: M. Minch

100% PASSING THE NO. 10 (2-mm) SIEVE 20 grams  
 100% PASSING THE NO. 4 (4.75-mm) SIEVE 100 grams  
 100% PASSING THE NO. 3/8-in. (9.5-mm) SIEVE 500 grams  
 100% PASSING THE NO 3/4-in. (19-mm) SIEVE 2.5 kilograms

A	SAMPLE NUMBER:	<u>1</u>	<u>2</u>		
B	TARE NUMBER,:	<u>A22</u>	<u>A57</u>		
C	WT. OF TARE	<u>4.5</u>	<u>4.4</u>		
D	WT. OF WET SOIL & TARE	<u>196.6</u>	<u>249.4</u>		
E	WT. OF DRY SOIL & TARE	<u>182.2</u>	<u>234.1</u>		
F	WT. OF WATER = D-E	<u>14.4</u>	<u>15.3</u>		
G	WT. OF DRY SOIL = E-C	<u>177.7</u>	<u>230.0</u>		
H	MOISTURE CONTENT = (F/G) * 100 %	<u>8.1</u>	<u>6.7</u>		
I	NUCLEAR DENSITY GAUGE READING:	<u>7.7</u>	<u>7.4</u>		
J	DELTA MOISTURE = H-I %	<u>1.4</u>	<u>0.3</u>		
K	FDT NUMBER	<u>FDT 228</u>	<u>FDT 234</u>		

**LABORATORY DETERMINATION OF MOISTURE CONTENT OF SOIL**

(ASTM D 2216/D4643)

PROJECT: Kekaha Sanitary Landfill Phase II, Cell 1 Expansion  
 LOCATION: Kekaha, Kauai, Hawaii PROJECT NO.: WG1298 TASK NO.: 02  
 DESCRIPTION: Cell 1A/1B Earthfill DATE: 12 day July month 2010 year  
 MATERIAL TYPE: Quarry Fines (import compacted fill)

OVEN METHOD (ASTM D2216):		Recommended Mass of Moist Sample Weight		QA ID: <u>M. Minch</u>	
100% PASSING THE NO. 10 (2-mm) SIEVE		20 grams			
100% PASSING THE NO. 4 (4.75-mm) SIEVE		100 grams			
100% PASSING THE NO. 3/8-in. (9.5-mm) SIEVE		500 grams			
100% PASSING THE NO. 3/4-in. (19-mm) SIEVE		2.5 kilograms			
A	SAMPLE NUMBER-	<u>1</u>	<u>2</u>		
B	TARE NUMBER-	<u>A22</u>	<u>A57</u>		
C	WT. OF TARE	<u>3.5</u>	<u>4.4</u>		
D	WT. OF WET SOIL & TARE	<u>197.6</u>	<u>228.8</u>		
E	WT. OF DRY SOIL & TARE	<u>182.2</u>	<u>208.8</u>		
F	WT. OF WATER = D-E		<u>16.6</u>		
G	WT. OF DRY SOIL = E-C		<u>205.3</u>		
H	MOISTURE CONTENT = (F/G) * 100 %		<u>8.1</u>		
I	NUCLEAR DENSITY GAUGE READING:	<u>9.1</u>	<u>9.4</u>		
J	DELTA MOISTURE = H-I %		<u>0.3</u>		
K	FDT NUMBER	<u>FDT 237</u>	<u>FDT 243</u>		



**LABORATORY DETERMINATION OF MOISTURE CONTENT OF SOIL**

(ASTM D 2216/D4643)

PROJECT: Kekaha Sanitary Landfill Phase II, Cell I Expansion  
 LOCATION: Kekaha, Kauai, Hawaii PROJECT NO.: WG1298 TASK NO.: 02  
 DESCRIPTION: Cell 1A/1B Earthfill DATE: 13 day July month 2010 year  
 MATERIAL TYPE: 1.5-in minus (import compacted fill)

OVEN METHOD (ASTM D2216): Recommended Mass of Moist Sample Weight QA ID: M. Minch

100% PASSING THE NO. 10 (2-mm) SIEVE 20 grams  
 100% PASSING THE NO. 4 (4.75-mm) SIEVE 100 grams  
 100% PASSING THE NO. 3/8-in. (9.5-mm) SIEVE 500 grams  
 100% PASSING THE NO. 3/4-in. (19-mm) SIEVE 2.5 kilograms

A	SAMPLE NUMBER:	1	2			
B	TARE NUMBER:	A57	A57			
C	WT. OF TARE	4.4	4.4			
D	WT. OF WET SOIL & TARE	404.1	393.1			
E	WT. OF DRY SOIL & TARE	360.0	352.1			
F	WT. OF WATER = D-E	44.1	41.0			
G	WT. OF DRY SOIL = E-C	355.6	347.7			
H	MOISTURE CONTENT = (F/G) * 100 %	12.4	11.8			
I	NUCLEAR DENSITY GAUGE READING:	11.8	12.1			
J	DELTA MOISTURE = H-I %	0.6	0.3			
K	FDT NUMBER	FDT 260	FDT 261			

**LABORATORY DETERMINATION OF MOISTURE CONTENT OF SOIL**

(ASTM D 2216/D4643)

PROJECT: Kekaha Sanitary Landfill Phase II, Cell 1 Expansion  
 LOCATION: Kekaha, Kauai, Hawaii PROJECT NO.: WG1298 TASK NO.: 02  
 DESCRIPTION: Cell 1A/1B Earthfill DATE: 15 day July month 2010 year  
 MATERIAL TYPE: 1.5-in minus (import compacted fill)

OVEN METHOD (ASTM D2216):

Recommended Mass of Moist Sample Weight

QA ID: M. Minch

100% PASSING THE NO. 10 (2-mm) SIEVE 20 grams  
 100% PASSING THE NO. 4 (4.75-mm) SIEVE 100 grams  
 100% PASSING THE NO. 3/8-in. (9.5-mm) SIEVE 500 grams  
 100% PASSING THE NO 3/4-in. (19-mm) SIEVE 2.5 kilograms

A	SAMPLE NUMBER:	1	2		
B	TARE NUMBER:	A57	A22		
C	WT. OF TARE	4.4	4.5		
D	WT. OF WET SOIL & TARE	421.5	408.2		
E	WT. OF DRY SOIL & TARE	389.9	373.2		
F	WT. OF WATER = D-E	32.6	35.0		
G	WT. OF DRY SOIL = E-C	385.5	368.7		
H	MOISTURE CONTENT = (F/G) * 100 %	8.5	9.5		
I	NUCLEAR DENSITY GAUGE READING:	8.6	12.5		
J	DELTA MOISTURE = H-I %	-0.9	1.0		
K	FDT NUMBER	FDT 291	FDT 294		

**Appendix G-2**  
**12" CMP Backfill Test Results**



**CONSTRUCTION SERVICES FIELD REPORT**

**PROJECT/SITE VISIT INFORMATION:**

Project: Kekaha Landfill Expansion		W.O.: 4907.0	Date: September 7, 2010
Site Visit Requested By: Geosyntec	Personnel Present at Site Doug - Geosyntec		Weather: Sunny
Purpose of Site Visit: <input checked="" type="checkbox"/> Density Testing <input checked="" type="checkbox"/> Observe Fill <input type="checkbox"/> Footing Excavation <input type="checkbox"/> Other: _____			

**NUCLEAR GAUGE INFORMATION:**

Gauge Make / Model X CPN/MC-3	Troyler 3440	Gauge No. 10	Xi Ratios (range 0.75 - 1.25) Standard Count	Wet DS =	H2O MS =
----------------------------------	--------------	--------------	---	----------	----------

**NOTES / OBSERVATIONS:**

As requested a site visit was made to test the compaction of fill being placed over the drain culvert near the entrance of the Kekaha landfill.

Contractor placed a 1' loose lift of onsite silty sand using the Hitachi 400 excavator. A water wagon was used to moisture condition material. Compaction was achieved using a Bomag 10 ton smooth drum vibratory roller. Contractor then placed 1' loose lifts of basecourse using the 400 excavator, moisture conditioned with the water wagon, and compacted with the 10 ton vibratory roller. Contractor will return prior to paving to fine grade and recompact the top lift.

Compaction Equipment Used: \_\_\_\_\_

**PROCTOR VALUES USED:**

Sample No.	Soil Description / Source	Maximum Dry Density (pcf)	Optimum Moist. Content (%)
20	Geosyntec sample (SB001)	99.5	18.5
7	Gray sandy gravels with silt/ 1/2" G.B.I. Kalaheo crusher (H-Bag 7)	151.0	6.7

**COMPACTION TEST RESULTS:**

Test No.	Location	Test Elev.	Dry Density	Moist. Cont.	% Comp.	P=pass F=fail	Proct. No.	Probe Depth	Remarks
1	Drain culvert road crossing near entrance	2.5'<fg	95.8	17.8	96.3	P	20	8"	
2	Drain culvert road crossing near entrance	1.3'<fg	146.2	7.6	96.8	P	7	8"	

Test results and/or recommendations provided in this report have not been reviewed by supervisory staff and may be subject to revisions or additions. If contents of this report are changed, a revised copy will be either provided to your field personnel or sent to your office.

Prepared By: Lawrence Vidinha III	Reviewed By: <i>DM</i>	Copy To: Doug - Geosyntec
--------------------------------------	---------------------------	------------------------------



**Appendix G-3**  
**MDOF Area Test Results**

**SUMMARY OF FIELD DENSITY TEST**

PROJECT: Kekaha Landfill  
 LOCATION: Kekaha, Hawaii  
 CONTRACTOR: Goodfellow Bros. Construction

PROJECT NO.: WG1298  
 TASK NO.: 02  
 DATE: 6-Apr-10

**SPECIFICATION REQUIREMENTS**

SOURCE: Kauai Quarry  
 % COMPACTION: 95%  
 MOISTURE RANGE: +/- 2%  
 NUCLEAR GAUGE TYPE: Troxler 3440 A  
 NUCLEAR GAUGE SERIAL NO.: 20877

DATE OF TEST (day/mo)	TEST NO.	TEST LOCATION	LAB RESULTS			TYPE OF TEST		FIELD TEST RESULTS				PERCENT COMPACT (%)	PASS/FAIL	RETEST NO.	QA ID
			SAMPLE NO.	MAX UNIT WT (pcf)	O.M.C. (%)	ASTM D-2922	ASTM D-1556	DEPTH/ELEV (ft)	WET UNIT WT (pcf)	DRY UNIT WT (pcf)	F.M.C. (%)				
06/Apr	FDT-1	Curb and Gutter base course backfill	H-Bag 7	151.2	6.7			6-in	163.0	150.8	8.1	100	Pass		CAS
06/Apr	FDT-2	Curb and Gutter base course backfill	H-Bag 7	151.2	6.7			6-in	160.7	151.2	6.3	100	Pass		CAS
06/Apr	FDT-3	Curb and Gutter base course backfill	H-Bag 7	151.2	6.7			6-in	155.2	145.9	6.4	96	Pass		CAS
06/Apr	FDT-4	Curb and Gutter base course backfill	H-Bag 7	151.2	6.7			6-in	157.1	146.7	7.1	97	Pass		CAS
06/Apr	FDT-5	Curb and Gutter base course backfill	H-Bag 7	151.2	6.7			6-in	158.7	149.8	6.0	99	Pass		CAS



SITE PLAN  
N/E



## **Appendix H**

### **Geosynthetic Conformance Testing: Laboratory Test Results**

<b>Appendix H-1</b>	<b>GCL</b>
<b>Appendix H-2</b>	<b>60 mil Double-sided Textured Geomembrane</b>
<b>Appendix H-3</b>	<b>80 mil Double-sided Textured Geomembrane</b>
<b>Appendix H-4</b>	<b>Interface Shear Test Results</b>

**Appendix H-1**  
**GCL**



January 29, 2010

**Mail To:**

**Mike Minch**  
Geosyntec  
475 14th Street, Suite 400  
Oakland, California 94612

**Bill To:**

↔ **Project # WG1298**

email: Mminch@Geosyntec.com  
cc: khuynh@geosyntec.com  
cc: Cscottl@geosyntec.com  
cc: jfrey@wm.com

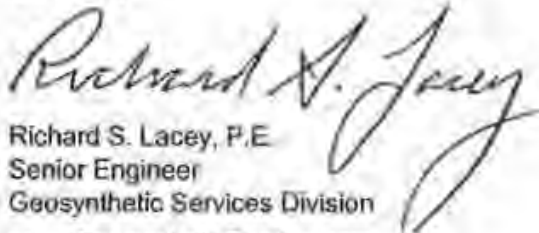
Dear Mr. Minch:

Thank you for consulting TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

Project:	<b>Kekaha Sanitary Landfill</b>
TRI Job Reference Number:	E2337-13-10
Material(s) Tested:	6 Bentomat FLW GCL(s)
Test(s) Requested:	Mass/Unit Area (ASTM D 5993) Peel Strength (ASTM D 6496) Index Flux (ASTM D 5887)

If you have any questions or require any additional information, please call us at 1-800-880-8378.

Sincerely,

  
Richard S. Lacey, P.E.  
Senior Engineer  
Geosynthetic Services Division  
[www.GeosyntheticTesting.com](http://www.GeosyntheticTesting.com)



**GCL TEST RESULTS**  
TRI Client: Geosynthetic  
Project: Kekaha Sanitary Landfill

Material: Bentomat FLW GCL  
Sample Identification: 257  
TRI Log #: E2337-13-10

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	
	1	2	3	4	5	6	7	8	9	10			
<b>Bentonite - Mass/Unit Area (ASTM D 5993, result @ 0% M.C.) ✓</b>													
Bentonite mass/unit area (lbs/ft <sup>2</sup> )	0.88	0.90	0.85	0.83	0.87							✓ 0.86	0.03
GCL mass/unit area (lbs/ft <sup>2</sup> )	0.98	0.99	0.95	0.92	0.88							✓ 0.96	0.03
Moisture Content (%)	32.5	31.9	32.8	32.0	33.4							32.5	0.6
<b>Peel Strength (ASTM D 6496) ✓</b>													
MD - Peel Strength (lbs/in)	10.8	12.0	11.3	8.6	11.6							✓ 10.9	1.3
<b>Index Flux (ASTM D 5887) ✓</b>													
Index Flux (m <sup>3</sup> /m <sup>2</sup> /sec)	2.5E-09										2.5E-09		
Hydraulic Conductivity (cm/sec)	2.1E-09										2.1E-09		
MD: Machine Direction	TD: Transverse Direction					NA: Not Available							

The testing is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



**GCL TEST RESULTS**

TRI Client: Geosyntec  
Project: Kekaha Sanitary Landfill

Material: Bentomat FLW GCL  
Sample Identification: 302  
TRI Log #: E2337-13-10

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	
	1	2	3	4	5	6	7	8	9	10			
<b>Bentonite - Mass/Unit Area (ASTM D 5993, result @ 0% M.C.)</b>													
Bentonite mass/unit area (lbs/ft <sup>2</sup> )	0.80	0.79	0.84	0.80	0.82							✓ 0.81	0.02
GCL mass/unit area (lbs/ft <sup>2</sup> )	0.89	0.89	0.94	0.90	0.91							✓ 0.91	0.02
Moisture Content (%)	34.1	35.3	33.6	33.5	32.8							✓ 33.9	0.9
<b>Peel Strength (ASTM D 6496)</b>													
MD - Peel Strength (lbs/in)	7.7	7.7	4.8	5.8	5.6							✓ 6.3	1.3
<b>Index Flux (ASTM D 5887)</b>													
Index Flux (m <sup>3</sup> /m <sup>2</sup> /sec)	3.1E-09										3.1E-09		
Hydraulic Conductivity (cm/sec)	2.9E-09										2.9E-09		
MO Machine Direction	TD Transverse Direction					NA Not Available							

This testing is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.





**GCL TEST RESULTS**  
TRI Client: Geosyntec  
Project: Kekaha Sanitary Landfill

Material: Bentonite FLW GCL  
Sample Identification: 348  
TRI Log #: E2337-13-10

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	
	1	2	3	4	5	6	7	8	9	10			
<b>Bentonite - Mass/Unit Area (ASTM D 5993, result @ 0% M.C.)</b>													
Bentonite mass/unit area (lbs/ft <sup>2</sup> )	0.87	0.87	0.82	0.88	0.85							✓ 0.85	0.02
GCL mass/unit area (lbs/ft <sup>2</sup> )	0.97	0.97	0.92	0.98	0.95							✓ 0.95	0.02
Moisture Content (%)	31.7	33.4	32.1	32.1	33.9							✓ 32.6	1.0
<b>Peel Strength (ASTM D 6496)</b>													
MD - Peel Strength (lbs/in)	6.0	3.5	4.2	6.2	5.3							✓ 5.0	1.2
<b>Index Flux (ASTM D 5887)</b>													
Index Flux (m <sup>3</sup> /m <sup>2</sup> /sec)	3.1E-09										✓ 3.1E-09		
Hydraulic Conductivity (cm/sec)	2.8E-09										✓ 2.8E-09		
MD Machine Direction	TD Transverse Direction				NA (Not Available)								

The testing is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI lends reproducible of this report, except in full, without prior approval of TRI.



**GCL TEST RESULTS**  
TRI Client: Geosyntec  
Project: Kekaha Sanitary Landfill

Material: Bentomat FLW GCL  
Sample Identification: 396  
TRI Log #: E2337-13-10

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	
	1	2	3	4	5	6	7	8	9	10			
<b>Bentonite - Mass/Unit Area (ASTM D 5993, result @ 0% M.C.)</b>													
Bentonite mass/unit area (lbs/ft <sup>2</sup> )	0.84	0.85	0.86	0.86	0.83							0.85	0.01
GCL mass/unit area (lbs/ft <sup>2</sup> )	0.94	0.95	0.96	0.96	0.93							0.95	0.01
Moisture Content (%)	30.9	32.4	32.5	31.3	32.0							31.8	0.7
<b>Peel Strength (ASTM D 6496)</b>													
MD - Peel Strength (lbs/in)	14.1	14.1	12.5	11.3	9.3							12.3	2.0
<b>Index Flux (ASTM D 5887)</b>													
Index Flux (m <sup>3</sup> /m <sup>2</sup> /sec)	2.9E-09										2.9E-09		
Hydraulic Conductivity (cm/sec)	2.1E-09										2.1E-09		
MD Machine Direction	TD Transverse Direction					NA Not Available							

This testing is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



**GCL TEST RESULTS**  
TRI Client: Geosyntec  
Project: Kekaha Sanitary Landfill

Material: Bentomat FLW GCL  
Sample Identification: 438  
TRI Log #: E2337-13-10

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	
	1	2	3	4	5	6	7	8	9	10			
<b>Bentonite - Mass/Unit Area (ASTM D 5903, result @ 0% M.C.)</b>													
Bentonite mass/unit area (lbs/ft <sup>2</sup> )	0.95	0.97	0.97	0.92	0.78							0.92	0.08
GCL mass/unit area (lbs/ft <sup>2</sup> )	1.05	1.07	1.07	1.01	0.88							1.02	0.08
Moisture Content (%)	32.6	32.5	33.4	32.5	68.1							39.8	15.8
<b>Peel Strength (ASTM D 6496)</b>													
MD - Peel Strength (lbs/in)	6.4	7.6	8.5	7.5	6.1							7.2	1.0
<b>Index Flux (ASTM D 5887)</b>													
Index Flux (m <sup>3</sup> /m <sup>2</sup> /sec)	3.0E-09										3.0E-09		
Hydraulic Conductivity (cm/sec)	3.0E-09										3.0E-09		
MD Machine Direction	TD Transverse Direction					NA Not Available							

The testing is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



**GCL TEST RESULTS**  
TRI Client: Geosyntec  
Project: Kekaha Sanitary Landfill

Material: Bentonite FLW GCL  
Sample Identification: 484  
TRI Log #: E2337-13-10

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	
	1	2	3	4	5	6	7	8	9	10			
<b>Bentonite - Mass/Unit Area (ASTM D 5993, result @ 0% M.C.)</b>													
Bentonite mass/unit area (lbs/ft <sup>2</sup> )	0.82	0.82	0.80	0.79	0.82							0.81	0.01
GCL mass/unit area (lbs/ft <sup>2</sup> )	0.92	0.91	0.90	0.89	0.92							0.91	0.01
Moisture Content (%)	32.8	35.4	33.4	33.7	35.3							34.1	1.2
<b>Peel Strength (ASTM D 6496)</b>													
MD - Peel Strength (lbs/in)	5.7	5.0	7.5	6.1	5.8							6.0	0.9
<b>Index Flux (ASTM D 5887)</b>													
Index Flux (m <sup>3</sup> /m <sup>2</sup> /sec)	3.4E-09										3.4E-09		
Hydraulic Conductivity (cm/sec)	3.4E-09										3.4E-09		
MD Machine Direction	TD Transverse Direction					NA Not Available							

The testing is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those listed. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

**Appendix H-2**  
**60 mil Double-Sided Textured Geomembrane**



January 18, 2010

**Mail To:**

**Michael J. Minch**  
Geosyntec  
475 14th Street, Suite #100  
Oakland, CA 94612

**Bill To:**

**Project # WG1298**

email: Mminch@Geosyntec.com  
cc: Cscott@geosyntec.com  
cc: jfrey@wm.com  
cc: kimhuynh@Geosyntec.com

Dear Mr. Minch:

Thank you for consulting TRI/Environmental, Inc. (TRI) for your geosynthetic testing needs. TRI is pleased to submit this final report for laboratory testing.

**Project:** Kekaha  
**TRI Job Reference Number:** E2339-46-07  
**Material(s) Tested:** 4, Agra 60mil Microspike HDPE Geomembrane(s)  
**Test(s) Requested:** Thickness (ASTM D 5994)  
Asperity Height (GRI GM 12)  
Density (ASTM D 1505)  
Carbon Content (ASTM D 1603, mod.)  
Carbon Dispersion (ASTM D 5508)  
Tensile (ASTM D 6693/GRI GM13)

If you have any questions or require any additional information, please call us at 1-800-880-8378.

Sincerely,

Dr. Mansukh Patel  
Sr. Laboratory Coordinator  
Geosynthetic Services Division  
[www.GeosyntheticTesting.com](http://www.GeosyntheticTesting.com)

cc: Sam R. Allen, Vice President and Division Manager



### GEOMEMBRANE TEST RESULTS

TRI Client: Geosynlec  
Project: Kekaha

Material: Agru 80mil Microspike HDPE Geomembrane(s)  
Sample Identification: 801615.10  
TRI Log #: E2339-46-07

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	
	1	2	3	4	5	6	7	8	9	10			
<b>Thickness (ASTM D 5994) ✓</b>													
Thickness (mils)	60	61	60	61	60	61	60	60	62	60	60	1 14 mils	
<b>Asperity Height (GRI GM 12) ✓</b>													
Asperity Height (mils) - Side A	32	32	32	31	32	33	34	32	32	34	32	1	
Asperity Height (mils) - Side B	25	26	26	26	25	27	28	26	25	27	26	1	
<b>Density (ASTM D 1505) ✓</b>													
Density (g/cm <sup>3</sup> )	0.945	0.945	0.945								0.945	0.000	
<b>Carbon Black Content (ASTM D 1603, mod.) ✓</b>													
% Carbon Black	2.56	2.37									2.37	0.01	
<b>Carbon Black Dispersion (ASTM D 5596) ✓</b>													
Rating - 1st field view	1	1	1	1	1	1	1	1	1	1			
Rating - 2nd field view	1	1	1	1	1	1	1	1	1	1			
<b>Tensile Properties (ASTM D 5693/GRI GM 13, Type IV specimen - HDPE) ✓</b>													
MD Yield Strength (psi)	144	153	154	164	159						151	4	
TD Yield Strength (psi)	163	166	169	167	167						168	2	
MD Break Strength (psi)	222	206	206	158	228						203	28	
TD Break Strength (psi)	177	188	119	162	130						155	29	
MD Yield Elongation (%)	22	22	21	21	21						21	1	
TD Yield Elongation (%)	15	16	15	16	16						15	0	
MD Break Elongation (%)	454	491	479	371	431						439	42	
TD Break Elongation (%)	545	501	64	545	108						363	233	
MD Machine Direction	TD Transverse Direction					NA Not Available							

The testing is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



### GEOMEMBRANE TEST RESULTS

TRI Client: Geosyntec  
Project: Kekaha

Material: Agri 80mil Microspike HDPE Geomembrane(s)  
Sample Identification: B01723.10  
TRI Log #: E2339-46-07

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.			
	1	2	3	4	5	6	7	8	9	10					
<b>Thickness (ASTM D 5994)</b>															
Thickness (mils)	62	62	59	59	61	62	61	60	60	61	61	61	61	1	<< min
<b>Asperity Height (GRI GM 12)</b>															
Asperity Height (mils) - Side A	30	31	31	31	31	30	32	32	26	25	29	29	29	2	
Asperity Height (mils) - Side B	25	26	25	27	27	25	27	28	28	27	27	27	27	1	
<b>Density (ASTM D 1505)</b>															
Density (g/cm <sup>3</sup> )	0.944	0.944	0.944											0.944	0.000
<b>Carbon Black Content (ASTM D 1603, mod.)</b>															
% Carbon Black	2.33	2.31												2.32	0.01
<b>Carbon Black Dispersion (ASTM D 5596)</b>															
Rating - 1st field view	1	1	1	1	1	1	1	1	1	1	1	1	1		
Rating - 2nd field view	1	1	1	1	1	1	1	1	1	1	1	1	1		
<b>Mechanical Properties (ASTM D 6693/GRI GM 13, Type IV specimen - HDPE)</b>															
MD Yield Strength (psi)	145	146	149	151	156									149	4
TD Yield Strength (psi)	162	160	161	161	166									161	1
MD Break Strength (psi)	182	243	180	177	202									209	40
TD Break Strength (psi)	187	163	165	172	115									160	27
MD Yield Elongation (%)	22	23	21	19	23									22	2
TD Yield Elongation (%)	18	18	16	18	16									18	0
MD Break Elongation (%)	436	491	423	189	485									465	33
TD Break Elongation (%)	588	496	483	543	121									448	187
MD Machine Direction	TD Transverse Direction					NA Not Available									

The testing is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.





### GEOMEMBRANE TEST RESULTS

TRI Client: Geosyntec  
Project: Kebab

Material: Agru 60mil Microspike HDPE Geomembranes)  
Sample Identification: 801734.10  
TRI Log #: E2339-46-07

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	
	1	2	3	4	5	6	7	8	9	10			
<b>Thickness (ASTM D 5994)</b>													
Thickness (mils)	61	65	62	63	61	61	61	62	63	61		62	1 ≤ 0.01 mil
<b>Asperity Height (GRI GM 12)</b>													
Asperity Height (mils) - Side A	30	31	31	32	31	32	32	35	32	33		32	1
Asperity Height (mils) - Side B	25	26	27	25	28	26	27	28	29	28		27	1
<b>Density (ASTM D 1505)</b>													
Density (g/cm <sup>3</sup> )	0.944	0.944	0.944									0.944	0.000
<b>Carbon Black Content (ASTM D 1603, mol.%)</b>													
% Carbon Black	2.32	2.31										2.32	0.01
<b>Carbon Black Dispersion (ASTM D 5596)</b>													
Rating - 1st field view	1	1	1	1	1								
Rating - 2nd field view	1	1	1	1	1								
<b>Tensile Properties (ASTM D 6693/GRI GM 13, Type IV specimen - HDPE)</b>													
MD Yield Strength (psi)	175	168	163	157	163							165	7
TD Yield Strength (psi)	183	184	191	173	180							182	7
MD Break Strength (psi)	236	182	207	146	174							189	35
TD Break Strength (psi)	179	197	180	162	169							177	13
MD Yield Elongation (%)	23	23	23	22	23							23	0
TD Yield Elongation (%)	18	18	18	18	18							18	0
MD Break Elongation (%)	505	418	481	465	418							458	38
TD Break Elongation (%)	486	566	631	475	494							503	36
MD Machine Direction	TD Transverse Direction					NA Not Available							

The testing is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



### GEOMEMBRANE TEST RESULTS

TRI Client: Geosyntec  
 Project: Kekaha

Material: Agru 60mil Microspike HDPE Geomembrane(4)  
 Sample Identification: 802103.10  
 TRI Log #: E2339-46-07

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	
	1	2	3	4	5	6	7	8	9	10			
<b>Thickness (ASTM D 5994)</b>													
Thickness (mils)	53	51	50	52	50	52	50	51	52	53	51	59	1 0.003 mils
<b>Asperity Height (GRI GM 12)</b>													
Asperity Height (mils) - Side A	30	30	23	27	28	30	32	31	34	33	31	26	2
Asperity Height (mils) - Side B	26	24	26	25	27	25	26	28	25	28	26	26	1
<b>Density (ASTM D 1505)</b>													
Density (g/cm <sup>3</sup> )	0.944	0.944	0.944									0.944	0.000
<b>Carbon Black Content (ASTM D 1603, mod.)</b>													
% Carbon Black	2.39	2.34										2.37	0.04
<b>Carbon Black Dispersion (ASTM D 5596)</b>													
Rating - 1st field view	1	1	1	1	1	1	1	1	1	1	1	1	
Rating - 2nd field view	1	1	1	1	1	1	1	1	1	1	1	1	
<b>Mechanical Properties (ASTM D 6693/GRI GM 13, Type IV specimen - HDPE)</b>													
MD Yield Strength (psi)	145	149	155	162	155							153	8
TD Yield Strength (psi)	163	162	163	165	171							165	4
MD Break Strength (psi)	226	176	216	203	247							218	26
TD Break Strength (psi)	180	175	173	149	177							171	12
MD Yield Elongation (%)	22	22	22	22	22							22	0
TD Yield Elongation (%)	15	15	15	15	15							15	0
MD Break Elongation (%)	486	464	486	408	470							477	11
TD Break Elongation (%)	566	544	528	433	518							517	51
MD Machine Direction	TD Transverse Direction										NA Not Available		

The testing is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



January 18, 2010

**Mail To:**

**Michael J. Minch**  
Geosyntec  
475 14th Street, Suite 400  
Oakland, CA 94612

email: Mminch@Geosyntec.com  
cc: Cscott@geosyntec.com  
cc: Jfrey@wm.com  
cc: kimhuynh@Geosyntec.com

**Bill To:**

**Project # WG1298**

Dear Mr. Minch:

Thank you for consulting TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

**Project:** Kekaha  
**TRI Job Reference Number:** E2339-48-03  
**Material(s) Tested:** 2, Agru 80mil Microspike HDPE Geomembrane(s)  
**Test(s) Requested:** Thickness (ASTM D 5994)  
Asperty Height (GRI GM 12)  
Density (ASTM D 1505)  
Carbon Content (ASTM D 1603, mod.)  
Carbon Dispersion (ASTM D 5596)  
Tensile (ASTM D 6693/GRI GM13)

If you have any questions or require any additional information, please call us at 1-800-880-8378.

Sincerely,

Dr. Mansukh Patel  
Sr. Laboratory Coordinator  
Geosynthetic Services Division  
[www.GeosyntheticTesting.com](http://www.GeosyntheticTesting.com)

cc: Sam R. Allen, Vice President and Division Manager



### GEOMEMBRANE TEST RESULTS

TRI Client: Geosyntec  
Project: Kahala

Material: Agri 60mil Microspike HDPE Geomembrane(s)  
Sample Identification: 802114.10  
TRI Log #: E2339-48-03

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	
	1	2	3	4	5	6	7	8	9	10			
<b>Thickness (ASTM D 5994)</b>													
Thickness (mils)	52	53	52	53	51	52	52	58	53	52		52 53 ✓	1 0.1 (mm)
<b>Asperity Height (GRI GM 12)</b>													
Asperity Height (mils) - Side A	30	27	27	28	29	28	30	32	31	29		29 ✓	2
Asperity Height (mils) - Side B	29	26	25	26	24	26	25	28	28	27		26 ✓	2
<b>Density (ASTM D 1505)</b>													
Density (g/cm <sup>3</sup> )	0.944	0.944	0.944									0.944 ✓	0.000
<b>Carbon Black Content (ASTM D 1603, med.)</b>													
% Carbon Black	2.33	2.35										2.34 ✓	0.01
<b>Carbon Black Dispersion (ASTM D 5596)</b>													
Rating - 1st field view	1	1	1	1	1	✓							
Rating - 2nd field view	1	1	1	1	1	✓							
<b>Tensile Properties (ASTM D 6693/GRI GM 13, Type IV specimen - HDPE)</b>													
MD Yield Strength (psi)	162	166	169	170	164							166 ✓	3
TD Yield Strength (psi)	153	183	180	174	186							183 ✓	7
MD Break Strength (psi)	210	200	215	217	203							219 ✓	20
TD Break Strength (psi)	185	162	179	162	182							180 ✓	11
MD Yield Elongation (%)	23	23	23	28	25							23 ✓	0
TD Yield Elongation (%)	18	16	18	18	18							18 ✓	0
MD Break Elongation (%)	446	443	461	459	486							459 ✓	17
TD Break Elongation (%)	526	568	525	491	530							530 ✓	27
MD Machine Direction	TD Transverse Direction					NA Not Available							

The listing is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



### GEOMEMBRANE TEST RESULTS

TRI Client: Geosyntec  
Project: Kekaha

Material: Agri 50mil Microspike HDPE Geomembrane(s)  
Sample Identification: 802225.10  
TRI Log #: E2339-48-03

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.		
	1	2	3	4	5	6	7	8	9	10				
<b>Thickness (ASTM D 5994)</b>														
Thickness (mils)	61	62	62	62	59	62	62	58	61	61	61	61	58	1 ±0.01 mils
<b>Asperity Height (GRI GM 12)</b>														
Asperity Height (mils) - Side A	32	33	33	29	33	35	32	34	33	32	32	32	32	1
Asperity Height (mils) - Side B	25	27	26	26	26	26	25	27	26	28	28	28	26	1
<b>Density (ASTM D 1505)</b>														
Density (g/cm <sup>3</sup> )	0.943	0.943	0.943										0.943	0.000
<b>Carbon Black Content (ASTM D 1603, mod.)</b>														
% Carbon Black	2.33	2.34											2.34	0.01
<b>Carbon Black Dispersion (ASTM D 5596)</b>														
Rating - 1st field view	1	1	1	1	1	1	1	1	1	1	1	1	1	
Rating - 2nd field view	1	1	1	1	1	1	1	1	1	1	1	1	1	
<b>Site Properties (ASTM D 6693/GRI GM 13, Type IV specimen - HDPE)</b>														
MD Yield Strength (psi)	158	157	154	155	160								157	2
TD Yield Strength (psi)	161	158	160	163	166								160	8
MD Break Strength (psi)	238	227	183	190	195								207	24
TD Break Strength (psi)	177	204	175	177	198								186	15
MD Yield Elongation (%)	23	23	23	23	23								23	0
TD Yield Elongation (%)	17	17	17	15	15								16	1
MD Break Elongation (%)	466	470	418	419	425								439	27
TD Break Elongation (%)	539	616	514	526	581								555	42
MD Machine Direction	TD Transverse Direction										NA Not Available			

The testing is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



January 19, 2010

**Mail To:**

**Michael J. Minch**  
Geosyntec  
475 14th Street, Suite 400  
Oakland, CA 94612

**Bill To:**

**Project # WG1298**

email: Mminch@Geosyntec.com  
cc: Cscott@geosyntec.com  
cc: jfrey@wm.com  
cc: kimhuynh@Geosyntec.com

Dear Mr. Minch:

Thank you for consulting TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

**Project:** Kekaha  
**TRI Job Reference Number:** E2339-49-08  
**Material(s) Tested:** 2, Agru 60mil Microspike HDPE Geomembrane(s)  
**Test(s) Requested:** Thickness (ASTM D 5994)  
Asperity Height (GRI GM 12)  
Density (ASTM D 1505)  
Carbon Content (ASTM D 1603, mod.)  
Carbon Dispersion (ASTM D 5596)  
Tensile (ASTM D 6693/GRI GM13)

If you have any questions or require any additional information, please call us at 1-800-580-8378.

Sincerely,

Mansukh Patel  
Sr. Laboratory Coordinator  
Geosynthetic Services Division  
[www.GeosyntheticTesting.com](http://www.GeosyntheticTesting.com)

cc: Sam R. Allen, Vice President and Division Manager



### GEOMEMBRANE TEST RESULTS

TRI Client: Geosyntec  
Project: Kekaha

Material: Agru 50mil Microspike HDPE Geomembrane(s)  
Sample Identification: 802235.10  
TRI Log #: E2339-49-08

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	
	1	2	3	4	5	6	7	8	9	10			
<b>Thickness (ASTM D 5994)</b>													
Thickness (mils)	60	60	60	62	59	60	59	60	61	62	60	59	1 << min
<b>Asperity Height (GRI GM 12)</b>													
Asperity Height (mils) - Side A	31	31	34	34	34	34	35	35	36	35	34	1	
Asperity Height (mils) - Side B	26	26	26	27	27	29	28	29	28	28	28	1	
<b>Density (ASTM D 1505)</b>													
Density (g/cm <sup>3</sup> )	0.944	0.944	0.945								0.944	0.001	
<b>Carbon Black Content (ASTM D 1603, mod.)</b>													
% Carbon Black	2.21	2.19									2.20	0.01	
<b>Carbon Black Dispersion (ASTM D 5596)</b>													
Rating - 1st field view	1	1	1	1	1								
Rating - 2nd field view	1	1	1	1	1								
<b>Tensile Properties (ASTM D 6693/GRI GM 13, Type IV specimen - HDPE)</b>													
MD Yield Strength (ppi)	151	147	147	149	152						149	2	
TD Yield Strength (ppi)	162	162	162	170	160						163	4	
MD Break Strength (ppi)	219	186	191	233	227						211	22	
TD Break Strength (ppi)	153	170	164	165	178						166	9	
MD Yield Elongation (%)	22	22	22	22	22						22	0	
TD Yield Elongation (%)	15	15	15	15	15						15	0	
MD Break Elongation (%)	453	414	419	465	420						435	22	
TD Break Elongation (%)	479	513	464	459	531						489	32	
MD Machine Direction	TD Transverse Direction					NA Not Available							

The testing is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



### GEOMEMBRANE TEST RESULTS

TRI Client: Geosyntec  
Project: Kokaha

Serial: Agro 60mil Microspike HDPE Geomembrane(s)  
Sample Identification: 802346.10  
TRI Log #: E2339-49-08

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	
	1	2	3	4	5	6	7	8	9	10			
<b>Thickness (ASTM D 5994)</b>													
Thickness (mils)	63	62	61	61	63	60	60	60	62	63	61	59	1 -0.4 mils
<b>Asperity Height (GRI GM 12)</b>													
Asperity Height (mils) - Side A	32	32	31	31	31	30	32	32	34	30	32	28	1
Asperity Height (mils) - Side B	26	28	29	28	28	27	28	29	28	28	28	28	1
<b>Density (ASTM D 1505)</b>													
Density (g/cm <sup>3</sup> )	0.943	0.944	0.944									0.944	0.001
<b>Carbon Black Content (ASTM D 1603, mod.)</b>													
% Carbon Black	2.41	2.41										2.41	0.00
<b>Carbon Black Dispersion (ASTM D 5596)</b>													
Rating - 1st field view	1	1	1	1	1								
Rating - 2nd field view	1	1	1	1	1								
<b>Stitch Properties (ASTM D 6693/GRI GM 13, Type IV specimen - HDPE)</b>													
Yield Strength (psi)	146	153	153	164	154							154	6
TD Yield Strength (psi)	165	166	167	168	178							169	5
MD Break Strength (psi)	228	209	216	220	254							226	17
TD Break Strength (psi)	192	169	173	188	176							178	13
MD Yield Elongation (%)	24	21	23	21	23							22	1
TD Yield Elongation (%)	16	16	16	16	16							16	0
MD Break Elongation (%)	469	496	464	504	486							484	17
TD Break Elongation (%)	581	475	488	553	488							517	47
MD Machine Direction	TD Transverse Direction					NA Not Available							

The testing is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.





January 20, 2010

**Mail To:**

**Michael J. Minch**  
Geosyntec  
475 14th Street, Suite 400  
Oakland, CA 94612

**Bill To:**

**Project # WG1298**

email: Mminch@Geosyntec.com  
cc: Cscott@geosyntec.com  
cc: Jfrey@wm.com  
cc: kimhuynh@Geosyntec.com

Dear Mr. Minch:

Thank you for consulting TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

**Project:** Kekaha  
**TRI Job Reference Number:** E2339-51-04  
**Material(s) Tested:** 2, Agru 60mil Microspike HDPE Geomembrane(s)  
**Test(s) Requested:** Thickness (ASTM D 5994)  
Asperity Height (GRI GM 12)  
Density (ASTM D 1505)  
Carbon Content (ASTM D 1603, mod.)  
Carbon Dispersion (ASTM D 5596)  
Tensile (ASTM D 6693/GRI GM13)

If you have any questions or require any additional information, please call us at 1-800-880-8378.

Sincerely,

Dr. Mansukh Patel  
Sr. Laboratory Coordinator  
Geosynthetic Services Division  
[www.GeosyntheticTesting.com](http://www.GeosyntheticTesting.com)

cc: Sam R. Allen, Vice President and Division Manager



### GEOMEMBRANE TEST RESULTS

TRI Client: Geosyntec  
Project: Kekaha

Material: Agri 60mil Microspike HDPE Geomembrane(s)  
Sample Identification: 802356.10  
TRI Log #: E2339-51-04

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	
	1	2	3	4	5	6	7	8	9	10			
<b>Thickness (ASTM D 5994)</b>													
Thickness (mils)	81	81	82	81	80	82	81	81	85	83	82	80 ✓	1 std. dev.
<b>Asperity Height (GRI GM 12)</b>													
Asperity Height (mils) - Side A	33	31	34	31	32	31	34	34	35	33	33 ✓	1	
Asperity Height (mils) - Side B	25	26	27	26	27	28	27	28	27	26	27 ✓	1	
<b>Density (ASTM D 1505)</b>													
Density (g/cm3)	0.944	0.944	0.944								0.944 ✓	0.000	
<b>Carbon Black Content (ASTM D 1503, mod.)</b>													
% Carbon Black	2.37	2.38									2.38 ✓	0.01	
<b>Carbon Black Dispersion (ASTM D 5596)</b>													
Rating - 1st field view	1	1	1	1	1 ✓								
Rating - 2nd field view	1	1	1	1	1 ✓								
<b>Tensile Properties (ASTM D 6693/GRI GM 13, Type IV specimen - HDPE)</b>													
MD Yield Strength (psi)	176	171	166	163	164						166 ✓	5	
TD Yield Strength (psi)	161	158	166	178	172						167 ✓	8	
MD Break Strength (psi)	228	229	204	231	241						227 ✓	14	
TD Break Strength (psi)	198	185	184	180	183						186 ✓	7	
MD Yield Elongation (%)	23	23	23	23	23						23 ✓	0	
TD Yield Elongation (%)	18	18	18	18	18						18 ✓	0	
MD Break Elongation (%)	476	471	471	486	465						478 ✓	5	
TD Break Elongation (%)	588	563	540	488	348						543 ✓	38	
MD Machine Direction	TD Transverse Direction					NA Not Available							

The testing is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



### GEOMEMBRANE TEST RESULTS

TRI Client: Geosyntec  
Project: Kekaha

Material: Agru 50mil Microspike HDPE Geomembrane(s)

Sample Identification: 802467.10

TRI Log #: E2339-51-04

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	
	1	2	3	4	5	6	7	8	9	10			
<b>Thickness (ASTM D 5994)</b>													
Thickness (mils)	60	60	60	60	62	62	62	62	63	64	62	60	1 0.4 (mils)
<b>Asperity Height (GRI GM 12)</b>													
Asperity Height (mils) - Side A	32	32	31	30	32	34	33	38	33	35	33	2	
Asperity Height (mils) - Side B	24	24	25	26	25	27	27	27	27	29	26	2	
<b>Density (ASTM D 1505)</b>													
Density (g/cm <sup>3</sup> )	0.944	0.944	0.944								0.944	0.000	
<b>Carbon Black Content (ASTM D 1603, mod.)</b>													
% Carbon Black	2.32	2.26									2.34	0.03	
<b>Carbon Black Dispersion (ASTM D 5596)</b>													
Rating - 1st field view	1	1	1	1	1	1	1	1	1	1	1		
Rating - 2nd field view	1	1	1	1	1	1	1	1	1	1	1		
<b>Stitch Properties (ASTM D 5693/GRI GM 13, Type IV specimen - HDPE)</b>													
MD Yield Strength (psi)	150	155	187	155	153						152	3	
TD Yield Strength (psi)	155	161	169	178	172						168	8	
MD Break Strength (psi)	220	220	222	191	253						221	22	
TD Break Strength (psi)	165	175	211	212	188						194	17	
MD Yield Elongation (%)	23	23	23	23	23						23	0	
TD Yield Elongation (%)	16	16	16	16	16						16	0	
MD Break Elongation (%)	459	449	458	468	501						467	20	
TD Break Elongation (%)	566	531	620	605	580						581	38	
MD Machine Direction	TD Transverse Direction										NA Not Available		

The testing is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

**Appendix H-3**  
**80 mil Double-Sided Textured Geomembrane**



January 18, 2010

**Mail To:**

**Michael J. Minch**  
Geosyntec  
475 14th Street, Suite 400  
Oakland, CA 94612

**Bill To:**

**Project # WG1298**

email: [Mminch@Geosyntec.com](mailto:Mminch@Geosyntec.com)  
cc: [Cscott@geosyntec.com](mailto:Cscott@geosyntec.com)  
cc: [jfrey@wm.com](mailto:jfrey@wm.com)  
cc: [kimhuynh@Geosyntec.com](mailto:kimhuynh@Geosyntec.com)

Dear Mr. Minch:

Thank you for consulting TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

**Project:** Kekaha  
**TRI Job Reference Number:** E2339-46-08  
**Material(s) Tested:** 1, Agri 80mil Microspike HDPE Geomembrane(s)  
**Test(s) Requested:** Thickness (ASTM D 5994)  
Asperity Height (GRI GM 12)  
Density (ASTM D 1505)  
Carbon Content (ASTM D 1603, mod.)  
Carbon Dispersion (ASTM D 5596)  
Tensile (ASTM D 8693/GRI GM13)

If you have any questions or require any additional information, please call us at 1-800-880-8378.

Sincerely,

Dr. Mansukh Patel  
Sr. Laboratory Coordinator  
Geosynthetic Services Division  
[www.GeosyntheticTesting.com](http://www.GeosyntheticTesting.com)

cc: Sam R. Allen, Vice President and Division Manager



### GEOMEMBRANE TEST RESULTS

TRI Client: Geosyntec  
Project: Kakaia

Material: Agru 80mil Microspike HDPE Geomembrane(s)  
Sample Identification: 801611.10  
TRI Log #: E2339-46-08

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
<b>Thickness (ASTM D 5994)</b>												
Thickness (mils)	80	79	79	80	81	81	83	81	85	84	81	2
											79	<or min ✓
<b>Asperity Height (GRI GM 12)</b>												
Asperity Height (mils) - Side A	28	30	30	29	29	28	27	30	29	32	29	1 ✓
Asperity Height (mils) - Side B	25	28	28	26	24	26	25	27	26	29	26	1 ✓
<b>Density (ASTM D 1505)</b>												
Density (g/cm3)	0.948	0.946	0.948								0.946	0.000
<b>Carbon Black Content (ASTM D 1603, mod.)</b>												
% Carbon Black	2.44	2.36									2.40	0.06
<b>Carbon Black Dispersion (ASTM D 5596)</b>												
Rating - 1st field view	1	1	1	1	1							
Rating - 2nd field view	1	1	1	1	1							
<b>Tensile Properties (ASTM D 6693/GRI GM 13, Type IV specimen - HDPE)</b>												
MD Yield Strength (psi)	241	229	224	221	220						227	9
TD Yield Strength (psi)	204	216	215	227	228						218	10
MD Break Strength (psi)	256	273	278	269	285						277	11
TD Break Strength (psi)	261	250	255	253	242						259	31
MD Yield Elongation (%)	21	21	22	23	22						22	1
TD Yield Elongation (%)	17	17	17	18	17						17	0
MD Break Elongation (%)	493	469	466	485	485						484	9
TD Break Elongation (%)	628	496	273	163	581						422	201
MD Machine Direction	TD Transverse Direction				NA, Not Available							

The testing is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, in whole or in part, without prior approval of TRI.

**Appendix H-4**  
**Interface Shear Test Results**

**SUMMARY OF INTERFACE SHEAR TEST RESULTS**

Cell 1, Phase II Lateral Expansion  
Kekaha Sanitary Landfill

Test No.*	Normal Stress (psf)								Specification Peak Friction Angle	Lab Peak Friction Angle	Lab Post-Peak Friction Angle	PASS OR FAIL	
1	30, 40, 50	Operations Layer	6oz NW GT						25 degr	33.0 degr	14.1 degr	Pass	
2	30, 40, 50		6oz NW GT	Drainage Gravel					25 degr	22.1 degr	10.1 degr	Pass*	
3A	30, 40, 50			Drainage Gravel	16 oz NW GT	60mil HDT (shiny side)			25 degr	21.0 degr	12.3 degr	Pass*	
3B	30, 40, 50			Drainage Gravel	16 oz NW GT			80mil HDT (shiny side)	25 degr	19.2 degr	11.4 degr	Pass*	
4A	30, 40, 50					60mil HDT (shiny side)	GCL (white side)		23 degr	24.4 degr	13.2 degr	Pass	
4B	30, 40, 50						GCL (white side)	80mil HDT (shiny side)	23 degr	15.0 degr	16.1 degr	Pass**	
5A	30, 40, 50					60mil HDT (dull side)	GCL (black side)		23 degr	23.1 degr	11.1 degr	Pass	
5B	30, 40, 50						GCL (black side)	80mil HDT (dull side)	23 degr	31.9 degr	14.9 degr	Pass	
6A	30, 40, 50					60mil HDT (dull side)		Subbase Soil 1	25 degr	30.3 degr	28.9 degr	Pass	
6B	30, 40, 50							Subbase Soil 1	80mil HDT (dull side)	25 degr	37.0 degr	29.7 degr	Pass
6C	30, 40, 50					60mil HDT (dull side)		Subbase Soil 2	25 degr	30.3 degr	28.7 degr	Pass	
6D	30, 40, 50							Subbase Soil 2	80mil HDT (dull side)	25 degr	37.1 degr	28.7 degr	Pass
7	2, 5, 10	Operations Layer	6oz NW GT						25 degr	53.2 degr	52.0 degr	Pass	
8	2, 5, 10		6oz NW GT	Drainage Gravel					25 degr	44.1 degr	42.1 degr	Pass	
9	2, 5, 10			Drainage Gravel	16 oz NW GT	60mil HDT (shiny side)			25 degr	28.0 degr	15.6 degr	Pass	
10	2, 5, 10					60mil HDT (shiny side)	GCL (white side)		23 degr	30.8 degr	20.7 degr	Pass	
11	2, 5, 10					60mil HDT (dull side)	GCL (black side)		23 degr	37.9 degr	17.1 degr	Pass	
12A	2, 5, 10					60 mil HDT (dull side)		Subbase Soil 1	25 degr	42.0 degr	34.5 degr	Pass	
12B	2, 5, 10					60mil HDT (dull side)		Subbase Soil 2	25 degr	52.0 degr	49.9 degr	Pass	

Notes:

- \* Test number corresponds to table in Section 02072, Part 2.04E of the Project Specifications (AECOM, July 2009).
- \* Interface shear strength results approved by AECOM per response to RFI #24.
- \*\* Interface 4B (initial) and 11 test peak shear strength results summarized below. Results rejected in response to RFI #5, but later approved in email dated 2/24/2010.

Normal Stress (psf)	Initial Test Peak Shear Strength (psf)	Re-Test by Precision Peak Shear Strength (psf)	Re-Test by TRF Peak Shear Strength (psf)
40	2908	2147	2706
40	2312	2358	3241
50	2778	2912	3479





# Precision Geosynthetic Laboratories



February 1, 2010

Kirk Lilleskare  
**Northwest Linings & Geotextile Products, Inc.**  
21000 77th Ave. South  
Kent, WA 98032

RE: **Kekaha Landfill**

Dear Mr. Lilleskare:

Thank you for consulting Precision Geosynthetic Laboratories (PGL) for your material testing needs.

Enclosed is the **final** laboratory report for interface shear testing of the materials in accordance to the test configurations listed on the next page.

It shall be noted that the samples tested are believed to be true representatives of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. PGL neither accepts responsibility for nor makes claims to the intended final use and purpose of the material and data evaluated.

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.

The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent entity duly authorized by the respective client or from the client itself.

It is a policy of the company to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. **Tested specimens and retained samples are kept for one (1) month.** On the other hand, should you need us to keep them at longer time, please advise us in writing.

Should you have any questions or if we may be of further service to you, please do not hesitate to contact us at telephone number: 800-522-4599.

Sincerely,

**PRECISION GEOSYNTHETIC LABORATORIES**

Carmelo V. Zantua  
Technical/Laboratory Director

Enclosure: (Job No. G100020)



# Precision Geosynthetic Laboratories



CLIENT: Northwest Linings & Geotextile Products, Inc.  
PROJECT: Kekaha Landfill

## INTERFACE SHEAR TESTING (PGL Job No. G100020)

### MATERIAL DESCRIPTION & IDENTIFICATIONS:

Material	Type	Manufacturer	Roll No.	PGL Control No.	Date Received
Soil	Subbase 001	NA	NA	64124	1/14/2010
Soil	1 1/2" Base Course	NA	NA	64127	1/14/2010
Soil	3/8" Quarry Fine	NA	NA	64129	1/14/2010
Geomembrane	60mil HDPE Microspike	AGRU	801613-10	64168	1/18/2010
Geomembrane	80mil HDPE Microspike	AGRU	801611-10	64168	1/18/2010 & 1/30/2010
Geotextile	16oz Non woven	TNS	2020626855	64183	1/21/2010
Geotextile	16oz Non woven	TNS	2020626871	64184	1/21/2010
Geotextile	6oz Non woven	TNS	300294086	64185	1/21/2010
Geotextile	6oz Non woven	TNS	300294615	64186	1/21/2010
Geotextile	6oz Non woven	TNS	300294624	64187	1/21/2010
GCL	Bentomat DN FLW	CETCO	257	64231	1/23/2010
GCL	Bentomat DN FLW	CETCO	287	64232	1/23/2010
GCL	Bentomat DN FLW	CETCO	318	64233	1/23/2010

SAMPLE SENT BY: CETCO Industries / AGRU America / TRI Environmental / Geosyntec Consultants

### TESTS REQUIRED:

TEST METHOD	DESCRIPTION
ASTM D6243	Interface Shear
ASTM D5231	Interface Shear

### TEST CONFIGURATIONS:

Test No.	Configuration
<del>1</del>	<del>3/8" Quarry Fine vs. 6oz Separation Geotextile</del>
<del>2</del>	<del>6oz Separation Geotextile vs. 1 1/2" Base Course</del>
<del>3A</del>	<del>1 1/2" Base Course vs. 16oz Cushion Geotextile vs 60mil HDPE Microspike</del>
<del>3B</del>	<del>1 1/2" Base Course vs. 16oz Cushion Geotextile vs 80mil HDPE Microspike</del>
4A	60mil HDPE Microspike vs. Bentomat DN
4B	80mil HDPE Microspike vs. Bentomat DN
5A	Bentomat DN vs. 60mil HDPE Microspike
5B	Bentomat DN vs. 80mil HDPE Microspike
6A	60mil HDPE Microspike vs Subbase 001
6B	80mil HDPE Microspike vs Subbase 001
<del>7</del>	<del>3/8" Quarry Fine vs. 6oz Separation Geotextile</del>
<del>8</del>	<del>6oz Separation Geotextile vs. 1 1/2" Base Course</del>
<del>9</del>	<del>1 1/2" Base Course vs. 16oz Cushion Geotextile vs 60mil HDPE Microspike</del>
10	60mil HDPE Microspike vs. Bentomat DN
11	Bentomat DN vs. 60mil HDPE Microspike
12A	60mil HDPE Microspike vs Subbase 001

SUPERCEDED  
BY 5 MAY  
2010 TEST  
RESULTS



# Precision Geosynthetic Laboratories



**TEST CONDITIONS:** The samples were conditioned for a minimum one hour in the laboratory at  $22 \pm 2^{\circ}\text{C}$  ( $71.6 \pm 3.6^{\circ}\text{F}$ ) and at  $60 \pm 10\%$  relative humidity prior to test.

## **TEST RESULTS:**

The test results are summarized in Tables 1 to 12A.

## **PRECISION GEOSYNTHETIC LABORATORIES**



Carmelo V. Zantua  
Technical/Laboratory Director

**TABLE 1**  
**CLIENT: Northwest Linings & Geotextile Products, Inc.**  
**PROJECT: Kekaha Landfill**

INTERFACE SHEAR TEST RESULT (ASTM D5321)  
 PGL Job No. G10-0020

Reviewed By: [Signature]  
 Date: 01/26/19

**TEST CONFIGURATION**



**TEST CONDITIONS:**

**SAMPLE PREPARATION:**

1. Specimens were cut along machine direction to 14" x 17" for the BOTTOM box, with effective test area of 12" x 12".
2. Specimens were secured via flat bar clamping mechanisms complete with bolts and nuts (7-pairs).

**CONSOLIDATION:**

1. Each set of specimen was consolidated under flooded condition for 1 hr @ normal load before shearing.
2. Normal loads were applied using Bladder for all loads.

**SHEAR TEST:**

1. Shear test was conducted @ 0.040 in/ min
2. Sheared @ minimum 3.0 inch horizontal displacement.
3. The test specimens were sheared at flooded condition.
4. Test were performed in general accordance with ASTM D5321 using Braford-Kilmer LG-112 Direct Shear machine with effective test area of 12 in X 12 in.

*SUPERSEDED*

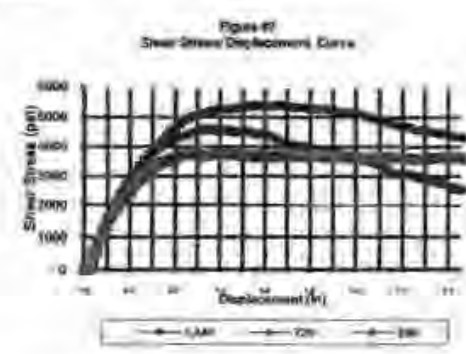
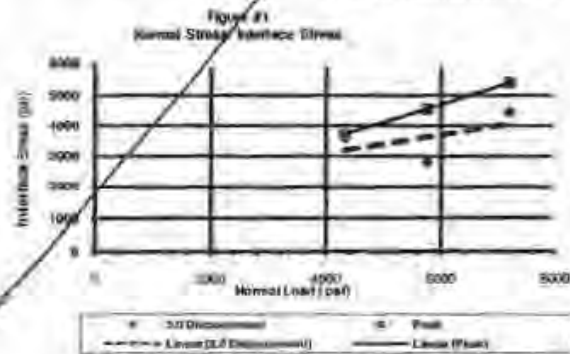
**TEST RESULTS:**

Normal Stresses Applied		Moisture Content		PEAK STRENGTH		POST- PEAK STRENGTH AT 3.0 INCHES	
		Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psi)	(psf)	(%)	(%)	(psf)	(degrees)	(psf)	(degrees)
2.00	288	7.4	15.5	3738	41	3611	40
5.00	720	7.4	13.7	4570	38	2810	28
10.00	1,440	7.4	12.7	5408	37	4470	32
COHESION (psf):				1232		1912	
COEFFICIENT OF FRICTION:				0.58		0.30	
FRICTION ANGLE (degrees):				30.1		15.6	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

**OBSERVATIONS:**

1. No tilting of the system or any abnormalities observed during and after the test.
2. Tearing and stretching of the geotextile was observed at all loads.
3. Sliding occurred between the two interfacing surfaces.



By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories (a laboratory firm) Client and all other parties for claims or losses due to the use of this data, to the extent for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories (a firm) and against all liabilities arising out of the aforementioned firm.

*[Signature]*

INTERFACE SHEAR TEST RESULT (ASTM D5321)  
 PGL Job No. G10-0020

Reviewed By: \_\_\_\_\_  
 Date: 01/26/10

TEST CONFIGURATION 2



*SUPERSEDED*

TEST CONDITIONS:

SAMPLE PREPARATION:

1. Specimens were cut along machine direction to 14" x 17" for the BOTTOM box, with effective test area of 12" x 12".
2. Specimens were secured via flat bar clamping mechanisms complete with bolts and nuts (7-pairs).

CONSOLIDATION:

1. Each set of specimen was consolidated under floated condition for 1 hr @ normal load before shearing.
2. Normal loads were applied using Bladder for the highest load, and Bladder for the lowest load.

SHEAR TEST:

1. Shear test was conducted @ 0.040 in/min
2. Sheared @ minimum 3.0 inch horizontal displacement.
3. The test specimens were sheared at floated condition.
4. Test were performed in general accordance with ASTM D5321 using Braniff-Kilman LG-12 Direct Shear machine with effective test area of 12 in X 12 in.

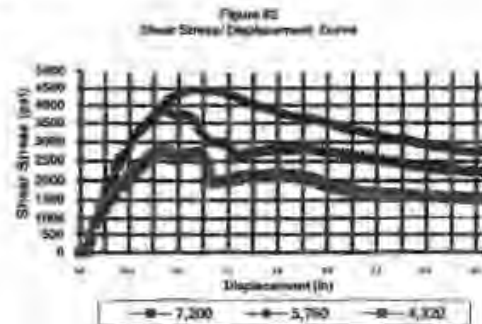
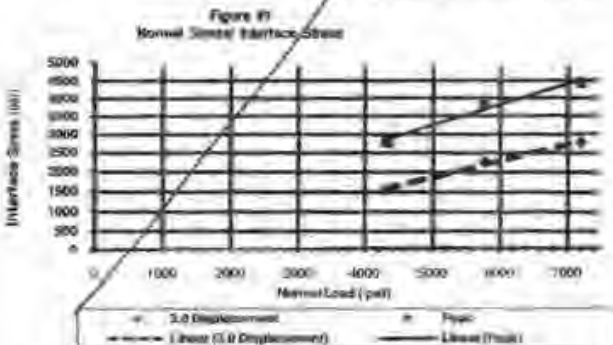
TEST RESULTS:

Normal Stresses Applied		PEAK STRENGTH		POST- PEAK STRENGTH AT 3.0 INCHES	
		Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psi)	(psf)	(psf)	(degrees)	(psf)	(degrees)
30.00	4,320	2,789	33	1,558	20
40.00	5,760	3,852	34	2,255	21
50.00	7,200	4,444	32	2,772	21
COHESION (psf):		385		0	
COEFFICIENT OF FRICTION:		0.57		0.42	
FRICTION ANGLE (degrees):		29.9		22.8	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

OBSERVATIONS:

1. No filling of the system or any abnormalities observed during and after the test.
2. Teasing and stretching of the geotextile was observed at all loads.
3. Sliding occurred between the two interlocking surfaces.



By accepting the data and results presented on this report, the Client agrees to waive his liability for cover Geosynthetic Laboratories from claims and all other parties for claims on cover. Due to the use of this data, to the suit for the respective tests presented in this report, and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities, claims, damages, costs and expenses of the aforementioned suit.

TABLE 3A  
 CLIENT: Northwest Linings & Geotextile Products, Inc.  
 PROJECT: Kokaha Landfill

INTERFACE SHEAR TEST RESULT (ASTM D5321)  
 PGL Job No. G10-0020

Reviewed By: *[Signature]*  
 Date: 01/25/10

TEST CONFIGURATION 3A



TEST CONDITIONS:

SAMPLE PREPARATION:

- Specimens were cut along machine direction to 14" x 10" for the upper box, and 14" x 17" for the lower box, with an effective test area of 12" x 12".
- Geosynthetic specimens were secured in the shear box via flat bar slamping mechanisms complete with bolts and nuts (7 pairs).

CONSOLIDATION:

- Each set of specimen or system was consolidated under bladder condition for 1 hr @ normal load before shearing.
- Normal loads were applied using bladder for all loads.

SHEAR TEST:

- Shear test was conducted @ 0.040 in/min.
- Sheared @ minimum 3.0 inch horizontal displacement.
- The test specimens were sheared in bladder condition.
- Test was performed in general accordance with ASTM D5321 using Branard-Nilman LG-11V Direct Shear machine with effective test area of 12 in x 12 in.

TEST RESULTS:

Normal Stresses Applied		Asperity Heights		PEAK STRENGTH		POST-PEAK STRENGTH AT 3.0 INCHES	
		Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psf)	(psf)	(mils)	(mils)	(psf)	(degrees)	(psf)	(degrees)
30	4,320	31	25	1,543	20	350	12
40	5,760	32	29	2,028	19	1,300	15
50	7,200	32	27	3,183	24	1,662	13
Note:		COHESION (psf):		0		0	
		COEFFICIENT OF FRICTION:		0.56		0.25	
		FRICTION ANGLE (degrees):		29.1		13.9	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit lines.

OBSERVATIONS:

- No tilting of the system or any abnormalities observed during and after the test.
- Superficial abrasion on the geosynthetics interacting shear (typical to all tests).
- Sliding occurred between the HDPE and geotextile interface.

Figure #1  
 Normal Shear Interface Stress

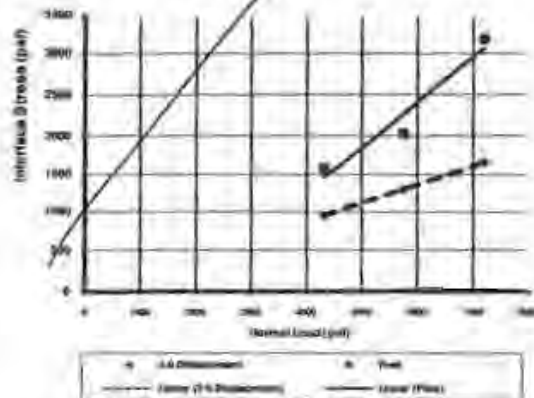
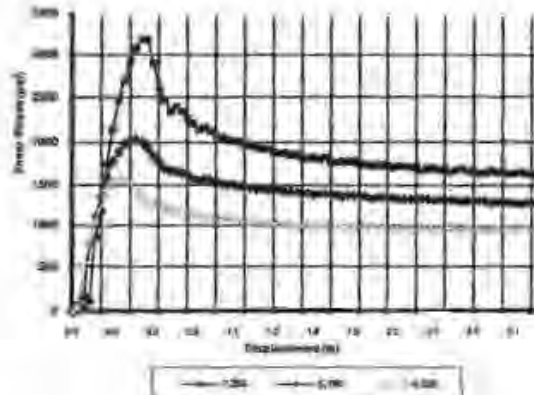


Figure #2  
 Shear Stress/Displacement Curve



Notwithstanding the data and results presented on this report, the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all claims, damages, losses, and expenses, including reasonable attorneys' fees, that may be asserted against or incurred by Precision Geosynthetic Laboratories from and against all third parties in connection with the above-referenced test.

TABLE 3B  
 CLIENT: Northwest Linings & Geotextile Products, Inc.  
 PROJECT: Kiskadee Landfill

INTERFACE SHEAR TEST RESULT (ASTM D5321)  
 PCL Job No. G10-0020

Reviewed By:   
 Date: 01/29/10

TEST CONFIGURATION 3B



TEST CONDITIONS:

SAMPLE PREPARATION:

- Specimens were cut along machine direction to 14" x 11" for the upper box, and 14" x 17" for the lower box, with an effective test area of 12" x 12".
- Geosynthetic specimens were secured in the shear box via flat bar clamping mechanisms complete with bolts and nuts (4 pairs).

CONSOLIDATION:

- Each set of specimen or system was consolidated under hooded condition for 1.5 @ normal load before shearing.
- Normal loads were applied using Bladder for all loads.

SHEAR TEST:

- Shear test was conducted @ 0.040 in/min.
- Sheared @ minimum 3.0 inch horizontal displacement.
- The test specimens were sheared in hooded condition.
- Test was performed in general accordance with ASTM D5321 using Brinard-Kilmer LG-112 Direct Shear machine with effective test area of 12 in x 12 in.

TEST RESULTS:

Normal Stresses Applied		Aperture Heights		PEAK STRENGTH		POST-PEAK STRENGTH AT 3.0 INCHES	
		Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psf)	(psf)	(mils)	(mils)	(psf)	(degrees)	(psf)	(degrees)
30	4,320	31	29	1,356	17	810	11
40	5,760	29	27	2,062	20	1,192	12
50	7,200	30	27	2,367	16	1,445	11
Note:		COHESION (psf) :		0		0	
		COEFFICIENT OF FRICTION :		0.35		0.22	
		FRICTION ANGLE (degrees) :		19.3		12.4	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

OBSERVATIONS:

- No tilting of the system or any abnormalities observed during and after the test.
- Superficial abrasion on the geosynthetic (fracturing sides) (typical to all loads).
- Sliding occurred between the HDPE and geotextile interface.

Figure #1  
Normal Stress/Interface Stress

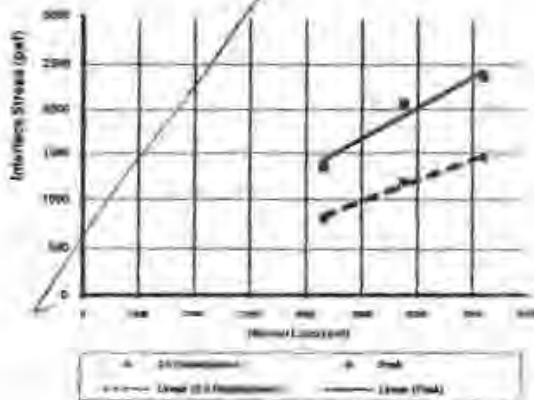
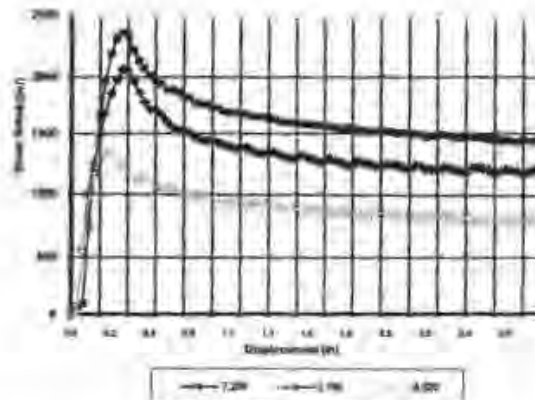


Figure #2  
Shear Stress/Displacement (Curve)



By accepting the drawings and/or reports generated on this system, the Client agrees to bear the full liability for any errors that may occur. The Client also agrees to bear the full liability for any errors that may occur due to the use of this data, for the cost of the test. The Client also agrees to bear the full liability for any errors that may occur due to the use of this data, for the cost of the test.

**INTERFACE SHEAR TEST RESULT (ASTM D6243)**  
**PGL Job No. G10-0020**

**Reviewed By:** \_\_\_\_\_  
**Date:** 01/28/10

**TEST CONFIGURATION 4A**



**TEST CONDITIONS:**

**SAMPLE PREPARATION:**

1. Specimens were cut along machine direction to 14" x 17" for the upper box, and 14" x 16" for the lower box, with an effective test area of 12" x 12".
2. Geosynthetic specimens were secured via rail bar clamping mechanisms complete with bolts and nuts (T-pairs).

**CONSOLIDATION:**

1. Each set of specimen was consolidated under **flooded** condition for **24 hrs** @ normal load before shearing.
2. Normal loads were applied using **Bladder** for all loads.

**SHEAR TEST:**

1. Shear test was conducted @ **0.040** in/min.
2. Shear'd @ minimum **3.0** inch horizontal displacement.
3. The test specimens were sheared at **flooded** condition.
4. Test were performed in general accordance with ASTM D6243 using Branard-Klimax LJS-112 Direct Shear machine with effective test area of 12 in x 12 in.

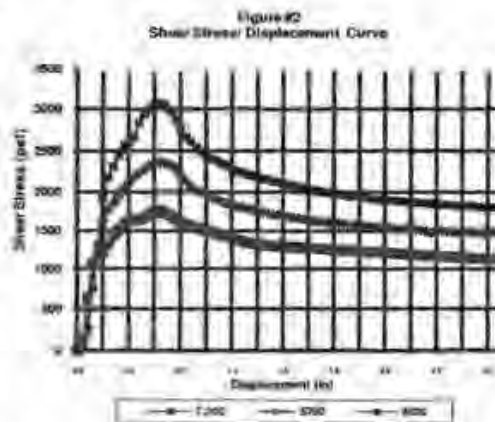
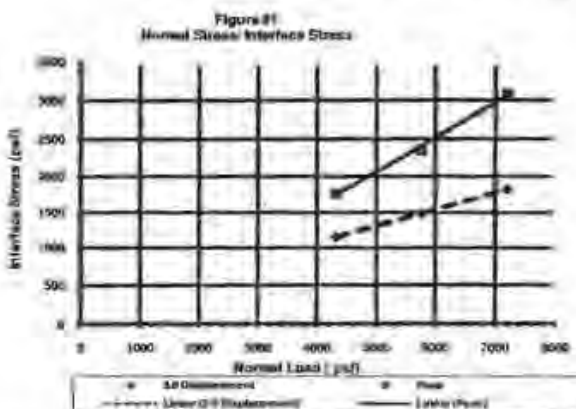
**TEST RESULTS:**

Normal Stresses Applied		GCL Moisture Content		Asperity Heights		PEAK STRENGTH		POST-PEAK STRENGTH AT 3.0 INCHES	
		Before	After	Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psf)	(psf)	(%)	(%)	(mils)	(mils)	(psf)	(degrees)	(psf)	(degrees)
30.00	4320	22.3	67.2	30	29	1768	22	1144	15
60.00	5760	22.3	60.5	30	29	2366	22	1478	14
50.00	7,200	22.3	54.2	30	28	3073	23	1819	14
<b>Note:</b>						COHESION (psf) :		130	
						COEFFICIENT OF FRICTION :		0.45	
						FRICTION ANGLE (degrees) :		24.4	
								13.2	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit lines.

**OBSERVATIONS:**

1. No bling of the system or any abnormalities observed during and after the test.
2. Superficial abrasion on the geosynthetic interfacing sides (typical at all loads).
3. Sliding occurred between the two interfacing surfaces.



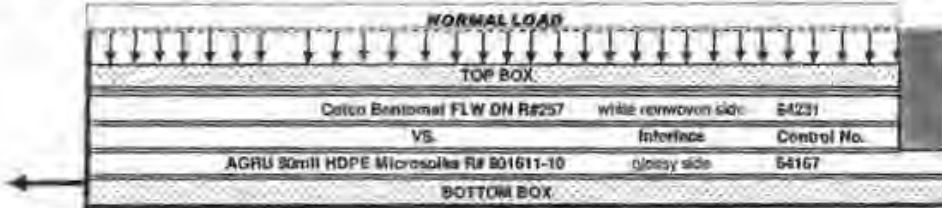
By creating the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from claims, suit or actions due to the use of this data, to the extent the respective test procedures in this report, and the Client agrees to maintain and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.



**INTERFACE SHEAR TEST RESULT (ASTM D6243)**  
**PGL Job No. G10-0020**

Reviewed L.  
 Date: 01/29/10

**TEST CONFIGURATION 4B**



**TEST CONDITIONS:**

**SAMPLE PREPARATION:**

1. Specimens were cut along machine direction to 14" x 17" for the upper box, and 14" x 19" for the lower box, with an effective test area of 12" x 12".
2. Geosynthetic specimens were secured via flat bar clamping mechanisms complete with bolts and nuts (7 pairs).

**CONSOLIDATION:**

1. Each set of specimen was consolidated under **Rooded** condition for **24 hrs** @ normal load before shearing.
2. Normal loads were applied using **Bladder** for all pads.

**SHEAR TEST:**

1. Shear test was conducted @ **0.040** in/min.
2. Sheared @ minimum **3.0** inch horizontal displacement.
3. The test specimens were sheared at **Rooded** condition.
4. Test were performed in general accordance with ASTM D6243 using Branard-Kilman LG-112 Direct Shear machine with effective test area of 12 in X 12 in.

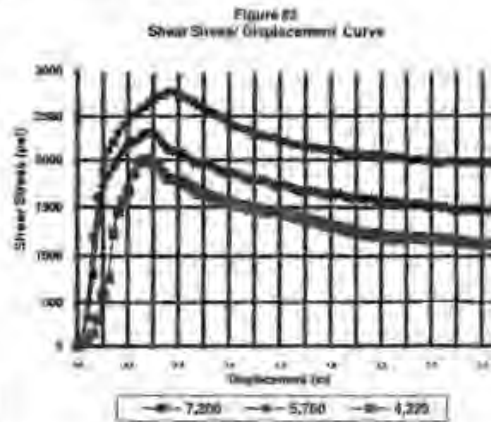
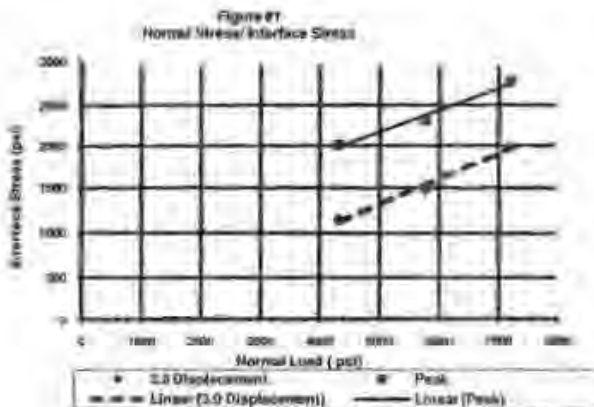
**TEST RESULTS:**

Normal Stresses Applied		OCL Moisture Content		Asperity Heights		PEAK STRENGTH		POST- PEAK STRENGTH AT 3.0 INCHES	
		Before	After	Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psi)	(psf)	(%)	(%)	(mils)	(mils)	(psf)	(degrees)	(psf)	(degrees)
30.00	4,320	22.2	65.5	32	29	2006	25	1147	15
40.00	5,760	22.2	61.0	31	27	2312	32	1477	14
50.00	7,200	22.2	52.8	31	24	2778	21	1978	15
Note:						COHESION (psf):	806	0	
						COEFFICIENT OF FRICTION:	0.27	0.29	
						FRICTION ANGLE (degrees):	15.0	16.1	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit lines.

**OBSERVATIONS:**

1. No tilting of the system or any abnormalities observed during and after the test.
2. Superficial abrasion on the geosynthetic interfacing sides (typical to all loads).
3. Sliding occurred between the two interfacing surfaces.

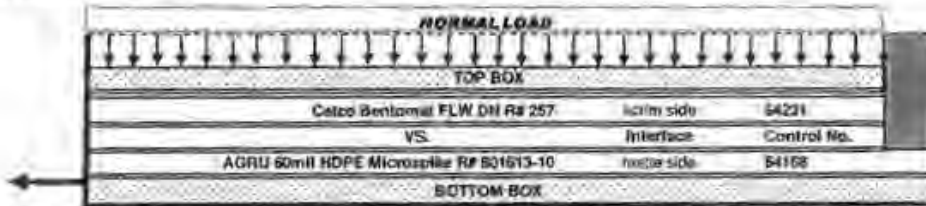


By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from claims and all other parties for claims or losses, for the use of this data, in the past or in the future, that is presented in this report and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all damages to be paid of the above-mentioned test.

INTERFACE SHEAR TEST RESULT (ASTM D6243)  
 PGL Job No. G10-0020

Reviewed By: \_\_\_\_\_  
 Date: 01/27/10

TEST CONFIGURATION 5A



TEST CONDITIONS:

SAMPLE PREPARATION:

- Specimens were cut along machine direction to 14" x 17" for the upper box, and 14" x 19" for the lower box, with an effective test area of 12" x 12".
- Geosynthetic specimens were secured via full bar clamping mechanisms complete with bolts and nuts (1 pair).

CONSOLIDATION:

- Each set of specimen was consolidated under floated condition for 24 hrs @ normal load before shearing.
- Normal loads were applied using Bladder in all tests.

SHEAR TEST:

- Shear test was conducted @ 0.050 in/min.
- Sheared @ minimum 3.0 inch normal displacement.
- The test specimens were sheared at floated condition.
- Test were performed in general accordance with ASTM D6243 using Brinard-Kilman LG-112 Direct Shear machine with effective test area of 12 in X 12 in.

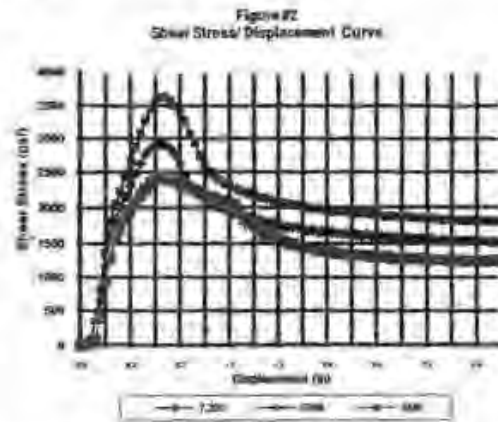
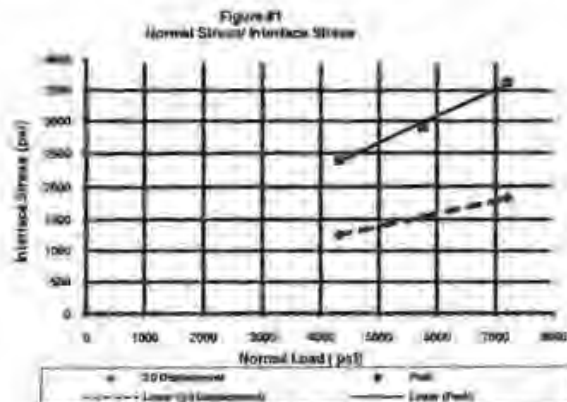
TEST RESULTS:

Normal Stresses Applied		GCL Moisture Content		Asperity Heights		PEAK STRENGTH		POST-PEAK STRENGTH AT 3.0 INCHES	
		Before	After	Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psf)	(psf)	(%)	(%)	(mil)	(mil)	(psf)	(degrees)	(psf)	(degrees)
30.00	4320	22.3	77.5	26	24	3406	29	1254	16
40.00	5760	22.3	71.0	27	22	2010	27	1529	15
50.00	7200	22.3	66.3	26	21	3636	27	1620	14
Note:		COHESION (psf):				524		402	
Note:		COEFFICIENT OF FRICTION:				0.43		0.20	
N/A - Not Applicable		FRICTION ANGLE (degrees):				23.1		11.1	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit lines.

OBSERVATIONS:

- No tilting of the system or any abnormalities observed during and after the test.
- Superficial abrasion on the geosynthetic interlocking plates (typical to all loads).
- Sliding occurred between the two interlocking surfaces.



By accepting the data and results presented in this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims arising out of the use of this data, to the extent of the respective tests presented in this report, and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all damages in any of the circumstances set forth.



**INTERFACE SHEAR TEST RESULT (ASTM D6243)**  
 PGL Job No. G10-0020

Reviewed By: \_\_\_\_\_  
 Date: 02/01/10

**TEST CONFIGURATION** 



**TEST CONDITIONS:**

**SAMPLE PREPARATION:**

1. Specimens were cut along machine direction to 14" x 17" for the upper box, and 14" x 19" for the lower box, with an effective test area of 12" x 12"
2. Geosynthetic specimens were secured via flat bar clamping mechanisms complete with bolts and nuts (7-pair).

**CONSOLIDATION:**

1. Each set of specimen was consolidated under flooded condition for 24 hrs @ normal load before shearing.
2. Normal loads were applied using Bladder for all loads.

**SHEAR TEST:**

1. Shear test was conducted @ 0.040 in/min.
2. Sheared @ minimum 3.0 inch horizontal displacement.
3. The test specimens were sheared at flooded condition.
4. Test were performed in general accordance with ASTM D6243 using Branard-Kimian LG-112 Direct Shear machine with effective test area of 12 in X 12 in.

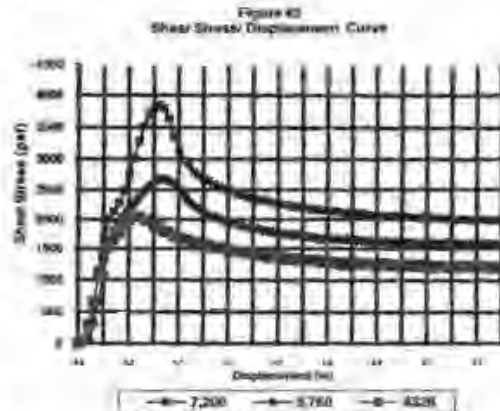
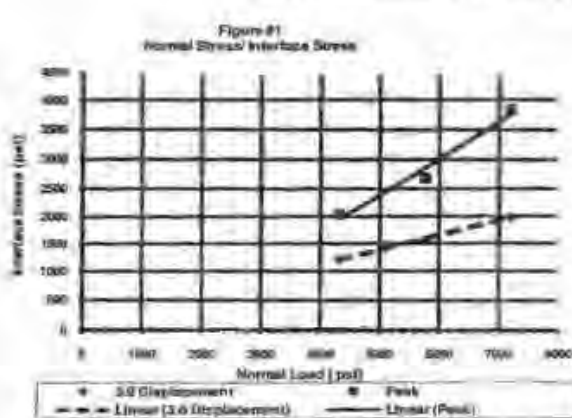
**TEST RESULTS:**

Normal Stresses Applied	GCL Moisture Content		Asperity Heights		PEAK STRENGTH		POST-PEAK STRENGTH AT 3.0 INCHES		
	Before	After	Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle	
(psf)	(psf)	(%)	(%)	(mic)	(mic)	(psf)	(degrees)	(psf)	(degrees)
30.00	4320	22.3	70.8	26	25	2043	25	1215	15
40.00	5,760	22.3	65.9	27	25	2580	25	1568	15
50.00	7,200	22.3	61.0	35	22	3639	20	1990	13
Note:					COHESION (psf):		59		
Note:					COEFFICIENT OF FRICTION:		0.62		
N/A - Not Applicable					FRICTION ANGLE (degrees):		31.3		

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

**OBSERVATIONS:**

1. No tilting of the system or any anomalies observed during and after the test.
2. Superficial abrasion on the geosynthetic interfacing sides (typical to all tests).
3. Sliding occurred between the two interfacing surfaces.

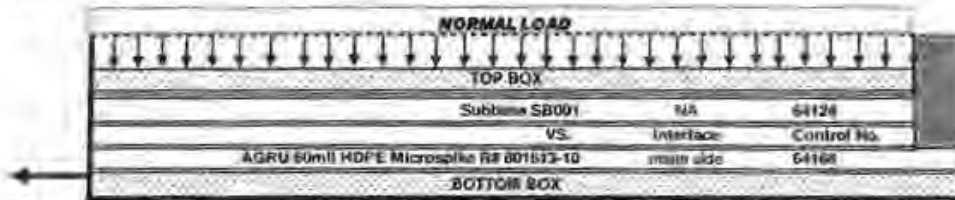


By including this data and results information on this report, the Client agrees to hold the liability of Precision Geosynthetic Laboratories from (and hold) any other parties for claims or damages, the use of this data, its disclosure for the respective tests presented in this report, and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in respect of the aforementioned tests.

INTERFACE SHEAR TEST RESULT (ASTM D5321)  
 PGL Job No. G10-0050

Reviewed By: \_\_\_\_\_  
 Date: 01/27/10

TEST CONFIGURATION 6A



TEST CONDITIONS:

SAMPLE PREPARATION:

- The TOP box contained the soil.
- Specimens were cut along machine direction to 14" x 12" for the BOTTOM box, with effective test area of 12" x 12".
- The Maximum Dry Density (MDD) of the soil is 99.5 pcf at 19.5% Optimum Moisture Content (OMC).
- Soil specimen was remolded to 94.5 pcf at 19.4% moisture content forming 2 test layers in the TOP box.
- Specimens were secured via flat bar clamping mechanisms complete with bolts and nuts (7 pairs).

CONSOLIDATION:

- Each set of specimen was consolidated under flooded condition for 1 hr @ normal load before shearing.
- Normal loads were applied using Bladder for all loads.

SHEAR TEST:

- Shear test was conducted @ 0.040 in/min.
- Sheared @ minimum 3.0 inch horizontal displacement.
- The test specimens were sheared at flooded condition.
- Test were performed in general accordance with ASTM D5321 using Branard/Kinton LG-112 Direct Shear machine with effective test area of 12 in X 12 in.

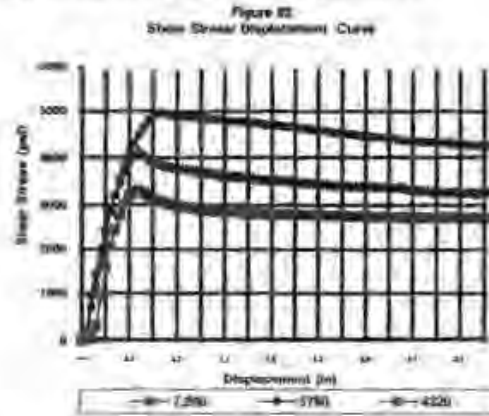
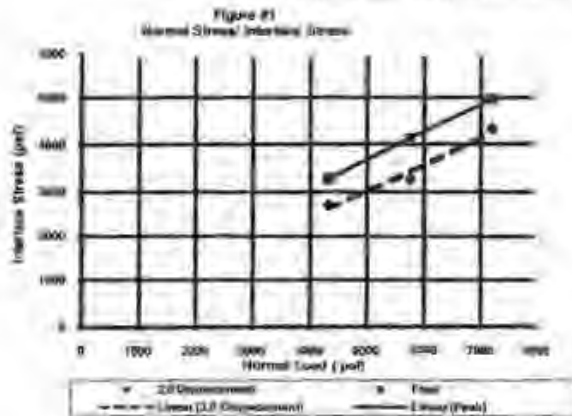
TEST RESULTS:

Normal Stresses Applied		Moisture Content		Asperity Heights		PEAK STRENGTH		POST-PEAK STRENGTH AT 3.0 INCHES	
(psf)	(psf)	(%)	(%)	(mils)	(mils)	Shear Stress (psf)	Secant Angle (degrees)	Shear Stress (psf)	Secant Angle (degrees)
30.00	4320	18.4	20.2	27	26	3292	37	2724	32
40.00	5760	18.4	21.5	27	29	4117	36	3273	30
50.00	7200	18.4	19.4	27	24	4973	35	4311	31
Note:						COHESION (psf):		262	
						COEFFICIENT OF FRICTION:		0.58	
						FRICTION ANGLE (degrees):		30.3	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

OBSERVATIONS:

- No tilting of the system or any abnormalities observed during and after the test.
- Superficial abrasion on the geosynthetic interfacing sides (typical to all tests).
- Sliding occurred within the soil substrate on all loads as soil film was retained on the surface of the geomembrane.

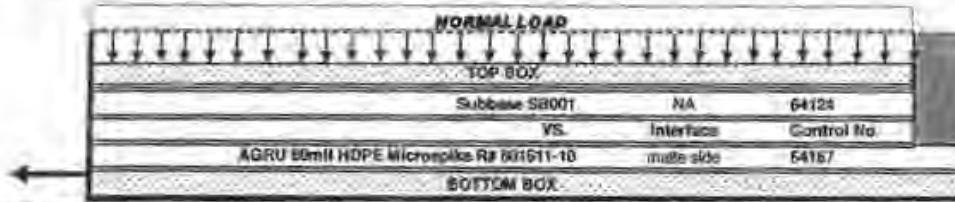


By accepting this data and report or e-mail or this report, the client agrees to hold the provider liable for friction measurements taken on Direct Shear after parties for (insert location, number) the use of this data, to the test for the equipment used (insert) or the effect, and the client agrees to indemnify and hold the provider harmless from and against all liabilities in respect of the aforementioned test.

(INTERFACE SHEAR TEST RESULT (ASTM D5321))  
 PGL Job No. G10-0020

Reviewed By: \_\_\_\_\_  
 Date: 02/01/10

TEST CONFIGURATION **BB**



TEST CONDITIONS:

SAMPLE PREPARATION:

- The TOP box contained the soil
- Specimens were cut along machine direction to 14" x 15" for the BOTTOM box, with effective end area of 12" x 12"
- The Maximum Dry Density (MDD) of the soil is 94.5 pcf at 16.5% Optimum Moisture Content (OMC)
- Soil specimen was remolded to 94.5 pcf at 18.2% moisture content, forming 2 inch layers in the TOP box
- Specimens were secured via fill bar clamping mechanism complete with bolts and nuts (7-pairs).

CONSOLIDATION:

- Each cell of specimen was consolidated under flooded condition for 1 hr @ normal load before shearing.
- Normal loads were applied using Bladder for all loads.

SHEAR TEST:

- Shear test was conducted @ 0.040 in/min
- Sheared @ minimum 3.0 inch horizontal displacement.
- The test specimens were sheared at flooded condition
- Test were performed in general accordance with ASTM D5321 using Brainard-Kimura LG-112 Direct Shear machine with effective test area of 12 in X 12 in.

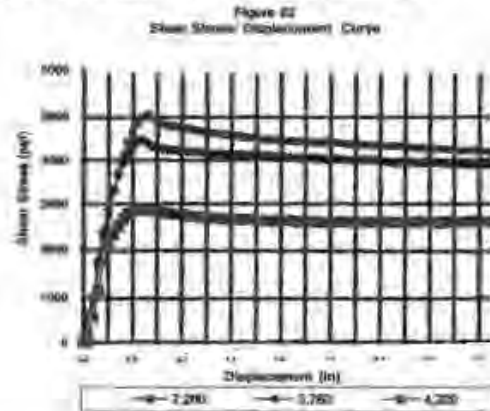
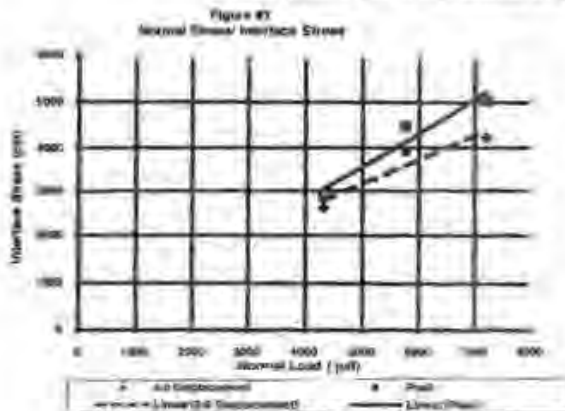
TEST RESULTS:

Normal Stresses Applied		Soil Moisture Content		Asperity Heights		PEAK STRENGTH		POST-PEAK STRENGTH AT 3.0 INCHES	
		Before	After	Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psf)	(psf)	(%)	(%)	(mils)	(mils)	(psf)	(degrees)	(psf)	(degrees)
30.00	4,320	18.2	24.8	27	25	2971	34	2620	34
40.00	5,760	18.2	23.0	27	25	4478	38	3909	34
50.00	7,200	18.2	21.1	21	24	5044	35	4225	36
Note:						COHESION (psf):	0	368	
						COEFFICIENT OF FRICTION:	0.75	0.56	
						FRICTION ANGLE (degrees):	37.0	29.2	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

OBSERVATIONS:

- No filling of the system or any abnormalities observed during and after the test.
- Superficial abrasion on the geomembrane (interlacing sipes) (typical to all loads)
- Sliding occurred within the soil substrate on all loads as soil film was retained on the surface of the geomembrane



In accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories (a subsidiary of Client) and all other parties for claims or losses, due to the use of this data, by the user for the purposes and conditions presented in this report, and the Client agrees to indemnify and hold Precision Geosynthetic Laboratories harmless from and against all claims, damages or the consequences thereof.

INTERFACE SHEAR TEST RESULT (ASTM D5321)  
 PGL Job No. G10-0020

Reviewed By: *[Signature]*  
 Date: 01/25/10

TEST CONFIGURATION **7**



TEST CONDITIONS:

SAMPLE PREPARATION:

1. Specimens were cut along machine direction to 14" x 19" for the upper box, and 14" x 17" for the lower box, with an effective test area of 12" x 12".
2. Specimens were secured via flat bar clamping mechanism complete with bolts and nuts (7 pieces).

CONSOLIDATION:

1. Each set of specimen was consolidated under flashed condition for 2 hr @ normal load (removal of air) for the highest load, and bladder for the lowest load, and Dead Weight for the medium load.

SHEAR TEST:

1. Shear test was conducted @ 0.040 in/min.
2. Sheared @ minimum 3.0 inch horizontal displacement.
3. The test specimens were sheared at flashed condition.
4. Test was performed in general accordance with ASTM D5321 using Baklund Kuhn T G-112 Direct Shear Apparatus with effective test area of 12 in X 12 in.

*SUPERGEDED*

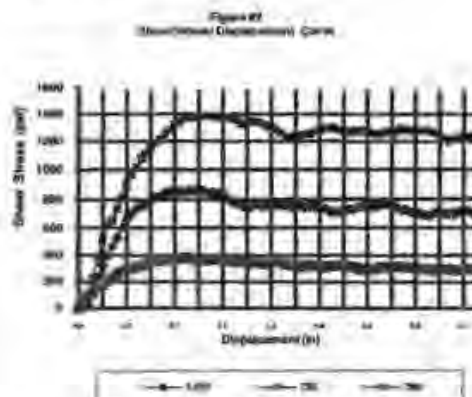
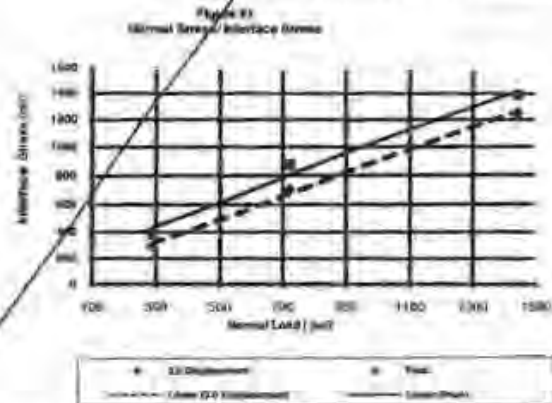
TEST RESULTS:

Normal Stresses Applied		Moisture Content		PEAK STRENGTH		POST- PEAK STRENGTH AT 3.0 INCHES	
		Before	After	Shear Stress (psf)	Secant Angle (degrees)	Shear Stress (psf)	Secant Angle (degrees)
2.00	298	6.0	14.5	388	53	296	46
5.00	720	6.0	12.8	870	50	704	44
10.00	1,440	6.0	11.5	1391	44	1249	41
Note:				COHESION (psf):	185	80	
				COEFFICIENT OF FRICTION:	0.66	0.82	
				FRICTION ANGLE (degrees):	40.8	39.4	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

OBSERVATIONS:

1. No tilting of the system or any abnormalities observed during and after the test.
2. Superficial abrasion on the geotextiles interfacing sides (typical to all loads).
3. Sliding occurred between the two interfacing surfaces.
4. Flaring was observed on the geotextile at high load.
5. A small deposit of soil film was retained on the surface of the geotextile.



Respecting the data and results presented in this report, the Client agrees that the accuracy of the test results is dependent on the quality of the test equipment and the quality of the test results. The Client is responsible for the accuracy of the test results presented in this report, and the Client agrees to indemnify and hold the geotextile manufacturer harmless from and against all claims, damages, and expenses of the geotextile manufacturer.

**TABLE 8**  
**CLIENT: Northwest Linings & Geotextile Products, Inc.**  
**PROJECT: Kekaha Landfill**

*[Signature]*  
 Reviewed By:  
 Date: 01/26/10

**INTERFACE SHEAR TEST RESULT (ASTM D6321)**  
 PGL Job No. G10-0020

TEST CONFIGURATION 8



**TEST CONDITIONS:**

**SAMPLE PREPARATION:**

- Specimens were cut along machine direction to 14" x 17" for the BOTTOM box, with effective test area of 12" x 12"
- Specimens were secured via flat bar clamping mechanisms complete with bolts and nuts (7 pairs).

**CONSOLIDATION:**

- Each set of specimen was consolidated under flooded condition for 7 hr @ normal load before shearing
- Normal loads were applied using Bladder for the highest load, Dead Weight for the lowest load.

**SHEAR TEST:**

- Shear test was conducted @ 0.040 in/min.
- Shearer @ minimum 3.0 inch horizontal displacement.
- The test specimens were sheared in flooded condition.
- Test were performed in general accordance with ASTM D5321 using Branam-Kilmer LG-112 Direct Shear machine with effective test area of 12 in X 12 in.

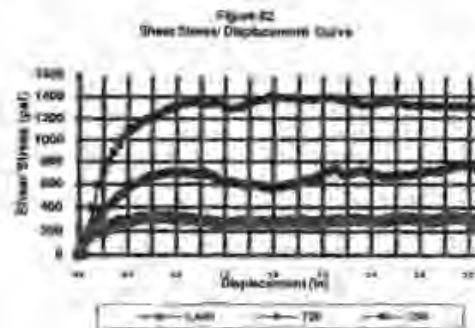
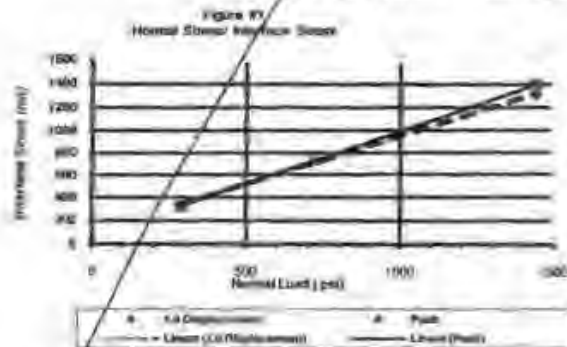
**TEST RESULTS:**

Normal Stresses Applied	PEAK STRENGTH		POST-PEAK STRENGTH AT 3.0 INCHES	
	Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psi)      (pcf)	(pcf)	(degrees)	(pcf)	(degrees)
2.00      288	322	48	312	47
5.00      720	731	45	743	46
10.00    1,440	1396	44	1312	42
COHESION (pcf):	0		0	
COEFFICIENT OF FRICTION:	0.93		0.86	
FRICTION ANGLE (degrees):	43.0		40.7	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

**OBSERVATIONS:**

- No filling of the system or any abnormalities observed during and after the test.
- Tearing and stretching of the geotextile was observed at high load.
- Sliding occurred between the two interacting surfaces.



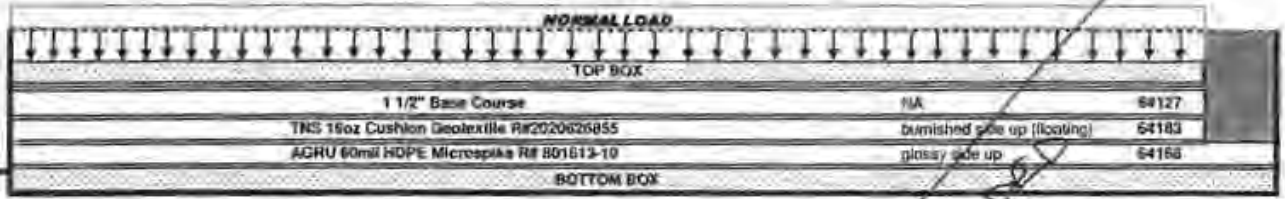
By signing this report and results presented on this record, the Client agrees to use the findings of Precision Geosynthetic Laboratories (PGL) as the basis for design and construction. The Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories, from and against all liabilities, claims, damages, costs and expenses, including reasonable attorneys' fees, that may be incurred by the Client for the use of the information presented in this report, and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories, from and against all liabilities, claims, damages, costs and expenses, including reasonable attorneys' fees, that may be incurred by the Client for the use of the information presented in this report.

TABLE 9  
 CLIENT: Northwest Linings & Geosynthetic Products, Inc.  
 PROJECT: Kakahe Landfill

INTERFACE SHEAR TEST RESULT (ASTM D5321)  
 PGL Job No.: G10-0020

Reviewed By: *[Signature]*  
 Date: 01/25/10

TEST CONFIGURATION 9



TEST CONDITIONS:

SAMPLE PREPARATION:

- Specimens were cut along machine direction to 14" x 10" for the upper box, and 14" x 17" for the lower box, with an effective test area of 12" x 12".
- Geosynthetic specimens were secured in the shear box via flat bar (slipping mechanisms complete with bolts and nuts (2 pairs)).

CONSOLIDATION:

- Each side of specimen or system was consolidated under flooded condition for 1 hr @ normal load before shearing.
- Normal loads were applied using Bladder for the highest load, and Dead Weight for the lowest load.

SHEAR TEST:

- Shear test was conducted @ 0.040 in/min.
- Sheared @ 3.0 inch horizontal displacement.
- The test specimens were sheared in flooded condition.
- Test were performed in general accordance with ASTM D5321 using Rainard-Kärner LG-112 Direct Shear machine with effective test area of 12 in X 12 in.

TEST RESULTS:

Normal Stresses Applied		Asperity Heights		PEAK STRENGTH		POST-PEAK STRENGTH AT 3.0 INCHES	
		Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psf)	(psf)	(mils)	(mils)	(psf)	(degrees)	(psf)	(degrees)
1/2	250	29.0	28.0	155	30	108	21
5	700	30.0	29.0	252	26	250	19
10	1,440	30.0	27.0	653	24	474	16
Note:				COHESION (psf): 53		44	
				COEFFICIENT OF FRICTION: 0.40		0.26	
				FRICTION ANGLE (degrees): 22.0		14.7	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

OBSERVATIONS:

- No tilting of the system or any abnormalities observed during and after the test.
- Superficial abrasion on the geosynthetic interfacing sides (typical to all tests).
- Sliding occurred between the HDPE and geosynthetic interface.

Figure #1  
 Normal Stress/Interface Stress

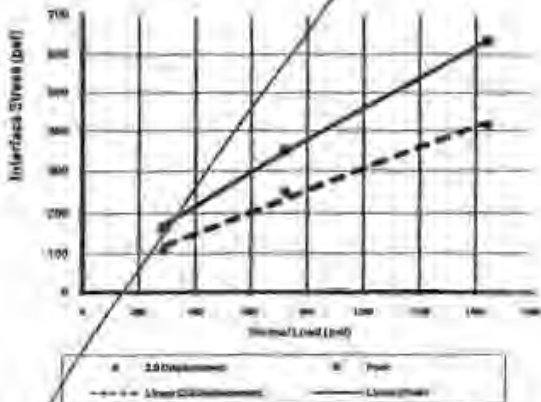
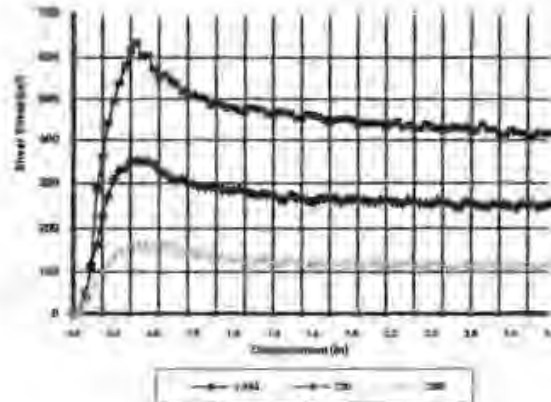


Figure #2  
 Shear Stress/Displacement Curve



The data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims or losses due to the use of this data. In the event for the data is to be used by the Client, and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liability (in excess of the aforementioned limit).





INTERFACE SHEAR TEST RESULT (ASTM D6243)  
 PGL Job No. G10-0020

Reviewed By: \_\_\_\_\_  
 Date: 01/25/10

TEST CONFIGURATION 10



TEST CONDITIONS:

SAMPLE PREPARATION:

1. Specimens were cut along machine direction to 14" x 17" for the upper box, and 14" x 19" for the lower box, with an effective test area of 12" x 12".
2. Geosynthetic specimens were secured via flat bar clamping mechanisms complete with bolts and nuts (7-pairs).

CONSOLIDATION:

1. Each set of specimen was consolidated under Roeder condition for 24 hrs @ normal load before testing.
2. Normal loads were applied using Bladder for the highest load, Dead Weight for the medium load, and Dead Weight for the lowest load.
3. Normal loads were applied at approximately 10% increments.

SHEAR TEST:

1. Shear test was conducted @ 0.040 in/min.
2. Sheared @ minimum 3.0 inch horizontal displacement.
3. The test specimens were sheared at Roeder condition.
4. Test were performed in general accordance with ASTM D6243 using Branard-Kilman LD-112 Direct Shear machine with effective test area of 12 in X 12 in.

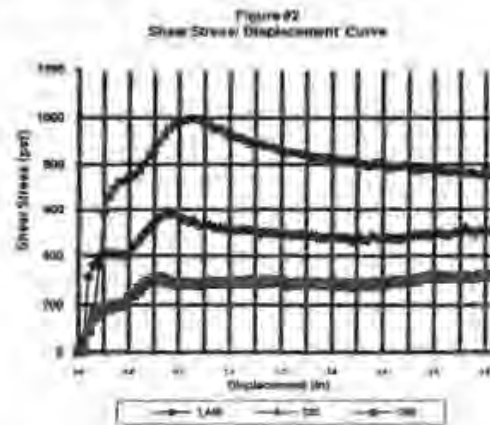
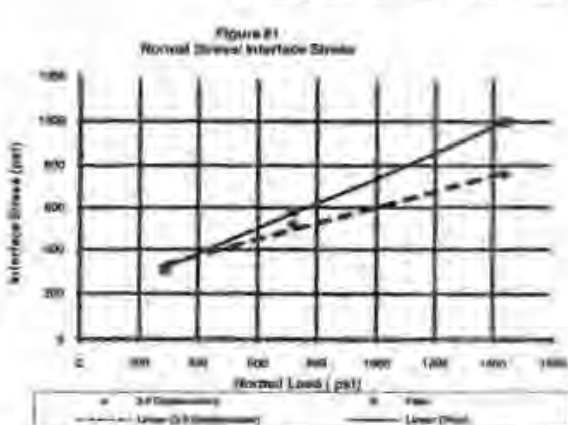
TEST RESULTS:

Normal Stresses Applied		GCL Moisture Content		Asperty Heights		PEAK STRENGTH		POST-PEAK STRENGTH AT 3.0 INCHES	
		Before	After	Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psi)	(pcf)	(%)	(%)	(mil)	(mil)	(psf)	(degrees)	(psf)	(degrees)
2.00	389	19.0	105.7	31	30	308	47	316	48
5.00	720	19.0	94.6	31	30	579	39	517	36
10.00	1,440	19.0	88.3	32	29	966	35	758	28
<b>Note:</b>						COHESION (psf):		223	
						COEFFICIENT OF FRICTION:		0.36	
						FRICTION ANGLE (degrees):		20.7	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

OBSERVATIONS:

1. No filling of the system or any abnormalities observed during and after the test.
2. Superficial abrasion on the geosynthetic interfacing sides (typical to all loads).
3. Sliding occurred between the two interfacing surfaces.

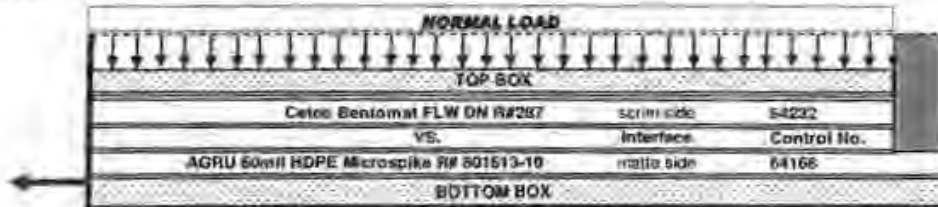


By accepting the data and results presented on this report, the client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims or damages arising out of the use of this data, to the extent to the maximum extent permitted by law, and the Client agrees to indemnify and hold harmless, Precision Geosynthetic Laboratories, from and against all liabilities in respect of the aforementioned, fees.

INTERFACE SHEAR TEST RESULT (ASTM D6243)  
 PGL Job No. GT0-0020

Reviewed By:  
 Date: 07/25/10

TEST CONFIGURATION 11



TEST CONDITIONS:

SAMPLE PREPARATION:

- Specimens were cut along machine direction to 14" x 17" for the upper box, and 14" x 10" for the lower box, with an effective test area of 12" x 12".
- Geosynthetic specimens were secured via flat bar clamping mechanisms complete with bolts and nuts (7-pairs).

CONSOLIDATION:

- Each set of specimen was consolidated under flooded condition for 24 hrs @ normal load before shearing.
- Normal loads were applied using Bladder for the highest load, Dead Weight for the medium load and Dead Weight for the lowest load.
- Normal loads were applied at approximately 10% increments.

SHEAR TEST:

- Shear test was conducted @ 0.040 in/min.
- Sheared @ minimum 3.0 inch horizontal displacement.
- The test specimens were sheared at flooded condition.
- Tests were performed in general accordance with ASTM D6243 using Brainard-Kilmer LD-112 Direct Shear machine with effective test area of 12 in X 12 in.

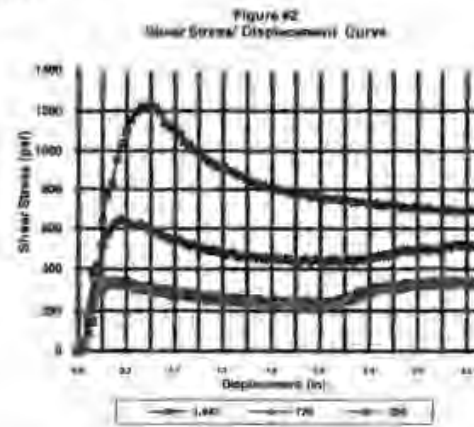
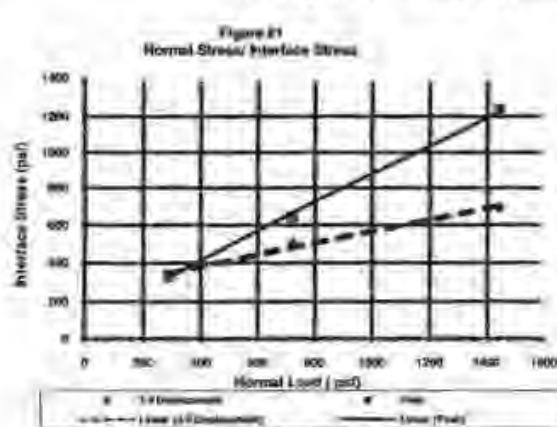
TEST RESULTS:

Normal Stresses Applied		GCL Moisture Content		Asperity Heights		PEAK STRENGTH		POST- PEAK STRENGTH AT 3.0 INCHES	
		Before	After	Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psi)	(psf)	(%)	(%)	(mils)	(mils)	(psf)	(degrees)	(psf)	(degrees)
2.00	288	19.3	168.1	27	26	337	48	331	49
5.00	720	19.3	84.2	27	25	642	42	502	35
10.00	1,440	19.3	83.5	26	24	1230	41	691	26
Note:		COHESION (psf) :				100		257	
		COEFFICIENT OF FRICTION :				0.78		0.31	
		FRICTION ANGLE (degrees) :				37.9		17.1	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

OBSERVATIONS:

- No tilting of the system or any abnormalities observed during and after the test.
- Superficial abrasion on the geosynthetic interfacing sides (typical to all loads).
- Sliding occurred between the two interfacing surfaces.

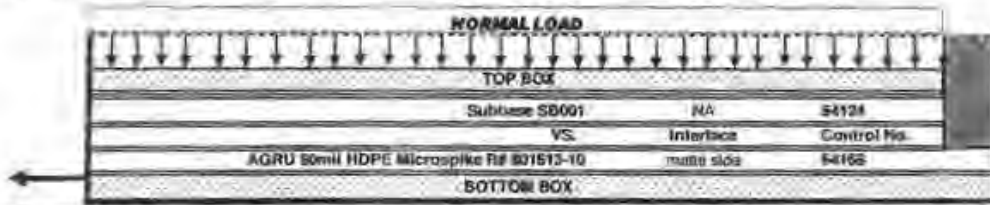


By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client with all other parties for claims or causes due to the use of this data, to the extent the respective data is presented in this report, and that Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities of any kind arising from the use of this data.

INTERFACE SHEAR TEST RESULT (ASTM D5321)  
 PGL Job No. G10-0020

Reviewed By: \_\_\_\_\_  
 Date: 1/25/2010

TEST CONFIGURATION 12A



TEST CONDITIONS:

SAMPLE PREPARATION:

- The TOP box contained the soil.  
 Specimens were cut along machine direction to 14" x 12" for the BOTTOM box, with effective test area of 12" x 12".
- The Maximum Dry Density (MDD) of the soil is 90.5 pcf @ 16.5% Optimum Moisture Content (OMC)
- Soil specimen was remolded at 88.5 pcf at 18.6% moisture content.  
 forming 2 inch layer in the TOP box.
- Specimens were secured via rail bar clamping mechanism complete with bolts and nuts (7-pairs).

CONSOLIDATION:

- Each set of specimen was consolidated under flooded condition for 1 hr @ normal level before shearing.
- Normal loads were applied using Slider for the highest load, Dead Weight for the lowest load.

SHEAR TEST:

- Shear test was conducted @ 0.040 in/min
- Sheared @ minimum 2.0 inch horizontal displacement.
- The test specimens were sheared at flooded condition.
- Test were performed in general accordance with ASTM D5321 using Brinard-Kimball LG-112 Direct Shear machine, with effective test area of 12 in X 12 in.

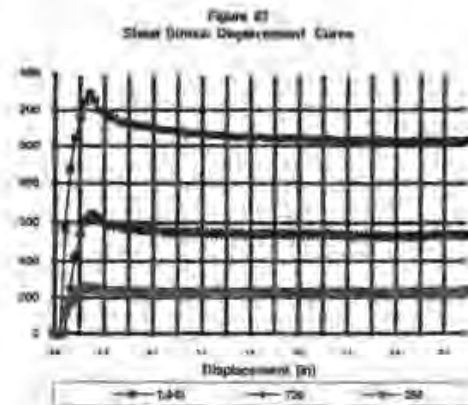
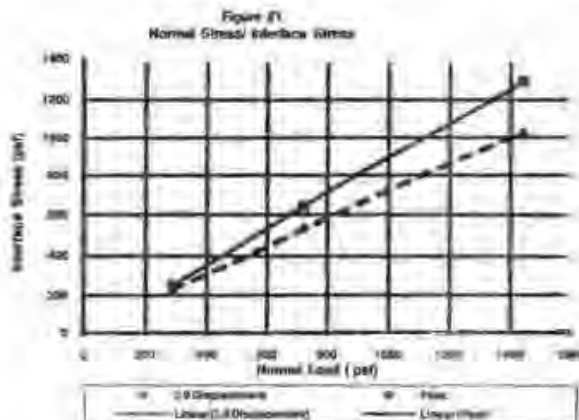
TEST RESULTS:

Normal Stresses Applied		Moisture Content		Asperity Heights		PEAK STRENGTH		POST-PEAK STRENGTH AT 1.0 INCHES	
		Before	After	Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psf)	(psf)	(%)	(%)	(mils)	(mils)	(psf)	(degrees)	(psf)	(degrees)
2.00	286	18.6	23.1	26	25	353	41	228	38
5.00	720	18.6	21.5	28	25	639	42	522	36
10.00	1,440	18.6	18.6	25	24	1291	42	1022	38
Note:		COHESION (psf):				0		32	
		COEFFICIENT OF FRICTION:				0.80		0.89	
		FRICTION ANGLE (degrees):				42.0		34.5	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

OBSERVATIONS:

- No tilting of the system or any abnormalities observed during and after the test.
- Superficial abrasion on the geosynthetic interfacing slides (typical to all loads).
- Slaking occurred within the soil substrate on all loads as soil film was retained on the surface of the geomembrane.



By executing this order and results presented herein, you agree that the liability of Precision Geosynthetic Laboratory, from clients and all other parties, is limited to the amount of the fee for this service. This agreement shall be null and void if the client agrees to indemnify and hold Precision Geosynthetic Laboratory, from and against all damages, claims, and expenses of any third party.



# Precision Geosynthetic Laboratories



Mark Liljeskare  
Northwest Linings & Geotextile Products, Inc.  
21000 77th Ave. South,  
Kent, WA 98032

Dear Mr. Liljeskare,

Thank you for consulting Precision Geosynthetic Laboratories (PGL) for your material testing needs.

Enclosed is the *final* laboratory report for the *Interface Shear* testing of the materials in accordance to the test configurations listed below.

**PROJECT NAME:** Kekaha Landfill

**REFERENCE PGL JOB NO.:** G100308

**DATE REPORTED:** May 5, 2010

**SAMPLES SENT BY:** Geosyntec Consultants and AGRU America

**MATERIAL DESCRIPTION & IDENTIFICATIONS:**

Material	Type	Manufacturer	Roll No.	PGL Control No.	Date Received
Gravel	1 1/2" Drainage Gravel - Coll# GD-001	NA	NA	65826	4/21/2010
Sand	3/8" Quarry Sand	NA	NA	65420	4/9/2010
Geomembrane	60mil HDPE Microspike	AGRU	802225-10	65825	4/21/2010
Geomembrane	80mil HDPE Microspike	AGRU	891511-10	64167	1/30/2010
Geotextile	16oz Non woven	TNS	202062691	65828	4/21/2010
Geotextile	6oz Non woven	TNS	300295451	65816	4/15/2010
Geotextile	6oz Non woven	TNS	300295425	65827	4/21/2010

**TEST REQUIRED:**

**TEST METHOD**  
ASTM D5321

**DESCRIPTION**  
Interface Shear

**TEST CONFIGURATIONS:**

Test No.	Configuration
1 (1)	3/8" Quarry Sand vs. 6oz Separation Geotextile
2 (2)	6oz Separation Geotextile vs. 1 1/2" Drainage Gravel
3 (3A)	1 1/2" Drainage Gravel vs. 16oz Cushion Geotextile vs 60mil HDPE Microspike
4 (3B)	1 1/2" Drainage Gravel vs. 16oz Cushion Geotextile vs 80mil HDPE Microspike
5 (7)	3/8" Quarry Sand vs. 6oz Separation Geotextile
6 (8)	6oz Separation Geotextile vs. 1 1/2" Drainage Gravel
7 (9)	1 1/2" Drainage Gravel vs. 16oz Cushion Geotextile vs 60mil HDPE Microspike

**TEST CONDITIONS:** The samples were conditioned for a minimum of one hour in the laboratory at  $22 \pm 2^{\circ}\text{C}$  ( $71.6 \pm 3.6^{\circ}\text{F}$ ) and at  $60 \pm 10\%$  relative humidity prior to test.

**TEST RESULTS:** The test results are summarized in Tables 1 to 7.

## PRECISION GEOSYNTHETIC LABORATORIES



Belinda Jade R. Yeo  
Quality Assurance



Carmelo V. Zantua  
Technical/Laboratory Director

It shall be noted that the samples tested are believed to be true representatives of the material produced under the designation herein stated. In addition, the attached laboratory test results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. Precision Geosynthetic Laboratories neither accepts responsibility for nor makes claims to the intended final use and purpose of the material. The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from personnel only duly authorized by the respective client or firm the client itself. It is a policy of the company to keep physical records of each file for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. *Tested specimens and retained samples are kept for one (1) month.* On the other hand, should you need us to keep them at longer time, please advise us in writing.

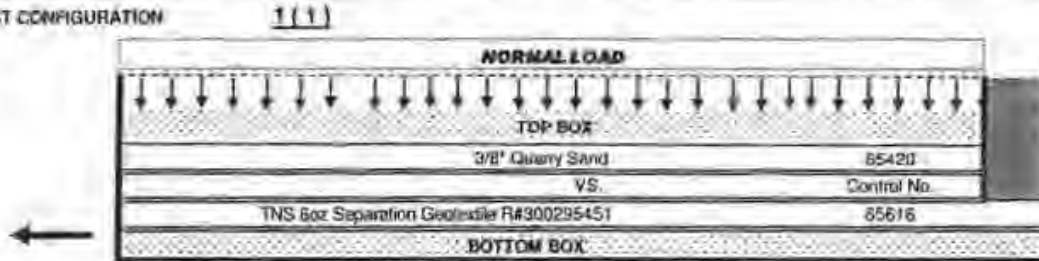
**TABLE 1**  
**CLIENT: Northwest Linings & Geotextile Products, Inc.**  
**PROJECT: Kokana Landfill**



**INTERFACE SHEAR TEST RESULT (ASTM D5321)**  
**PGL Job No. G100308**

**Reviewed By: B. Yeo**  
**Date: 04/23/10**

**TEST CONFIGURATION**



**TEST CONDITIONS:**

**SAMPLE PREPARATION:**

1. Specimens were cut along machine direction to 14" x 17" for the BOTTOM box, with effective test area of 12" x 12".
2. Specimens were secured via bail bar clamping mechanisms complete with bolts and nuts (7-pairs).

**CONSOLIDATION:**

1. Each set of specimen was consolidated under flashed condition for 1 hr @ normal load before shearing.
2. Normal loads were applied using Bladder for all loads.

**SHEAR TEST:**

1. Shear test was conducted @ 0.040 in/min.
2. Sheared @ minimum 3.0 inch horizontal displacement.
3. The test specimens were sheared at flashed condition.
4. Test were performed in general accordance with ASTM ASTM D5321 using Brainard-Kirman L15-112 Direct Shear machine with effective test area of 12 in X 12 in.

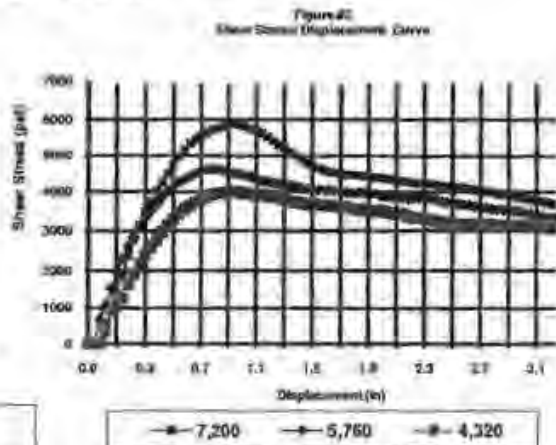
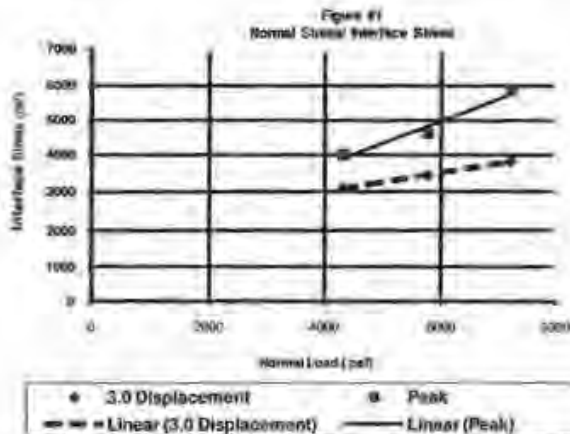
**TEST RESULTS:**

Normal Stresses Applied		PEAK STRENGTH		POST- PEAK STRENGTH AT 3.0 INCHES	
		Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psi)	(psf)	(psf)	(degrees)	(psf)	(degrees)
30.00	4,320	4006	43	3098	36
40.00	5,760	4818	39	3433	31
50.00	7,200	5873	39	3822	28
COHESION (psi):		1096		2003	
COEFFICIENT OF FRICTION:		0.65		0.25	
FRICTION ANGLE (degrees):		33.0		14.1	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

**OBSERVATIONS:**


1. No tilting of the system or any abnormalities observed during and after the test.
2. Tearing and stretching of the geotextile was observed at all loads.
3. Sliding occurred between the two interfacing surfaces.



By accepting the data and results presented in this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims or losses due to the use of this data, to the extent the negligence has occurred in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from any and all claims or losses in connection with the information herein.

**TABLE 2**  
**CLIENT: Northwest Linings & Geotextile Products, Inc.**  
**PROJECT: Kakaia Landfill**

**INTERFACE SHEAR TEST RESULT (ASTM D5321)**  
**PGL Job No. G100308**

  
**Review By: B. Yeo**  
**Date: 05/05/10**

**TEST CONFIGURATION** **2**



**TEST CONDITIONS:**

**SAMPLE PREPARATION:**

1. Specimens were cut along machine direction to 14" x 17" for the BOTTOM box, with effective test area of 12" x 12".
2. Specimens were secured via flat bar clamping mechanisms complete with bolts and nuts (7 pairs).

**CONSOLIDATION:**

1. Each set of specimen was consolidated under flooded condition for 1 hr @ normal load before shearing.
2. Normal loads were applied using bladder for all loads.

**SHEAR TEST:**

1. Shear test was conducted @ 0.040 in/min
2. Sheared @ minimum 3.0 inch horizontal displacement.
3. The test specimens were sheared at flooded condition.
4. Test were performed in general accordance with ASTM D5321 using Brinard-Kilmer LG-112 Direct Shear machine with effective test area of 12 in x 12 in.

**TEST RESULTS:**

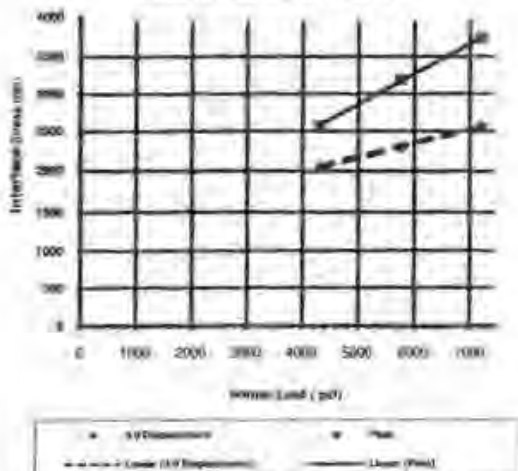
Normal Stresses Applied		PEAK STRENGTH		POST- PEAK STRENGTH AT <u>3.0</u> INCHES	
		Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psf)	(psf)	(psf)	(degrees)	(psf)	(degrees)
30.00	4,320	2566	31	2048	25
40.00	5,760	3185	29	2287	22
50.00	7,200	3737	27	2562	20
<b>COHESION (psf):</b>		<b>821</b>		<b>1271</b>	
<b>COEFFICIENT OF FRICTION:</b>		<b>0.11</b>		<b>0.18</b>	
<b>FRICTION ANGLE (degrees):</b>		<b>22.1</b>		<b>10.1</b>	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

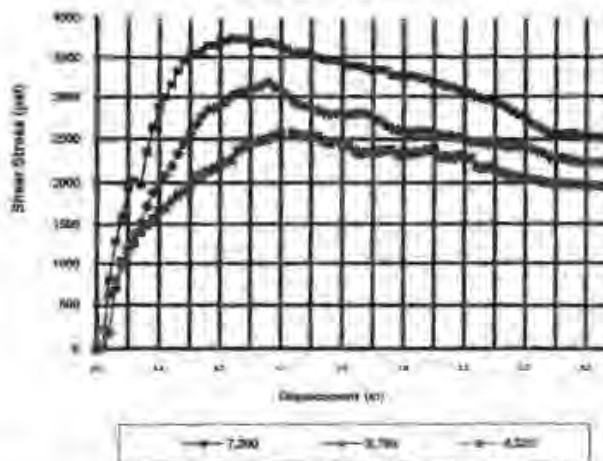
**OBSERVATIONS:**

1. No tilting of the system or any abnormalities observed during and after the test.
2. Tearing and stretching of the geotextile was observed at all loads.
3. Sliding occurred between the two interfacing surfaces.

**Figure #1**  
Normal Stress/ Interface Stress



**Figure #2**  
Shear Stress/ Displacement Curve



By accepting the DATA AND REPORT presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories, Inc. and all other parties for claims or damages to the user of this data, to the extent that the user of this data is permitted in this report. The Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories, Inc. from and against all claims, damages, costs and expenses, including reasonable attorneys' fees, that may be asserted against or incurred by Precision Geosynthetic Laboratories, Inc. or any of its employees, agents, contractors, subcontractors, or other parties in connection with the use of this data.



**Precision Geosynthetic Laboratories**



**TABLE 3**  
**CLIENT: Northwest Linings & Geosynthetic Products, Inc.**  
**PROJECT: Kishka Landfill**

**INTERFACE SHEAR TEST RESULT (ASTM D5321)**  
 PGL Job No. G10308

Reviewed By: **B. Yao**  
 Date: **05/05/10**

**TEST CONFIGURATION 3 (SA)**



**TEST CONDITIONS:**

**SAMPLE PREPARATION:**

1. Specimens were cut along machine direction to 14" x 10" for the upper box, and 14" x 17" for the lower box, with an effective test area of 12" x 12".
2. Geosynthetic specimens were secured in the shear box via flat bar clamping mechanisms complete with bolts and nuts (7 pairs).

**CONSOLIDATION:**

1. Each set of specimen or system was consolidated under Roading condition to 1 lb @ normal load (after shearing).
2. Normal loads were applied using bladder for all loads.

**SHEAR TEST:**

1. Shear test was conducted @ 0.040 in/min.
2. Sheared @ minimum 3.0 inch horizontal displacement.
3. The test specimens were sheared in Roading condition.
4. Test was performed in general accordance with ASTM D5321 using Binhard-Kulman LG-115 Direct Shear machine, with effective test area of 12 in. x 12 in.

**TEST RESULTS:**

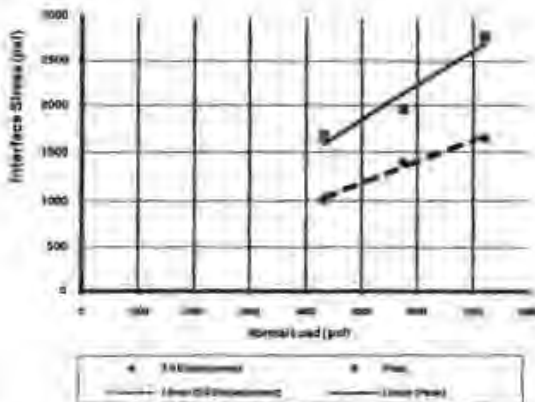
Normal Stresses Applied		Asperity Heights		PEAK STRENGTH		POST- PEAK STRENGTH AT 3.0 INCHES	
		Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psi)	(psf)	(mils)	(mils)	(psf)	(degrees)	(psf)	(degrees)
30	4,320	30	28	1,605	21	1,018	13
40	5,760	30	28	1,857	19	1,334	14
50	7,200	30	25	2,758	21	1,644	13
<b>Note:</b>		COHESION (psf) :		0		100	
		COEFFICIENT OF FRICTION :		0.38		0.22	
		FRICTION ANGLE (degrees) :		21.3		12.3	

NOTE: The friction angle and cohesion results given here are based on mathematically determined best fit line.

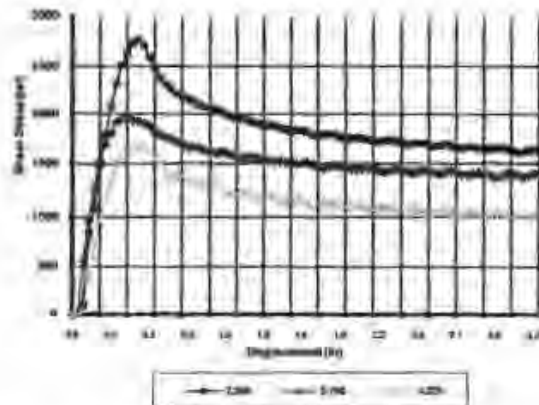
**OBSERVATIONS:**

1. No tilting of the system or any abnormalities observed during and after the test.
2. Superficial abrasion on the geosynthetics lubricating slides (typical to all tests).
3. Sliding occurred between the HDPE and geotextile interface.

**Figure #1**  
Normal Stress / Interface Stress



**Figure #2**  
Shear Stress / Displacement Curve



By using the data and results presented in this report, the Client agrees to hold the facility of Precision Geosynthetic Laboratories (PGL) harmless for any and all claims, damages, losses, or expenses, including reasonable attorneys' fees, that may be incurred by the Client or any third party as a result of the use of the data and results presented in this report. Client's agreement to hold PGL harmless for any and all claims, damages, losses, or expenses, including reasonable attorneys' fees, shall be deemed to constitute an acknowledgment of the accuracy of the data and results presented in this report.



**TABLE 4**  
 CLIENT: Northwest Linings & Geotextile Products, Inc.  
 PROJECT: Kelisha Landfill



INTERFACE SHEAR TEST RESULT (ASTM D5321)  
 PGL Job No. G100308

Reviewed By: B. Fee  
 Date: 05/05/10

TEST CONFIGURATION **4 [38]**



**TEST CONDITIONS:**

**SAMPLE PREPARATION:**

1. Specimens were cut along machine direction to 14" x 19" for the upper box, and 14" x 17" for the lower box, with an effective test area of 12" x 12".
2. Geosynthetic specimens were secured in the shear box via flat bar clamping mechanism complete with bolts and nuts (7 pairs).

**CONSOLIDATION:**

1. Each test of specimen or system was consolidated under floating condition for 1 hr @ normal load before shearing.
2. Normal loads were applied using blades in all tests.

**SHEAR TEST:**

1. Shear test was conducted @ 0.040 in/min.
2. Sheared @ minimum 3.0 inch horizontal displacement.
3. The test specimens were sheared in floating condition.
4. Test were performed in general accordance with ASTM D5321 using Brinhard-Kimber LG-112 Direct Shear machine with effective test area of 12 in x 12 in.

**TEST RESULTS:**

Normal Stresses Applied		Asperity Heights		PEAK STRENGTH		POST-PEAK STRENGTH AT 3.0 INCHES	
		Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psi)	(psf)	(mils)	(mils)	(psf)	(degrees)	(psf)	(degrees)
30	4,200	25	27	1,381	17	993	13
40	5,700	29	25	1,854	18	1,141	11
50	7,200	29	23	2,365	18	1,567	12
<b>Note:</b>		COHESION (psf) :		0		74	
		COEFFICIENT OF FRICTION :		0.28		0.20	
		FRICTION ANGLE (degrees) :		16.2		11.4	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit lines.

**OBSERVATIONS:**

1. No tilting of the system or any anomalies observed during and after the test.
2. Superficial abrasion on the geosynthetic interfacing skins (typical to all tests).
3. Sliding occurred between the HDPE and geotextile interface.

Figure #1  
Normal Stress Interface Stress

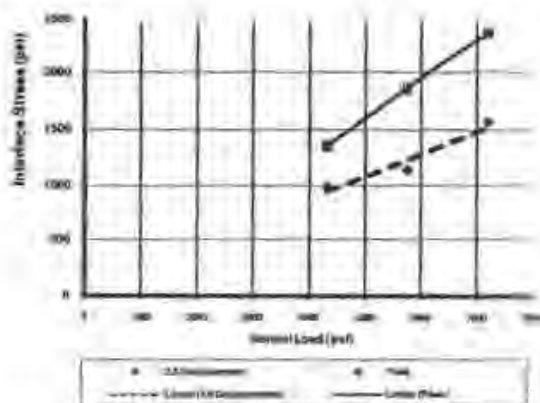
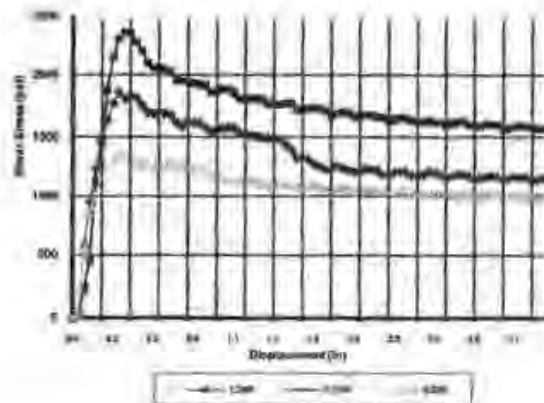


Figure #2  
Shear Stress Displacement Curve



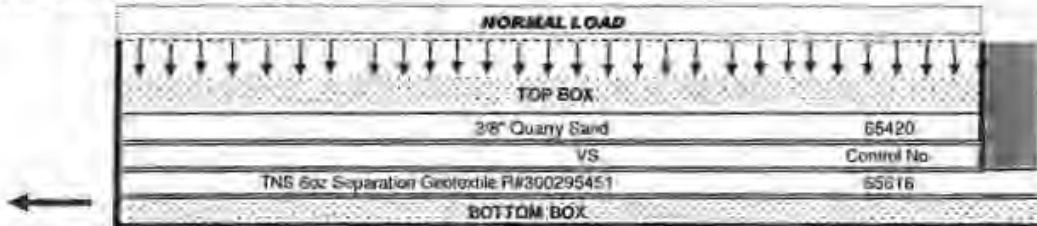
By passing the test and results presented on this report, the client agrees to limit the liability of Precision Geosynthetic Laboratories, Inc. and all other parties by disclaimer, see the disclaimer on the back of the instruction book provided at this time and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories, Inc. and all other parties of liability in connection with the performance of such.



INTERFACE SHEAR TEST RESULT (ASTM D5321)  
 PGL Job No. G100308

Reviewed By: B. Yen  
 Date: 04/23/10

**TEST CONFIGURATION**      5 (7)



**TEST CONDITIONS:**

**SAMPLE PREPARATION:**

1. Specimens were cut along machine direction to 14" x 17" for the BOTTOM box, with effective test area of 12" x 12".
2. Specimens were secured via rail bar clamping mechanisms complete with bolts and nuts (7-pairs).

**CONSOLIDATION:**

1. Each set of specimen was consolidated under flooded condition for 1 hr @ normal load before shearing.
2. Normal loads were applied using Ridder for all loads.

**SHEAR TEST:**

1. Shear test was conducted @ 0.04 in/min.
2. Sheared @ minimum 3.0 inch horizontal displacement.
3. The test specimens were sheared at flooded condition.
4. Test were performed in general accordance with ASTM ASTM D5321 using Brainard-Kilman LG-112 Direct Shear machine with effective test area of 12 in X 12 in.

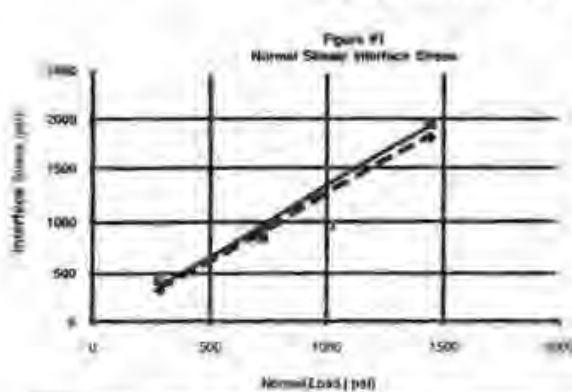
**TEST RESULTS:**

Normal Stresses Applied		PEAK STRENGTH		POST-PEAK STRENGTH AT 3.0 INCHES	
		Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psi)	(psf)	(psf)	(degrees)	(psf)	(degrees)
2.00	288	435	56	323	48
5.00	720	866	50	642	53
10.00	1,440	1952	54	1808	51
COHESION (psf):		0		0	
COEFFICIENT OF FRICTION:		1.34		1.26	
FRICTION ANGLE (degrees):		53.2		52.0	

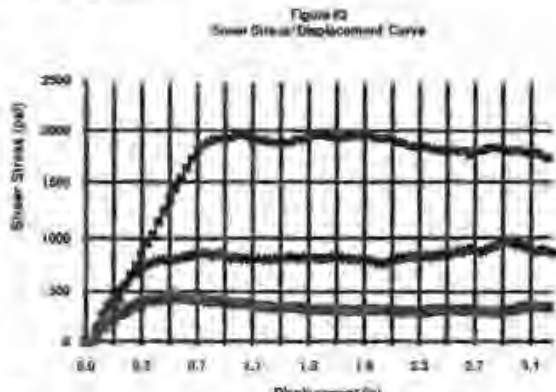
NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

**OBSERVATIONS:**

1. No filling of the system or any abnormalities observed during and after the test.
2. Tearing and stretching of the geotextile was observed at all loads.
3. Sliding occurred between the two interfacing surfaces.



3.0 Displacement     
  Peak  
 Linear (3.0 Displacement)     
  Linear (Peak)



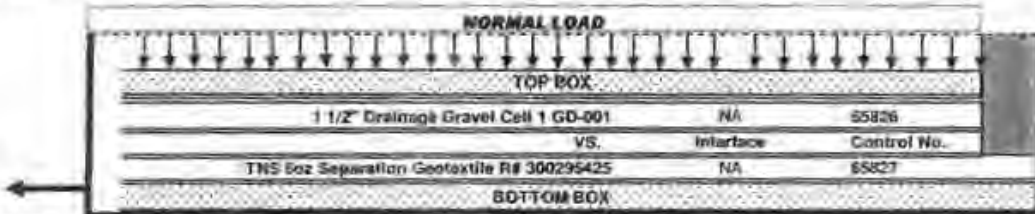
1,440     
  720     
  288

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client's activities parties for claims or lawsuit. Due to the use of test data, to the date for the respective tests presented in this report, and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all third-party claims of the aforementioned test.

INTERFACE SHEAR TEST RESULT (ASTM D5321)  
 PGL Job No. G100306

Reviewed By: B. Yeo  
 Date: 05/05/10

TEST CONFIGURATION 6 (B)



TEST CONDITIONS:

SAMPLE PREPARATION:

1. Specimens were cut along machine direction to 14" x 17" in the BOTTOM box, with effective test area of 12" x 12"
2. Specimens were secured via flat bar clamping mechanism complete with bolts and nuts (7-pairs).

CONSOLIDATION:

1. Each set of specimen was consolidated under floated condition for 1 hr @ normal load before shearing.
2. Normal loads were applied using bladder for the highest load, dead weight at the medium load and low loads.

SHEAR TEST:

1. Shear test was conducted @ 0.040 in/min.
2. Sheared @ minimum 3.0 inch horizontal displacement.
3. The test specimens were sheared at floated condition.
4. Test were performed in general accordance with ASTM D5321 using Brinard-Klinck LG-112 Direct Shear machine with effective test area of 12 in x 12 in.

TEST RESULTS:

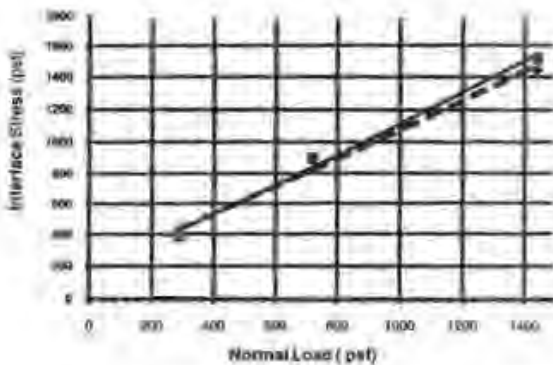
Normal Stresses Applied		PEAK STRENGTH		POST- PEAK STRENGTH AT 3.0 INCHES	
		Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psi)	(psf)	(psf)	(degrees)	(psf)	(degrees)
2.00	288	365	53	365	53
5.00	720	895	51	894	51
10.00	1,440	1516	46	1443	45
COHESION (psf):		141		171	
COEFFICIENT OF FRICTION:		0.97		0.90	
FRICTION ANGLE (degrees):		44.1		42.1	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

OBSERVATIONS:

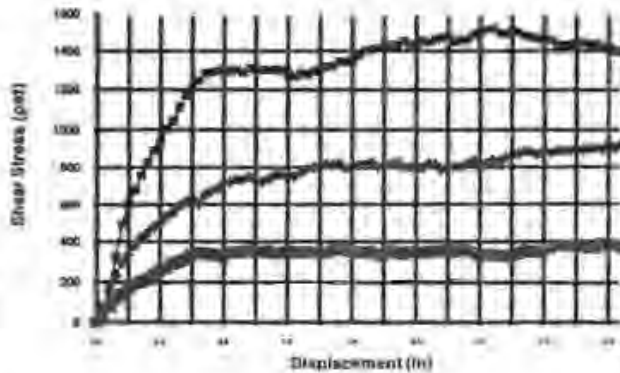
1. No tilting of the system or any abnormalities observed during and after the test.
2. Tearing and stretching of the geotextile was observed at high load.
3. Sliding occurred between the two interfacing surfaces.

Figure #1  
 Normal Stress/ Interface Stress



\* 3.0 Displacement      \* Peak  
 --- Linear (3.0 Displacement)      --- Linear (Peak)

Figure #2  
 Shear Stress/ Displacement Curve



← 2.00      ← 5.00      ← 10.00

By accepting the data and results presented on this report, the Client agrees to hold the Publisher/Provider harmless from and all claims or suits, in the event the publisher/Provider is held liable for any errors or omissions in the data presented herein.

**TABLE 7**  
 CLIENT: Northwest Linings & Geotextile Products, Inc.  
 PROJECT: Kokohe Landfill

**INTERFACE SHEAR TEST RESULT (ASTM D5321)**  
 PGL Job No. G10308

Reviewed By: **S. Yeo**  
 Date: **05/05/10**

**TEST CONFIGURATION 7 (9)**



**TEST CONDITIONS:**

**SAMPLE PREPARATION:**

- Specimens were cut along machine direction to 14" x 19" for the upper box, and 14" x 17" for the lower box, with an effective test area of 12" x 12"
- Geosynthetic specimens were secured in the shear box via flat bar clamping mechanisms complete with bolts and nuts (2-pairs).

**CONSOLIDATION:**

- Each set of specimen or system was consolidated under flooding condition for 1 hr @ normal load before shearing.
- Normal loads were applied using plankler for the highest load, dead weight for the medium and low load.

**SHEAR TEST:**

- Shear test was conducted @ 0.040 in/min.
- Sheared @ minimum 3.0 inch horizontal displacement.
- The test specimens were sheared in flooding condition.
- Test were performed in general accordance with ASTM D5321 using Brinard-Kilmer LC-112 Direct Shear machine, with effective test area of 12 in X 12 in.

**TEST RESULTS:**

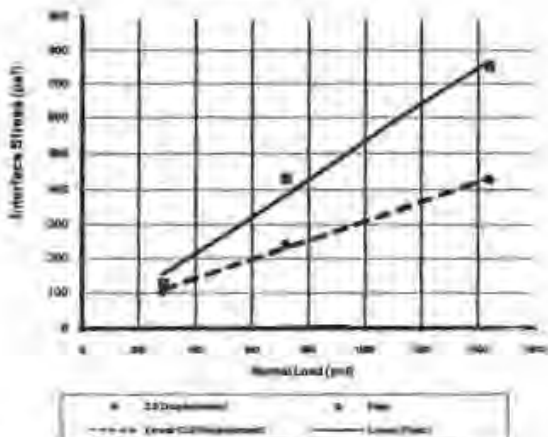
Normal Stresses Applied		Asperity Heights		PEAK STRENGTH		POST- PEAK STRENGTH AT 3.0 INCHES	
		Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psf)	(psf)	(mils)	(mils)	(psf)	(degrees)	(psf)	(degrees)
2	288	29.0	28.0	126	24	100	20
5	720	29.0	26.0	431	31	342	15
10	1,440	29.0	25.0	750	28	428	17
<b>Note:</b>				COHESION (psf): <b>2</b>		25	
				COEFFICIENT OF FRICTION: <b>0.53</b>		0.28	
				FRICTION ANGLE (degrees): <b>28.0</b>		15.5	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit lines.

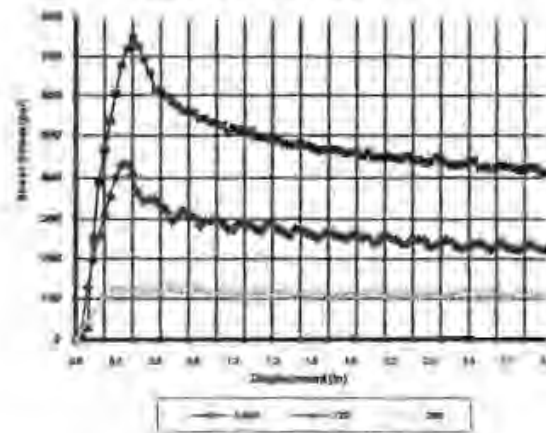
**OBSERVATIONS:**

- No rilling of the system or any abnormalities observed during and after the test.
- Superficial abrasion on the geosynthetics interfacing sides (typical for all loads).
- Sliding occurred between the HDPE and geosynthetic mat/geom.

**Figure #1**  
Normal Stress/Interface Stress



**Figure #2**  
Shear Stress/Displacement Curve



Using the data and results presented herein, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from claims of other parties resulting or caused by the use of the data presented herein for the project. The Client agrees to indemnify and hold Precision Geosynthetic Laboratories harmless from and against all liabilities in connection with the information herein.



# Precision Geosynthetic Laboratories



Kirk Lilleskare  
Northwest Linings & Geotextile Products, Inc.  
21000 77th Ave. South,  
Kent, WA 98032

Dear Mr. Lilleskare,

Thank you for consulting Precision Geosynthetic Laboratories (PGL) for your material testing needs.

Enclosed is the final laboratory report for the Interface Shear testing of the materials in accordance to the test configurations listed below.

**PROJECT NAME:** Kekaha Landfill

**REFERENCE PGL JOB NO.:** G100772

**DATE REPORTED:** July 12, 2010

**SAMPLES SENT BY:** Geosyntec Consultants and AGRU America

**MATERIAL DESCRIPTION & IDENTIFICATIONS:**

Material	Type	Manufacturer	Roll No.	PGL Control No.	Date Received
Soil	Subbase SB005	NA	NA	67966	7/2/2010
Geomembrane	80mil HDPE Microspike	AGRU	801613-10	64168	1/18/2010
Geomembrane	80mil HDPE Microspike	AGRU	801611-10	64167	1/30/2010

**TEST REQUIRED:**

**TEST METHOD**  
ASTM D5321

**DESCRIPTION**  
Interface Shear

**TEST CONFIGURATIONS:**

Test No.	Configuration
6C	60mil HDPE Microspike vs Subbase 005 (SUBBASE SOIL 2)
6D	80mil HDPE Microspike vs Subbase 005 (SUBBASE SOIL 2)
12B	60mil HDPE Microspike vs Subbase 005 (SUBBASE SOIL 2)

**TEST CONDITIONS:** The samples were conditioned for a minimum of one hour in the laboratory at  $22 \pm 2^{\circ}\text{C}$  ( $71.6 \pm 3.6^{\circ}\text{F}$ ) and at  $60 \pm 10\%$  relative humidity prior to test.



# Precision Geosynthetic Laboratories



**TEST RESULTS:** The test results are summarized in Tables 6C, 6D and 12E.

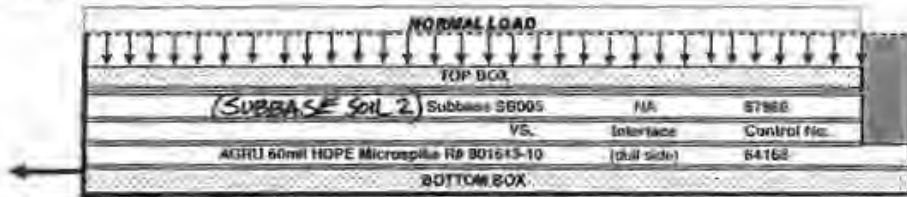
## PRECISION GEOSYNTHETIC LABORATORIES

Belinda Jade R. Yeo  
Quality Assurance

Carmelo V. Zantua  
Technical/Laboratory Director

It shall be noted that the samples tested are believed to be true representatives of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. Precision Geosynthetic Laboratories neither accepts responsibility for nor makes claims to the intended final use and purpose of the material. The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent entity duly authorized by the respective client or from the client itself. It is a policy of the company to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. *Tested specimens and retained samples are kept for one (1) month.* On the other hand, should you need us to keep them at longer time, please advise us in writing.

TEST CONFIGURATION 6C



TEST CONDITIONS:

SAMPLE PREPARATION:

- The TCP box contained the soil.
- Specimens were cut along machine direction to 14" x 19" for the BOTTOM box, with effective test area of 12" x 12".
- The Maximum Dry Density (MDD) of the soil is 1.89 pcf at 11.5% Optimum Moisture Content (OMC).
- Soil specimen was remolded to 1.321 pcf at 13.5% moisture content, forming 2 inch layer in the TCP box.
- Specimens were secured via flat bar clamping mechanisms complete with bolts and nuts (7-pairs).

CONSOLIDATION:

- Each soil specimen was consolidated under flooded condition for 1 hr @ normal load before shearing.
- Normal loads were applied using blades.

SHEAR TEST:

- Shear test was conducted @ 0.040 in/min.
- Sheared @ minimum 3.0 inch horizontal displacement.
- The soil specimens were sheared at flooded condition.
- Tests were performed in general accordance with ASTM D5321 using Branard-Kühnau G-112 Direct Shear Testers with effective test area of 12 in X 12 in.

TEST RESULTS:

Normal Stresses Applied		Moisture Content		Asperity Heights		PEAK STRENGTH		POST-PEAK STRENGTH AT 3.0 INCHES	
		Before	After	Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psf)	(pcf)	(%)	(%)	(mils)	(mils)	(pcf)	(degrees)	(pcf)	(degrees)
30.00	4320	13.5	13.6	26	24	3715	41	2999	34
40.00	5760	13.5	17.9	26	23	4229	36	3315	30
50.00	7200	13.5	16.6	26	22	5396	37	4473	32
Note:						COHESION (pcf):		414	
						COEFFICIENT OF FRICTION:		0.56	
						FRICTION ANGLE (degrees):		28.7	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

OBSERVATIONS:

- No tilting of the system or any abnormalities observed during and after the test.
- Superficial abrasion on the geosynthetic interfacing sides (typical for all loads).
- Sliding occurred within the soil substrate on all loads as soil film was retained on the surface of the geosynthetic.

Figure #1  
 Normal Stress vs. Shear Stress

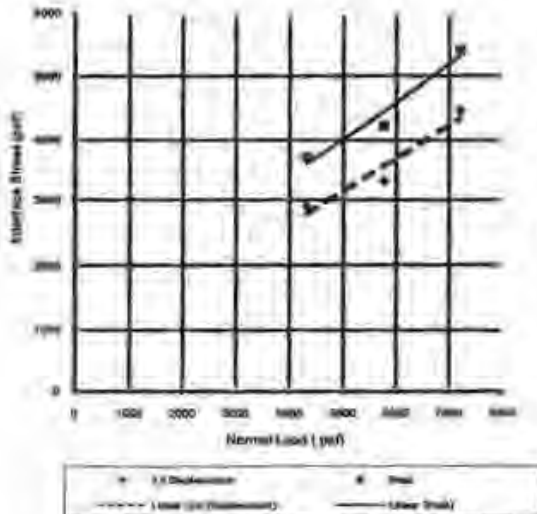
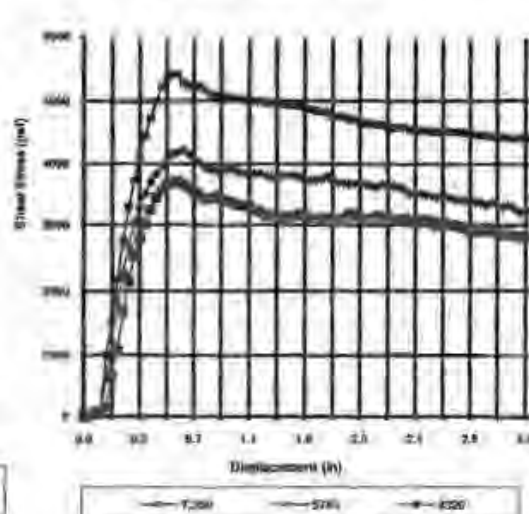


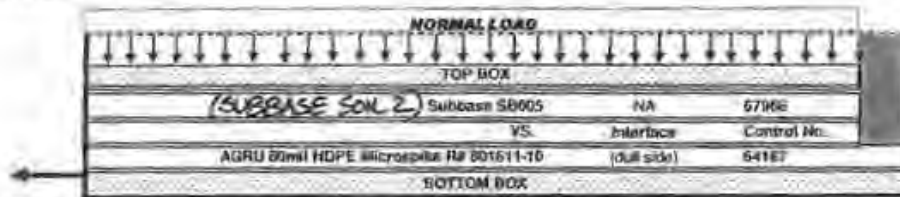
Figure #2  
 Shear Stress vs. Displacement Curve



By accepting this data and using it in your design, the Client agrees to bear the liability of Precision Geosynthetic Laboratories (PGL) and its personnel (including employees, agents, and subcontractors) for any and all claims, damages, losses, and expenses, including reasonable attorneys' fees, that may be incurred by the Client or any third party as a result of the use of this data in any design or construction project.



TEST CONFIGURATION BD



TEST CONDITIONS:

SAMPLE PREPARATION:

- The TOP box contained the soil.
- Specimens were cut along machine direction to 14" x 19" for the BOTTOM box, with effective test area of 12" x 12".
- The Maximum Dry Density (MDD) of the soil is 139 pcf at 11.5% Optimum Moisture Content (OMC).
- Soil specimen was remolded at 122.1 pcf at 11.5% moisture content, forming 2 inch layers in the TOP box.
- Specimens were secured via bar clamping mechanism complete with bolts and nuts (7 pairs).

CONSOLIDATION:

- Each set of specimens was consolidated under flatted condition for 1 hr @ normal load before shearing.
- Normal loads were applied using bedrock.

SHEAR TEST:

- Shear test was conducted @ 0.040 in/min.
- Sheared @ maximum 3.0 inch horizontal displacement.
- The test specimens were sheared at flatted condition.
- Test were performed in general accordance with ASTM D6321 using Brinard-Kilmer LG-112 Direct Stress machine, with effective test area of 12 in X 12 in.

TEST RESULTS:

Normal Stresses Applied		Soil Moisture Content		Asperity Heights		PEAK STRENGTH		POST-PEAK STRENGTH AT 3.0 INCHES	
		Before	After	Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psf)	(psi)	(%)	(%)	(mil)	(mil)	(psf)	(degrees)	(psf)	(degrees)
30.00	4.320	13.5	20.2	27	25	2912	34	2596	31
40.00	5.780	13.5	18.9	27	24	4091	35	3255	29
50.00	7.200	13.5	15.8	27	25	5087	35	4171	30
Note:		COHESION (psf):				0		191	
		COEFFICIENT OF FRICTION:				0.76		0.55	
		FRICTION ANGLE (degrees):				37.1		28.7	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit lines.

OBSERVATIONS:

- No tilting of the system or any abnormalities observed during and after the test.
- Superficial abrasion on the geosynthetic interlocking slider (typical to all loads).
- Sliding occurred within the soil substrate on all loads as soil fines was retained on the surface of the geomembrane.

Figure #1  
Normal Stress/Interface Stress

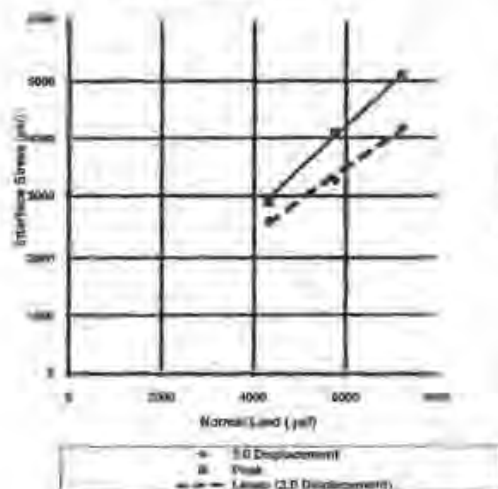
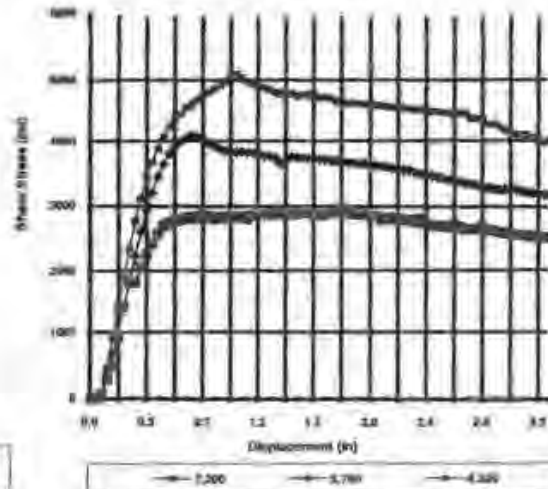


Figure #2  
Shear Stress/Displacement Curve

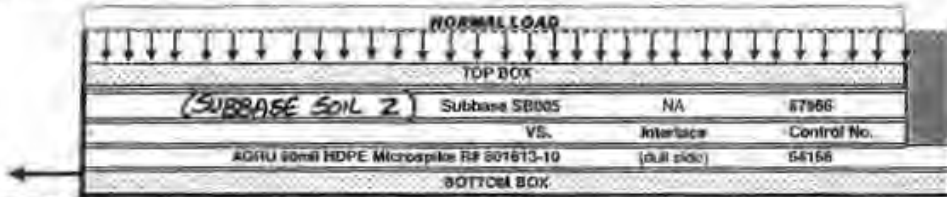


By signing the attached report, the Precision Geosynthetic Laboratory (PGL) certifies that the facility of the test was in accordance with the requirements of the American Society for Testing and Materials (ASTM) D6321. The test results are the property of Precision Geosynthetic Laboratory and shall not be used for any other purpose without the written consent of Precision Geosynthetic Laboratory.





TEST CONFIGURATION 12B



TEST CONDITIONS:

SAMPLE PREPARATION:

- The TOP box contained the soil.  
 Specimens were cut along machine direction in 14" x 19" for the BOTTOM box, with effective test area of 12" x 12".
- The Maximum Dry Density (MDD) of the soil is 139 pcf at 11.5% Optimum Moisture Content (OMC).  
 Soil specimen was remolded to 132.3 pcf at 13.5% moisture content forming 2 inch layer in the TOP box.
- Specimens were retained in the bar clamping mechanisms complete with bolts and nuts (7-pairs).

CONSOLIDATION:

- Each set of specimen was consolidated with bladder condition for 1 hr @ normal load before shearing.
- Normal loads were applied using bladder for the highest load and dead weights for the rest of the loads.

SHEAR TEST:

- Shear test was conducted @ 0.040 in/min.
- Sheared @ minimum 3.0 inch horizontal displacement.
- The test specimens were sheared at flooded condition.
- Test was performed in general accordance with ASTM (D5321) using Brinhard-Kramer (G-112) Direct Shear machine with effective test area of 12 in x 12 in.

TEST RESULTS:

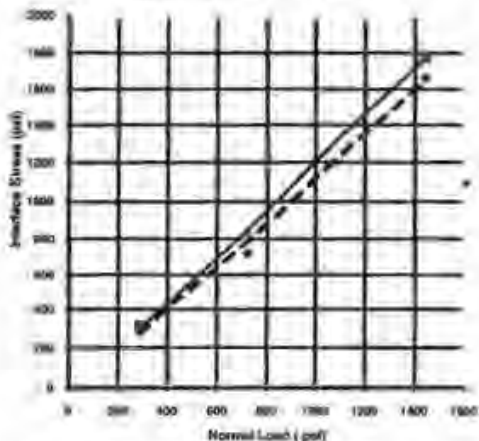
Normal Stresses Applied		Moisture Content		Aspenity Heights		PEAK STRENGTH		POST-PEAK STRENGTH AT 3.0 INCHES	
		Before	After	Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psf)	(pcf)	(%)	(%)	(inits)	(inits)	(psf)	(degrees)	(pcf)	(degrees)
2.00	265	13.5	19.3	27	25	312	47	312	47
5.00	720	13.5	17.2	27	25	817	48	722	45
10.00	1,440	13.5	16.1	27	24	1775	51	1664	49
Note:		COHESION (psf) :				0		0	
		COEFFICIENT OF FRICTION :				1.26		1.19	
		FRICTION ANGLE (degrees) :				52.0		49.9	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

OBSERVATIONS:

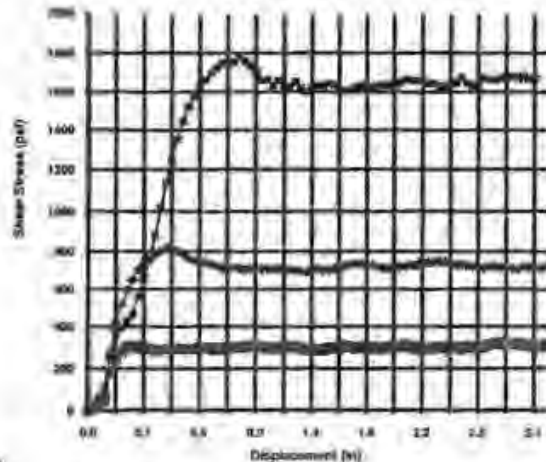
- No tilting of the system or any abnormalities observed during and after the test.
- Superficial abrasion on the geosynthetics (interfacing sides typical to all loads).
- Siding occurred within the soil substrate on all loads as soil film was retained on the surface of the geosynthetics.

Figure #1  
 Normal Stress/ Interface Stress



● 3.0 Displacement    ○ Peak  
 --- Linear (3.0 Displacement)    --- Linear (Peak)

Figure #2  
 Shear Stress/ Displacement Curve



— 1,440    — 720    — 288

By accepting the data and results presented in this report, the Client agrees to hold the liability of Precision Geosynthetic Laboratories (located from Client) and all other parties for claims not caused due to the use of this data, to the extent that the test results presented in this report and the Client agree to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all third-party claims of the above-referenced firm.



# **Appendix I**

## **Geosynthetic Field Logs**

- Appendix I-1 Subgrade Acceptance Forms**
- Appendix I-2 Geomembrane Trial Seam Logs**
- Appendix I-3 Geomembrane Production Seam Logs**
- Appendix I-4 Geomembrane Panel Placement and Repair Summary Logs**
- Appendix I-5 Geomembrane Destructive Sample Logs**

**Appendix I-1**  
**Subgrade Acceptance Forms**



# Subgrade Surface Acceptance

Date: 06-Apr-10

Project: WM of Hawaii, Inc. Site Mgr. Joel Mondragon

Project # \_\_\_\_\_

Location: Kekaha, Hawaii Partial: x Final: \_\_\_\_\_

*This document only applies to the acceptability of surface conditions for installation of geosynthetic products. ESI does not accept responsibility for compaction, elevation or moisture content, nor for the surface maintenance during deployment. Structural integrity of the subgrade and maintenance of these conditions are the responsibility of the owner or earthwork contractor.*

Cell 1 (C&D) Construction

Panels # S-1 to # S-10

For Northwest Lining & Geotextile Products, Inc.

Joel Mondragon

For Owner / Contractor

Chris Scott/ Geosyntec

Acceptance Number: 1 Area Accepted 34,224 s.f. Total Area Accepted to date: 34,224 s.f.



# Subgrade Surface Acceptance

Date: 07-Apr-10

Project: WM of Hawaii, Inc.

Site Mgr. Joel Mondragon

Project # \_\_\_\_\_

Location: Kekaha, Hawaii

Partial: x

Final: \_\_\_\_\_

*This document only applies to the acceptability of surface conditions for installation of geosynthetic products. ESI does not accept responsibility for compaction, elevation or moisture content, nor for the surface maintenance during deployment. Structural integrity of the subgrade and maintenance of these conditions are the responsibility of the owner or earthwork contractor.*

Cell 1 (C&D) Construction

Panels # S-11 to # S-17

For Northwest Lining & Geotextile Products, Inc.

Joel Mondragon

Joel Mondragon

For Owner / Contractor

Chris Scott/ Geosyntec

Chris Scott

Acceptance Number: 2

Area Accepted 25,116 s.f.

Total Area Accepted to date: 59,340 s.f.



# Subgrade Surface Acceptance

Date: 14-Apr-10

Project: WM of Hawaii, Inc.

Site Mgr. Joel Mondragon

Project # \_\_\_\_\_

Location: Kekaha, Hawaii

Partial: x

Final: \_\_\_\_\_

*This document only applies to the acceptability of surface conditions for installation of geosynthetic products. ESI does not accept responsibility for compaction, elevation or moisture content, nor for the surface maintenance during deployment. Structural integrity of the subgrade and maintenance of these conditions are the responsibility of the owner or earthwork contractor.*

Cell 1 (C&D) Construction

Panels # S-18 to # S-25

For Northwest Lining & Geotextile Products, Inc.

For Owner / Contractor

Joel Mondragon

Chris Scott/ Geosyntec

Acceptance Number: 3

Area Accepted 25,208 s.f.

Total Area Accepted to date: 84,548 s.f.



# Subgrade Surface Acceptance

Date: 15-Apr-10

Project: WM of Hawaii, Inc.

Site Mgr. Joel Mondragon

Project # \_\_\_\_\_

Location: Kekaha, Hawaii

Partial: x

Final: \_\_\_\_\_

*This document only applies to the acceptability of surface conditions for installation of geosynthetic products. ESI does not accept responsibility for compaction, elevation or moisture content, nor for the surface maintenance during deployment. Structural integrity of the subgrade and maintenance of these conditions are the responsibility of the owner or earthwork contractor.*

Cell 1 (C&D) Construction

Panels # S-26 to # S-35

For Northwest Lining & Geotextile Products, Inc.

For Owner / Contractor

Joel Mondragon

Chris Scott/ Geosyntec

Acceptance Number: 4

Area Accepted 32,729 s.f.

Total Area Accepted to date: 117,277 s.f.





# Subgrade Surface Acceptance

Date: 21-Apr-10

Project: WM of Hawaii, Inc.

Site Mgr. Joel Mondragon

Project # \_\_\_\_\_

Location: Kekaha, Hawaii

Partial: x

Final: \_\_\_\_\_

*This document only applies to the acceptability of surface conditions for installation of geosynthetic products. ESI does not accept responsibility for compaction, elevation or moisture content, nor for the surface maintenance during deployment. Structural integrity of the subgrade and maintenance of these conditions are the responsibility of the owner or earthwork contractor.*

Cell 1 (C&D) Construction

Panels # S-36 to # S-47

For Northwest Lining & Geotextile Products, Inc.

Joel Mondragon

For Owner / Contractor

Chris Scott/ Geosyntec

Acceptance Number: 5 Area Accepted 12,719 s.f. Total Area Accepted to date: 129,996 s.f.



# Subgrade Surface Acceptance

Date: 11-May-10

Project: WM of Hawaii, Inc.

Site Mgr. Joel Mondragon

Project # \_\_\_\_\_

Location: Kekaha, Hawaii

Partial: \_\_\_\_\_

Final: x

*This document only applies to the acceptability of surface conditions for installation of geosynthetic products. ESI does not accept responsibility for compaction, elevation or moisture content, nor for the surface maintenance during deployment. Structural integrity of the subgrade and maintenance of these conditions are the responsibility of the owner or earthwork contractor.*

Cell 1 (C&D) Construction

Panels # S-48 to # S-59

For Northwest Lining & Geotextile Products, Inc.

Joel Mondragon

For Owner / Contractor

Chris Scott/ Geosyntec

Acceptance Number: 6

Area Accepted 11,569 s.f.

Total Area Accepted to date: 141,565 s.f.



# Subgrade Surface Acceptance

Date: 30-Jul-10

Project: WM of Hawaii, Inc.

Site Mgr. Joel Mondragon

Project # \_\_\_\_\_

Location: Kekaha, Hawaii

Partial: \_\_\_\_\_

Final: x

*This document only applies to the acceptability of surface conditions for installation of geosynthetic products. ESI does not accept responsibility for compaction, elevation or moisture content, nor for the surface maintenance during deployment. Structural integrity of the subgrade and maintenance of these conditions are the responsibility of the owner or earthwork contractor.*

Cell 1 (C&D) Construction

Panels # S-60 to # S-73

For Northwest Lining & Geotextile Products, Inc.

Joel Mondragon

For Owner / Contractor

Doug Hamilton/ Geosyntec

Acceptance Number: 7 Area Accepted 46,000 s.f. Total Area Accepted to date: 187,565 s.f.



# Subgrade Surface Acceptance

Date: 31-Jul-10

Project: WM of Hawaii, Inc.

Site Mgr. Joel Mondragon

Project # \_\_\_\_\_

Location: Kekaha, Hawaii

Partial: \_\_\_\_\_

Final: x

*This document only applies to the acceptability of surface conditions for installation of geosynthetic products. ESI does not accept responsibility for compaction, elevation or moisture content, nor for the surface maintenance during deployment. Structural integrity of the subgrade and maintenance of these conditions are the responsibility of the owner or earthwork contractor.*

Cell 1 (C&D) Construction

Panels # S-74 to # S-88

For Northwest Lining & Geotextile Products, Inc.

Joel Mondragon

For Owner / Contractor

Doug Hamilton/ Geosyntec

Acceptance Number: 8

Area Accepted: 51,750 s.f.

Total Area Accepted to date: 239,315 s.f.



# Subgrade Surface Acceptance

Date: 02-Aug-10

Project: WM of Hawaii, Inc.

Site Mgr. Joel Mondragon

Project # \_\_\_\_\_

Location: Kekaha, Hawaii

Partial: \_\_\_\_\_

Final: x

*This document only applies to the acceptability of surface conditions for installation of geosynthetic products. ESI does not accept responsibility for compaction, elevation or moisture content, nor for the surface maintenance during deployment. Structural integrity of the subgrade and maintenance of these conditions are the responsibility of the owner or earthwork contractor.*

Cell 1 (C&D) Construction

Panels # S-89 to # S-95

For Northwest Lining & Geotextile Products, Inc.

Joel Mondragon

For Owner / Contractor

Doug Hamilton/ Geosyntec

Acceptance Number: 9

Area Accepted 28,750 s.f.

Total Area Accepted to date: 268,065 s.f.



# Subgrade Surface Acceptance

Date: 03-Aug-10

Project: WM of Hawaii, Inc.

Site Mgr. Joel Mondragon

Project # \_\_\_\_\_

Location: Kekaha, Hawaii

Partial: \_\_\_\_\_

Final: x

*This document only applies to the acceptability of surface conditions for installation of geosynthetic products. ESI does not accept responsibility for compaction, elevation or moisture content, nor for the surface maintenance during deployment. Structural integrity of the subgrade and maintenance of these conditions are the responsibility of the owner or earthwork contractor.*

Cell 1 (C&D) Construction

Panels # S-96 to # S-110

For Northwest Lining & Geotextile Products, Inc.

Joel Mondragon

For Owner / Contractor

Doug Hamilton/ Geosyntec

Acceptance Number: 10 Area Accepted 11,059 s.f. Total Area Accepted to date: 279,124 s.f.

**Appendix I-2**  
**Geomembrane Trial Seam Logs**



## Trial Seam Log - Fusion , 60 mil HDPE GEOMEMBRANE

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WQ122X</u>	TaskNo: <u>02</u>
Location: <u>6900 D Kaunuaia Hwy, Kekaha, HI 96752</u>		
Description: <u>Cell I C&amp;D Construction</u>		
Tensiometer Description: M2405-750		
Material Type: <u>gml r 2</u>	Peel Inside: <u>91 ppi</u>	Shear: <u>120 ppi</u>
	Peel Outside: <u>91 ppi</u>	

Trial Seam No	Date	Time	Mach ID	Oper ID	Mat Desc	Fusion		Test Results					QA ID
						Wedge ° Celsius	Speed ft./Min	Peel In	Peel Out	Shear	Unit ppi/psi	Result	
1-022	4/9/2010	10:05	20431	AM	SxS	d	6.0	122	129	153	ppi	p	CAS
1-023	4/9/2010	10:05	20431	AM	SxS	d	6.0	121	121	154	ppi	p	CAS
1-024	4/9/2010	10:05	20431	AM	SxS	d	6.0	124	110	151	ppi	p	CAS
1-025	4/9/2010	10:40	20431	AM	TxT	d	5.0	133	118	142	ppi	p	CAS
1-026	4/9/2010	10:40	20431	AM	TxT	d	5.0	113	121	136	ppi	p	CAS
1-027	4/9/2010	10:40	20431	AM	TxT	d	5.0	123	112	122	ppi	p	CAS
1-028	4/9/2010	13:15	20431	AM	SxS	d	6.0	121	112	139	ppi	p	CAS
1-029	4/9/2010	13:15	20431	AM	SxS	d	6.0	112	111	129	ppi	p	CAS
1-030	4/9/2010	13:15	20431	AM	SxS	d	6.0	115	111	138	ppi	p	CAS
1-031	4/9/2010	13:20	20431	AM	TxT	d	5.0	123	115	131	ppi	p	CAS
1-032	4/9/2010	13:20	20431	AM	TxT	d	5.0	118	118	121	ppi	p	CAS
1-033	4/9/2010	13:20	20431	AM	TxT	d	5.0	113	113	124	ppi	p	CAS
1-034	4/9/2010	13:50	1110	AM	TxT	d	5.0	122	116	139	ppi	p	CAS
1-035	4/9/2010	13:50	1110	AM	TxT	d	5.0	124	124	136	ppi	p	CAS
1-036	4/9/2010	14:50	1110	AM	TxT	d	5.0	115	117	141	ppi	p	CAS
1-037	4/9/2010	14:55	1110	AM	SxS	d	6.0	127	122	151	ppi	p	CAS
1-038	4/9/2010	14:55	1110	AM	SxS	d	6.0	129	126	154	ppi	p	CAS
1-039	4/9/2010	14:55	1110	AM	SxS	d	6.0	125	124	149	ppi	p	CAS
1-040	4/12/2010	8:15	1110	AM	SxS	d	6.0	129	121	169	ppi	p	CAS
1-041	4/12/2010	8:15	1110	AM	SxS	d	6.0	134	134	170	ppi	p	CAS
1-042	4/12/2010	8:15	1110	AM	SxS	d	6.0	123	133	164	ppi	p	CAS
1-043	4/12/2010	8:30	1110	AM	TxT	d	5.0	146	142	149	ppi	p	CAS
1-044	4/12/2010	8:30	1110	AM	TxT	d	5.0	139	141	150	ppi	p	CAS
1-045	4/12/2010	8:30	1110	AM	TxT	d	5.0	140	140	153	ppi	p	CAS
1-046	4/12/2010	13:20	1110	AM	SxS	d	6.0	125	124	135	ppi	p	CAS
1-047	4/12/2010	13:20	1110	AM	SxS	d	6.0	116	122	137	ppi	p	CAS
1-048	4/12/2010	13:20	1110	AM	SxS	d	6.0	116	121	135	ppi	p	CAS
1-049	4/12/2010	13:35	1110	AM	TxT	d	5.0	118	106	124	ppi	p	CAS
1-050	4/12/2010	13:35	1110	AM	TxT	d	5.0	108	115	115	ppi	p	CAS
1-051	4/12/2010	13:35	1110	AM	TxT	d	5.0	116	112	118	ppi	p	CAS
1-082	4/19/2010	8:35	1110	AM	TxT	d	5.0	143	144	164	ppi	p	CAS
1-083	4/19/2010	8:35	1110	AM	TxT	d	5.0	144	150	153	ppi	p	CAS
1-084	4/19/2010	8:35	1110	AM	TxT	d	5.0	130	137	143	ppi	p	CAS
1-085	4/19/2010	8:19	1110	AM	SxS	d	6.0	128	128	173	ppi	p	CAS





## Trial Seam Log - Fusion

Project: Kekaha Landfill	ProjNo: WG1298	TaskNo: 02
Location: 6900 D Kaulaali Hwy, Kekaha, HI 96752		
Description: Cell 1 C&D Construction		
Tensiometer Description: M2405-750		
Material Type: gmf : 2	Peel Inside: 91 ppi	Shear: 120 ppi
	Peel Outside: 91 ppi	

Trial Seam No	Date	Time	Mach ID	Oper ID	Mat Desc	Fusion		Test Results					QA ID
						Wedge ° Celsius	Speed ft/Min	Peel In	Peel Out	Shear	Unit ppi/psi	Result	
I-086	4/19/2010	8:19	1110	AM	SxS	d	6.0	134	133	172	ppi	p	CAS
I-087	4/19/2010	8:19	1110	AM	SxS	d	6.0	123	117	177	ppi	p	CAS
I-100	4/22/2010	8:00	1110	AM	TxT	d	5.0	125	119	156	ppi	p	CAS
I-101	4/22/2010	8:00	1110	AM	TxT	d	5.0	122	120	158	ppi	p	CAS
I-102	4/22/2010	8:00	1110	AM	TxT	d	5.0	126	127	162	ppi	p	CAS
I-103	4/22/2010	7:55	1110	AM	SxS	d	6.0	133	126	169	ppi	p	CAS
I-104	4/22/2010	7:55	1110	AM	SxS	d	6.0	137	114	169	ppi	p	CAS
I-105	4/22/2010	7:55	1110	AM	SxS	d	6.0	131	125	165	ppi	p	CAS
I-106	4/23/2010	9:40	1110	AM	TxT	d	5.0	131	126	162	ppi	p	CAS
I-107	4/23/2010	9:40	1110	AM	TxT	d	5.0	118	128	155	ppi	p	CAS
I-108	4/23/2010	9:40	1110	AM	TxT	d	5.0	129	130	157	ppi	p	CAS
I-109	4/23/2010	9:55	1110	AM	SxS	d	6.0	128	123	171	ppi	p	CAS
I-110	4/23/2010	9:55	1110	AM	SxS	d	6.0	124	110	165	ppi	p	CAS
I-111	4/23/2010	9:55	1110	AM	SxS	d	6.0	125	113	163	ppi	p	CAS
I-112	4/23/2010	1:00	1110	AM	SxS	d	5.0	116	119	165	ppi	p	CAS
I-113	4/23/2010	1:00	1110	AM	SxS	d	5.0	117	125	158	ppi	p	CAS
I-114	4/23/2010	1:00	1110	AM	SxS	d	5.0	111	109	157	ppi	p	CAS
I-115	4/23/2010	1:05	1110	AM	TxT	d	6.0	122	116	138	ppi	p	CAS
I-116	4/23/2010	1:05	1110	AM	TxT	d	6.0	113	113	149	ppi	p	CAS
I-117	4/23/2010	1:05	1110	AM	TxT	d	6.0	126	119	149	ppi	n	CAS
I-140	5/12/2010	9:00	1110	AM	SxS	d	6.0	149	131	171	ppi	p	CAS
I-141	5/12/2010	9:00	1110	AM	SxS	d	6.0	154	114	160	ppi	p	CAS
I-142	5/12/2010	9:00	1110	AM	SxS	d	6.0	149	115	153	ppi	p	CAS
I-146	5/12/2010	9:15	1110	AM	TxT	d	5.0	119	129	156	ppi	p	CAS
I-147	5/12/2010	9:15	1110	AM	TxT	d	5.0	114	123	156	ppi	p	CAS
I-148	5/12/2010	9:15	1110	AM	TxT	d	5.0	121	126	151	ppi	p	CAS
I-149	8/4/2010	8:53	20624	AM	SxS	d	6.0	117	116	167	ppi	p	DWH
I-150	8/4/2010	8:53	20624	AM	SxS	d	6.0	127	129	167	ppi	p	DWH
I-151	8/4/2010	8:53	20624	AM	SxS	d	6.0	136	118	169	ppi	p	DWH
I-152	8/4/2010	9:03	20624	AM	TxT	d	5.0	118	120	160	ppi	p	DWH
I-153	8/4/2010	9:03	20624	AM	TxT	d	5.0	122	120	165	ppi	p	DWH
I-154	8/4/2010	9:03	20624	AM	TxT	d	5.0	117	129	162	ppi	p	DWH
I-185	8/5/2010	11:18	20624	AM	SxS	d	6.0	133	112	149	ppi	p	DWH
I-186	8/5/2010	11:18	20624	AM	SxS	d	6.0	141	107	148	ppi	p	DWH



## Trial Seam Log - Fusion

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WG1298</u>	TaskNo: <u>02</u>
Location: <u>6900 D Kaunualii Hwy, Kekaha, HI 96752</u>		
Description: <u>Cell 1 C&amp;D Construction</u>		
Tensiometer Description: <u>M2405-750</u>		
Material Type: <u>gml : 2</u>	Peel Inside: <u>91 ppi</u>	Shear: <u>120 ppi</u>
	Peel Outside: <u>91 ppi</u>	

Trial Seam No	Date	Time	Mach ID	Oper ID	Mat Desc	Fusion		Test Results					QA ID
						Wedge ° Celsius	Speed ft./Min	Peel In	Peel Out	Shear	Unit ppi/psi	Result	
1-187	8/5/2010	11:18	20624	AM	SxS	d	6.0	107	118	149	ppi	p	DWH
1-188	8/5/2010	11:22	20624	AM	TxT	d	5.0	134	118	136	ppi	p	DWH
1-189	8/5/2010	11:22	20624	AM	TxT	d	5.0	137	119	132	ppi	p	DWH
1-190	8/5/2010	11:22	20624	AM	TxT	d	5.0	127	117	132	ppi	p	DWH
1-191	8/5/2010	13:27	20624	AM	TxT	d	5.0	134	126	136	ppi	p	DWH
1-192	8/5/2010	13:27	20624	AM	TxT	d	5.0	134	133	134	ppi	p	DWH
1-193	8/5/2010	13:27	20624	AM	TxT	d	5.0	128	123	135	ppi	p	DWH
1-197	8/6/2010	9:39	20624	AM	TxT	d	5.5	120	113	132	ppi	p	DWH
1-198	8/6/2010	9:39	20624	AM	TxT	d	5.5	127	130	132	ppi	p	DWH
1-199	8/6/2010	9:39	20624	AM	TxT	d	5.5	128	128	130	ppi	p	DWH
1-200	8/6/2010	9:45	20624	AM	SxS	d	6.0	122	115	153	ppi	p	DWH
1-201	8/6/2010	9:45	20624	AM	SxS	d	6.0	120	103	152	ppi	p	DWH
1-202	8/6/2010	9:45	20624	AM	SxS	d	6.0	124	110	149	ppi	p	DWH
1-203	8/6/2010	13:14	20624	AM	TxT	d	5.0	126	116	137	ppi	p	DWH
1-204	8/6/2010	13:14	20624	AM	TxT	d	5.0	130	115	127	ppi	p	DWH
1-205	8/6/2010	13:14	20624	AM	TxT	d	5.0	122	114	125	ppi	p	DWH
1-206	8/6/2010	13:45	20624	AM	SxS	d	6.0	109	113	141	ppi	p	DWH
1-207	8/6/2010	13:45	20624	AM	SxS	d	6.0	117	117	146	ppi	p	DWH
1-208	8/6/2010	13:45	20624	AM	SxS	d	6.0	112	107	145	ppi	p	DWH
1-209	8/9/2010	8:57	20624	AM	TxT	d	4.5	139	136	144	ppi	p	DWH
1-210	8/9/2010	8:57	20624	AM	TxT	d	4.5	139	147	152	ppi	p	DWH
1-211	8/9/2010	8:57	20624	AM	TxT	d	4.5	143	134	144	ppi	p	DWH
1-212	8/9/2010	9:03	20624	AM	SxS	d	5.5	127	117	168	ppi	p	DWH
1-213	8/9/2010	9:03	20624	AM	SxS	d	5.5	117	110	168	ppi	p	DWH
1-214	8/9/2010	9:03	20624	AM	SxS	d	5.5	120	112	173	ppi	p	DWH
1-221	8/10/2010	13:50	20624	AM	TxT	d	5.0	136	129	132	ppi	p	DWH
1-222	8/10/2010	13:50	20624	AM	TxT	d	5.0	124	123	137	ppi	p	DWH
1-223	8/10/2010	13:50	20624	AM	TxT	d	5.0	130	127	134	ppi	p	DWH
1-224	8/10/2010	14:00	20624	AM	SxS	d	6.0	138	108	155	ppi	p	DWH
1-225	8/10/2010	14:00	20624	AM	SxS	d	6.0	122	107	154	ppi	p	DWH
1-226	8/10/2010	14:00	20624	AM	SxS	d	6.0	122	118	151	ppi	p	DWH
1-227	8/11/2010	8:22	20624	AM	TxT	d	4.5	140	122	148	ppi	p	DWH
1-228	8/11/2010	8:22	20624	AM	TxT	d	4.5	133	141	151	ppi	p	DWH
1-229	8/11/2010	8:22	20624	AM	TxT	d	4.5	138	140	145	ppi	p	DWH



## Trial Seam Log - Fusion

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WGI298</u>	TaskNo: <u>02</u>
Location: <u>6900 D Kaunualii Hwy, Kekaha, HI 96751</u>		
Description: <u>Cell 1 C&amp;D Construction</u>		
Tensiometer Description: <u>M2405-750</u>		
Material Type: <u>gml - 2</u>	Peel Inside: <u>91 ppi</u>	Shear: <u>120 ppi</u>
	Peel Outside: <u>VI ppi</u>	

Trial Seam No	Date	Time	Mach ID	Oper ID	Mat Desc	Fusion		Test Results					QA ID
						Wedge ° Celsius	Speed ft/Min	Peel In	Peel Out	Shear	Unit ppi/psi	Result	
1-230	8/11/2010	8:33	20624	AM	SxS	d	5.5	128	132	169	ppi	p	DWH
1-231	8/11/2010	8:33	20624	AM	SxS	d	5.5	125	125	155	ppi	p	DWH
1-232	8/11/2010	8:33	20624	AM	SxS	d	5.5	138	119	175	ppi	p	DWH
1-233	8/11/2010	13:10	20624	AM	TxS	d	4.5	127	125	133	ppi	p	DWH
1-234	8/11/2010	13:10	20624	AM	TxS	d	4.5	131	130	132	ppi	p	DWH
1-235	8/11/2010	13:10	20624	AM	TxS	d	4.5	125	122	132	ppi	p	DWH
1-236	8/11/2010	13:16	20624	AM	SxS	d	5.5	138	115	153	ppi	p	DWH
1-237	8/11/2010	13:16	20624	AM	SxS	d	5.5	118	110	147	ppi	p	DWH
1-258	8/11/2010	13:16	20624	AM	SxS	d	5.5	127	114	128	ppi	p	DWH
2-001	4/6/2010	12:00	20431	AM	SxS	d	5.0	117	109	170	ppi	p	CAS
2-002	4/6/2010	12:00	20431	AM	SxS	d	5.0	111	117	175	ppi	p	CAS
2-003	4/6/2010	12:00	20431	AM	SxS	d	5.0	117	105	168	ppi	p	CAS
2-004	4/6/2010	12:10	20431	AM	TxT	d	6.0	131	123	147	ppi	p	CAS
2-005	4/6/2010	12:10	20431	AM	TxT	d	6.0	127	126	139	ppi	p	CAS
2-006	4/6/2010	12:10	20431	AM	TxT	d	6.0	127	122	147	ppi	p	CAS
2-007	4/6/2010	12:45	1110	GM	TxT	d	5.0	103	112	131	ppi	p	CAS
2-008	4/6/2010	12:45	1110	GM	TxT	d	5.0	103	114	131	ppi	p	CAS
2-009	4/6/2010	12:45	1110	GM	TxT	d	5.0	118	108	122	ppi	p	CAS
2-010	4/6/2010	14:50	1110	GM	SxS	d	5.0	122	120	155	ppi	p	CAS
2-011	4/6/2010	14:50	1110	GM	SxS	d	5.0	109	124	152	ppi	p	CAS
2-012	4/6/2010	14:50	1110	GM	SxS	d	5.0	117	123	157	ppi	p	CAS
2-013	4/7/2010	7:10	20431	AM	SxS	d	6.0	114	121	172	ppi	p	CAS
2-014	4/7/2010	7:10	20431	AM	SxS	d	6.0	127	115	171	ppi	p	CAS
2-015	4/7/2010	7:10	20431	AM	SxS	d	6.0	125	127	170	ppi	p	CAS
2-016	4/7/2010	7:15	20431	AM	TxT	d	5.0	137	141	149	ppi	p	CAS
2-017	4/7/2010	7:15	20431	AM	TxT	d	5.0	135	137	152	ppi	p	CAS
2-018	4/7/2010	7:15	20431	AM	TxT	d	5.0	143	139	145	ppi	p	CAS
2-019	4/7/2010	9:00	1110	GM	SxS	d	5.0	121	111	159	ppi	p	CAS
2-020	4/7/2010	9:00	1110	GM	SxS	d	5.0	113	110	153	ppi	p	CAS
2-021	4/7/2010	9:00	1110	GM	SxS	d	5.0	125	115	137	ppi	p	CAS
2-052	4/14/2010	8:50	1110	AM	SxS	d	6.0	138	119	172	ppi	p	CAS
2-053	4/14/2010	8:50	1110	AM	SxS	d	6.0	122	118	151	ppi	p	CAS
2-054	4/14/2010	8:50	1310	AM	SxS	d	6.0	118	120	171	ppi	p	CAS
2-055	4/14/2010	8:55	1110	AM	TxT	d	5.0	140	141	149	ppi	p	CAS



## Trial Seam Log - Fusion

Project: Kekaha Landfill	ProfNo: W051298	TaskNo: 02
Location: 6900 D Kayamalii Hwy, Kekaha, HI 96752		
Description: Cell 1 C&D Construction		
Tensuometer Description: M2405-750		
Material Type: gmf : 2	Peel Inside: 91 ppi	Shear: 120 ppi
	Peel Outside: 91 ppi	

Trial Seam No	Date	Time	Mach ID	Oper ID	Mat Desc	Fusion		Test Results					QA ID
						Wedge * Celsius	Speed ft./Min	Peel In	Peel Out	Shear	Unit ppi/psi	Result	
2-056	4/14/2010	8:55	1110	AM	TxT	d	5.0	130	149	152	ppi	p	CAS
2-057	4/14/2010	8:55	1110	AM	TxT	d	5.0	144	140	156	ppi	p	CAS
2-058	4/14/2010	13:15	20664	AM	SxS	d	6.0	107	116	133	ppi	p	CAS
2-059	4/14/2010	13:15	20664	AM	SxS	d	6.0	123	117	137	ppi	p	CAS
2-060	4/14/2010	13:15	20664	AM	SxS	d	6.0	109	116	137	ppi	p	CAS
2-061	4/14/2010	13:25	20664	AM	TxT	d	5.0	126	116	140	ppi	p	CAS
2-062	4/14/2010	13:25	20664	AM	TxT	d	5.0	125	123	139	ppi	p	CAS
2-063	4/14/2010	13:25	20664	AM	TxT	d	5.0	123	122	137	ppi	p	CAS
2-064	4/14/2010	13:15	1110	AM	TxT	d	5.0	128	128	125	ppi	p	CAS
2-065	4/14/2010	13:15	1110	AM	TxT	d	5.0	130	129	128	ppi	p	CAS
2-066	4/14/2010	13:15	1110	AM	TxT	d	5.0	128	128	128	ppi	p	CAS
2-067	4/14/2010	13:40	1110	AM	SxS	d	6.0	134	122	148	ppi	p	CAS
2-068	4/14/2010	13:40	1110	AM	SxS	d	6.0	122	130	155	ppi	p	CAS
2-069	4/14/2010	13:40	1110	AM	SxS	d	6.0	116	126	137	ppi	p	CAS
2-070	4/15/2010	7:30	20664	AM	SxS	d	5.5	137	121	187	ppi	p	CAS
2-071	4/15/2010	7:30	20664	AM	SxS	d	5.5	133	118	184	ppi	p	CAS
2-072	4/15/2010	7:30	20664	AM	SxS	d	5.5	138	119	184	ppi	p	CAS
2-073	4/15/2010	7:40	20664	AM	TxT	d	4.5	136	136	166	ppi	p	CAS
2-074	4/15/2010	7:40	20664	AM	TxT	d	4.5	139	145	137	ppi	p	CAS
2-075	4/15/2010	7:40	20664	AM	TxT	d	4.5	134	140	164	ppi	p	CAS
2-076	4/15/2010	7:40	1110	GM	SxS	d	5.0	141	137	179	ppi	p	CAS
2-077	4/15/2010	7:40	1110	GM	SxS	d	5.0	133	138	177	ppi	p	CAS
2-078	4/15/2010	7:40	1110	GM	SxS	d	5.0	124	135	182	ppi	p	CAS
2-079	4/15/2010	7:55	1110	GM	TxT	d	4.5	138	141	163	ppi	p	CAS
2-080	4/15/2010	7:55	1110	GM	TxT	d	4.5	141	139	160	ppi	p	CAS
2-081	4/15/2010	7:55	1110	GM	TxT	d	4.5	136	144	165	ppi	p	CAS
2-088	4/21/2010	7:40	1110	AM	SxS	d	6.0	127	141	149	ppi	p	CAS
2-089	4/21/2010	7:40	1110	AM	SxS	d	6.0	111	139	137	ppi	p	CAS
2-090	4/21/2010	7:40	1110	AM	SxS	d	6.0	122	137	148	ppi	p	CAS
2-091	4/21/2010	7:50	1110	AM	TxT	d	5.0	129	136	169	ppi	p	CAS
2-092	4/21/2010	7:50	1110	AM	TxT	d	5.0	132	129	150	ppi	p	CAS
2-093	4/21/2010	7:50	1110	AM	TxT	d	5.0	137	127	163	ppi	p	CAS
2-124	5/11/2010	7:55	1110	AM	SxS	d	6.0	141	142	164	ppi	p	CAS
2-125	5/11/2010	7:55	1110	AM	SxS	d	6.0	139	123	168	ppi	p	CAS



## Trial Seam Log - Fusion

Project: <u>Kekaha Landfill</u>		ProjNo: <u>WG1298</u>		TaskNo: <u>02</u>	
Location: <u>6900 D Kaunaloa Hwy, Kekaha, HI 96752</u>					
Description: <u>Cell 1 C&amp;D Construction</u>					
Tensometer Description: <u>M2405-750</u>					
Material Type: <u>grii - 2</u>		Peel Inside: <u>91 ppi</u>	Shear: <u>120 ppi</u>		
		Peel Outside: <u>91 ppi</u>			

Trial Seam No	Date	Time	Mach ID	Oper ID	Mat Desc	Fusion		Test Results					QA ID
						Wedge ° Celsius	Speed ft/Min	Peel In	Peel Out	Shear	Unit ppi/psi	Result	
2-126	5/11/2010	7:55	1110	AM	SxS	d	6.0	117	127	198	ppi	p	CAS
2-127	5/11/2010	8:00	1110	AM	TxT	d	5.0	140	118	211	ppi	p	CAS
2-128	5/11/2010	8:00	1110	AM	TxT	d	5.0	134	122	206	ppi	p	CAS
2-129	5/11/2010	8:00	1110	AM	TxT	d	5.0	118	124	208	ppi	p	CAS
2-130	5/11/2010	13:05	1110	AM	SxS	d	6.0	111	114	152	ppi	p	CAS
2-131	5/11/2010	13:05	1110	AM	SxS	d	6.0	119	114	148	ppi	p	CAS
2-132	5/11/2010	13:05	1110	AM	SxS	d	6.0	115	113	150	ppi	p	CAS
2-136	5/11/2010	16:15	1110	AM	TxT	d	4.0	124	118	132	ppi	p	CAS
2-137	5/11/2010	16:15	1110	AM	TxT	d	4.0	131	126	132	ppi	p	CAS
2-139	5/11/2010	16:15	1110	AM	TxT	d	4.0	126	124	132	ppi	p	CAS
2-140	7/30/2010	10:03	20624	AM	SxS	d	6.0	118	120	159	ppi	p	DWH
2-141	7/30/2010	10:03	20624	AM	SxS	d	6.0	120	132	156	ppi	p	DWH
2-142	7/30/2010	10:03	20624	AM	SxS	d	6.0	121	119	153	ppi	p	DWH
2-143	7/30/2010	10:20	1109	GM	TxT	d	5.0	118	127	131	ppi	p	DWH
2-144	7/30/2010	10:20	1109	GM	TxT	d	5.0	113	120	125	ppi	p	DWH
2-145	7/30/2010	10:20	1109	GM	TxT	d	5.0	110	112	134	ppi	p	DWH
2-146	7/30/2010	12:49	20624	AM	SxS	d	6.0	124	117	157	ppi	p	DWH
2-147	7/30/2010	12:49	20624	AM	SxS	d	6.0	122	119	153	ppi	p	DWH
2-148	7/30/2010	12:49	20624	AM	SxS	d	6.0	130	121	157	ppi	p	DWH
2-149	7/30/2010	13:35	1109	GM	TxT	d	5.0	118	117	129	ppi	p	DWH
2-150	7/30/2010	13:35	1109	GM	TxT	d	5.0	111	111	123	ppi	p	DWH
2-151	7/30/2010	13:35	1109	GM	TxT	d	5.0	107	111	125	ppi	p	DWH
2-158	7/30/2010	15:09	1109	GM	SxS	d	5.0	130	109	160	ppi	p	DWH
2-159	7/30/2010	15:09	1109	GM	SxS	d	5.0	136	110	158	ppi	p	DWH
2-160	7/30/2010	15:09	1109	GM	SxS	d	5.0	131	108	162	ppi	p	DWH
2-161	7/31/2010	7:25	20624	AM	SxS	d	5.0	124	142	178	ppi	p	DWH
2-162	7/31/2010	7:25	20624	AM	SxS	d	5.0	129	115	173	ppi	p	DWH
2-163	7/31/2010	7:25	20624	AM	SxS	d	5.0	139	126	164	ppi	p	DWH
2-164	7/31/2010	7:49	1109	GM	TxT	d	5.0	136	116	144	ppi	p	DWH
2-165	7/31/2010	7:49	1109	GM	TxT	d	5.0	141	117	144	ppi	p	DWH
2-166	7/31/2010	7:49	1109	GM	TxT	d	5.0	133	114	141	ppi	p	DWH
2-167	7/31/2010	9:21	1109	GM	SxS	d	5.0	125	105	157	ppi	p	DWH
2-168	7/31/2010	9:21	1109	GM	SxS	d	5.0	122	102	153	ppi	p	DWH
2-169	7/31/2010	9:21	1109	GM	SxS	d	5.0	117	97	153	ppi	p	DWH



**Trial Seam Log - Fusion**

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WG1298</u>	TaskNo: <u>02</u>
Location: <u>6900 D Kaunualii Hwy, Kekaha, HI 96752</u>		
Description: <u>Cell 1 C&amp;D Construction</u>		
Tensiometer Description: <u>M2405-750</u>		

Material Type	<u>gmf - 2</u>	Peel Inside:	<u>91 ppi</u>	Shear:	<u>120 ppi</u>
		Peel Outside:	<u>91 ppi</u>		

Trial Seam No	Date	Time	Mach ID	Oper ID	Mat Desc	Fusion		Test Results					QA ID
						Wedge ° Celsius	Speed ft./Min	Peel In	Peel Out	Shear	Unit ppi/psi	Result	
2-176	8/2/2010	13:00	20624	AM	SxS	d	6.0	123	119	157	ppi	p	DWH
2-177	8/2/2010	13:00	20624	AM	SxS	d	6.0	123	106	138	ppi	p	DWH
2-178	8/2/2010	13:00	20624	AM	SxS	d	6.0	120	119	121	ppi	p	DWH
2-179	8/3/2010	7:30	20624	AM	TxS	d	5.0	134	125	134	ppi	p	DWH
2-180	8/3/2010	7:30	20624	AM	TxS	d	5.0	107	122	129	ppi	p	DWH
2-181	8/3/2010	7:30	20624	AM	TxS	d	5.0	106	129	128	ppi	p	DWH
2-182	8/3/2010	7:22	20624	AM	SxS	d	6.0	129	113	184	ppi	p	DWH
2-183	8/3/2010	7:22	20624	AM	SxS	d	6.0	124	116	182	ppi	p	DWH
2-184	8/3/2010	7:22	20624	AM	SxS	d	6.0	123	115	182	ppi	p	DWH



## Trial Seam Log - Fusion, 80mil HDPE GEOMEMBRANE

Project: Kekaha Landfill	ProjNo: WG1298	TaskNo: 02
Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752		
Description: Cell 1 C&D Construction		
Tensionmeter Description: M2405-750		

Material Type: gml : 3	Peel Inside: 91 ppi	Shear: 120 ppi
	Peel Outside: 91 ppi	

Trial Seam No	Date	Time	Mach ID	Oper ID	Mat Desc	Fusion		Test Results					QA ID
						Wedge ° Celsius	Speed ft/Min	Peel In	Peel Out	Shear	Unit ppi/psi	Result	
1-118	4/23/2010	3:00	1110	AM	SxT	d	5.0	117	114	148	ppi	p	CAS
1-119	4/23/2010	3:00	1110	AM	SxT	d	5.0	116	111	152	ppi	p	CAS
1-120	4/23/2010	3:00	1110	AM	SxT	d	5.0	114	111	162	ppi	p	CAS
1-121	4/23/2010	3:05	1110	AM	TxT	d	4.0	116	102	151	ppi	p	CAS
1-122	4/23/2010	3:05	1110	AM	TxT	d	4.0	131	116	147	ppi	p	CAS
1-123	4/23/2010	3:05	1110	AM	TxT	d	4.0	116	126	149	ppi	p	CAS
1-143	5/12/2010	9:13	1110	AM	SxS	d	4.5	126	123	167	ppi	p	CAS
1-144	5/12/2010	9:13	1110	AM	SxS	d	4.5	122	136	161	ppi	p	CAS
1-145	5/12/2010	9:13	1110	AM	SxS	d	4.5	123	129	161	ppi	p	CAS
1-194	8/5/2010	13:33	20624	AM	SxS	d	6.0	117	134	159	ppi	p	DWH
1-195	8/5/2010	13:33	20624	AM	SxS	d	6.0	120	140	156	ppi	p	DWH
1-196	8/5/2010	13:33	20624	AM	SxS	d	6.0	111	133	164	ppi	p	DWH
1-215	8/9/2010	13:49	20624	AM	TxT	d	4.0	128	118	126	ppi	p	DWH
1-216	8/9/2010	13:49	20624	AM	TxT	d	4.0	134	131	127	ppi	p	DWH
1-217	8/9/2010	13:49	20624	AM	TxT	d	4.0	131	129	131	ppi	p	DWH
1-218	8/9/2010	14:22	20624	AM	SxS	d	4.5	114	137	161	ppi	p	DWH
1-219	8/9/2010	14:22	20624	AM	SxS	d	4.5	114	137	167	ppi	p	DWH
1-220	8/9/2010	14:22	20624	AM	SxS	d	4.5	112	138	156	ppi	p	DWH
2-094	4/21/2010	10:00	1110	AM	SxS	d	4.0	155	144	153	ppi	p	CAS
2-095	4/21/2010	10:00	1110	AM	SxS	d	4.0	152	144	163	ppi	p	CAS
2-096	4/21/2010	10:00	1110	AM	SxS	d	4.0	163	111	158	ppi	p	CAS
2-097	4/21/2010	10:05	1110	AM	TxT	d	4.0	146	144	153	ppi	p	CAS
2-098	4/21/2010	10:05	1110	AM	TxT	d	4.0	136	130	158	ppi	p	CAS
2-099	4/21/2010	10:05	1110	AM	TxT	d	4.0	136	138	151	ppi	p	CAS
2-133	5/11/2010	14:50	1110	AM	SxS	d	4.3	165	172	185	ppi	p	CAS
2-134	5/11/2010	14:50	1110	AM	SxS	d	4.3	167	164	188	ppi	p	CAS
2-135	5/11/2010	14:50	1110	AM	SxS	d	4.3	122	144	187	ppi	p	CAS
2-152	7/30/2010	14:00	20624	AM	SxS	d	4.0	118	125	132	ppi	p	DWH
2-153	7/30/2010	14:00	20624	AM	SxS	d	4.0	128	125	145	ppi	p	DWH
2-154	7/30/2010	14:00	20624	AM	SxS	d	4.0	130	120	169	ppi	p	DWH
2-155	7/30/2010	14:10	1109	GM	TxT	d	5.0	136	130	156	ppi	p	DWH
2-156	7/30/2010	14:10	1109	GM	TxT	d	5.0	127	126	153	ppi	p	DWH
2-157	7/30/2010	14:10	1109	GM	TxT	d	5.0	129	120	154	ppi	p	DWH
2-170	7/31/2010	11:00	20624	AM	SxS	d	4.5	122	108	128	ppi	p	DWH



**Trial Seam Log - Fusion**

Project: <u>Kekaha Landfill</u>	ProfNo: <u>WGL1298</u>	TaskNo: <u>02</u>
Location: <u>8900 D Kaunaloa Hwy, Kekaha, HI 96752</u>		
Description: <u>Cell 1 C&amp;D Construction</u>		
Tensionmeter Description: <u>M2405-750</u>		

Material Type: <u>gml : 3</u>	Peel Inside: <u>91 ppi</u>	Shear: <u>120 ppi</u>
	Peel Outside: <u>91 ppi</u>	

Trial Seam No	Date	Time	Mach ID	Oper ID	Mat Desc	Fusion		Test Results					QA ID
						Wedge ° Celsius	Speed ft/Min	Peel In	Peel Out	Shear	Unit ppi/psi	Result	
2-171	7/31/2010	11:00	20624	AM	SxS	d	4.5	114	134	157	ppi	p	DWH
2-172	7/31/2010	11:00	20624	AM	SxS	d	4.5	117	144	155	ppi	p	DWH
2-173	7/31/2010	11:36	1109	GM	TxT	d	4.0	135	118	134	ppi	p	DWH
2-174	7/31/2010	11:36	1109	GM	TxT	d	4.0	126	121	132	ppi	p	DWH
2-175	7/31/2010	11:36	1109	GM	TxT	d	4.0	126	117	129	ppi	p	DWH





## Trial Seam Log - Extrusion , 60mil HDPE GEOMEMBRANE

Project: Kekaha Landfill													
Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752						ProjNo: WG1298				TaskNo: 02			
Description: Cell 1 C&D Construction													
Tensiometer Description: M2405-750													
Material Type		gmi : 2		Peel: 78 ppi		Shear: 120 ppi							
Trial Seam No	Date	Time	Mach ID	Oper ID	Mat Desc	Extrusion		Test Results				Retest No	QA ID
						Pre heat ° Celsius	Barrel ° Celsius	Peel	Shear	Unā ppi/psi	Result P/F		
1-009	4/13/2010	8:00	5117	AM	TxT	500	350	153	151	ppi	p		CAS
1-010	4/13/2010	8:00	5117	AM	TxT	500	350	110	152	ppi	p		CAS
1-011	4/13/2010	8:00	5117	AM	TxT	500	350	115	158	ppi	p		CAS
1-024	4/20/2010	7:50	5117	AM	TxT	500	350	123	165	ppi	p		CAS
1-025	4/20/2010	7:50	5117	AM	TxT	500	350	125	170	ppi	p		CAS
1-026	4/20/2010	7:50	5117	AM	TxT	500	350	129	167	ppi	p		CAS
1-030	4/22/2010	13:00	5117	AM	TxT	500	350	126	148	ppi	p		CAS
1-031	4/22/2010	13:00	5117	AM	TxT	500	350	126	152	ppi	p		CAS
1-032	4/22/2010	13:00	5117	AM	TxT	500	350	127	145	ppi	p		CAS
1-033	4/23/2010	15:40	5117	AM	TxT	500	350	137	143	ppi	p		CAS
1-034	4/23/2010	15:40	5117	AM	TxT	500	350	139	148	ppi	p		CAS
1-035	4/23/2010	15:40	5117	AM	TxT	500	350	141	143	ppi	p		CAS
1-036	4/24/2010	8:05	5117	AM	TxT	500	350	142	153	ppi	p		CAS
1-037	4/24/2010	8:05	5117	AM	TxT	500	350	128	148	ppi	p		CAS
1-038	4/24/2010	8:05	5117	AM	TxT	500	350	132	143	ppi	p		CAS
1-045	5/12/2010	14:00	5117	AM	TxT	500	350	113	120	ppi	p		CAS
1-046	5/12/2010	14:00	5117	AM	TxT	500	350	116	121	ppi	p		CAS
1-047	5/12/2010	14:00	5117	AM	TxT	500	350	114	122	ppi	p		CAS
1-048	8/4/2010	13:40	5117	AM	TXT	400	500	107	121	ppi	p		DWH
1-049	8/4/2010	13:40	5117	AM	TXT	400	500	99	121	ppi	p		DWH
1-050	8/4/2010	13:40	5117	AM	TXT	400	500	129	121	ppi	p		DWH
1-072	8/6/2010	7:40	5117	AM	TXT	400	500	143	143	ppi	p		DWH
1-073	8/6/2010	7:40	5117	AM	TXT	400	500	140	143	ppi	p		DWH
1-074	8/6/2010	7:40	5117	AM	TXT	400	500	140	130	ppi	p		DWH
1-075	8/7/2010	9:00	5117	AM	TXT	400	500	132	136	ppi	p		DWH
1-076	8/7/2010	9:00	5117	AM	TXT	400	500	136	137	ppi	p		DWH
1-077	8/7/2010	9:00	5117	AM	TXT	400	500	127	133	ppi	p		DWH
1-081	8/10/2010	11:05	5117	AM	TXT	400	500	116	143	ppi	p		DWH
1-082	8/10/2010	11:05	5117	AM	TXT	400	500	104	142	ppi	p		DWH
1-083	8/10/2010	11:05	5117	AM	TXT	400	500	116	142	ppi	p		DWH
1-084	8/10/2010	15:30	5117	JM	TXT	400	500	131	144	ppi	p		DWH
1-085	8/10/2010	15:30	5117	JM	TXT	400	500	115	145	ppi	p		DWH
1-086	8/10/2010	15:30	5117	JM	TXT	400	500	128	143	ppi	p		DWH
1-087	8/12/2010	10:50	5117	AM	TXT	400	500	121	121	ppi	p		DWH
1-088	8/12/2010	10:50	5117	AM	TXT	400	500	106	121	ppi	p		DWH
1-089	8/12/2010	10:50	5117	AM	TXT	400	500	106	121	ppi	p		DWH



## Trial Seam Log - Extrusion

Project: Kekaha Landfill  
 Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752  
 Description: Cell L C&D Construction  
 Proj No: WJ298  
 Task No: 02  
 Tensiometer Description: M2405-750

Material Type: gml - 2      Peel: 78 ppi      Shear: 120 ppi

Trial Seam No	Date	Time	Mach ID	Oper ID	Mur Desc	Extrusion		Test Results				Retest No	QA ID
						Pre heat ° Celsius	Barrel ° Celsius	Peel	Shear	Unit ppi/pd	Result P/F		
1-090	8/12/2010	13:00	5117	AM	TXT	400	500	127	131	ppi	p		DWH
1-091	8/12/2010	13:00	5117	AM	TXT	400	500	124	132	ppi	p		DWH
1-092	8/12/2010	13:00	5117	AM	TXT	400	500	130	134	ppi	p		DWH
2-001	4/7/2010	10:25	5117	AM	TxT	500	350	111	148	ppi	p		CAS
2-002	4/7/2010	10:25	5117	AM	TxT	500	350	108	150	ppi	p		CAS
2-003	4/7/2010	10:25	5117	AM	TxT	500	350	111	149	ppi	p		CAS
2-004	4/10/2010	7:45	5117	AM	TxT	500	350	113	152	ppi	p		CAS
2-005	4/10/2010	7:45	5117	AM	TxT	500	350	139	151	ppi	p		CAS
2-006	4/10/2010	7:45	5117	AM	TxT	500	350	105	139	ppi	p		CAS
2-012	4/14/2010	11:20	5117	AM	TxT	500	350	143	139	ppi	p		CAS
2-013	4/14/2010	11:20	5117	AM	TxT	500	350	135	129	ppi	p		CAS
2-014	4/14/2010	11:20	5117	AM	TxT	500	350	134	134	ppi	p		CAS
2-015	4/14/2010	14:40	5117	AM	TxT	500	350	137	137	ppi	p		CAS
2-016	4/14/2010	14:40	5117	AM	TxT	500	350	129	128	ppi	p		CAS
2-017	4/14/2010	14:40	5117	AM	TxT	500	350	141	140	ppi	p		CAS
2-018	4/15/2010	10:40	5117	AM	TxT	500	350	133	149	ppi	p		CAS
2-019	4/15/2010	10:40	5117	AM	TxT	500	350	130	152	ppi	p		CAS
2-020	4/15/2010	10:40	5117	AM	TxT	500	350	129	150	ppi	p		CAS
2-021	4/20/2010	7:50	5117	AM	TxT	500	350	123	165	ppi	p		CAS
2-022	4/20/2010	7:50	5117	AM	TxT	500	350	125	170	ppi	p		CAS
2-023	4/20/2010	7:50	5117	AM	TxT	500	350	129	167	ppi	p		CAS
2-027	4/21/2010	10:30	5117	AM	TxT	500	350	120	148	ppi	p		CAS
2-028	4/21/2010	10:30	5117	AM	TxT	500	350	119	146	ppi	p		CAS
2-029	4/21/2010	10:30	5117	AM	TxT	500	350	121	150	ppi	p		CAS
2-039	5/11/2010	9:10	5117	AM	TxT	500	350	141	167	ppi	p		CAS
2-040	5/11/2010	9:10	5117	AM	TxT	500	350	112	158	ppi	p		CAS
2-041	5/11/2010	9:10	5117	AM	TxT	500	350	153	147	ppi	p		CAS
2-048	8/2/2010	7:30	5117	AM	TXT	520	550	147	157	ppi	p		DWH
2-049	8/2/2010	7:30	5117	AM	TXT	520	550	150	157	ppi	p		DWH
2-050	8/2/2010	7:30	5117	AM	TXT	520	550	145	147	ppi	p		DWH
2-051	8/2/2010	13:50	5117	RA	TXT	500	550	127	138	ppi	p		DWH
2-052	8/2/2010	13:50	5117	RA	TXT	500	550	124	140	ppi	p		DWH
2-053	8/2/2010	13:50	5117	RA	TXT	500	550	121	123	ppi	p		DWH
2-054	8/3/2010	9:30	5117	JM	TXT	400	550	116	156	ppi	p		DWH
2-055	8/3/2010	9:30	5117	JM	TXT	400	550	111	152	ppi	p		DWH
2-056	8/3/2010	9:30	5117	JM	TXT	400	550	133	154	ppi	p		DWH



## Trial Seam Log - Extrusion

Project: Kekaha Landfill						ProfNo: W01298		TaskNo: 02					
Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752													
Description: Cell 1 C&D Construction						Tensiometer Description: M2405-750							
Material Type: gmf = 2		Peel: 78 ppi		Shear: 120 ppi									
Trial Seam No	Date	Time	Mach ID	Oper ID	Mat Desc	Extrusion		Test Results				Retest No	QA ID
						Pre heat ° Celsius	Barrel ° Celsius	Peel	Shear	Unit ppi/psi	Result P/F		
2-057	8/3/2010	13:55	263	JM	TXT	460	500	120	136	ppi	p		DWH
2-058	8/3/2010	13:55	263	JM	TXT	460	500	123	136	ppi	p		DWH
2-059	8/3/2010	13:55	263	JM	TXT	400	500	130	137	ppi	p		DWH
2-060	8/3/2010	14:00	263	AM	TXT	460	500	137	139	ppi	p		DWH
2-061	8/3/2010	14:00	263	AM	TXT	460	500	139	140	ppi	p		DWH
2-062	8/3/2010	14:00	263	AM	TXT	460	500	135	139	ppi	p		DWH
2-063	8/5/2010	7:30	5117	AM	TXT	400	500	145	152	ppi	p		DWH
2-064	8/5/2010	7:30	5117	AM	TXT	400	500	151	144	ppi	p		DWH
2-065	8/5/2010	7:30	5117	AM	TXT	400	500	131	150	ppi	p		DWH
2-066	8/5/2010	9:50	5117	AM	TXT	400	500	116	132	ppi	p		DWH
2-067	8/5/2010	9:50	5117	AM	TXT	400	500	117	135	ppi	p		DWH
2-068	8/5/2010	9:50	5117	AM	TXT	400	500	119	135	ppi	p		DWH



## Trial Seam Log - Extrusion, 80 mil HDPE GEOMEMBRANE

Project: Kekaha Landfill	ProjNo: WG1298	TaskNo: 02
Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752		
Description: Cell 1 C&D Construction		
Tensiometer Description: M2405-750		

Material Type: gml : 3	Peel: 78 ppi	Shear: 120 ppi
------------------------	--------------	----------------

Trial Seam No	Date	Time	Mach ID	Oper ID	Mat Desc	Extrusion		Test Results				Retest No	QA ID
						Pre heat ° Celsius	Barrel ° Celsius	Peel	Shear	Unit ppi/psi	Result P/F		
* 1-007	4/10/2010	11:30	5117	AM	TxS	550	500	164	172	ppi	p		CAS
* 1-008	4/10/2010	11:30	5117	AM	TxS	550	500	182	172	ppi	p		CAS
1-069	8/6/2010	7:36	5117	AM	TXT	500	520	169	159	ppi	p		DWH
1-070	8/6/2010	7:36	5117	AM	TXT	500	520	168	197	ppi	p		DWH
1-071	8/6/2010	7:36	5117	AM	TXT	500	520	173	194	ppi	p		DWH
1-078	8/10/2010	11:00	5117	AM	TXT	450	550	138	152	ppi	p		DWH
1-079	8/10/2010	11:00	5117	AM	TXT	450	550	125	155	ppi	p		DWH
1-080	8/10/2010	11:00	5117	AM	TXT	450	550	134	153	ppi	p		DWH
2-042	5/11/2010	16:45	5117	AM	TxT	550	350	122	211	ppi	p		CAS
2-043	5/11/2010	16:45	5117	AM	TxT	550	350	117	213	ppi	p		CAS
2-044	5/11/2010	16:45	5117	AM	TxT	550	350	108	204	ppi	p		CAS
2-045	7/31/2010	8:00	5117	JM	TXT	520	550	143	211	ppi	p		DWH
2-046	7/31/2010	8:00	5117	JM	TXT	520	550	123	201	ppi	p		DWH
2-047	7/31/2010	8:00	5117	JM	TXT	520	550	145	206	ppi	p		DWH

\* 80 mil HDPE GEOMEMBRANE - TO - 1/2" HDPE FLATSTOCK EXTRUSION WELD

**Appendix I-3**  
**Geomembrane Production Seam Logs**

## Production Seam Log



Project: Kekaha Landfill ProjNo: WG1298  
 Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752 TaskNo: 02  
 Description: Cell 1 C&D Construction

Material Type: gml : 2 Specifications: Seam Pressure: 30 psi / 5 min Vacuum Box: 5 psi / 10 sec.

Primary / Secondary: SDCBASE Secondary 60 mil GM Series: 2

Production Seam					Location			Nondestructive Test					
Date	Time	Mach. ID	Oper. ID	Ext/Fus:	Seam No <small>Series-Seam1-Seam2-Begin-End</small>	Length (ft.)	QA ID	Location	Detail	Oper.	Result	Action	QA ID
4/6/2010	12:30	20431	AM	f	2-002-003-0-23	23	CAS	0-23	AT	EB	p		CAS
4/6/2010	12:35	20431	AM	f	2-004-005-0-23	23	CAS	0-23	AT	EB	p		CAS
4/6/2010	12:45	20431	AM	f	2-001-002-0-140	140	CAS	0-140	AT	EB	p		CAS
4/6/2010	13:05	20431	AM	f	2-001-003-0-114	114	CAS	0-114	AT	EB	p		CAS
4/6/2010	13:25	20431	AM	f	2-002-004-0-73	73	CAS	0-73	AT	EB	p		CAS
4/6/2010	13:25	1110	GM	f	2-006-007-0-23	23	CAS	0-23	AT	EB	p		CAS
4/6/2010	13:35	20431	AM	f	2-002-005-0-63	63	CAS	0-63	AT	EB	p		CAS
4/6/2010	13:45	20431	AM	f	2-003-005-0-108	108	CAS	0-108	AT	EB	p		CAS
4/6/2010	14:15	20431	AM	f	2-004-006-0-73	73	CAS	0-73	AT	EB	p		CAS
4/6/2010	14:25	20431	AM	f	2-005-006-0-158	158	CAS	0-158	AT	EB	p		CAS
4/6/2010	14:52	1110	GM	f	2-009-010-0-23	23	CAS	0-23	AT	EB	p		CAS
4/6/2010	14:55	20431	AM	f	2-005-007-0-15	15	CAS	0-15	AT	EB	p		CAS
4/6/2010	15:00	20431	AM	f	2-006-008-0-228	228	CAS	0-228	AT	EB	p		CAS
4/6/2010	15:02	1110	GM	f	2-008-009-0-136	136	CAS	0-136	AT	EB	p		CAS
4/6/2010	15:21	1110	GM	f	2-008-010-0-109	109	CAS	0-109	AT	EB	p		CAS
4/6/2010	15:45	20431	AM	f	2-007-008-0-15	15	CAS	0-15	AT	EB	p		CAS



Project: Kekaha Landfill ProjNo: WG1298  
 Location: 6900 D Kaunua'ali Hwy, Kekaha, HI 96752 TaskNo: 02  
 Description: Cell 1 C&D Construction

Material Type: gml : 2 Specifications: Seam Pressure: 30 psi / 5 min Vacuum Box: 2 psi / 10 sec.

Primary / Secondary: SUBBASE  
Secondary 60mil GM Series: 2

Production Seam					Location			Nondestructive Test					
Date	Time	Mach. ID	Oper. ID	Ext/Fut:	Seam No <small>Series-Seam1-Seam2-Stage-Run</small>	Length (ft.)	QA ID	Location	Detail	Oper.	Result	Action	QA ID
4/7/2010	8:05	20431	AM	f	2-012-013-0-23	23	CAS	0-23	AT	EB	p		CAS
4/7/2010	8:15	20431	AM	f	2-011-012-0-37	37	CAS	0-37	AT	EB	p		CAS
4/7/2010	8:20	20431	AM	f	2-011-013-0-211	211	CAS	0-211	AT	EB	p		CAS
4/7/2010	8:45	20431	AM	f	2-014-015-0-23	23	CAS	0-23	AT	EB	p		CAS
4/7/2010	8:50	20431	AM	f	2-012-014-0-36	36	CAS	0-36	AT	EB	p		CAS
4/7/2010	8:55	20431	AM	f	2-013-014-0-161	161	CAS	0-161	AT	EB	p		CAS
4/7/2010	9:13	1110	GM	f	2-014-016-0-194	194	CAS	0-194	AT	EB	p		CAS
4/7/2010	9:15	20431	AM	f	2-013-015-0-54	54	CAS	0-54	AT	EB	p		CAS
4/7/2010	9:30	20431	AM	f	2-009-011-0-135	135	CAS	0-135	AT	EB	p		CAS
4/7/2010	9:40	1110	GM	f	2-015-016-0-55	55	CAS	0-55	AT	EB	p		CAS
4/7/2010	9:50	20431	AM	f	2-010-011-0-111	111	CAS	0-111	AT	EB	p		CAS
4/7/2010	10:00	1110	GM	f	2-016-017-0-97	97	CAS	0-97	AT	EB	p		CAS
4/10/2010	8:00	5117	AM	e	2-000-001-0-23	23	CAS	0-23	VB	GM	p		CAS
4/10/2010	8:25	5117	AM	e	2-000-003-0-23	23	CAS	0-23	VB	GM	p		CAS
4/10/2010	8:30	5117	AM	e	2-000-005-0-23	23	CAS	0-23	VB	GM	p		CAS
4/10/2010	8:35	5117	AM	e	2-000-007-0-23	23	CAS	0-23	VB	GM	p		CAS

Production Seam Log



Project: Kekaha Landfill ProjNo: WG1298  
 Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752 TaskNo: 02  
 Description: Cell 1 C&D Construction

Material Type: gml : 2 Specifications: Seam Pressure: 30 psi / 8 min Vacuum Box: 5 psi / 10 sec.

Primary / Secondary: SUBBASE Secondary GOMIL GM Series: 2

Production Seam					Location			Nondestructive Test					
Date	Time	Mach. ID	Oper. ID	Ext/ Fus:	Seam No Series-Seam1-Seam2-Begin-End	Length (ft.)	QA ID	Location	Detail	Oper.	Result	Action	QA ID
4/10/2010	8:40	5117	AM	e	2-000-008-0-23	23	CAS	0-23	VB	GM	p		CAS
4/10/2010	8:55	5117	AM	e	2-000-010-0-23	23	CAS	0-23	VB	GM	p		CAS
4/10/2010	9:00	5117	AM	e	2-000-011-0-23	23	CAS	0-23	VB	GM	p		CAS
4/10/2010	9:05	5117	AM	e	2-000-013-0-23	23	CAS	0-23	VB	GM	p		CAS
4/10/2010	9:10	5117	AM	e	2-000-015-0-23	23	CAS	0-23	VB	GM	p		CAS
4/10/2010	9:20	5117	AM	e	2-000-016-0-23	23	CAS	0-23	VB	GM	p		CAS
4/10/2010	9:30	5117	AM	e	2-000-017-0-23	23	CAS	0-23	VB	GM	p		CAS
4/14/2010	9:15	1110	AM	f	2-017-018-0-23	23	CAS	0-23	AT	EB	p		CAS
4/14/2010	9:23	1110	AM	f	2-016-018-0-155	155	CAS	0-155	AT	EB	p		CAS
4/14/2010	9:50	1110	AM	f	2-017-019-0-22	22	CAS	0-22	AT	EB	p		CAS
4/14/2010	9:55	1110	AM	f	2-017-020-0-75	75	CAS	0-75	AT	EB	p		CAS
4/14/2010	10:05	1110	AM	f	2-018-020-0-153	153	CAS	0-153	AT	EB	p		CAS
4/14/2010	10:35	1110	AM	f	2-021-022-0-23	23	CAS	0-23	AT	EB	p		CAS
4/14/2010	10:40	1110	AM	f	2-019-022-0-24	24	CAS	0-24	AT	EB	p		CAS
4/14/2010	10:45	1110	AM	f	2-020-022-0-40	40	CAS	0-40	AT	EB	p		CAS
4/14/2010	10:50	20664	AM	f	2-020-021-15-185	170	CAS	15-185	AT	EB	p		CAS



Production Seam Log



Project: Kekaha Landfill ProjNo: WG1298  
 Location: 6900 D Kaunualii Hwy. Kekaha, HI 96752 TaskNo: 02  
 Description: Cell 1 C&D Construction

Material Type: gml : 2 Specifications: Seam Pressure: 30 psi / 5 min Vacuum Box: 5 psi / 10 sec.

Primary / Secondary: SUBBASE Secondary 60mil GM Series: 2

Production Seam					Location			Nondestructive Test					
Date	Time	Mach. ID	Oper. ID	Ex/Flt	SeamNo <small>Seam1-Seam2-Begin-End</small>	Length (ft.)	QA ID	Location	Detail	Oper.	Result	Action	QA ID
4/14/2010	11:05	5117	AM	e	2-000-019-0-23	23	CAS	0-23	VB	GM	p		CAS
4/14/2010	13:30	20664	AM	f	2-022-023-0-67	67	CAS	0-67	AT	EB	p		CAS
4/14/2010	13:40	20664	AM	f	2-021-023-0-181	181	CAS	0-181	AT	EB	p		CAS
4/14/2010	14:05	20664	AM	f	2-023-024-0-95	95	CAS	0-95	AT	EB	p		CAS
4/14/2010	14:20	20664	AM	f	2-023-025-0-100	100	CAS	0-100	AT	EB	p		CAS
4/15/2010	7:50	20664	AM	f	2-024-026-0-97	97	CAS	0-97	AT	EB	p		CAS
4/15/2010	8:05	20664	AM	f	2-025-026-0-100	100	CAS	0-100	AT	EB	p		CAS
4/15/2010	8:10	1110	GM	f	2-027-028-0-23	23	CAS	0-23	AT	EB	p		CAS
4/15/2010	8:15	1110	GM	f	2-026-028-0-99	99	CAS	0-99	AT	EB	p		CAS
4/15/2010	8:15	20664	AM	f	2-028-029-0-99	99	CAS	0-99	AT	EB	p		CAS
4/15/2010	8:25	20664	AM	f	2-027-029-0-103	103	CAS	0-101	AT	EB	p		CAS
4/15/2010	8:40	1110	GM	f	2-026-027-0-102	102	CAS	0-102	AT	EB	p		CAS
4/15/2010	8:50	1110	GM	f	2-030-031-0-023	23	CAS	0-23	AT	EB	p		CAS
4/15/2010	8:55	1110	GM	f	2-029-031-0-101	101	CAS	0-101	AT	EB	p		CAS
4/15/2010	8:55	20664	AM	f	2-031-032-0-100	100	CAS	0-100	AT	EB	p		CAS
4/15/2010	9:10	1110	GM	f	2-029-030-0-100	100	CAS	0-100	AT	EB	p		CAS



Production Seam Log

Project: Kekaha Landfill ProjNo: WG122H  
 Location: 6900 D Kaunualii Hwy, Kekaha, HI 96753 TaskNo: 02  
 Description: Cell 1 C&D Construction

Material Type: gmf : 2 Specifications: Seam Pressure: 30 psi / 5 min Vacuum Box: 5 psi / 10 sec.

Primary / Secondary: SUBBASE Secondary 60mil GM Series: 2

Production Seam					Location			Nondestructive Test					
Date	Time	Mach. ID	Oper. ID	Ext/ Fus:	Seam No <small>Seam1-Seam2-Begin-End</small>	Length (ft.)	QA ID	Location	Detail	Oper.	Result	Action	QA ID
4/15/2010	9:10	20664	AM	f	2-030-032-0-103	103	CAS	0-103	AT	EB	p		CAS
4/15/2010	9:30	20664	AM	f	2-032-034-0-99	99	CAS	0-99	AT	EB	p		CAS
4/15/2010	9:30	1110	GM	f	2-033-034-0-23	23	CAS	0-23	AT	EB	p		CAS
4/15/2010	9:42	1110	GM	f	2-033-035-0-104	104	CAS	0-104	AT	EB	p		CAS
4/15/2010	9:45	20664	AM	f	2-032-033-0-104	104	CAS	0-104	AT	EB	p		CAS
4/15/2010	9:57	1110	GM	f	2-034-035-0-100	100	CAS	0-100	AT	EB	p		CAS
4/15/2010	11:16	5117	AM	e	2-000-035-0-23	23	CAS	0-23	VB	GM	p		CAS
4/15/2010	11:21	5117	AM	e	2-000-033-0-23	23	CAS	0-23	VB	GM	p		CAS
4/15/2010	11:28	5117	AM	e	2-000-032-0-23	23	CAS	0-23	VB	GM	p		CAS
4/15/2010	11:36	5117	AM	e	2-000-030-0-23	23	CAS	0-23	VB	GM	p		CAS
4/15/2010	11:43	5117	AM	e	2-000-029-0-23	23	CAS	0-23	VB	GM	p		CAS
4/15/2010	11:47	5117	AM	e	2-000-027-0-23	23	CAS	0-23	VB	GM	p		CAS
4/15/2010	11:55	5117	AM	e	2-000-026-0-23	23	CAS	0-23	VB	GM	p		CAS
4/15/2010	12:00	5117	AM	e	2-000-024-0-23	23	CAS	0-23	VB	GM	p		CAS
4/15/2010	12:10	5117	AM	e	2-000-023-0-23	23	CAS	0-23	VB	GM	p		CAS
4/21/2010	8:10	1110	AM	f	2-038-039-0-32	32	CAS	0-32	AT	EB	p		CAS

Production Seam Log



Project: Kekaha Landfill ProjNo: WG1298  
 Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752 TaskNo: 02  
 Description: Cell 1 C&D Construction

Material Type: gml / 2 Specifications: Seam Pressure: 10 psi / 5 min Vacuum Box: 5 psi / 10 sec.

Primary / Secondary: SUBBASE Secondary 60mil Gm Series: 1

Production Seam					Location			Nondestructive Test					
Date	Time	Mach. ID	Oper. ID	Ext/Fus:	Seam No <small>Series-Seam1-Seam2-Begin-End</small>	Length (ft.)	QA ID	Location	Detail	Oper.	Result	Action	QA ID
4/21/2010	8:15	1110	AM	f	2-039-040-0-30	30	CAS	0-30	AT	EB	p		CAS
4/21/2010	8:20	1110	AM	f	2-040-041-0-28	28	CAS	0-28	AT	EB	p		CAS
4/21/2010	8:35	1110	AM	f	2-041-042-0-25	25	CAS	0-25	AT	EB	p		CAS
4/21/2010	8:45	1110	AM	f	2-042-043-0-23	23	CAS	0-23	AT	EB	p		CAS
4/21/2010	8:55	1110	AM	f	2-043-044-0-20	20	CAS	0-20	AT	EB	p		CAS
4/21/2010	9:05	1110	AM	f	2-037-038-0-23	23	CAS	0-23	AT	EB	p		CAS
4/21/2010	9:07	1110	AM	f	2-037-039-0-23	23	CAS	0-23	AT	EB	p		CAS
4/21/2010	9:10	1110	AM	f	2-037-040-0-23	23	CAS	0-23	AT	EB	p		CAS
4/21/2010	9:15	1110	AM	f	2-037-041-0-23	23	CAS	0-23	AT	EB	p		CAS
4/21/2010	9:20	1110	AM	f	2-037-042-0-23	23	CAS	0-23	AT	EB	p		CAS
4/21/2010	9:25	1110	AM	f	2-037-043-0-23	23	CAS	0-23	AT	EB	p		CAS
4/21/2010	9:28	1110	AM	f	2-001-037-0-172	172	CAS	0-172	AT	EB	p		CAS
4/21/2010	9:30	1110	AM	f	2-037-044-0-23	23	CAS	0-23	AT	EB	p		CAS
4/21/2010	10:05	1110	AM	f	2-045-046-0-36	36	CAS	0-36	AT	EB	p		CAS
4/21/2010	10:05	1110	AM	f	2-046-047-0-38	38	CAS	0-38	AT	EB	p		CAS
4/21/2010	10:18	1110	AM	f	2-038-045-0-33	33	CAS	0-33	AT	EB	p		CAS



Production Seam Log

Project: Kekaha Landfill ProjNo: WG1298  
 Location: 6900 D Kaunualii Hwy, Kekaha, HI 96753 TaskNo: 02  
 Description: Cell 1 C&D Construction

Material Type: gml - 2 Specifications: Seam Pressure: 30 psi / 5 min Vacuum Box: 5 psi / 10 sec

Primary / Secondary: SUBCASE Secondary: 60mil GM Series: 2

Production Seam					Location			Nondestructive Test					
Date	Time	Mach. ID	Oper. ID	Exc/ FAS:	SeamNo <small>Seam1-Start-End</small>	Length (ft.)	QA ID	Location	Detail	Oper.	Result	Action	QA ID
4/21/2010	10:30	1110	AM	f	2-036-047-0-23	23	CAS	0-23	AT	EB	p		CAS
4/21/2010	10:38	1110	AM	f	2-036-046-0-23	23	CAS	0-23	AT	EB	p		CAS
4/21/2010	11:00	1110	AM	f	2-001-036-0-60	60	CAS	0-60	AT	EB	p		CAS
5/11/2010	8:20	1110	AM	f	2-047-048-0-43	43	CAS	0-43	AT	EB	p		CAS
5/11/2010	8:30	1110	AM	f	2-048-049-0-42	42	CAS	0-42	AT	EB	p		CAS
5/11/2010	8:35	1110	AM	f	2-049-050-0-21	21	CAS	0-21	AT	EB	p		CAS
5/11/2010	8:40	1110	AM	f	2-050-051-0-10	10	CAS	0-10	AT	EB	p		CAS
5/11/2010	8:45	1110	AM	f	2-036-049-0-12	12	CAS	0-12	AT	EB	p		CAS
5/11/2010	8:47	1110	AM	f	2-036-048-0-23	23	CAS	0-23	AT	EB	p		CAS
5/11/2010	9:35	1110	AM	f	2-000-036-0-23	23	CAS	0-23	AT	EB	p		CAS
5/11/2010	9:40	1110	AM	f	2-000-049-0-23	23	CAS	0-23	AT	EB	p		CAS
5/11/2010	9:45	1110	AM	f	2-000-050-0-23	23	CAS	0-23	AT	EB	p		CAS
5/11/2010	9:50	1110	AM	f	2-000-051-0-10	10	CAS	0-10	AT	EB	p		CAS
5/11/2010	13:15	1110	AM	f	2-023-052-0-50	50	CAS	0-50	AT	EB	p		CAS
5/11/2010	15:25	1110	AM	f	2-054-055-0-51	51	CAS	0-51	AT	EB	p		CAS
5/11/2010	15:30	1110	AM	f	2-055-056-0-50	50	CAS	0-50	AT	EB	p		CAS

## Production Seam Log



Project: Kekaha Landfill ProjNo: WG1298  
 Location: 6900 D Kaunialii Hwy, Kekaha, HI 96752 TaskNo: 02  
 Description: Cell 1 C&D Construction

Material Type: gml : 2 Specifications: Seam Pressure: 30 psi / 5 min Vacuum Box: 5 psi / 10 sec.

Primary / Secondary: SUBBASE Secondary 60mil GM Series: 2

Production Seam					Location			Nondestructive Test					
Date	Time	Mach. ID	Oper. ID	Ext/ Fus:	SeamNo Series-Seam1-Seam2-Begin-End	Length (ft.)	QA ID	Location	Detail	Oper.	Result	Action	QA ID
5/11/2010	15:45	1110	AM	f	2-056-057-0-48	48	CAS	0-48	AT	EB	p		CAS
5/11/2010	15:55	1110	AM	f	2-057-058-0-51	51	CAS	0-51	AT	EB	p		CAS
5/11/2010	16:05	1110	AM	f	2-058-059-0-48	48	CAS	0-48	AT	EB	p		CAS
5/11/2010	16:20	1110	AM	f	2-035-059-0-23	23	CAS	0-23	AT	EB	p		CAS
5/11/2010	16:25	1110	AM	f	2-034-058-0-23	23	CAS	0-23	AT	EB	p		CAS
5/11/2010	16:30	1110	AM	f	2-032-057-0-23	23	CAS	0-23	AT	EB	p		CAS
5/11/2010	16:35	1110	AM	f	2-031-056-0-23	23	CAS	0-23	AT	EB	p		CAS
5/11/2010	16:40	1110	AM	f	2-029-059-0-23	23	CAS	0-23	AT	EB	p		CAS
5/11/2010	16:45	1110	AM	f	2-028-054-0-23	23	CAS	0-23	AT	EB	p		CAS
5/11/2010	17:25	5117	AM	e	2-025-052-0-23	23	CAS	0-23	VB	GM	p		CAS
7/30/2010	10:00	20624	AM	f	2-035-060-250-43	207	DWH	43-250	AT	EB	p		DWH
7/30/2010	10:30	20624	AM	f	2-059-060-43-0	43	DWH	0-43	AT	EB	p		DWH
7/30/2010	10:35	20624	AM	f	2-060-061-245-221	24	DWH	221-245	AT	EB	p		DWH
7/30/2010	10:38	1109	GM	f	2-061-062-0-23	23	DWH	0-23	AT	EB	p		DWH
7/30/2010	10:42	20624	AM	f	2-060-062-221-0	221	DWH	0-221	AT	EB	p		DWH
7/30/2010	10:58	1109	GM	f	2-063-064-0-23	23	DWH	0-23	AT	EB	p		DWH



Production Seam Log

Project: Kekaha Landfill ProjNo: WG1298  
 Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752 TaskNo: 02  
 Description: Cell C&D Construction

Material Type: gml : 2 Specifications: Seam Pressure: 30 psi / 5 min Vacuum Box: 5 psi / 10 sec.

Primary / Secondary: SUBBASE Secondary 60mil GM Series: 2

Production Seam					Location			Nondestructive Test					
Date	Time	Mach. ID	Oper. ID	Ext/ Fus:	Seam No Series-Seam(-Seam)-Begin-End	Length (ft.)	QA ID	Location	Detail	Oper.	Result	Action	QA ID
7/30/2010	11:12	20624	AM	F	2-061-064-250-220	30	DWH	220-250	AT	EB	p		DWH
7/30/2010	11:15	20624	AM	F	2-062-064-220-186	24	DWH	196-220	AT	EB	p		DWH
7/30/2010	11:19	20624	AM	F	2-062-063-186-0	186	DWH	0-186	AT	EB	p		DWH
7/30/2010	11:04	20624	AM	F	2-064-065-250-184	56	DWH	184-250	AT	EB	p		DWH
7/30/2010	11:11	20624	AM	F	2-063-065-184-0	184	DWH	0-184	AT	EB	p		DWH
7/30/2010	13:42	20624	AM	F	2-063-066-250-162	88	DWH	162-250	AT	EB	p		DWH
7/30/2010	14:01	1109	GM	F	2-066-068-0-23	23	DWH	0-23	AT	EB	p		DWH
7/30/2010	14:20	20624	AM	F	2-065-068-162-82	80	DWH	82-162	AT	EB	p		DWH
7/30/2010	14:57	1109	GM	F	2-070-071-0-23	23	DWH	0-23	AT	EB	p		DWH
7/30/2010	15:10	20624	AM	F	2-068-069-80-159	79	DWH	80-159	AT	EB	p		DWH
7/30/2010	15:20	20624	AM	F	2-066-069-159-250	91	DWH	159-250	AT	EB	p		DWH
7/30/2010	15:25	1109	GM	F	2-072-073-0-23	23	DWH	0-23	AT	EB	p		DWH
7/30/2010	15:35	1109	GM	F	2-069-071-0-182	182	DWH	0-182	AT	EB	p		DWH
7/30/2010	15:35	20624	AM	F	2-071-072-0-182	182	DWH	0-182	AT	EB	p		DWH
7/30/2010	16:00	1109	GM	F	2-069-070-182-250	68	DWH	182-250	AT	EB	p		DWH
7/30/2010	16:05	20624	AM	F	2-070-072-182-221	59	DWH	182-221	AT	EB	p		DWH

## Production Seam Log



Project: Kekaha Landfill ProjNo: WG1298  
 Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752 TaskNo: 02  
 Description: Cell 1 C&D Construction

Material Type: gml / 2 Specifications: Seam Pressure: 30 psi / 5 mm Vacuum Box: 5 psi / 10 sec.

Primary / Secondary: Secondary <sup>SUBBASE</sup> 60mil GM Series: 2

Production Seam					Location			Nondestructive Test					
Date	Time	Mach. ID	Oper. ID	Ext/Fus:	Seam No. <small>Series-Seam1-Seam2-Begin-End</small>	Length (ft.)	QA ID	Location	Detail	Oper.	Result	Action	QA ID
7/30/2010	16:12	20624	AM	f	2-070-073-221-250	29	DWH	221-250	AT	EB	p		DWH
7/31/2010	7:44	20624	AM	f	2-072-074-0-219	219	DWH	0-219	AT	EB	p		DWH
7/31/2010	8:16	20624	AM	f	2-073-074-219-250	31	DWH	219-250	AT	EB	p		DWH
7/31/2010	8:22	1109	GM	f	2-075-076-0-23	23	DWH	0-22	AT	EB	p		DWH
7/31/2010	8:30	20624	AM	f	2-074-076-0-126	126	DWH	0-126	AT	EB	p		DWH
7/31/2010	8:48	20624	AM	f	2-074-075-126-250	124	DWH	126-250	AT	EB	p		DWH
7/31/2010	9:00	20624	AM	f	2-075-077-250-123	127	DWH	123-250	AT	EB	p		DWH
7/31/2010	9:01	1109	GM	f	2-078-079-0-23	23	DWH	0-23	AT	EB	p		DWH
7/31/2010	9:21	20624	AM	f	2-076-077-123-0	123	DWH	0-123	AT	EB	p		DWH
7/31/2010	9:41	1109	GM	f	2-080-081-0-23	23	DWH	0-23	AT	EB	p		DWH
7/31/2010	9:45	20624	AM	f	2-077-078-250-226	24	DWH	226-250	AT	EB	p		DWH
7/31/2010	9:47	20624	AM	f	2-077-079-226-0	226	DWH	0-226	AT	EB	p		DWH
7/31/2010	9:50	1109	GM	f	2-078-081-250-222	28	DWH	222-250	AT	EB	p		DWH
7/31/2010	9:53	1109	GM	f	2-079-081-222-179	43	DWH	179-221	AT	EB	p		DWH
7/31/2010	9:55	1109	GM	f	2-079-080-179-0	179	DWH	0-179	AT	EB	p		DWH
7/31/2010	10:20	20624	AM	f	2-081-082-250-177	73	DWH	177-250	AT	EB	p		DWH



Production Seam Log

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WG1298</u>
Location: <u>6900 D Kaunualii Hwy, Kekaha, HI 96752</u>	TaskNo: <u>02</u>
Description: <u>Cell 1 C&amp;D Construction</u>	

Material Type: <u>gml : 2</u>	Specifications: <u>Seam Pressure: 30 psi / 4 min</u>	Vacuum Box: <u>5 psi / 10 sec</u>
-------------------------------	--	-----------------------------------

Primary / Secondary: <u>SUBBASE Secondary 60mil GM</u>	Series: <u>2</u>
--	------------------

Production Seam					Location			Nondestructive Test					
Date	Time	Mach. ID	Oper. ID	Ext/ Fns:	Seam No <small>Series-Seam1-Seam2-Begin-End</small>	Length (ft.)	QA ID	Location	Detail	Oper.	Result	Action	QA ID
7/31/2010	10:28	1139	GM	f	2-083-084-0-23	23	DWH	0-23	AT	EB	p		DWH
7/31/2010	10:30	20624	AM	f	2-080-082-177-0	177	DWH	0-177	AT	EB	p		DWH
7/31/2010	10:49	1109	GM	f	2-082-084-170-0	170	DWH	0-170	AT	EB	p		DWH
7/31/2010	11:09	1109	GM	f	2-082-083-250-170	80	DWH	170-250	AT	EB	p		DWH
7/31/2010	11:18	1109	GM	f	2-087-088-0-23	23	DWH	0-23	AT	EB	p		DWH
7/31/2010	11:27	20624	AM	f	2-083-085-250-169	81	DWH	169-250	AT	EB	p		DWH
7/31/2010	11:36	20624	AM	f	2-084-085-169-80	89	DWH	89-169	AT	EB	p		DWH
7/31/2010	11:50	1109	GM	f	2-085-088-78-189	111	DWH	78-189	AT	EB	p		DWH
7/31/2010	12:05	1109	GM	f	2-085-087-189-250	61	DWH	189-250	AT	EB	p		DWH
8/2/2010	8:40	5117	AM	e	2-000-060-0-23	23	DWH	0-23	VB	ASM	p		DWH
8/2/2010	8:50	5117	AM	e	2-000-061-0-23	23	DWH	0-23	VB	ASM	p		DWH
8/2/2010	9:02	5117	AM	e	2-000-064-0-23	23	DWH	0-23	VB	ASM	p		DWH
8/2/2010	9:08	5117	AM	e	2-000-065-0-23	23	DWH	0-23	VB	ASM	p		DWH
8/2/2010	9:16	5117	AM	e	2-000-066-0-23	23	DWH	0-23	VB	ASM	p		DWH
8/2/2010	9:26	5117	AM	e	2-000-069-0-23	23	DWH	0-23	VB	ASM	p		DWH
8/2/2010	9:36	5117	AM	e	2-000-070-0-23	23	DWH	0-23	VB	ASM	p		DWH



Production Seam Log



Project: Kekaha Landfill ProjNo: WG1298  
 Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752 TaskNo: 02  
 Description: Cell 1 C&D Construction

Material Type: gmi / 2 Specifications: Seam Pressure: 30 psi / 3 min Vacuum Box: 5 psi / 10 sec

Primary / Secondary: SUBBASE Secondary 60mil GUM Series: 2

Production Seam					Location			Nondestructive Test					
Date	Time	Mach. ID	Oper. ID	Ext/ Fuel	Seam No <small>Serial-Seam 1 - Seam 2 - Begin-End</small>	Length (ft.)	QA ID	Location	Detail	Oper.	Result	Action	QA ID
8/2/2010	9:44	5117	AM	e	2-000-073-0-23	23	DWH	0-23	VB	ASM	p		DWH
8/2/2010	9:52	5117	AM	e	2-000-074-0-23	23	DWH	0-23	VB	ASM	p		DWH
8/2/2010	10:00	5117	AM	e	2-000-075-0-23	23	DWH	0-23	VB	ASM	p		DWH
8/2/2010	13:30	20624	AM	f	2-089-090-0-23	23	DWH	0-23	AT	EB	p		DWH
8/2/2010	13:45	20624	AM	f	2-088-089-0-186	186	DWH	0-186	AT	EB	p		DWH
8/2/2010	14:10	20624	AM	f	2-087-089-186-216	30	DWH	186-216	AT	EB	p		DWH
8/2/2010	14:12	20624	AM	f	2-087-090-216-250	34	DWH	216-250	AT	EB	p		DWH
8/2/2010	14:23	20624	AM	f	2-089-091-0-215	215	DWH	0-215	AT	EB	p		DWH
8/2/2010	14:50	20624	AM	f	2-090-0910215-250	35	DWH	215-250	AT	EB	p		DWH
8/2/2010	14:59	20624	AM	f	2-092-093-0-23	23	DWH	0-23	AT	EB	p		DWH
8/2/2010	15:09	20624	AM	f	2-091-092-0-124	124	DWH	0-124	AT	EB	p		DWH
8/2/2010	15:24	20624	AM	f	2-091-093-124-250	126	DWH	124-250	AT	EB	p		DWH
8/2/2010	15:47	20624	AM	f	2-092-094-0-123	123	DWH	0-123	AT	EB	p		DWH
8/2/2010	16:01	20624	AM	f	2-093-094-123-265	142	DWH	123-265	AT	EB	p		DWH
8/2/2010	16:24	20624	AM	f	2-094-095-0-265	265	DWH	0-265	AT	EB	p		DWH
8/3/2010	7:42	20624	AM	f	2-096-097-0-27	27	DWH	0-27	AT	EB	p		DWH

**Production Seam Log**



Project: Kekaha Landfill ProjNo: WG1298  
 Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752 TaskNo: 02  
 Description: Cell 1 C&D Construction

Material Type: gmf : 2 Specifications: Seam Pressure: 30 psi / 5 min Vacuum Box: 5 psi / 10 sec.

Primary / Secondary: SUBBASE Secondary 60mil GM Series: 2

Production Seam					Location			Nondestructive Test					
Date	Time	Mach. ID	Oper. ID	Ext/ Fus:	Seam No <small>Series-Seam1-Seam2-Begin-End</small>	Length (ft.)	QA ID	Location	Detail	Oper.	Result	Action	QA ID
8/3/2010	7:50	20624	AM	f	2-096-098-52-27	25	DWH	27-52	AT	EB	p		DWH
8/3/2010	7:51	20624	AM	f	2-097-098-27-0	27	DWH	0-27	AT	EB	p		DWH
8/3/2010	8:02	20624	AM	f	2-098-099-52-0	52	DWH	0-52	AT	EB	p		DWH
8/3/2010	8:09	20624	AM	f	2-099-100-0-52	52	DWH	0-52	AT	EB	p		DWH
8/3/2010	8:17	20624	AM	f	2-100-101-0-48	48	DWH	0-48	AT	EB	p		DWH
8/3/2010	8:33	20624	AM	f	2-101-102-0-47	47	DWH	0-47	AT	EB	p		DWH
8/3/2010	8:39	20624	AM	f	2-102-103-0-44	44	DWH	0-44	AT	EB	p		DWH
8/3/2010	8:50	20624	AM	f	2-103-104-0-42	42	DWH	0-42	AT	EB	p		DWH
8/3/2010	9:00	20624	AM	f	2-104-105-0-40	40	DWH	0-40	AT	EB	p		DWH
8/3/2010	9:10	20624	AM	f	2-105-106-0-38	38	DWH	0-38	AT	EB	p		DWH
8/3/2010	9:15	20624	AM	f	2-106-107-0-36	36	DWH	0-36	AT	EB	p		DWH
8/3/2010	9:23	20624	AM	f	2-107-108-0-34	34	DWH	0-34	AT	EB	p		DWH
8/3/2010	9:29	20624	AM	f	2-108-109-0-30	30	DWH	0-30	AT	EB	p		DWH
8/3/2010	9:35	5117	JM	e	2-000-095-0-28	28	DWH	0-28	VB	ASM	p		DWH
8/3/2010	9:37	20624	AM	f	2-109-110-0-13	13	DWH	0-13	AT	EB	p		DWH
8/3/2010	9:39	5117	JM	e	2-000-094-0-25	25	DWH	0-25	VB	ASM	p		DWH

Production Seam Log



Project: Kekaha Landfill ProjNo: WG1298  
 Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752 TaskNo: 02  
 Description: Cell 1 C&D Construction

Material Type: gml : 2 Specifications: Seam Pressure: 10 psi / 5 min Vacuum Box: 5 psi / 10 sec

Primary / Secondary: SUBBASE  
Secondary 60 mil GM Series: 2

Production Seam					Location			Nondestructive Test					
Date	Time	Mach. ID	Oper. ID	Ext/ Fus.	Seam No <small>(Serial-Start / Seam / Begin-End)</small>	Length (ft.)	QA ID	Location	Detail	Oper.	Result	Action	QA ID
8/3/2010	9:44	5117	JM	e	2-000-093-0-24	24	DWH	0-24	VB	ASM	p		DWH
8/3/2010	9:45	20624	AM	f	2-095-103-0-35	35	DWH	0-35	AT	EB	p		DWH
8/3/2010	9:49	5117	JM	e	2-000-091-0-23	23	DWH	0-23	VB	ASM	p		DWH
8/3/2010	9:50	20624	AM	f	2-095-098-0-23	23	DWH	0-23	AT	EB	p		DWH
8/3/2010	9:54	5117	JM	e	2-000-090-0-23	23	DWH	0-23	VB	ASM	p		DWH
8/3/2010	9:55	20624	AM	f	2-095-099-0-23	23	DWH	0-23	AT	EB	p		DWH
8/3/2010	10:00	5117	JM	e	2-000-087-0-23	23	DWH	0-23	VB	ASM	p		DWH
8/3/2010	10:00	20624	AM	f	2-095-100-0-23	23	DWH	0-23	AT	EB	p		DWH
8/3/2010	10:05	20624	AM	f	2-095-101-0-23	23	DWH	0-23	AT	EB	p		DWH
8/3/2010	10:10	5117	JM	e	2-000-085-0-23	23	DWH	0-23	VB	ASM	p		DWH
8/3/2010	10:10	20624	AM	f	2-095-102-0-23	23	DWH	0-23	AT	EB	p		DWH
8/3/2010	10:15	20624	AM	f	2-095-103-0-23	23	DWH	0-23	AT	EB	p		DWH
8/3/2010	10:20	5117	JM	e	2-000-083-0-23	23	DWH	0-23	VB	ASM	p		DWH
8/3/2010	10:20	20624	AM	f	2-095-104-0-23	23	DWH	0-23	AT	EB	p		DWH
8/3/2010	10:25	20624	AM	f	2-095-105-0-23	23	DWH	0-23	AT	EB	p		DWH
8/3/2010	10:30	5117	JM	e	2-000-082-0-23	23	DWH	0-23	VB	ASM	p		DWH

Production Seam Log



Project: Kekaha Landfill ProjNo: WG1298  
 Location: 6900 D Kaunualii Hwy, Kekaha, HI 96753 TaskNo: 02  
 Description: Cell 1 C&D Construction

Material Type: gml - 2 Specifications: Seam Pressure: 30 psi / 5 min Vacuum Box: 5 psi / 10 sec.

Primary / Secondary: SUBBASE secondary 60mil GM Series: 2

Production Seam					Location			Nondestructive Test					
Date	Time	Mach. ID	Oper. ID	Ext/Fus:	SeamNo Series-Seam1-Seam2-Begin-End	Length (ft.)	QA ID	Location	Detail	Oper.	Result	Action	QA ID
8/3/2010	10:30	20624	AM	f	2-095-106-0-23	23	DWH	0-23	AT	EB	p		DWH
8/3/2010	10:34	20624	AM	f	2-095-107-0-23	23	DWH	0-23	AT	EB	p		DWH
8/3/2010	10:38	20624	AM	f	2-095-108-0-23	23	DWH	0-23	AT	EB	p		DWH
8/3/2010	10:40	5117	JM	e	2-000-081-0-23	23	DWH	0-23	VB	ASM	p		DWH
8/3/2010	10:50	5117	JM	e	2-000-078	23	DWH	0-23	VB	ASM	p		DWH
8/3/2010	11:00	5117	JM	e	2-000-077-0-23	23	DWH	0-23	VB	ASM	p		DWH
8/5/2010	7:45	5117	AM	e	2-000-110-0-19	19	DWH	0-19	VB	ASM	p		DWH
8/5/2010	7:48	5117	AM	e	2-000-109-0-21	21	DWH	0-21	VB	ASM	p		DWH
8/5/2010	9:00	5117	AM	e	2-000-108-0-6	6	DWH	0-6	VB	ASM	p		DWH

Total Length Fusion: 13284

Total Length Extrusion: 1105

60mil SECONDARY GM PRODUCTION SEAMS

Comments:

## Production Seam Log



Project: Kekaha Landfill ProjNo: WG1298  
 Location: 6901 D Keolu Rd Hwy. Kekaha, HI 96752 TaskNo: 02  
 Description: Cell 1 C&D Construction

Material Type: gml : 3 Specifications: Seam Pressure: 30 psi / 3 min Vacuum Box: 5 psi / 10 sec

Primary / Secondary: Secondary Bomil GM Series: 2

Production Seam					Location			Nondestructive Test					
Date	Time	Mach. ID	Oper. ID	Ext/ Fus:	Seam No <small>Series-Seam1-Seam2-Begin-End</small>	Length (ft.)	QA ID	Location	Detail	Oper.	Result	Action	QA ID
4/21/2010	10:20	1110	AM	F	2-037-045-0-23	23	CAS	0-23	AT	EB	p		CAS
4/21/2010	10:40	1110	AM	F	2-036-045-0-23	23	CAS	0-23	AT	EB	p		CAS
4/21/2010	10:50	1110	AM	F	2-001-045-0-34	23	CAS	0-23	AT	EB	p		CAS
5/11/2010	15:00	1110	AM	F	2-052-053-0-53	53	CAS	0-53	AT	EB	p		CAS
5/11/2010	15:15	1110	AM	F	2-053-054-0-53	53	CAS	0-53	AT	EB	p		CAS
5/11/2010	17:15	5117	AM	e	2-026-053-0-39	39	CAS	0-39	VB	GM	p		CAS
7/30/2010	14:30	1109	GM	F	2-067-068-0-23	23	DWH	0-23	AT	EB	p		DWH
7/30/2010	14:34	20624	AM	F	2-065-067-82-0	82	DWH	0-82	AT	EB	p		DWH
7/30/2010	14:55	20624	AM	F	2-067-069-0-80	80	DWH	0-80	AT	EB	p		DWH
7/31/2010	11:43	1109	GM	F	2-085-086-0-23	23	DWH	0-23	AT	EB	p		DWH
7/31/2010	11:49	20624	AM	F	2-084-086-80-0	80	DWH	0-80	AT	EB	p		DWH
7/31/2010	11:55	20624	AM	F	2-086-088-0-78	78	DWH	0-78	AT	EB	p		DWH

Total Length Fusion: 13284 Total Length Extrusion: 1105 } Bomil SECONDARY GM PRODUCTION SEAMS

Comments:

## Production Seam Log



Project: Kekaha Landfill ProjNo: WG1298  
 Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752 TaskNo: 02  
 Description: Cell 1 C&D Construction

Material Type: gmf - 2 Specifications: Seam Pressure: 30 psi / 5 min Vacuum Box: 5 psi / 10 sec.

Primary / Secondary: Primary 60 mil GM Series: i

Production Seam					Location			Nondestructive Test					
Date	Time	Mach. ID	Oper. ID	Ext/ Fus:	Seam No <small>Series-Seam1-Seam2-Begin-End</small>	Length (ft.)	QA ID	Location	Detail	Oper.	Result	Action	QA ID
4/9/2010	11:15	20431	AM	f	1-002-003-0-23	23	CAS	0-23	AT	EB	p		CAS
4/9/2010	11:20	20431	AM	f	1-001-003-0-85	85	CAS	0-85	AT	EB	p		CAS
4/9/2010	11:30	20431	AM	f	1-001-002-0-164	164	CAS	0-164	AT	EB	p		CAS
4/9/2010	13:45	20431	AM	f	1-003-004-0-86	86	CAS	0-86	AT	EB	p		CAS
4/9/2010	13:55	20431	AM	f	1-002-004-0-160	160	CAS	0-160	AT	EB	p		CAS
4/9/2010	14:50	1110	AM	f	1-005-006-0-23	23	CAS	0-23	AT	EB	p		CAS
4/9/2010	15:00	1110	AM	f	1-004-006-0-177	177	CAS	0-177	AT	EB	p		CAS
4/9/2010	15:25	1110	AM	f	1-004-005-0-68	68	CAS	0-68	AT	EB	p		CAS
4/10/2010	11:00	5117	AM	e	1-000-001-0-23	23	CAS	0-23	VB	GM	p		CAS
4/10/2010	11:10	5117	AM	e	1-000-002-0-23	23	CAS	0-23	VB	GM	p		CAS
4/10/2010	11:20	5117	AM	e	1-000-004-0-23	23	CAS	0-23	VB	GM	p		CAS
4/10/2010	11:30	5117	AM	e	1-000-005-0-23	23	CAS	0-23	VB	GM	p		CAS
4/12/2010	8:50	1110	AM	f	1-007-008-0-23	23	CAS	0-23	AT	EB	p		CAS
4/12/2010	8:55	1110	AM	f	1-006-008-0-21	21	CAS	0-21	AT	EB	p		CAS
4/12/2010	9:05	1110	AM	f	1-006-007-0-163	163	CAS	0-163	AT	EB	p		CAS
4/12/2010	9:20	1110	AM	f	1-005-007-0-69	69	CAS	0-69	AT	EB	p		CAS

## Production Seam Log



Project: Kekaha Landfill ProjNo: WG1298  
 Location: 6900 O Kaunualii Hwy, Kekaha, HI 96752 TaskNo: 02  
 Description: Cell 1 C&D Construction

Material Type: gml : 2 Specifications: Seam Pressure: 30 psi / 5 min Vacuum Box: 5 psi / 10 sec

Primary / Secondary: Primary 60mil GM Series: 1

Production Seam					Location			Nondestructive Test					
Date	Time	Mach. ID	Oper. ID	Est/ FUSR	Seam No <small>Seam1-Begin-Seam2-Begin-End</small>	Length (ft.)	QA ID	Location	Detail	Oper.	Result	Action	QA ID
4/12/2010	10:05	1110	AM	f	1-008-009-0-22	22	CAS	0-22	AT	EB	p		CAS
4/12/2010	10:10	1110	AM	f	1-007-009-0-227	227	CAS	0-227	AT	EB	p		CAS
4/12/2010	11:05	1110	AM	f	1-010-011-0-23	23	CAS	0-23	AT	EB	p		CAS
4/12/2010	11:15	1110	AM	f	1-009-010-0-117	117	CAS	0-117	AT	EB	p		CAS
4/12/2010	11:30	1110	AM	f	1-009-011-0-135	135	CAS	0-135	AT	EB	p		CAS
4/12/2010	13:50	1110	AM	f	1-011-012-0-119	119	CAS	0-119	AT	EB	p		CAS
4/12/2010	14:20	1110	AM	f	1-010-012-0-130	130	CAS	0-130	AT	EB	p		CAS
4/12/2010	15:05	1110	AM	f	1-013-014-0-23	23	CAS	0-23	AT	EB	p		CAS
4/12/2010	15:15	1110	AM	f	1-012-014-0-218	218	CAS	0-218	AT	EB	p		CAS
4/12/2010	15:40	1110	AM	f	1-012-013-0-29	29	CAS	0-29	AT	EB	p		CAS
4/19/2010	9:05	1110	AM	f	1-015-016-0-23	23	CAS	0-23	AT	EB	p		CAS
4/19/2010	9:10	1110	AM	f	1-001-015-0-96	96	CAS	0-96	AT	EB	p		CAS
4/19/2010	9:20	1110	AM	f	1-001-016-0-158	158	CAS	0-158	AT	EB	p		CAS
4/19/2010	10:10	1110	AM	f	1-015-017-0-95	95	CAS	0-95	AT	EB	p		CAS
4/19/2010	10:20	1110	AM	f	1-016-017-0-152	152	CAS	0-152	AT	EB	p		CAS
4/19/2010	11:05	1110	AM	f	1-017-018-0-193	193	CAS	0-193	AT	EB	p		CAS

## Production Seam Log



Project: Kekaha Landfill ProjNo: WG1298  
 Location: 6900 D Kamehali Hwy, Kekaha, HI 96752 TaskNo: 02  
 Description: Coff I C&D Construction

Material Type: gml / Z Specifications: Seam Pressure: 30 psi / 5 min Vacuum Box: 5 psi / 10 sec

Primary / Secondary: Primary 60 mil GM Series: I

Production Seam					Location			Nondestructive Test					
Date	Time	Mach. ID	Oper. ID	Est/ Fus:	Seam No (Series-Start)-Seam2-Beg/End	Length (ft.)	QA ID	Location	Detail	Oper.	Result	Action	QA ID
4/19/2010	12:15	1110	AM	f	1-018-019-0-196	196	CAS	0-196	AT	EB	p		CAS
4/19/2010	14:15	1110	AM	f	1-019-020-0-199	199	CAS	0-199	AT	EB	p		CAS
4/19/2010	14:55	1110	AM	f	1-020-021-0-199	199	CAS	0-199	AT	EB	p		CAS
4/19/2010	15:45	1110	AM	f	1-021-022-0-199	200	CAS	0-200	AT	EB	p		CAS
4/20/2010	8:00	5117	AM	e	1-000-015-0-23	23	CAS	0-23	VB	GM	p		CAS
4/20/2010	8:00	5117	AM	e	1-000-017-0-23	23	CAS	0-23	VB	GM	p		CAS
4/20/2010	8:00	5117	AM	e	1-000-018-0-23	23	CAS	0-23	VB	GM	p		CAS
4/20/2010	8:00	5117	AM	e	1-000-019-0-23	23	CAS	0-23	VB	GM	p		CAS
4/20/2010	8:00	5117	AM	e	1-000-020-0-23	23	CAS	0-23	VB	GM	p		CAS
4/20/2010	8:00	5117	AM	e	1-000-021-0-23	23	CAS	0-23	VB	GM	p		CAS
4/20/2010	8:00	5117	AM	e	1-000-022-0-23	23	CAS	0-23	VB	GM	p		CAS
4/22/2010	8:15	1110	AM	f	1-022-023-0-205	205	CAS	0-205	AT	EB	p		CAS
4/22/2010	8:50	1110	AM	f	1-023-024-0-201	201	CAS	0-201	AT	EB	p		CAS
4/22/2010	9:20	1110	AM	f	1-025-026-0-23	23	CAS	0-23	AT	EB	p		CAS
4/22/2010	9:25	1110	AM	f	1-024-026-0-12	12	CAS	0-12	AT	EB	p		CAS
4/22/2010	9:30	1110	AM	f	1-024-025-0-192	192	CAS	0-192	AT	EB	p		CAS





Production Seam Log

Project: Kekaha Landfill ProjNo: WG1298  
 Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752 TaskNo: 02  
 Description: Cell 1 C&D Construction

Material Type: gml : 2 Specifications: Seam Pressure: 30 psi / 5 min Vacuum Box: 5 psi / 10 sec.

Primary / Secondary: Primary 60mil GM Series: 1

Production Seam					Location			Nondestructive Test					
Date	Time	Mach. ID	Oper. ID	Ext/Pass	Seam No <small>Seam1-Seam2-Seam3-Began-End</small>	Length (ft.)	QA ID	Location	Detail	Oper.	Result	Action	QA ID
4/22/2010	10:15	1110	AM	f	1-026-027-0-13	13	CAS	0-13	AT	EB	p		CAS
4/22/2010	10:20	1110	AM	f	1-025-027-0-195	195	CAS	0-195	AT	EB	p		CAS
4/22/2010	10:50	1110	AM	f	1-027-028-0-207	207	CAS	0-207	AT	EB	p		CAS
4/23/2010	10:30	1110	AM	f	1-029-030-0-23	23	CAS	0-23	AT	EB	p		CAS
4/23/2010	10:40	1110	AM	f	1-014-029-0-192	192	CAS	0-192	AT	EB	p		CAS
4/23/2010	11:05	1110	AM	f	1-014-030-0-30	30	CAS	0-30	AT	EB	p		CAS
4/23/2010	11:08	1110	GM	f	1-013-030-0-35	35	CAS	0-35	AT	EB	p		CAS
4/23/2010	11:35	1110	AM	f	1-029-031-0-163	157	CAS	0-157	AT	EB	p		CAS
4/23/2010	13:15	1110	AM	f	1-030-032-0-69	69	CAS	0-69	AT	EB	p		CAS
4/23/2010	13:40	1110	AM	f	1-033-034-0-31	31	CAS	0-31	AT	EB	p		CAS
4/23/2010	13:50	1110	AM	f	1-034-035-0-29	29	CAS	0-29	AT	EB	p		CAS
4/23/2010	14:05	1110	AM	f	1-035-036-0-26	26	CAS	0-26	AT	EB	p		CAS
4/23/2010	14:10	1110	AM	f	1-036-037-0-24	24	CAS	0-24	AT	EB	p		CAS
4/23/2010	14:15	1110	AM	f	1-037-038-0-22	22	CAS	0-22	AT	EB	p		CAS
4/23/2010	14:20	1110	AM	f	1-038-039-0-19	19	CAS	0-19	AT	EB	p		CAS
4/23/2010	14:30	1110	AM	f	1-031-034-0-23	23	CAS	0-23	AT	EB	p		CAS

## Production Seam Log



Project: Kekaha Landfill ProjNo: WG1298  
 Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752 TaskNo: 02  
 Description: Cell I C&D Construction

Material Type: gml : 2 Specifications: Seam Pressure: 30 psi / 5 min Vacuum Box: 5 psi / 10 sec

Primary / Secondary: Primary 60 mil GM Series: 1

Production Seam					Location			Nondestructive Test					
Date	Time	Mach. ID	Oper. ID	Ext/ Pus.	Seam No <small>Seam1-Seam2-Begin-End</small>	Length (ft.)	QA ID	Location	Detail	Oper.	Result	Action	QA ID
4/23/2010	14:34	1110	AM	f	1-031-035-0-23	23	CAS	0-23	AT	EB	p		CAS
4/23/2010	14:40	1110	AM	f	1-031-036-0-23	23	CAS	0-23	AT	EB	p		CAS
4/23/2010	14:45	1110	AM	f	1-031-037-0-23	23	CAS	0-23	AT	EB	p		CAS
4/23/2010	14:50	1110	AM	f	1-031-038-0-23	23	CAS	0-23	AT	EB	p		CAS
4/23/2010	14:55	1110	AM	f	1-031-039-0-23	23	CAS	0-23	AT	EB	p		CAS
4/23/2010	15:00	1110	AM	f	1-040-041-0-37	37	CAS	0-37	AT	EB	p		CAS
4/23/2010	15:08	1110	AM	f	1-032-040-0-23	23	CAS	0-23	AT	EB	p		CAS
4/23/2010	15:40	1110	GM	f	1-029-033-0-23	23	CAS	0-23	AT	EB	p		CAS
4/23/2010	15:50	1110	AM	f	1-031-033-0-23	23	CAS	0-23	AT	EB	p		CAS
4/24/2010	8:20	5117	AM	e	1-000-028-0-23	23	CAS	0-23	VB	GM	p		CAS
4/24/2010	8:30	5117	AM	e	1-000-027-0-23	23	CAS	0-23	VB	GM	p		CAS
4/24/2010	8:40	5117	AM	e	1-000-025-0-23	23	CAS	0-23	VB	GM	p		CAS
4/24/2010	8:50	5117	AM	e	1-000-024-0-23	23	CAS	0-23	VB	GM	p		CAS
4/24/2010	9:00	5117	AM	e	1-000-023-0-23	23	CAS	0-23	VB	GM	p		CAS
5/11/2010	0:05	1110	AM	e	1-000-044-0-20	20	CAS	0-20	VB	GM	p		CAS
5/11/2010	10:30	1110	AM	f	1-040-043-0-40	40	CAS	0-40	AT	EB	p		CAS

Production Seam Log



Project: Kekaha Landfill ProjNo: WG1298  
 Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752 TaskNo: 02  
 Description: Cell 1 C&D Construction

Material Type: gml : 2 Specifications: Seam Pressure: 30 psi / 5 min Vacuum Box: 5 psi / 10 sec.

Primary / Secondary: Primary 60mil GM Series: 1

Production Seam					Location			Nondestructive Test					
Date	Time	Mach. ID	Oper. ID	Ext/ PWS:	Seam No Series-Seam1-Seam2-Begin-End	Length (ft.)	QA ID	Location	Detail	Oper.	Result	Action	QA ID
5/11/2010	10:35	1110	AM	F	1-043-044-0-42	42	CAS	0-42	AT	EB	p		CAS
5/11/2010	10:45	1110	AM	F	1-044-045-0-45	23	CAS	0-23	AT	EB	p		CAS
5/11/2010	10:50	1110	AM	F	1-045-046-0-12	12	CAS	0-12	AT	EB	p		CAS
5/11/2010	10:54	1110	AM	F	1-032-044-0-12	12	CAS	0-12	AT	EB	p		CAS
5/11/2010	10:59	1110	AM	F	1-032-043-0-23	23	CAS	0-23	AT	EB	p		CAS
5/11/2010	11:33	1110	AM	e	1-000-030-0-23	23	CAS	0-23	VB	GM	p		CAS
5/11/2010	11:42	1110	AM	e	1-000-032-0-23	23	CAS	0-23	VB	GM	p		CAS
5/11/2010	11:50	1110	AM	e	1-000-046-0-10	10	CAS	0-10	VB	GM	p		CAS
5/11/2010	11:57	1110	AM	e	1-000-045-0-23	23	CAS	0-23	VB	GM	p		CAS
5/12/2010	0:10	1110	AM	F	1-055-056-0-46	46	CAS	0-46	AT	EB	p		CAS
5/12/2010	0:15	1110	AM	F	1-028-056-0-23	23	CAS	0-23	AT	EB	p		CAS
5/12/2010	0:20	1110	AM	F	1-027-055-0-23	23	CAS	0-23	AT	EB	p		CAS
5/12/2010	0:25	1110	AM	F	1-026-054-0-23	23	CAS	0-23	AT	EB	p		CAS
5/12/2010	0:30	1110	AM	F	1-024-053-0-23	23	CAS	0-23	AT	EB	p		CAS
5/12/2010	0:45	1110	AM	e	1-020-050-0-10	10	CAS	0-10	VB	GM	p		CAS
5/12/2010	9:25	1110	AM	F	1-018-047-0-23	23	CAS	0-23	AT	EB	p		CAS

Production Seam Log



Project: Kekaha Landfill ProjNo: WG1298  
 Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752 TaskNo: 02  
 Description: Cell 1 C&D Construction

Material Type: gmf : 2 Specifications: Seam Pressure: 30 psi / 5 min Vacuum Box: 5 psi / 10 sec.

Primary / Secondary: Primary 60mil GM Series: 1

Production Seam					Location			Nondestructive Test					
Date	Time	Mach. ID	Oper. ID	Ext/ Fus:	Seam No <small>Seam1-Seam2-Begin-End</small>	Length (ft.)	QA ID	Location	Detail	Oper.	Result	Action	QA ID
5/12/2010	9:30	1110	AM	f	1-019-048-0-23	23	CAS	0-23	AT	EB	p		CAS
5/12/2010	9:35	1110	AM	f	1-017-048-0-56	56	CAS	0-56	AT	EB	p		CAS
5/12/2010	9:45	1110	AM	f	1-019-047-0-14	14	CAS	0-14	AT	EB	p		CAS
5/12/2010	9:50	1110	AM	f	1-047-048-0-41	41	CAS	0-41	AT	EB	p		CAS
5/12/2010	9:55	1110	AM	f	1-020-049-0-23	23	CAS	0-23	AT	EB	p		CAS
5/12/2010	10:00	1110	AM	f	1-019-020-0-15	15	CAS	0-15	AT	EB	p		CAS
5/12/2010	10:03	1110	AM	f	1-048-049-0-38	38	CAS	0-38	AT	EB	p		CAS
5/12/2010	10:10	1110	AM	f	1-051-052-0-45	45	CAS	0-45	AT	EB	p		CAS
5/12/2010	10:30	1110	AM	f	1-021-050-0-23	23	CAS	0-23	AT	EB	p		CAS
5/12/2010	10:50	1110	AM	f	1-022-051-0-23	23	CAS	0-23	AT	EB	p		CAS
5/12/2010	10:55	1110	AM	f	1-023-052-0-23	23	CAS	0-23	AT	EB	p		CAS
5/12/2010	11:00	1110	AM	f	1-052-053-0-42	42	CAS	0-42	AT	EB	p		CAS
5/12/2010	11:03	1110	AM	f	1-023-053-0-7	7	CAS	0-7	AT	EB	p		CAS
5/12/2010	11:08	1110	AM	f	1-053-054-0-52	52	CAS	0-52	AT	EB	p		CAS
5/12/2010	11:12	1110	AM	f	1-054-055-0-48	48	CAS	0-48	AT	EB	p		CAS
8/4/2010	9:25	20624	AM	f	1-028-057-250-43	207	DWH	43-250	AT	EB	p		DWH

**Production Seam Log**



Project: Kekaha Landfill ProjNo: WG1298  
 Location: 6900 D Kamehali Hwy, Kekaha, HI 96752 TaskNo: 02  
 Description: Cell 1 C&D Construction

Material Type: gml : 2 Specifications: Seam Pressure: 30 psi / 5 min Vacuum Box: 5 psi / 10 sec.

Primary / Secondary: Primary 60mil GM Series: 1

Production Seam					Location			Nondestructive Test					
Date	Time	Mach. ID	Oper. ID	Ext/ FAs:	Seam No Serial-Serial-Serial-Begin-End	Length (ft.)	QA ID	Location	Detail	Oper.	Result	Action	QA ID
8/4/2010	9:57	20624	AM	f	1-056-057-43-0	43	DWH	0-43	AT	EB	p		DWH
8/4/2010	10:17	20624	AM	f	1-057-058-250-0	250	DWH	0-250	AT	EB	p		DWH
8/4/2010	11:07	20624	AM	f	1-059-060-0-23	23	DWH	0-23	AT	EB	p		DWH
8/4/2010	11:18	20624	AM	f	1-058-059-250-95	155	DWH	95-250	AT	EB	p		DWH
8/4/2010	11:35	20624	AM	f	1-058-060-95-0	95	DWH	0-95	AT	EB	p		DWH
8/4/2010	11:56	20624	AM	f	1-059-061-250-93	157	DWH	93-250	AT	EB	p		DWH
8/4/2010	12:15	20624	AM	f	1-060-061-93-0	93	DWH	0-93	AT	EB	p		DWH
8/5/2010	8:30	5117	AM	e	1-000-061-0-23	23	DWH	0-23	VB	GM	p		DWH
8/5/2010	8:38	5117	AM	e	1-000-060-0-23	23	DWH	0-23	VB	GM	p		DWH
8/5/2010	8:42	5117	AM	e	1-000-058-0-23	23	DWH	0-23	VB	GM	p		DWH
8/5/2010	8:51	5117	AM	e	1-000-057-0-23	23	DWH	0-23	VB	GM	p		DWH
8/5/2010	11:28	20624	AM	f	1-061-062-250-62	188	DWH	62-250	AT	EB	p		DWH
8/5/2010	13:43	20624	AM	f	1-064-065-0-23	23	DWH	0-23	AT	EB	p		DWH
8/5/2010	13:50	20624	AM	f	1-063-064-0-61	61	DWH	0-61	AT	EB	p		DWH
8/5/2010	14:01	20624	AM	f	1-062-064-61-220	159	DWH	61-220	AT	EB	p		DWH
8/5/2010	14:21	20624	AM	f	1-062-065-220-250	30	DWH	220-250	AT	EB	p		DWH

Production Seam Log



Project: Kekaha Landfill ProjNo: WG1298  
 Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752 TaskNo: 02  
 Description: Cell 1 C&D Construction

Material Type: gml : 2 Specifications: Seam Pressure: 30 psi / 5 min Vacuum Box: 5 psi / 10 sec.

Primary / Secondary: Primary 60mil GAM Series: i

Production Seam					Location			Nondestructive Test					
Date	Time	Mach. ID	Oper. ID	Ext/ Fus:	Seam No <small>Series-Seam1-Seam2-Begin-End</small>	Length (ft.)	QA ID	Location	Detail	Oper.	Result	Action	QA ID
8/6/2010	8:20	5117	AM	e	1-000-065-0-23	23	DWH	0-23	VB	GM	p		DWH
8/6/2010	8:30	5117	AM	e	1-000-062-0-23	23	DWH	0-23	VB	GM	p		DWH
8/6/2010	10:07	20624	AM	f	1-064-066-0-218	218	DWH	0-218	AT	EB	p		DWH
8/6/2010	10:32	20624	AM	f	1-065-066-218-250	32	DWH	218-250	AT	EB	p		DWH
8/6/2010	10:53	20624	AM	f	1-067-068-0-23	23	DWH	0-23	AT	EB	p		DWH
8/6/2010	11:00	20624	AM	f	1-066-068-0-96	96	DWH	0-96	AT	EB	p		DWH
8/6/2010	11:14	20624	AM	f	1-066-067-96-250	154	DWH	96-250	AT	EB	p		DWH
8/6/2010	11:45	20624	AM	f	1-068-069-0-93	93	DWH	0-93	AT	EB	p		DWH
8/6/2010	11:59	20624	AM	f	1-067-069-93-250	157	DWH	93-250	AT	EB	p		DWH
8/6/2010	14:03	20624	AM	f	1-070-071-0-23	23	DWH	0-23	AT	EB	p		DWH
8/6/2010	14:12	20624	AM	f	1-069-071-0-191	191	DWH	0-191	AT	EB	p		DWH
8/6/2010	14:34	20624	AM	f	1-069-070-191-250	59	DWH	191-250	AT	EB	p		DWH
8/6/2010	15:15	20624	AM	f	1-072-073-0-23	23	DWH	0-23	AT	EB	p		DWH
8/6/2010	15:25	20624	AM	f	1-071-073-0-37	37	DWH	0-37	AT	EB	p		DWH
8/6/2010	15:29	20624	AM	f	1-071-072-37-188	151	DWH	37-188	AT	EB	p		DWH
8/6/2010	15:47	20624	AM	f	1-070-072-188-250	62	DWH	188-250	AT	EB	p		DWH

Production Seam Log



Project: Kekaha Landfill  
Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752  
Description: Cell 1 C&D Construction

ProjNo: WG1298  
TaskNo: 02

Material Type: gml : 2      Specifications: Seam Pressure: 30 psi / 3 min      Vacuum Box: 2 psi / 10 sec.

Primary / Secondary: Primary 60 mil GM      Series: 1

Production Seam					Location			Nondestructive Test					
Date	Time	Mach. ID	Oper. ID	Ext/Flg	Seam No <small>Seam-Start-Start-Begin-End</small>	Length (ft.)	QA ID	Location	Detail	Oper.	Result	Action	QA ID
8/6/2010	16:03	20624	AM	f	1-072-074-250-35	215	DWB	35-250	AT	EB	p		DWH
8/6/2010	16:26	20624	AM	f	1-073-074-35-0	35	DWH	0-35	AT	EB	p		DWH
8/7/2010	10:50	5117	AM	e	1-000-074-0-23	23	DWH	0-23	VB	RA	p		DWH
8/7/2010	10:55	5117	AM	e	1-000-072-0-23	23	DWH	0-23	VB	RA	p		DWH
8/7/2010	10:58	5117	AM	e	1-000-070-0-23	23	DWH	0-23	VB	RA	p		DWH
8/7/2010	11:05	5117	AM	e	1-000-069-0-23	23	DWH	0-23	VB	RA	p		DWH
8/7/2010	11:12	5117	AM	e	1-000-067-0-23	23	DWH	0-23	VB	RA	p		DWH
8/7/2010	11:20	5117	AM	e	1-000-066-0-23	23	DWH	0-23	VB	RA	p		DWH
8/9/2010	9:48	20624	AM	f	1-075-076-0-23	23	DWH	0-23	AT	EB	p		DWH
8/9/2010	9:55	20624	AM	f	1-074-075-250-104	146	DWH	104-250	AT	EB	p		DWH
8/9/2010	10:10	20624	AM	f	1-074-076-104-0	104	DWH	0-104	AT	EB	p		DWH
8/9/2010	10:36	20624	AM	f	1-075-077-250-102	148	DWH	102-250	AT	EB	p		DWH
8/9/2010	10:49	20624	AM	f	1-076-077-102-0	102	DWH	0-102	AT	EB	p		DWH
8/9/2010	11:47	20624	AM	f	1-078-079-0-23	23	DWH	0-23	AT	EB	p		DWH
8/9/2010	11:53	20624	AM	f	1-077-078-250-201	49	DWH	201-250	AT	EB	p		DWH
8/9/2010	11:58	20624	AM	f	1-077-079-201-0	201	DWH	0-201	AT	EB	p		DWH

**Production Seam Log**



Project: Kekaha Landfill  
Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752  
Description: Cell 1 C&D Construction

ProjNo: WG1298  
TaskNo: 02

Material Type: gml : 2      Specifications: Seam Pressure: 20 psi / 5 min      Vacuum Box: 5 psi / 10 sec.

Primary / Secondary: Primary **60 mil GM**      Series: 1

Production Seam					Location			Nondestructive Test					
Date	Time	Mach. ID	Oper. ID	Ext/Fus:	Seam No <small>Series-Seam1-Seam2-Begin-End</small>	Length (ft.)	QA ID	Location	Detail	Oper.	Result	Action	QA ID
8/9/2010	15:12	20624	AM	f	1-078-080-250-300	50	DWH	200-250	AT	EB	p		DWH
8/9/2010	15:18	20624	AM	f	1-079-080-200-66	134	DWH	66-200	AT	EB	p		DWH
8/9/2010	15:57	20624	AM	f	1-080-082-65-250	185	DWH	65-250	AT	EB	p		DWH
8/10/2010	14:26	20624	AM	f	1-083-084-0-23	23	DWH	0-23	AT	EB	p		DWH
8/10/2010	14:33	20624	AM	f	1-082-084-0-99	99	DWH	0-99	AT	EB	p		DWH
8/10/2010	14:47	20624	AM	f	1-082-083-99-250	151	DWH	99-250	AT	EB	p		DWH
8/10/2010	15:10	20624	AM	f	1-084-085-0-97	97	DWH	0-97	AT	EB	p		DWH
8/10/2010	15:26	20624	AM	f	1-083-085-97-250	153	DWH	97-250	AT	EB	p		DWH
8/10/2010	15:35	5117	JM	e	1-000-080-0-23	23	DWH	0-23	VB	ASM	p		DWH
8/10/2010	15:41	5117	JM	e	1-000-078-0-23	23	DWH	0-23	VB	ASM	p		DWH
8/10/2010	15:46	5117	JM	e	1-000-077-0-23	23	DWH	0-23	VB	ASM	p		DWH
8/10/2010	15:54	5117	JM	e	1-000-075-0-23	23	DWH	0-23	VB	ASM	p		DWH
8/11/2010	8:52	20624	AM	f	1-085-086-0-250	250	DWH	0-250	AT	EB	p		DWH
8/11/2010	10:01	20624	AM	f	1-087-088-0-23	23	DWH	0-23	AT	EB	p		DWH
8/11/2010	10:10	20624	AM	f	1-086-088-0-117	117	DWH	0-117	AT	EB	p		DWH
8/11/2010	10:28	20624	AM	f	1-086-087-117-250	133	DWH	117-250	AT	EB	p		DWH





Production Seam Log

Project: Kekaha Landfill  
Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752  
Description: Cell 1 C&D Construction

ProjNo: WG1298  
TaskNo: 02

Material Type: gml : 2      Specifications: Seam Pressure: 30 psi / 5 min      Vacuum Box: 5 psi / 10 sec.

Primary / Secondary: Primary 60 mil GM      Series: 1

Production Seam					Location			Nondestructive Test					
Date	Time	Mach. ID	Oper. ID	Ex/Fus:	Seam No <small>Seam1-Seam2-Range-End</small>	Length (ft.)	QA ID	Location	Detail	Oper.	Result	Action	QA ID
8/11/2010	11:10	20624	AM	f	1-088-089-0-115	115	DWH	0-115	AT	EB	p		DWH
8/11/2010	11:26	20624	AM	f	1-087-089-115-264	149	DWH	115-264	AT	EB	p		DWH
8/11/2010	13:42	20624	AM	f	1-090-091-0-33	33	DWH	0-33	AT	EB	p		DWH
8/11/2010	13:48	20624	AM	f	1-091-092-0-30	30	DWH	0-30	AT	EB	p		DWH
8/11/2010	13:54	20624	AM	f	1-092-093-0-20	20	DWH	0-20	AT	EB	p		DWH
8/11/2010	13:59	20624	AM	f	1-090-094-0-35	35	DWH	0-35	AT	EB	p		DWH
8/11/2010	14:04	20624	AM	f	1-094-095-0-38	38	DWH	0-38	AT	EB	p		DWH
8/11/2010	14:13	20624	AM	f	1-095-096-0-38	38	DWH	0-38	AT	EB	p		DWH
8/11/2010	14:20	20624	AM	f	1-096-097-0-43	43	DWH	0-43	AT	EB	p		DWH
8/11/2010	14:31	20624	AM	f	1-097-098-0-43	43	DWH	0-43	AT	EB	p		DWH
8/11/2010	14:40	20624	AM	f	1-098-099-0-46	46	DWH	0-46	AT	EB	p		DWH
8/11/2010	14:49	20624	AM	f	1-099-100-0-49	49	DWH	0-49	AT	EB	p		DWH
8/11/2010	15:09	20624	AM	f	1-100-101-0-52	52	DWH	0-52	AT	EB	p		DWH
8/11/2010	15:19	20624	AM	f	1-101-102-0-53	53	DWH	0-53	AT	EB	p		DWH
8/11/2010	15:27	20624	AM	f	1-103-104-0-27	27	DWH	0-27	AT	EB	p		DWH
8/11/2010	15:28	20624	AM	f	1-102-103-50-27	23	DWH	27-50	AT	EB	p		DWH



Production Seam Log

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WG1298</u>
Location: <u>6900 D Kaunualii Hwy, Kekaha, HI 96752</u>	TaskNo: <u>02</u>
Description: <u>Cell 1 C&amp;D Construction</u>	

Material Type	gml : 2	Specifications:	Seam Pressure: <u>10 psi / 5 min</u>	Vacuum Box: <u>5 gal / 10 sec</u>
---------------	---------	-----------------	--------------------------------------	-----------------------------------

Primary / Secondary:	Primary <u>60 gal GM</u>	Series:	<u>1</u>
----------------------	--------------------------	---------	----------

Production Seam					Location			Nondestructive Test					
Date	Time	Mach. ID	Oper. ID	Ext/ FMS	Seam No <small>Series-Seam1-Seam2-Begin-End</small>	Length (ft.)	QA ID	Location	Detail	Oper.	Result	Action	QA ID
8/11/2010	15:40	20624	AM	f	1-102-104-27-0	27	DWH	0-27	AT	EB	p		DWH
8/11/2010	15:47	20624	AM	f	1-089-103-0-36	36	DWH	0-36	AT	EB	p		DWH
8/11/2010	15:50	20624	AM	f	1-089-102-0-23	23	DWH	0-23	AT	EB	p		DWH
8/11/2010	15:55	20624	AM	f	1-089-101-0-23	23	DWH	0-23	AT	EB	p		DWH
8/11/2010	15:59	20624	AM	f	1-089-100-0-23	23	DWH	0-23	AT	EB	p		DWH
8/11/2010	16:03	20624	AM	f	1-089-099-0-23	23	DWH	0-23	AT	EB	p		DWH
8/11/2010	16:07	20624	AM	f	1-089-098-0-23	23	DWH	0-23	AT	EB	p		DWH
8/11/2010	16:10	20624	AM	f	1-089-097-0-23	23	DWH	0-23	AT	EB	p		DWH
8/11/2010	16:13	20624	AM	f	1-089-096-0-23	23	DWH	0-23	AT	EB	p		DWH
8/11/2010	16:20	20624	AM	f	1-089-095-0-23	23	DWH	0-23	AT	EB	p		DWH
8/11/2010	16:21	20624	AM	f	1-089-094-0-23	23	DWH	0-23	AT	EB	p		DWH
8/11/2010	16:28	20624	AM	f	1-089-090-0-23	23	DWH	0-23	AT	EB	p		DWH
8/11/2010	16:29	20624	AM	f	1-089-091-0-23	23	DWH	0-23	AT	EB	p		DWH
8/12/2010	13:36	5117	AM	e	1-000-093-0-22	22	DWH	0-22	VB	EB	p		DWH
8/12/2010	14:00	5117	AM	e	1-000-092-0-27	27	DWH	0-27	VB	EB	p		DWH
8/12/2010	14:08	5117	AM	e	1-000-091-0-1	1	DWH	0-1	VB	EB	p		DWH

## Production Seam Log



Project: Kekaha Landfill ProjNo: WG1298  
 Location: 6900 D Kaunapali Hwy, Kekaha, HI 96752 TaskNo: 02  
 Description: Cell 1 C&D Construction

Material Type: gml : 2 Specifications: Seam Pressure: 30 psi / 5 min Vacuum Box: 5 psi / 10 sec.

Primary / Secondary: Primary 60 mil GM Series: 1

Production Seam					Location			Nondestructive Test					
Date	Time	Mach. ID	Oper. ID	Ext/ Fus:	Seam No <small>Seam1-Seam2-Begin-End</small>	Length (ft.)	QA ID	Location	Detail	Oper.	Result	Action	QA ID
8/12/2010	14:04	5117	AM	e	1-000-089-0-28	28	DWH	0-28	VB	EB	p		DWH
8/12/2010	14:18	5117	AM	e	1-000-087-0-24	24	DWH	0-24	VB	EB	p		DWH
8/12/2010	14:28	5117	AM	e	1-000-086-0-23	23	DWH	0-23	VB	EB	p		DWH
8/12/2010	14:39	5117	AM	e	1-000-085-0-23	23	DWH	0-23	VB	EB	p		DWH
8/12/2010	14:45	5117	AM	e	1-000-083-0-23	23	DWH	0-23	VB	EB	p		DWH
8/12/2010	14:52	5117	AM	e	1-000-082-0-23	23	DWH	0-23	VB	EB	p		DWH

Total Length Fusion: 13228 Total Length Extrusion: 1039 } 60mil GM PRIMARY PRODUCTION SEAMS

Comments:

## Production Seam Log



Project: Kekaha Landfill ProjNo: WGL298  
 Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752 TaskNo: 02  
 Description: Cell 1 C&D Construction

Material Type: gml : 3 Specifications: Seam Pressure: 30 psi / 5 min Vacuum Box: 5 psi / 10 sec.

Primary / Secondary: Primary 80 mil GVM Series: 1

Production Seam					Location			Nondestructive Test					
Date	Time	Mach. ID	Oper. ID	Ext/ Fus:	Seam No <small>Series-Seam1-Seam2-Begin-End</small>	Length (ft.)	QA ID	Location	Detail	Oper.	Result	Action	QA ID
4/23/2010	15:15	1110	AM	f	1-032-042-0-23	23	CAS	0-23	AT	EB	p		CAS
4/23/2010	15:20	1110	AM	f	1-041-042-0-36	36	CAS	0-36	AT	EB	p		CAS
4/23/2010	15:23	1110	AM	f	1-033-042-0-57	57	CAS	0-57	AT	EB	p		CAS
4/23/2010	15:38	1110	AM	f	1-029-042-0-32	32	CAS	0-32	AT	EB	p		CAS
4/23/2010	15:45	1110	AM	f	1-030-042-0-10	10	CAS	0-10	AT	EB	p		CAS
5/12/2010	10:05	1110	AM	f	1-049-050-0-51	51	CAS	0-51	AT	EB	p		CAS
5/12/2010	10:20	1110	AM	f	1-050-051-0-55	55	CAS	0-55	AT	EB	p		CAS
8/5/2010	11:53	20624	AM	f	1-062-063-0-23	23	DWH	0-23	AT	EB	p		DWH
8/5/2010	12:00	20624	AM	f	1-061-063-62-0	62	DWH	0-62	AT	EB	p		DWH
8/9/2010	15:01	20624	AM	f	1-080-081-0-23	23	DWH	0-23	AT	EB	p		DWH
8/9/2010	15:40	20624	AM	f	1-079-081-66-0	66	DWH	0-66	AT	EB	p		DWH
8/9/2010	15:50	20624	AM	f	1-081-082-0-65	65	DWH	0-65	AT	EB	p		DWH

Total Length Fusion: 13228 Total Length Extrusion: 1039 } 80 mil PRIMARY PRODUCTION SEAMS

Comments:

**Appendix I-4**  
**Geomembrane Panel Placement**  
**and Repair Summary Logs**



Panel Placement Log

Project: Kekaha Landfill  
Location: 6900 D Kaunaloa Hwy, Kekaha, HI 96752  
Description: Cell 1 C&D Construction

ProjNo: WG1298  
TaskNo: 02

Primary / Secondary: Secondary		SUBBASE		Series: 7	Material Type: gml		
Panel	Batch-Roll	Date	Time	Placement/Location/Comments	Width (ft.)	Length (ft.)	QA ID
1	7291454-802465.10	4/6/2010	11:45		23	256	CAS
2	7291454-802465.10	4/6/2010	11:50		23	143	CAS
3	7291454-802358.10	4/6/2010	12:00		23	111	CAS
4	7291454-802358.10	4/6/2010	12:15		23	73	CAS
5	7291454-802227.10	4/6/2010	12:20		23	172	CAS
6	7291454-802227.10	4/6/2010	13:05		23	230	CAS
7	7291454-802225.10	4/6/2010	13:10		23	15	CAS
8	7291454-802225.10	4/6/2010	14:05		23	243	CAS
9	7291454-802225.10	4/6/2010	14:30		23	136	CAS
10	7291454-802119.10	4/6/2010	14:40		23	109	CAS
11	7291454-802119.10	4/7/2010	7:10		23	237	CAS
12	7291454-802119.10	4/7/2010	7:15		23	37	CAS
13	7291454-802233.10	4/7/2010	7:30		23	213	CAS
14	7291454-802233.10	4/7/2010	7:35		23	196	CAS
15	7291454-802354.10	4/7/2010	8:00		23	55	CAS
16	7291454-802354.10	4/7/2010	8:15		23	257	CAS
17	7291454-802354.10	4/7/2010	9:00		23	97	CAS
18	7291454-802352.10	4/14/2010	8:50		23	154	CAS
19	7291454-802352.10	4/14/2010	9:10		23	23	CAS
20	7291454-802229.10	4/14/2010	9:40		23	227	CAS
21	7291454-802229.10	4/14/2010	10:00		23	183	CAS
22	7291454-802234.10	4/14/2010	13:00		23	66	CAS
23	7291454-802234.10	4/14/2010	13:30		23	248	CAS
24	7291454-802234.10	4/14/2010	13:40		23	95	CAS
25	7291454-802120.10	4/14/2010	13:50		23	100	CAS
26	7291454-802120.10	4/15/2010	7:30		23	199	CAS
27	7291454-802120.10	4/15/2010	7:35		23	103	CAS
28	7291467-802113.10	4/15/2010	7:40		23	99	CAS
29	7291467-802113.10	4/15/2010	7:45		23	202	CAS
30	7291467-802113.10	4/15/2010	7:50		23	102	CAS
31	7291454-802464.10	4/15/2010	7:55		23	101	CAS



## Panel Placement Log

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WG1298</u>
Location: <u>6900 D Kaunualii Hwy, Kekaha, HI 96752</u>	TaskNo: <u>02</u>
Description: <u>Cell 1 C&amp;D Construction</u>	

Primary / Secondary: Secondary **SUBBASE** Series: 2 Material Type: gml

Panel	Batch-Roll	Date	Time	Placement/Location/Comments	Width (ft.)	Length (ft.)	QA ID
32	7291454-802464.10	4/15/2010	8:00		23	203	CAS
33	7291454-802464.10	4/15/2010	8:05		23	106	CAS
34	7291467-802112.10	4/15/2010	8:10		23	100	CAS
35	7291467-802112.10	4/15/2010	9:40		23	208	CAS
36	7291467-802110.10	4/21/2010	7:40		23	69	CAS
37	7291467-802110.10	4/21/2010	7:45		23	166	CAS
38	7291467-802110.10	4/21/2010	8:00		23	31	CAS
39	7291467-802110.10	4/21/2010	8:05		23	31	CAS
40	7291467-802110.10	4/21/2010	8:10		23	29	CAS
41	7291467-802110.10	4/21/2010	8:15		23	27	CAS
42	7291467-802106.10	4/21/2010	8:20		23	24	CAS
43	7291467-802106.10	4/21/2010	8:25		23	22	CAS
44	7291467-802106.10	4/21/2010	8:30		23	20	CAS
45	7291467-801612.10	4/21/2010	8:50		23	58	CAS
46	7291467-802106.10	4/21/2010	8:55		23	37	CAS
47	7291467-802106.10	4/21/2010	9:00		23	39	CAS
48	7291467-802103.10	5/11/2010	7:40		23	43	CAS
49	7291467-802103.10	5/11/2010	7:45		23	33	CAS
50	7291467-802103.10	5/11/2010	7:50		23	15	CAS
51	7291467-802103.10	5/11/2010	8:00		23	10	CAS
52	7291467-802103.10	5/11/2010	14:00		23	52	CAS
53	7291467-801612.10	5/11/2010	14:50		23	53	CAS
54	7291467-802103.10	5/11/2010	14:55		23	52	CAS
55	7291467-802103.10	5/11/2010	15:00		23	51	CAS
56	7291467-802111.10	5/11/2010	15:05		23	49	CAS
57	7291467-802111.10	5/11/2010	15:10		23	49	CAS
58	7291467-802111.10	5/11/2010	15:15		23	48	CAS
59	7291467-802111.10	5/11/2010	15:20		23	48	CAS
60	7291467-802109.10	7/30/2010	13:45		23	248	DWH
61	7291467-802109.10	7/30/2010	10:00		23	27	DWH
62	7291467-801724-10	7/30/2010	10:01		23	220.5	DWH



Panel Placement Log

Project: Kekaha Landfill	ProjNo: WGI298
Location: 6900 D Kaunaloa Hwy, Kekaha, HI 96752	TaskNo: 02
Description: Cell 1 C&D Construction	

Primary / Secondary: Secondary **SUBBASE** Series: 2 Material Type: gmf

Panel	Batch-Roll	Date	Time	Placement/Location/Comments	Width (ft.)	Length (ft.)	QA ID
63	7291467-801724-10	7/30/2010	10:03		23	185	DWH
64	7291467-801724-10	7/30/2010	10:40		23	63	DWH
65	7291467-801470-10	7/30/2010	12:42		23	249	DWH
66	7291467-801470-10	7/30/2010	12:51		23	88.5	DWH
67	7291467-801611-10	7/30/2010	13:33		23	81	DWH
68	7291467-801617-10	7/30/2010	13:47		23	79.5	DWH
69	7291467-801617-10	7/30/2010	14:14		23	248.5	DWH
70	7291467-801617-10	7/30/2010	16:30		23	67	DWH
71	7291467-801721-10	7/30/2010	14:36		23	182	DWH
72	7291467-801721-10	7/30/2010	15:04		23	220	DWH
73	7291467-802101-10	7/30/2010	15:13		23	29.5	DWH
74	7291467-802101-10	7/31/2010	7:21		23	249	DWH
75	7291467-802101-10	7/31/2010	7:30		23	124.5	DWH
76	7291467-801741-10	7/31/2010	7:41		23	124.5	DWH
77	7291467-801741-10	7/31/2010	8:12		23	249	DWH
78	7291467-801741-10	7/31/2010	8:50		23	25	DWH
79	7291467-802104-10	7/31/2010	8:58		23	224	DWH
80	7291467-802104-10	7/31/2010	9:10		23	178	DWH
81	7291467-802100-10	7/31/2010	9:20		23	71	DWH
82	7291467-802100-10	7/31/2010	9:40		23	249	DWH
83	7291467-802100-10	7/31/2010	9:52		23	80	DWH
84	7291454-802223-10	7/31/2010	10:04		23	169.5	DWH
85	7291454-802223-10	7/31/2010	10:21		23	170	DWH
86	7291467-801611-10	7/31/2010	10:47		23	79	DWH
87	7291454-802223-10	7/31/2010	11:03		23	62	DWH
88	7291467-802118-10	7/31/2010	11:06		23	187.5	DWH
89	7291467-802118-10	8/2/2010	12:50		23	215.5	DWH
90	7291467-802224-10	8/2/2010	12:55		23	34	DWH
91	7291467-802224-10	8/2/2010	13:15		23	250	DWH
92	7291467-802224-10	8/2/2010	13:16		23	123.5	DWH
93	7291467-802222-10	8/2/2010	13:37		23	128.5	DWH





Panel Placement Log

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WG1298</u>
Location: <u>6900 D Kaunualii Hwy, Kekaha, HI 96752</u>	TaskNo: <u>02</u>
Description: <u>Cell 1 C&amp;D Construction</u>	

Primary / Secondary: Secondary **SUBBASE**      Series: 2      Material Type: gml

Panel	Batch-Roll	Date	Time	Placement/Location/Comments	Width (ft.)	Length (ft.)	QA ID
94	7291467-802222-10	8/2/2010	15:11		23	258.5	DWH
95	7291467-801723-10	8/2/2010	15:25		23	270	DWH
96	7291467-801614-10	8/3/2010	7:30		23	31	DWH
97	7291467-801614-10	8/3/2010	7:31		13.5	27	DWH
98	7291467-801723-10	8/3/2010	7:32		23	50.5	DWH
99	7291467-801723-10	8/3/2010	7:33		23	51.5	DWH
100	7291467-801614-10	8/3/2010	7:34		23	50	DWH
101	7291467-801614-10	8/3/2010	7:35		23	48	DWH
102	7291467-801614-10	8/3/2010	7:36		23	46	DWH
103	7291467-801614-10	8/3/2010	7:41		23	44	DWH
104	7291467-801614-10	8/3/2010	7:43		23	41.5	DWH
105	7291467-801614-10	8/3/2010	7:45		23	39	DWH
106	7291467-801614-10	8/3/2010	7:49		23	37	DWH
107	7291467-801739-10	8/3/2010	7:58		23	35	DWH
108	7291467-801739-10	8/3/2010	8:02		23	31	DWH
109	7291467-801739-10	8/3/2010	8:18		23	14	DWH
110	7291467-801739-10	8/3/2010	8:24		23	5	DWH

Number of Panels: <u>110</u>	Approx. Area (sq. ft.): <u>280711.5</u>
------------------------------	---



Panel Placement Log

Project: Kekaha Landfill  
Location: 6900 D Kaunassli Hwy, Kekaha, HI 96752  
Description: Cell J C&D Construction

ProjNo: WGI298  
TaskNo: 02

Primary / Secondary: Primary			Series: 1		Material Type: gml		
Panel	Batch-Roll	Date	Time	Placement/Location/Comments	Width (ft.)	Length (ft.)	QA ID
1	7291454-802355.10	4/9/2010	10:55		23	249	CAS
2	7291454-802355.10	4/9/2010	11:00		23	162	CAS
3	7291467-802114.10	4/9/2010	11:05		23	86	CAS
4	7291467-802114.10	4/9/2010	13:45		23	246	CAS
5	7291467-802114.10	4/9/2010	14:45		23	68	CAS
6	7291454-802226.10	4/9/2010	14:55		23	177	CAS
7	7291454-802226.10	4/12/2010	8:30		23	230	CAS
8	7291454-802232.10	4/12/2010	8:20		23	22	CAS
9	7291454-802232.10	4/12/2010	10:50		23	251	CAS
10	7291454-802232.10	4/12/2010	10:55		23	133	CAS
11	7291454-802230.10	4/12/2010	11:00		23	118	CAS
12	7291454-802230.10	4/12/2010	14:05		23	218	CAS
13	7291454-802230.10	4/12/2010	14:10		23	29	CAS
14	7291454-802352.10	4/12/2010	14:15		23	220	CAS
15	7291467-802112.10	4/19/2010	8:55		23	96	CAS
16	7291467-802115.10	4/19/2010	9:08		23	155	CAS
17	7291467-802115.10	4/19/2010	10:05		23	247	CAS
18	7291467-802107.10	4/19/2010	11:05		23	193	CAS
19	7291467-802107.10	4/19/2010	11:30		23	215	CAS
20	7291467-802116.10	4/19/2010	13:30		23	199	CAS
21	7291467-802116.10	4/19/2010	13:40		23	199	CAS
22	7291454-802228.10	4/19/2010	13:50		23	200	CAS
23	7291467-802102.10	4/22/2010	8:00		23	203	CAS
24	7291467-802102.10	4/22/2010	8:40		23	203	CAS
25	7291454-802228.10	4/22/2010	9:10		23	194	CAS
26	7291467-802117.10	4/22/2010	9:15		23	13	CAS
27	7291467-802117.10	4/22/2010	10:10		23	208	CAS
28	7291454-802221.10	4/22/2010	10:20		23	207	CAS
29	7291454-802221.10	4/23/2010	10:17		23	191	CAS
30	7291467-802106.10	4/23/2010	10:30		23	68	CAS
31	7291467-802106.10	4/23/2010	11:25		23	152	CAS



Panel Placement Log

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WG1298</u>
Location: <u>6900 D Kaunamuli Hwy, Kekaha, HI 96752</u>	TaskNo: <u>02</u>
Description: <u>Cell 1 C&amp;D Construction</u>	

Primary / Secondary: Primary		Series: 1		Material Type: gmi			
Panel	Batch-Roll	Date	Time	Placement/Location/Comments	Width (ft.)	Length (ft.)	QA ID
32	7291467-802108.10	4/23/2010	11:30		23	72	CAS
33	7291467-802108.10	4/23/2010	13:10		23	56	CAS
34	7291467-802108.10	4/23/2010	13:15		23	30	CAS
35	7291467-802108.10	4/23/2010	13:30		23	28	CAS
36	7291467-802108.10	4/23/2010	14:00		23	25	CAS
37	7291467-802108.10	4/23/2010	14:05		23	23	CAS
38	7291467-802108.10	4/23/2010	14:10		23	21	CAS
39	7291467-802108.10	4/23/2010	14:15		23	19	CAS
40	7291467-802108.10	4/23/2010	14:25		23	38	CAS
41	7291467-802108.10	4/23/2010	14:30		23	37	CAS
42	7291467-801612.10	4/23/2010	14:35		23	58	CAS
43	7291467-802103.10	5/11/2010	10:25		23	42	CAS
44	7291467-802103.10	5/11/2010	10:30		23	33	CAS
45	7291467-802103.10	5/11/2010	10:35		23	18	CAS
46	7291467-802103.10	5/11/2010	10:40		12	10	CAS
47	7291467-802111.10	5/12/2010	9:00		23	56	CAS
48	7291467-802111.10	5/12/2010	9:05		23	40	CAS
49	7291467-802111.10	5/12/2010	9:10		23	52	CAS
50	7291467-801612.10	5/12/2010	9:15		23	65	CAS
51	7291467-801738.10	5/12/2010	9:45		23	47	CAS
52	7291467-801738.10	5/12/2010	9:50		23	43	CAS
53	7291467-801738.10	5/12/2010	10:00		23	52	CAS
54	7291467-801738.10	5/12/2010	10:05		21	50	CAS
55	7291467-801738.10	5/12/2010	10:40		23	47	CAS
56	7291467-801738.10	5/12/2010	10:45		23	48	CAS
57	7291467-801739-10	8/4/2010	8:57		23	249.5	DWH
58	7291467-802473-10	8/4/2010	10:07		23	250	DWH
59	7291467-802473-10	8/4/2010	10:54		23	156	DWH
60	7291467-801727-10	8/4/2010	11:01		23	94	DWH
61	7291467-801727-10	8/4/2010	11:39		21	249.5	DWH
62	7291467-801728-10	8/5/2010	11:14		23	187.5	DWH



Panel Placement Log

Project: Kekaha Landfill  
Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752  
Description: Cell 1 C&D Construction

ProjNo: WG1298  
TaskNo: 02

Primary / Secondary: Primary		Series: 1		Material Type: gml			
Panel	Batch-Roll	Date	Time	Placement/Location/Comments	Width (ft)	Length (ft)	QA ID
63	7291467-801612-10	8/5/2010	11:29		23	61.5	DWH
64	7291467-801723-10	8/5/2010	13:08		23	219	DWH
65	7291467-801739-10	8/5/2010	13:42		23	31.5	DWH
66	7291467-801735-10	8/6/2010	9:37		23	250	DWH
67	7291467-801735-10	8/6/2010	10:37		23	155	DWH
68	7291467-801729-10	8/6/2010	10:48		23	94.5	DWH
69	7291467-801729-10	8/6/2010	11:32		23	249	DWH
70	7291467-801729-10	8/6/2010	13:45		23	59.5	DWH
71	7291467-801732-10	8/6/2010	13:57		23	189.5	DWH
72	7291467-801732-10	8/6/2010	15:02		23	213	DWH
73	7291467-801727-10	8/6/2010	15:11		23	36	DWH
74	7291467-801734-10	8/6/2010	15:34		23	249	DWH
75	7291467-801734-10	8/9/2010	9:31		23	146	DWH
76	7291467-801722-10	8/9/2010	9:42		23	103	DWH
77	7291467-801722-10	8/9/2010	10:10		23	249.5	DWH
78	7291467-801722-10	8/9/2010	11:29		23	49.5	DWH
79	7291467-801733-10	8/9/2010	11:39		23	200.5	DWH
80	7291467-801733-10	8/9/2010	14:35		23	183.5	DWH
81	7291467-801612-10	8/9/2010	14:56		23	65.5	DWH
82	7291467-801725-10	8/9/2010	15:02		23	249	DWH
83	7291467-801725-10	8/10/2010	14:09		23	151	DWH
84	7291467-801737-10	8/10/2010	14:20		23	98	DWH
85	7291467-801737-10	8/10/2010	14:56		23	249.5	DWH
86	7291467-801616-10	8/11/2010	8:40		23	253	DWH
87	7291467-801616-10	8/11/2010	9:42		23	144.5	DWH
88	7291467-801618-10	8/11/2010	9:53		23	116	DWH
89	7291467-801618-10	8/11/2010	10:51		23	272	DWH
90	7291467-801737-10	8/11/2010	13:30		23	34	DWH
91	7291467-801619-10	8/11/2010	13:37		23	32	DWH
92	7291467-801619-10	8/11/2010	13:40		23	24	DWH
93	7291467-801619-10	8/11/2010	13:43		9	17	DWH



Panel Placement Log

Project: Kekaha Landfill	ProjNo: WG1298
Location: 6900 D Kaunaloa Hwy, Kekaha, HI 96752	TaskNo: 02
Description: Cell I C&D Construction	

Primary / Secondary: Primary      Series: 1      Material Type: gml

Panel	Batch-Roll	Date	Time	Placement/Location/Comments	Width (ft.)	Length (ft.)	QA ID
94	7291467-801619-10	8/11/2010	13:45		23	36.5	DWH
95	7291467-801619-10	8/11/2010	13:48		23	39.5	DWH
96	7291467-801619-10	8/11/2010	14:09		23	42	DWH
97	7291467-801619-10	8/11/2010	14:12		23	44	DWH
98	7291467-801619-10	8/11/2010	14:14		23	46	DWH
99	7291467-801619-10	8/11/2010	14:33		23	48.5	DWH
100	7291467-801619-10	8/11/2010	14:37		23	51	DWH
101	7291467-801613-10	8/11/2010	15:06		23	52.5	DWH
102	7291467-801613-10	8/11/2010	15:09		23	52	DWH
103	7291467-801613-19	8/11/2010	15:12		23	31.5	DWH
104	7291467-801613-10	8/11/2010	15:15		11	27	DWH

Number of Panels: 104      Approx. Area (sq. ft.): 281400



Repair Summary Log

Project: Kekaha Landfill  
 Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752  
 Description: Cell 1 C&D Construction  
 Installer: Northwest Lining & Geotextile, Inc.

ProjNo: WQ1298 TaskNo: 02

Primary / Secondary: Secondary SUBBASE Series: 2

Repair Date	Repair ID	DS No	Repair Type	Location				Size			Welder I.D.		QA ID	Non-Destructive Testing				
				Seam	Panel	Distance (ft.)	Offset (ft.)	Length (ft.)	Width (ft.)	Dia. (ft.)	Mach ID	Oper ID		Date	Oper ID	Result (p/i)	Action	QA ID
4/7/2010	2-001		P	2-001-002-003		INT		2	2		5117	AM	CAS	4/7/2010	GM	p		CAS
4/7/2010	2-002	2-001	DS	2-002-003		15-S		6	0		5117	AM	CAS	4/7/2010	GM	p		CAS
4/7/2010	2-003		P	2-002-003-004		INT		2	2		5117	AM	CAS	4/7/2010	GM	p		CAS
4/7/2010	2-004	2-003	DS	2-003-005		157-E		6	0		5117	AM	CAS	4/7/2010	GM	p		CAS
4/7/2010	2-005		P	2-005-006-007		INT		2	2		5117	AM	CAS	4/7/2010	GM	p		CAS
4/7/2010	2-006		P	2-006-007-008		INT		2	2		5117	AM	CAS	4/7/2010	GM	p		CAS
4/7/2010	2-007		P	2-002-004-005		INT		2	2		5117	AM	CAS	4/7/2010	GM	p		CAS
4/7/2010	2-008		P	2-004-005-006		INT		2	2		5117	AM	CAS	4/7/2010	GM	p		CAS
4/7/2010	2-009	2-002	DS	2-001-002		30-E		6	0		5117	AM	CAS	4/7/2010	GM	p		CAS
4/7/2010	2-010	2-005	DS	2-008-009		45-E		6	0		5117	AM	CAS	4/7/2010	GM	p		CAS
4/7/2010	2-011		P	2-008-009-010		INT		2	2		5117	AM	CAS	4/7/2010	GM	p		CAS
4/7/2010	2-012	2-004	DS	2-009-010		8-S		6	0		5117	AM	CAS	4/7/2010	GM	p		CAS
4/7/2010	2-013		P	2-009-010-011		INT		2	2		5117	AM	CAS	4/7/2010	GM	p		CAS
4/7/2010	2-014	2-006	DS	2-011-013		43-E		6	0		5117	AM	CAS	4/7/2010	GM	p		CAS
4/7/2010	2-015		P	2-011-012-013		INT		2	2		5117	AM	CAS	4/7/2010	GM	p		CAS
4/7/2010	2-016		P	2-012-013-014		INT		2	2		5117	AM	CAS	4/7/2010	GM	p		CAS



Repair Summary Log

Project: Kekaha Landfill  
 Location: 8900 D Kaunakūhi Hwy, Kekaha, HI 96757 ProjNo: WG1228 TaskNo: 02  
 Description: Cell 1 C&D Construction  
 Installer: Northwest Lining & Geotextile, Inc.

Primary / Secondary: Secondary **SUBBASE** Series: 2

Repair Date	Repair ID	DS No	Repair Type	Location				Size			Welder I.D.		QA ID	Non-Destructive Testing				
				Seam	Panel	Distance (ft.)	Offset (ft.)	Length (ft.)	Width (ft.)	Dia. (ft.)	Mach ID	Oper ID		Date	Oper ID	Result (p/f)	Action	QA ID
4/7/2010	2-017	2-007	DS	2-014-016			38-E	6	2		5117	AM	CAS	4/7/2010	GM	p		CAS
4/7/2010	2-018		P	2-013-014-015			INT	2	2		5117	AM	CAS	4/7/2010	GM	p		CAS
4/7/2010	2-019		P	2-014-015-016			INT	2	2		5117	AM	CAS	4/7/2010	GM	p		CAS
4/10/2010	2-020		R	2-000-001-003			INT	2	2		5117	AM	CAS	4/10/2010	GM	p		CAS
4/10/2010	2-021		R	2-000-008			10-N	4	4		5117	AM	CAS	4/10/2010	GM	p		CAS
4/10/2010	2-022	2-008	DS	2-000-001			11-S	6	2		5117	AM	CAS	4/10/2010	GM	p		CAS
4/14/2010	2-023		P	2-016-017-018			INT	3	2		5117	AM	CAS	4/15/2010	GM	p		CAS
4/14/2010	2-024		P	2-017-018-020			INT	2	2		5117	AM	CAS	4/15/2010	GM	p		CAS
4/14/2010	2-025		P	2-017-019-020			INT	2	2		5117	AM	CAS	4/15/2010	GM	p		CAS
4/14/2010	2-026		P	2-019-020-022			INT	2	2		5117	AM	CAS	4/15/2010	GM	p		CAS
4/14/2010	2-027		P	2-020-021-022			INT	2	2		5117	AM	CAS	4/15/2010	GM	p		CAS
4/14/2010	2-028	2-009	DS	2-017-018			13-S	6	2		5117	AM	CAS	4/15/2010	GM	p		CAS
4/14/2010	2-029		P	2-021-022-023			INT	2	2		5117	AM	CAS	4/15/2010	GM	p		CAS
4/14/2010	2-030	2-011	DS	2-023-024-025			INT	8	2		5117	AM	CAS	4/15/2010	GM	p		CAS
4/15/2010	2-031		P	2-024-025-026			INT	2	2		5117	AM	CAS	4/15/2010	GM	p		CAS
4/15/2010	2-032		P	2-026-027-028			INT	2	2		5117	AM	CAS	4/15/2010	GM	p		CAS

## Repair Summary Log



Project: Kekaha Landfill  
 Location: 6900 O Kaunualii Hwy, Kekaha, HI 96752 ProjNo: WQ1298 TaskNo: 02  
 Description: Cell 1 C&D Construction  
 Installer: Northwest Lining & Geotextile, Inc.

Primary / Secondary: Secondary SUBBASE Series: 2

Repair Date	Repair ID	DS No	Repair Type	Location				Size			Welder I.D.		QA ID	Non-Destructive Testing				
				Seam	Panel	Distance (ft.)	Offset (ft.)	Length (ft.)	Width (ft.)	Dia. (ft.)	Much ID	Oper ID		Date	Oper ID	Result (p/f)	Action	QA ID
4/15/2010	2-033	2-013	DS	2-026-027		97-W		6	2		5117	AM	CAS	4/15/2010	GM	p		CAS
4/15/2010	2-034		P	2-027-028-029		INT		2	2		5117	AM	CAS	4/15/2010	GM	p		CAS
4/15/2010	2-035		P	2-029-030-31		INT		2	2		5117	AM	CAS	4/15/2010	GM	p		CAS
4/15/2010	2-036		P	2-030-031-032		INT		2	2		5117	AM	CAS	4/15/2010	GM	p		CAS
4/15/2010	2-037	2-014	DS	2-031-032		90-W		6	2		5117	AM	CAS	4/15/2010	GM	p		CAS
4/15/2010	2-038		P	2-032-033-034		INT		2	2		5117	AM	CAS	4/15/2010	GM	p		CAS
4/15/2010	2-039	2-015	DS	2-033-034-035		INT		8	2		5117	AM	CAS	4/15/2010	GM	p		CAS
4/15/2010	2-040	2-016	DS	2-032-033		33-W		6	2		5117	AM	CAS	4/15/2010	GM	p		CAS
4/15/2010	2-041		P	2-000-017-019		INT		3	2		5117	AM	CAS	4/15/2010	GM	p		CAS
4/15/2010	2-042		P	2-000-019		4-S		3	2		5117	AM	CAS	4/15/2010	GM	p		CAS
4/15/2010	2-043	2-012	DS	2-000-022		5-N		6	2		5117	AM	CAS	4/15/2010	GM	p		CAS
4/15/2010	2-044		P	2-000-023-024		INT		2	2		5117	AM	CAS	4/15/2010	GM	p		CAS
4/20/2010	2-045	2-018	C	2-028-029		90-W		6	2		5117	AM	CAS	4/20/2010	GM	p		CAS
4/20/2010	2-046	2-014	C	2-031-032		90-W		6	2		5117	AM	CAS	4/20/2010	GM	p		CAS
4/20/2010	2-047		C	2-031-032-R-46-R48		INT		28	2		5117	AM	CAS	4/20/2010	GM	p		CAS
4/20/2010	2-048	2-017	C	2-031-032-R-47-R49		INT		6	2		5117	AM	CAS	4/20/2010	GM	p		CAS





Repair Summary Log

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WQ1204</u>	TaskNo: <u>12</u>
Location: <u>6900 D Kaunualii Hwy, Kekaha, HI 96752</u>		
Description: <u>Cell 1 C&amp;D Construction</u>		
Installer: <u>Northwest Lining &amp; Geotextile, Inc.</u>		

Primary / Secondary: <u>Secondary</u> <b>SUBBASE</b>	Series: <u>2</u>
--	------------------

Repair Date	Repair ID	DS No	Repair Type	Location				Size			Welder I.D.		QA ID	Non-Destructive Testing				
				Seam	Panel	Distance (ft.)	Offset (ft.)	Length (ft.)	Width (ft.)	Dia. (ft.)	Mach ID	Oper ID		Date	Oper ID	Result (p/f)	Action	QA ID
4/20/2010	2-049		C	2-031-032-R-48-R50		INT		27	2		5117	AM	CAS	4/20/2010	GM	p		CAS
4/20/2010	2-050		C	2-031-032-R-36-R49		INT		25	2		5117	AM	CAS	4/20/2010	GM	p		CAS
4/20/2010	2-051		C	2-031-032-R-36-R52		INT		19	2		5117	AM	CAS	4/20/2010	GM	p		CAS
4/20/2010	2-052		C	2-031-032-R-51-R53		INT		28	2		5117	AM	CAS	4/20/2010	GM	p		CAS
4/20/2010	2-053		C	2-031-032-R-52-R54		INT		27	2		5117	AM	CAS	4/20/2010	GM	p		CAS
4/20/2010	2-054		C	2-000-031-032-R53		INT		27	2		5117	AM	CAS	4/20/2010	GM	p		CAS
4/21/2010	2-055	2-020	DS	2-001-037		26-E		6	2		5117	AM	CAS	4/21/2010	GM	p		CAS
4/21/2010	2-056		P	2-037-043-044		INT		2	2		5117	AM	CAS	4/21/2010	GM	p		CAS
4/21/2010	2-057		P	2-037-041-043		INT		2	2		5117	AM	CAS	4/21/2010	GM	p		CAS
4/21/2010	2-058		P	2-037-042-043		INT		2	2		5117	AM	CAS	4/21/2010	GM	p		CAS
4/21/2010	2-059		P	2-037-040-041		INT		2	2		5117	AM	CAS	4/21/2010	GM	p		CAS
4/21/2010	2-060		P	2-037-039-040		INT		2	2		5117	AM	CAS	4/21/2010	GM	p		CAS
4/21/2010	2-061		P	2-037-038-039		INT		2	2		5117	AM	CAS	4/21/2010	GM	p		CAS
4/21/2010	2-062	2-019	DS	2-037-038		6-W		6	2		5117	AM	CAS	4/21/2010	GM	p		CAS
4/21/2010	2-063		P	2-037-038-045		INT		2	2		5117	AM	CAS	4/21/2010	GM	p		CAS
4/21/2010	2-064	2-021	DS	2-038-045		10-S		6	2		5117	AM	CAS	4/21/2010	GM	p		CAS



## Repair Summary Log

Project: Kekaha Landfill  
 Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752  
 Description: Cell 1 C&D Construction  
 Installer: Northwest Lining & Geotextile, Inc.

ProjNo: WG1298      TaskNo: 02

Primary / Secondary: Secondary      **SUBBASE**      Series: 2

Repair Date	Repair ID	DS No	Repair Type	Location				Size			Welder I.D.		QA ID	Non-Destructive Testing				
				Seam	Panel	Distance (ft.)	Offset (ft.)	Length (ft.)	Width (ft.)	Dia. (ft.)	Mach ID	Oper ID		Date	Oper ID	Result (p/f)	Action	QA ID
4/21/2010	2-065		P	2-038-045		3-S		3	2		5117	AM	CAS	4/21/2010	GM	p		CAS
4/21/2010	2-066		P	2-001-037-045		INT		3	2		5117	AM	CAS	4/21/2010	GM	p		CAS
4/21/2010	2-067		P	2-001-036-045		INT		2	2		5117	AM	CAS	4/21/2010	GM	p		CAS
4/21/2010	2-068		P	2-036-045-046		INT		2	2		5117	AM	CAS	4/21/2010	GM	p		CAS
4/21/2010	2-069		P	2-036-046-047		INT		2	2		5117	AM	CAS	4/21/2010	GM	p		CAS
4/22/2010	2-070	2-022	C	2-001-037		16-E		6	2		5117	AM	CAS	4/22/2010	GM	p		CAS
4/22/2010	2-071		C	2-001-037-R70-R72		INT		4	2		5117	AM	CAS	4/22/2010	GM	p		CAS
4/22/2010	2-072		C	2-001-037-R55-R71		INT		10	2		5117	AM	CAS	4/22/2010	GM	p		CAS
4/22/2010	2-073		C	2-001-037-R55-R74		INT		10	2		5117	AM	CAS	4/22/2010	GM	p		CAS
4/22/2010	2-074	2-023	C	2-001-037		36-E		6	2		5117	AM	CAS	4/22/2010	GM	p		CAS
4/22/2010	2-075		P		2-045	30-S	12-W	14	4		5117	AM	CAS	4/22/2010	GM	p		CAS
5/11/2010	2-076		P	2-036-047-048		INT		3	3		5117	AM	CAS	5/11/2010	GM	p		CAS
5/11/2010	2-077		P	2-036-048-049		INT		2	2		5117	AM	CAS	5/11/2010	GM	p		CAS
5/11/2010	2-078		P		2-053	30-E	4-N	4	14		5117	AM	CAS	5/11/2010	GM	p		CAS
5/11/2010	2-079		P	2-023-025-052				2	2		5117	AM	CAS	5/11/2010	GM	p		CAS
5/11/2010	2-080	2-010	DS	2-020-021		16-E		6	2		5117	AM	CAS	5/11/2010	GM	p		CAS



Repair Summary Log

Project: Kekaha Landfill  
 Location: 6900 D Kaunaulii Hwy, Kekaha, HI 96752      ProjNo: WG1298      TaskNo: 02  
 Description: Cell I C&D Construction  
 Installer: Northwest Lining & Geotextile, Inc.

Primary / Secondary: Secondary SUBBASE      Series: 2

Repair Date	Repair ID	DS No	Repair Type	Location				Size			Welder I.D.		QA ID	Non-Destructive Testing				
				Seam	Panel	Distance (ft.)	Offset (ft.)	Length (ft.)	Width (ft.)	Dia. (ft.)	Mach ID	Oper ID		Date	Oper ID	Result (p/f)	Action	QA ID
5/11/2010	2-081		S		2-023	15-N	2-E	23	3		5117	AM	CAS	5/11/2010	GM	p		CAS
5/11/2010	2-082		P	2-026-028-053-054		INT		3	2		5117	AM	CAS	5/11/2010	GM	p		CAS
5/11/2010	2-083		P	2-028-029-054-055		INT		2	2		5117	AM	CAS	5/11/2010	GM	p		CAS
5/11/2010	2-084		P	2-029-031-055-056		INT		2	2		5117	AM	CAS	5/11/2010	GM	p		CAS
5/11/2010	2-085		P	2-031-032-056-057		INT		2	2		5117	AM	CAS	5/11/2010	GM	p		CAS
5/11/2010	2-086		P	2-032-034-057-058		INT		5	2		5117	AM	CAS	5/11/2010	GM	p		CAS
5/11/2010	2-087		P	2-033-035-058-059		INT		2	2		5117	AM	CAS	5/11/2010	GM	p		CAS
5/12/2010	2-088		P		2-047	15-S	5-E	5	5		5117	AM	CAS	5/12/2010	GM	p		CAS
8/2/2010	2-089		p	59-60		46 E		2	2		5117	AM	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-090	24	p	35-60		163 E		5	2		5117	AM	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-091		t	00-35-60		INT		1			5117	AM	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-092		p	00-60-61		INT		2	2		5117	AM	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-093		p	60-61-62		INT		2	1		5117	AM	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-094	25	DS	62-63		162 E		5	2		5117	AM	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-095		p	62-63-64		INT		2	1		5117	AM	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-096	26	DS	63-64		8 S		5	2		5117	AM	DWH	8/3/2010	ASM	p		DWH



## Repair Summary Log

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WG129E</u>	TaskNo: <u>02</u>
Location: <u>6900 D Kaunualii Hwy, Kekaha, HI 96752</u>		
Description: <u>Cell 1 C&amp;D Construction</u>		
Installer: <u>Northwest lining &amp; Geotextile, Inc.</u>		

Primary / Secondary: <u>Secondary SUBBASE</u>	Series: <u>2</u>
---	------------------

Repair Date	Repair ID	DS No	Repair Type	Location				Size			Welder I.D.		QA ID	Non-Destructive Testing				
				Seam	Panel	Distance (ft.)	Offset (ft.)	Length (ft.)	Width (ft.)	Dia. (ft.)	Mach ID	Oper ID		Date	Oper ID	Result (p/f)	Action	QA ID
8/2/2010	2-097		p	63-64-65		INT		2	1		5117	AM	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-098		p		65	214 E		1	1		5117	AM	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-099		p	61-62-64		INT		2	1		5117	AM	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-100		p	00-61-64		INT		6	2		5117	AM	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-101		p	00-64-65		INT		2	1		5117	AM	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-102		i	00-65-66		INT		1			5117	AM	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-103		i	00-66-69		INT		1			5117	AM	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-104		p	66-68-69		INT		2	2		5117	AM	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-105		p	65-66-68		INT		3	2		5117	AM	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-106		p	65-67-68		INT		3	1		5117	AM	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-107		p	67-68-69		INT		2	1		5117	AM	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-108		p		67	69 E	2 S	1	1		5117	AM	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-109	27	DS	67-69		66 E		5	2		5117	AM	DWH	8/3/2010	ASM	p		DWH
7/30/2010	2-110		p		67	39 E	4 N	13	4		5117	JM	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-111		p		71	8 E	5 S	1	1		5117	AM	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-112	28	DS	69-71		165 E		5	2		5117	AM	DWH	8/3/2010	ASM	p		DWH

## Repair Summary Log



Project: Kekaha Landfill  
 Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752  
 Description: Cell 1 C&D Construction  
 Installer: Northwest Lining & Geotextile, Inc.

ProjNo: WGL1298 TaskNo: 02

Primary / Secondary: Secondary SUBBASE Series: 2

Repair Date	Repair ID	DS No	Repair Type	Location				Size			Welder I.D.		QA ID	Non-Destructive Testing				
				Seam	Panel	Distance (ft.)	Offset (ft.)	Length (ft.)	Width (ft.)	Dia. (ft.)	Mach ID	Oper ID		Date	Oper ID	Result (p/f)	Action	QA ID
8/2/2010	2-113		p	69-70-71		INT		2	2		5117	AM	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-114		t	00-69-70		INT		1			5117	AM	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-115		t	00-70-73		INT		1			5117	AM	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-116		p	70-72-73		INT		2	1		5117	AM	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-117		p	70-71-72		INT		2	1		5117	AM	DWH	8/3/2010	ASM	p		DWH
8/3/2010	2-118		t	00-73-74		INT		1			5117	JM	DWH	8/3/2010	ASM	p		DWH
8/3/2010	2-119		t	00-74-75		INT		1			5117	JM	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-120		p	72-73-74		INT		2	1		5117	AM	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-121	29	DS	72-74		130 E		5	2		5117	AM	DWH	8/3/2010	ASM	p		DWH
8/3/2010	2-122		p	74-75-76		INT		2	1		5117	AM	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-123	30	DS	75-76		10 S		5	1		5117	AM	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-124		p	75-76-77		INT		2	1		5117	AM	DWH	8/3/2010	ASM	p		DWH
8/3/2010	2-125		t	00-75-77		INT		1			5117	JM	DWH	8/3/2010	ASM	p		DWH
8/3/2010	2-126		t	00-77-78		INT		1	1		5117	JM	DWH	8/3/2010	ASM	p		DWH
8/3/2010	2-127		t	78-81		INT		1			5117	JM	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-128		p	78-79-81		INT		2	1		5117	AM	DWH	8/3/2010	ASM	p		DWH



Repair Summary Log

Project: Kekaha Landfill  
 Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752  
 Description: Cell 1 C&D Construction  
 Installer: Northwest Lining & Geotextile, Inc.

Proj No: WG1298      Tank No: 02

Primary / Secondary: Secondary SUBBASE      Series: 2

Repair Date	Repair ID	DS No	Repair Type	Location				Size			Welder I.D.		QA ID	Non-Destructive Testing				
				Seam	Panel	Distance (ft.)	Offset (ft.)	Length (ft.)	Width (ft.)	Dir. (ft.)	Mach ID	Oper ID		Date	Oper ID	Result (p/f)	Action	QA ID
8/2/2010	2-129		p	77-78-79		INT		2	1		5117	AM	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-130	31	DS	79-80		186 E		5	2		5117	RA	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-131		p	80-81-82		INT		2	1		5117	RA	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-132		p	86-88		36 E		1	1		5117	RA	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-133		p	86-88		40 E		13	3		5117	AM	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-134		p	86-88		44 E		2	1		5117	RA	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-135		p	85-86-88		INT		3	2		5117	RA	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-136	33	DS	84-85-86		INT		6	2		5117	RA	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-137		p	85-84-85		INT		2	1		5117	RA	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-138		p	82-83-84		INT		2	1		5117	RA	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-139	32	DS	83-85		178 E		5	2		5117	RA	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-140		p	85-87-88		INT		2	1		5117	RA	DWH	8/3/2010	ASM	p		DWH
8/3/2010	2-141		t	00-85-87		INT		1			5117	JM	DWH	8/3/2010	ASM	p		DWH
8/3/2010	2-142		t	00-83-85		INT		1			5117	JM	DWH	8/3/2010	ASM	p		DWH
8/3/2010	2-143		t	00-82-83		INT		1			5117	RA	DWH	8/3/2010	ASM	p		DWH
8/3/2010	2-144		t	00-81-82		INT		1			5117	RA	DWH	8/3/2010	ASM	p		DWH



## Repair Summary Log

Project: Kekaha Landfill  
 Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752 ProjNo: WG1298 TaskNo: 02  
 Description: Cell 1 C&D Construction  
 Installer: Northwest Lining & Geotextile, Inc.

Primary / Secondary: **Secondary SUBBASE** Series: **2**

Repair Date	Repair ID	DS No	Repair Type	Location				Size			Welder I.D.		QA ID	Non-Destructive Testing				
				Seam	Panel	Distance (ft.)	Offset (ft.)	Length (ft.)	Width (ft.)	Dia. (ft.)	Mach ID	Oper ID		Date	Oper ID	Result (p/f)	Action	QA ID
8/3/2010	2-145		c	81-82		INT		23	2		263	AM	DWH	8/3/2010	ASM	p		DWH
8/3/2010	2-146		c	83-84		INT		23	2		263	AM	DWH	8/3/2010	ASM	p		DWH
8/3/2010	2-147		c	86-88		INT		23	2		263	AM	DWH	8/3/2010	ASM	p		DWH
8/3/2010	2-148	39	DS	87-88		INT		6	2		263	AM	DWH	8/3/2010	ASM	p		DWH
8/3/2010	2-149	41	DS	79-80		145 E		5	2		263	AM	DWH	8/3/2010	ASM	p		DWH
8/3/2010	2-150		c	78-79-80-81		150-250 E		97	2		263	AM	DWH	8/3/2010	ASM	p		DWH
8/3/2010	2-151	42	DS	00-81		8 N		5	2		263	JM	DWH	8/3/2010	ASM	p		DWH
8/3/2010	2-152		c	78-79		INT		22.5	2		263	AM	DWH	8/3/2010	ASM	p		DWH
8/3/2010	2-153		c	80-81		INT		22.5	2		263	AM	DWH	8/3/2010	ASM	p		DWH
8/3/2010	2-154		c	75-76		INT		6	2		263	JM	DWH	8/3/2010	ASM	p		DWH
8/3/2010	2-155	40	DS	00-81		10 N		5	2		263	AM	DWH	8/5/2010	ASM	p		DWH
8/2/2010	2-156		p		88	41 E	4 N	1	1		5117	RA	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-157		p	88-89		47 E		3	2		5117	RA	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-158	34	DS	88-89		71 E		5	2		5117	RA	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-159		p	87-88-89		INT		2	2		5117	AM	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-160		p	87-89-90		INT		1	1		5117	RA	DWH	8/3/2010	ASM	p		DWH



Repair Summary Log

Project: Kekaha Landfill  
 Location: 6900 D Kaunuaui Hwy, Kekaha, HI 96752  
 Description: Cell 1 C&D Construction  
 Installer: Northwest Lining & Geotextile, Inc.

ProjNo: WG1298 TaskNo: 02

Primary / Secondary: Secondary **SUBBASE** Series: 2

Repair Date	Repair ID	DS No	Repair Type	Location				Size			Welder I.D.		QA ID	Non-Destructive Testing				
				Seam	Panel	Distance (ft.)	Offset (ft.)	Length (ft.)	Width (ft.)	Dia. (ft.)	Mach ID	Oper ID		Date	Oper ID	Result (p/f)	Action	QA ID
8/2/2010	2-161		p	89-90-91		INT		1	1		5117	AM	DWH	8/3/2010	ASM	p		DWH
8/3/2010	2-162		p		90	231 E	6 S	1	1		5117	JM	DWH	8/3/2010	ASM	p		DWH
8/3/2010	2-163		p		90	237 E	6 S	1	1		5117	JM	DWH	8/3/2010	ASM	p		DWH
8/3/2010	2-164		p		90	245 E	6 S	1	1		5117	JM	DWH	8/3/2010	ASM	p		DWH
8/3/2010	2-165		t	00-87-90		INT		1			5117	JM	DWH	8/3/2010	ASM	p		DWH
8/3/2010	2-166		t	00-90-91		INT		1			5117	JM	DWH	8/3/2010	ASM	p		DWH
8/3/2010	2-167		t	00-91-93		INT		1			5117	JM	DWH	8/3/2010	ASM	p		DWH
8/3/2010	2-168		t	00-93-94		INT		1			5117	JM	DWH	8/3/2010	ASM	p		DWH
8/3/2010	2-169		t	00-94-95		INT		1			5117	JM	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-170	35	DS	91-93		152 E		5	2		5117	RA	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-171		p	91-92-93		INT		2	1		5117	RA	DWH	8/3/2010	ASM	p		DWH
8/2/2010	2-172		p	92-93-94		INT		2	1		5117	RA	DWH	8/3/2010	ASM	p		DWH
8/4/2010	2-173		p	97-98		1 N		1	1		5117	AM	DWH	8/4/2010	ASM	p		DWH
8/4/2010	2-174		p	96-97-98		INT		2	1		5117	AM	DWH	8/4/2010	ASM	p		DWH
8/4/2010	2-175		p		96	28 E	9 N	1	1		5117	AM	DWH	8/4/2010	ASM	p		DWH
8/4/2010	2-176		p	95-96-98		INT		2	1		5117	AM	DWH	8/4/2010	ASM	p		DWH





Repair Summary Log

Project: Kekaha Landfill  
 Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752 Proj No: W01208 Task No: 02  
 Description: Cell 1 C&D Construction  
 Installer: Northwest Lining & Geotextile, Inc.

Primary / Secondary: Secondary SUBBASE Series: 2

Repair Date	Repair ID	DS No	Repair Type	Location				Size			Welder ID		QA ID	Non-Destructive Testing				
				Seam	Panel	Distance (ft.)	Offset (ft.)	Length (ft.)	Width (ft.)	Dia. (ft.)	Mach ID	Oper ID		Date	Oper ID	Result (p/f)	Action	QA ID
8/4/2010	2-177		p	95-98-99		INT		2	1		5117	AM	DWH	8/4/2010	ASM	p		DWH
8/4/2010	2-178		p	95-99-100		INT		2	1		5117	AM	DWH	8/4/2010	ASM	p		DWH
8/4/2010	2-179	38	DS	95-100		98 E		5	2		5117	AM	DWH	8/4/2010	ASM	p		DWH
8/4/2010	2-180		p	95-100-101		INT		2	1		5117	AM	DWH	8/4/2010	ASM	p		DWH
8/4/2010	2-181		p	95-101-102		INT		2	1		5117	AM	DWH	8/4/2010	ASM	p		DWH
8/4/2010	2-182	37	DS	101-102		35 N		5	2		5117	AM	DWH	8/4/2010	ASM	p		DWH
8/4/2010	2-183		p	95-102-103		INT		2	1		5117	AM	DWH	8/4/2010	ASM	p		DWH
8/4/2010	2-184		c	89-91-92		2 E		25	2		5117	AM	DWH	8/4/2010	ASM	p		DWH
8/4/2010	2-185		p	95-103-104		INT		2	1		5117	AM	DWH	8/4/2010	ASM	p		DWH
8/4/2010	2-186		p	95-104-105		INT		2	1		5117	AM	DWH	8/4/2010	ASM	p		DWH
8/4/2010	2-187		p	95-105-106		INT		2	1		5117	AM	DWH	8/4/2010	ASM	p		DWH
8/4/2010	2-188	36	DS	94-95		177 E		5	2		5117	AM	DWH	8/4/2010	ASM	p		DWH
8/4/2010	2-189		p	95-106-107		INT		2	1		5117	AM	DWH	8/4/2010	ASM	p		DWH
8/4/2010	2-190		p		107	31 N	12 E	2	1		5117	AM	DWH	8/4/2010	ASM	p		DWH
8/4/2010	2-191		p		107	25 N	12 E	2	1		5117	AM	DWH	8/4/2010	ASM	p		DWH
8/4/2010	2-192		p	95-107-108		INT		2	1		5117	AM	DWH	8/4/2010	ASM	p		DWH



Repair Summary Log

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WG1228</u>	TaskNo: <u>02</u>
Location: <u>6900 D Kaunuaolu Hwy, Kekaha, HI 96752</u>		
Description: <u>Cell I C&amp;D Construction</u>		
Installer: <u>Northwest Lining &amp; Geotextile, Inc.</u>		

Primary / Secondary: Secondary SUBBASE Series: 2

Repair Date	Repair ID	DS No	Repair Type	Location				Size			Welder I.D.		QA ID	Non-Destructive Testing				
				Seam	Panel	Distance (ft.)	Offset (ft.)	Length (ft.)	Width (ft.)	Dia. (ft.)	Mach ID	Oper ID		Date	Oper ID	Result (p/f)	Action	QA ID
8/5/2010	2-193		I	00-95-108		INT		1			5117	AM	DWH	8/5/2010	ASM	p		DWH
8/5/2010	2-194		I	00-108-109		INT		1			5117	AM	DWH	8/5/2010	ASM	p		DWH
8/5/2010	2-195		I	00-109-110		INT		1			5117	AM	DWH	8/5/2010	ASM	p		DWH
8/5/2010	2-196		C	67-68		INT		15	5		5117	AM	DWH	8/5/2010	ASM	p		DWH



## Repair Summary Log

Project: Kekaha Landfill  
 Location: 5900 D Kaunaloa Hwy, Kekaha, HI 96752 Profile: WG1295 Task No: 02  
 Description: Cell 1 C&D Construction  
 Installer: Northwest Lining & Geotextile, Inc.

Primary / Secondary: Primary Series: 1

Repair Date	Repair ID	DS No	Repair Type	Location				Size			Welder I.D.		QA ID	Non-Destructive Testing				
				Seam	Panel	Distance (ft.)	Offset (ft.)	Length (ft.)	Width (ft.)	Dia. (ft.)	Mach ID	Oper ID		Date	Oper ID	Result (p/f)	Action	QA ID
4/10/2010	1-001	1-003	DS	1-005-006		9-N		6	2		5117	AM	CAS	4/10/2010	GM	p		CAS
4/10/2010	1-002		P	1-004-005-006		INT		2	2		5117	AM	CAS	4/10/2010	GM	p		CAS
4/10/2010	1-003		P	1-002-003-004		INT		2	2		5117	AM	CAS	4/10/2010	GM	p		CAS
4/10/2010	1-004	1-001	DS	1-001-002-003		INT		6	2		5117	AM	CAS	4/10/2010	GM	p		CAS
4/10/2010	1-005	1-002	DS	1-002-004		166-E		6	2		5117	AM	CAS	4/10/2010	GM	p		CAS
4/10/2010	1-006		R		1-002	158-E	10-N	2	2		5117	AM	CAS	4/10/2010	GM	p		CAS
4/10/2010	1-007		R		1-002	158-E	8-N	2	2		5117	AM	CAS	4/10/2010	GM	p		CAS
4/12/2010	1-008		R		1-004	240-E	15-N	2	2		5117	AM	CAS	4/13/2010	GM	p		CAS
4/12/2010	1-009		P	1-000-004-005		INT		5	2		5117	AM	CAS	4/13/2010	GM	p		CAS
4/12/2010	1-010		P	1-000-005		INT		2	2		5117	AM	CAS	4/13/2010	GM	p		CAS
4/12/2010	1-011		P	1-000-005		INT		2	2		5117	AM	CAS	4/13/2010	GM	p		CAS
4/13/2010	1-012		P	1-000-005		INT		4	2		5117	AM	CAS	4/13/2010	GM	p		CAS
4/13/2010	1-013	1-007	DS	1-000-013		10-S		6	2		5117	AM	CAS	4/13/2010	GM	p		CAS
4/13/2010	1-014	1-006	DS	1-013-014		5-S		6	2		5117	AM	CAS	4/13/2010	GM	p		CAS
4/13/2010	1-015		P	1-012-013-014		INT		2	2		5117	AM	CAS	4/13/2010	GM	p		CAS
4/13/2010	1-016		P	1-010-011-012		INT		2	2		5117	AM	CAS	4/13/2010	GM	p		CAS

Repair Summary Log

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WG1298</u>	TaskNo: <u>02</u>
Location: <u>6900 D Kaunualii Hwy, Kekaha, HI 96752</u>		
Description: <u>Cell 1 C&amp;D Construction</u>		
Installer: <u>Northwest Lining &amp; Geotextile, Inc.</u>		

Primary / Secondary: <u>Primary</u>	Series: <u>1</u>
-------------------------------------	------------------

Repair Date	Repair ID	DS No	Repair Type	Location				Size			Welder I.D.		QA ID	Non-Destructive Testing					
				Seam	Panel	Distance (ft.)	Offset (ft.)	Length (ft.)	Width (ft.)	Dia. (ft.)	Mach ID	Oper ID		Date	Oper ID	Result (p/f)	Action	QA ID	
4/15/2010	1-017	1-005	DS	1-009-010-011			INT		8	2		5117	AM	CAS	4/13/2010	GM	p		CAS
4/13/2010	1-018	1-004	DS	1-006-007			110-E		6	2		5117	AM	CAS	4/13/2010	GM	p		CAS
4/13/2010	1-019		P	1-006-007-008			INT		2	2		5117	AM	CAS	4/13/2010	GM	p		CAS
4/13/2010	1-020		P	1-007-008-009			INT		2	2		5117	AM	CAS	4/13/2010	GM	p		CAS
4/13/2010	1-021		P	1-005-006-007			INT		2	2		5117	AM	CAS	4/13/2010	GM	p		CAS
4/20/2010	1-022		P	1-001-015-016			INT		2	2		5117	AM	CAS	4/20/2010	GM	p		CAS
4/20/2010	1-023		P		1-001		1-N	81-W	2	2		5117	AM	CAS	4/20/2010	GM	p		CAS
4/20/2010	1-024		P	1-015-016-017			INT		2	2		5117	AM	CAS	4/20/2010	GM	p		CAS
4/20/2010	1-025	1-009	DS	1-018-019			117-W		6	2		5117	AM	CAS	4/20/2010	GM	p		CAS
4/20/2010	1-026	1-010	DS	1-021-022			25-W		6	2		5117	AM	CAS	4/20/2010	GM	p		CAS
4/20/2010	1-027	1-008	DS	1-015-017			8-W		6	2		5117	AM	CAS	4/20/2010	GM	p		CAS
4/20/2010	1-028		P		1-017		2-W	15-N	3	2		5117	AM	CAS	4/20/2010	GM	p		CAS
4/20/2010	1-029		P	1-000-017-R28			INT		2	2		5117	AM	CAS	4/20/2010	GM	p		CAS
4/20/2010	1-030		P	1-000-017-018			INT		2	2		5117	AM	CAS	4/20/2010	GM	p		CAS
4/22/2010	1-031	1-012	DS	1-023-024			186-W		6	2		5117	AM	CAS	4/22/2010	GM	p		CAS
4/22/2010	1-032		P	1-024-025-026			INT		2	2		5117	AM	CAS	4/22/2010	GM	p		CAS



Repair Summary Log

Project: Kekaha Landfill  
 Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752      Proj No: WG1208      Task No: 02  
 Description: Cell 1 C&D Construction  
 Installer: Northwest Lining & Geotextile, Inc.

Primary / Secondary: Primary      Series: 1

Repair Date	Repair ID	DS No	Repair Type	Location				Size			Welder I.D.		QA ID	Non-Destructive Testing				
				Seam	Panel	Distance (ft.)	Offset (ft.)	Length (ft.)	Width (ft.)	Dia. (ft.)	Mach ID	Oper ID		Date	Oper ID	Result (p/t)	Action	QA ID
4/22/2010	1-033	1-013	DS	1-025-026		S-S		6	2		5117	AM	CAS	4/22/2010	GM	p		CAS
4/22/2010	1-034		P	1-025-026-027		INT		2	2		5117	AM	CAS	4/22/2010	GM	p		CAS
4/22/2010	1-035	1-015	DS	1-027-028		188-W		6	2		5117	AM	CAS	4/22/2010	GM	p		CAS
4/22/2010	1-036	1-011	DS	1-000-022		6-N		6	2		5117	AM	CAS	4/22/2010	GM	p		CAS
4/22/2010	1-037		C	1-000-022-R36		INT		11	2		5117	AM	CAS	4/22/2010	GM	p		CAS
4/22/2010	1-038		C	1-000-021-022		INT		5	3		5117	AM	CAS	4/22/2010	GM	p		CAS
4/22/2010	1-039		C	1-000-021-R36-R40		INT		11	2		5117	AM	CAS	4/22/2010	GM	p		CAS
4/22/2010	1-040		C	000-020-R21-R39-R		INT		6	2		5117	AM	CAS	4/22/2010	GM	p		CAS
4/22/2010	1-041		C	000-020-R21-R40-R		INT		2	2		5117	AM	CAS	4/22/2010	GM	p		CAS
4/22/2010	1-042		C	000-020-019-R41-R		INT		17	2		5117	AM	CAS	4/22/2010	GM	p		CAS
4/22/2010	1-043		C	000-018-019-R42-R		INT		27	2		5117	AM	CAS	4/22/2010	GM	p		CAS
4/22/2010	1-044		C	1-000-018-R43-R45		INT		17	2		5117	AM	CAS	4/22/2010	GM	p		CAS
4/22/2010	1-045		C	1-000-017-R44-R46		INT		15	4		5117	AM	CAS	4/22/2010	GM	p		CAS
4/22/2010	1-046		C	1-000-015-R45-R47		INT		29	2		5117	AM	CAS	4/22/2010	GM	p		CAS
4/22/2010	1-047		C	1-000-015-R46-R48		INT		5	2		5117	AM	CAS	4/22/2010	GM	p		CAS
4/22/2010	1-048		C	1-000-015-R47-R49		INT		8	2		5117	AM	CAS	4/22/2010	GM	p		CAS



Repair Summary Log

Project: Kekaha Landfill  
 Location: @900 D Kaunuailli Hwy, Kekaha, HI 96757  
 Description: Cell L.C.&D Construction  
 Installer: Northwest Linning & Geotextile, Inc.

ProjNo: WG1298 TaskNo: 02

Primary / Secondary: Primary Series: 1

Repair Date	Repair ID	DS No	Repair Type	Location				Size			Welder I.D.		QA ID	Non-Destructive Testing				
				Seam	Panel	Distance (ft.)	Offset (ft.)	Length (ft.)	Width (ft.)	Dia. (ft.)	Mach ID	Oper ID		Date	Oper ID	Result (p/f)	Action	QA ID
4/22/2010	1-049	1-014	DS	1-000-001-R48				6	3		5117	AM	CAS	4/22/2010	GM	p		CAS
4/23/2010	1-050		P	1-031-034-035				2	2		5117	AM	CAS	4/23/2010	GM	p		CAS
4/23/2010	1-051		P	1-031-035-036				2	2		5117	AM	CAS	4/23/2010	GM	p		CAS
4/23/2010	1-052		P	1-031-036-037				2	2		5117	AM	CAS	4/23/2010	GM	p		CAS
4/23/2010	1-053	1-017	DS	1-031-037-038				6	2		5117	AM	CAS	4/23/2010	GM	p		CAS
4/23/2010	1-054		P	1-021-038-039				2	2		5117	AM	CAS	4/23/2010	GM	p		CAS
4/23/2010	1-055	1-016	DS	1-029-031	34-E			6	2		5117	AM	CAS	4/23/2010	GM	p		CAS
4/23/2010	1-056		P	1-029-031-032				4	2		5117	AM	CAS	4/23/2010	GM	p		CAS
4/23/2010	1-057		P	1-029-033-042				2	2		5117	AM	CAS	4/23/2010	GM	p		CAS
4/23/2010	1-058		P	1-029-030-042				2	2		5117	AM	CAS	4/23/2010	GM	p		CAS
4/23/2010	1-059		P	1-011-033-034				4	2		5117	AM	CAS	4/23/2010	GM	p		CAS
4/23/2010	1-060		P	1-032-041-042				2	2		5117	AM	CAS	4/23/2010	GM	p		CAS
4/23/2010	1-061		P	1-032-040-041				2	2		5117	AM	CAS	4/23/2010	GM	p		CAS
4/23/2010	1-062	1-018	DS	1-032-042	6-N			6	2		5117	AM	CAS	4/23/2010	GM	p		CAS
4/23/2010	1-063		P	1-030-032-042				6	2		5117	AM	CAS	4/23/2010	GM	p		CAS
4/23/2010	1-064		P	1-014-029-030				2	2		5117	AM	CAS	4/23/2010	GM	p		CAS



Repair Summary Log

Project: Kekaha Landfill  
 Location: 6900 D Naumouali Hwy, Kekaha, HI 96752 ProjNo: W/G1298 TaskNo: 02  
 Description: Cell 1 C&D Construction  
 Installer: Northwest lining & Geotextile, Inc.

Primary / Secondary: Primary

Series: 1

Repair Date	Repair ID	DS No	Repair Type	Location				Size			Welder I.D.		QA ID	Non-Destructive Testing				
				Seam	Panel	Distance (ft.)	Offset (ft.)	Length (ft.)	Width (ft.)	Dia. (ft.)	Mach ID	Oper ID		Date	Oper ID	Result (p/f)	Action	QA ID
4/23/2010	1-065		P	1-013-014-030		INT		2	2		5117	AM	CAS	4/23/2010	GM	p		CAS
4/24/2010	1-066		P		1-042	30-S	12-W	14	4		5117	AM	CAS	4/24/2010	GM	p		CAS
4/24/2010	1-067		P	1-000-027-028		INT		2	2		5117	AM	CAS	4/24/2010	GM	p		CAS
5/11/2010	1-068		P	1-032-040-043		INT		4	3		5117	AM	CAS	5/11/2010	GM	p		CAS
5/11/2010	1-069		P	1-032-043-044		INT		2	2		5117	AM	CAS	5/11/2010	GM	p		CAS
5/11/2010	1-070		P	1-000-013-030		INT		2	2		5117	AM	CAS	5/11/2010	GM	p		CAS
5/11/2010	1-071		P	1-000-032-044		INT		2	2		5117	AM	CAS	5/11/2010	GM	p		CAS
5/12/2010	1-072		P	1-017-018-R73		INT		3	2		5117	AM	CAS	4/21/2010	GM	p		CAS
5/12/2010	1-073		P	1-018-047-R-72		INT		7	2		5117	AM	CAS	4/21/2010	GM	p		CAS
5/12/2010	1-074		P	1-018-019-047		INT		3	2		5117	AM	CAS	4/21/2010	GM	p		CAS
5/12/2010	1-075		P	1-019-047-048		INT		2	2		5117	AM	CAS	4/22/2010	GM	p		CAS
5/12/2010	1-076	1-019	DS	1-047-048		11-B		6	2		5117	AM	CAS	4/22/2010	GM	p		CAS
5/12/2010	1-077		P	1-020-048-049		INT		2	2		5117	AM	CAS	4/22/2010	GM	p		CAS
5/12/2010	1-078		P	1-020-021-049		INT		3	2		5117	AM	CAS	4/22/2010	GM	p		CAS
5/12/2010	1-079		P	1-020-049-050		INT		2	2		5117	AM	CAS	4/22/2010	GM	p		CAS
5/12/2010	1-080		P	1-020-021-050		INT		2	2		5117	AM	CAS	4/22/2010	GM	p		CAS



Repair Summary Log

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WG1298</u>	TaskNo: <u>02</u>
Location: <u>5900 D Kaunualii Hwy, Kekaha, HI 96752</u>		
Description: <u>Cell 1 C&amp;D Construction</u>		
Installer: <u>Northwest Lining &amp; Geotextile, Inc.</u>		

Primary / Secondary: <u>Primary</u>	Series: <u>1</u>
-------------------------------------	------------------

Repair Date	Repair ID	DS No	Repair Type	Location				Size			Welder I.D.		QA ID	Non-Destructive Testing				
				Seam	Panel	Distance (ft.)	Offset (ft.)	Length (ft.)	Width (ft.)	Dia. (ft.)	Mach ID	Oper ID		Date	Oper ID	Result (p/f)	Action	QA ID
5/12/2010	1-081		C	1-021-022-R82		INT		8	2		5117	AM	CAS	5/11/2010	GM	p		CAS
5/12/2010	1-082		C	1-050-051-R81		INT		14	2		5117	AM	CAS	5/11/2010	GM	p		CAS
5/12/2010	1-083	1-020	DS	1-050-051		16-E		6	2		5117	AM	CAS	5/11/2010	GM	p		CAS
5/12/2010	1-084		P	1-022-023-051-052		INT		2	2		5117	AM	CAS	5/11/2010	GM	p		CAS
5/12/2010	1-085		P	1-023-052-053		INT		2	2		5117	AM	CAS	5/11/2010	GM	p		CAS
5/12/2010	1-086		P	1-023-024-053		INT		3	2		5117	AM	CAS	5/11/2010	GM	p		CAS
5/12/2010	1-087		P	1-024-025-053-054		INT		2	2		5117	AM	CAS	5/11/2010	GM	p		CAS
5/12/2010	1-088	1-021	DS	1-053-054		16-E		6	2		5117	AM	CAS	5/11/2010	GM	p		CAS
5/12/2010	1-089		P	1-026-027-054-055		INT		2	2		5117	AM	CAS	5/11/2010	GM	p		CAS
5/12/2010	1-090		P	1-027-028-055-056		INT		2	2		5117	AM	CAS	5/11/2010	GM	p		CAS
5/12/2010	1-091		R		2-047	15-S	5-E	6	6		5117	AM	CAS	5/11/2010	GM	p		CAS
8/4/2010	1-092		p	56-57		INT		2	1		5117	AM	DWH	8/4/2010	GM	p		DWH
8/4/2010	1-093	22	DS	28-57		85 E		5	2		5117	AM	DWH	8/4/2010	GM	p		DWH
8/4/2010	1-094		p	58-59-60		INT		2	1		5117	AM	DWH	8/4/2010	GM	p		DWH
8/4/2010	1-095		p	59-60-61		INT		2	1		5117	AM	DWH	8/4/2010	GM	p		DWH
8/4/2010	1-096	23	DS	59-61		106 E		5	2		5117	AM	DWH	8/4/2010	GM	p		DWH





**Repair Summary Log**

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WG1298</u>	TaskNo: <u>02</u>
Location: <u>6900 D Kaunualii Hwy, Kekaha, HI 96751</u>		
Description: <u>Cell 1 C&amp;D Construction</u>		
Installer: <u>Northwest Lining &amp; Geotextile, Inc.</u>		

Primary / Secondary: <u>Primary</u>	Series: <u>1</u>
-------------------------------------	------------------

Repair Date	Repair ID	DS No	Repair Type	Location				Size			Welder ID		QA ID	Non-Destructive Testing				
				Seam	Panel	Distance (ft.)	Offset (ft.)	Length (ft.)	Width (ft.)	Dia. (ft.)	Mach ID	Oper ID		Date	Oper ID	Result (p/f)	Action	QA ID
8/4/2010	1-097		p	57-58		144 E		2	1		5117	AM	DWH	8/4/2010	GM	p		DWH
8/5/2010	1-098		t	00-60-61		INT		1			5117	AM	DWH	8/5/2010	GM	p		DWH
8/5/2010	1-099		r	00-58-60		INT		1			5117	AM	DWH	8/5/2010	GM	p		DWH
8/5/2010	1-100		f	00-57-58		INT		1			5117	AM	DWH	8/5/2010	GM	p		DWH
8/5/2010	1-101		t	00-28-57		INT		1			5117	AM	DWH	8/5/2010	GM	p		DWH
8/6/2010	1-102	24	DS	61-63		41 E		5	2		5117	AM	DWH	8/6/2010	GM	p		DWH
8/6/2010	1-103		B		63	38 E	3 N	8	3		5117	AM	DWH	8/6/2010	GM	p		DWH
8/6/2010	1-104		p	62-63-64		INT		2	1		5117	AM	DWH	8/6/2010	GM	p		DWH
8/6/2010	1-105		p	61-62-63		INT		3	2		5117	AM	DWH	8/6/2010	GM	p		DWH
8/6/2010	1-106	25	DS	62-64		177 E		5	2		5117	AM	DWH	8/6/2010	GM	p		DWH
8/6/2010	1-107		p	62-64-65		INT		2	1		5117	AM	DWH	8/6/2010	GM	p		DWH
8/6/2010	1-108		t	00-62-65		INT		1			5117	AM	DWH	8/6/2010	GM	p		DWH
8/6/2010	1-109		p		62	247 E	7 S	2	1		5117	AM	DWH	8/6/2010	GM	p		DWH
8/6/2010	1-110		r	00-61-62		INT		1			5117	AM	DWH	8/6/2010	GM	p		DWH
8/6/2010	1-111		p	00-61		4 N		1	1		5117	AM	DWH	8/6/2010	GM	p		DWH
8/6/2010	1-112		p		64	1 E	9 S	1	1		5117	AM	DWH	8/6/2010	GM	p		DWH



Repair Summary Log

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WG1298</u>	TaskNo: <u>02</u>
Location: <u>6900 D Kaunualii Hwy, Kekaha, HI 96752</u>		
Description: <u>Cell 1 C&amp;D Construction</u>		
Installer: <u>Northwest Lining &amp; Geotextile, Inc.</u>		

Primary / Secondary: <u>Primary</u>	Series: <u>1</u>
-------------------------------------	------------------

Repair Date	Repair ID	DS No	Repair Type	Location				Size			Welder I.D.		QA ID	Non-Destructive Testing				
				Seam	Panel	Distance (ft.)	Offset (ft.)	Length (ft.)	Width (ft.)	Dia. (ft.)	Mach ID	Oper ID		Date	Oper ID	Result (p/f)	Action	QA ID
8/6/2010	1-113		p		64	1 E	12 S	1	1		5117	AM	DWH	8/6/2010	GM	p		DWH
8/7/2010	1-114	26	DS	64-66		131 E		5	2		5117	AM	DWH	8/7/2010	RA	p		DWH
8/7/2010	1-115		p	64-65-66		INT		2	1		5117	AM	DWH	8/7/2010	RA	p		DWH
8/7/2010	1-116		t	00-65-66		INT		1			5117	AM	DWH	8/7/2010	GM	p		DWH
8/7/2010	1-117		t	00-66-67		INT		1			5117	AM	DWH	8/7/2010	GM	p		DWH
8/7/2010	1-118		p	66-67-68		INT		2	1		5117	AM	DWH	8/7/2010	RA	p		DWH
8/7/2010	1-119		p	64-66		44 E		4	2		5117	AM	DWH	8/7/2010	RA	p		DWH
8/7/2010	1-120		p		64	40 E	4 N	1	1		5117	AM	DWH	8/7/2010	RA	p		DWH
8/7/2010	1-121		p		64	1 E	1 N	1	1		5117	AM	DWH	8/7/2010	GM	p		DWH
8/7/2010	1-122		p	67-68-69		INT		2	1		5117	AM	DWH	8/7/2010	RA	p		DWH
8/7/2010	1-123	27	DS	67-69		159 E		5	2		5117	AM	DWH	8/7/2010	RA	p		DWH
8/7/2010	1-124		t	00-67-69		INT		1			5117	AM	DWH	8/7/2010	RA	p		DWH
8/7/2010	1-125		t	00-69-70		INT		1			5117	AM	DWH	8/7/2010	RA	p		DWH
8/7/2010	1-126		p	69-70-71		INT		2	1		5117	AM	DWH	8/7/2010	RA	p		DWH
8/7/2010	1-127	28	DS	70-71		10 S		5	2		5117	AM	DWH	8/7/2010	RA	p		DWH
8/7/2010	1-128		p	71-72-73		INT		2	1		5117	AM	DWH	8/7/2010	RA	p		DWH



Repair Summary Log

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WCG1298</u>	TaskNo: <u>02</u>
Location: <u>5960 D Kaunualii Hwy, Kekaha, HI 96757</u>		
Description: <u>Cell 1 C&amp;D Construction</u>		
Installer: <u>Northwest Lining &amp; Geotextile, Inc.</u>		

Primary / Secondary: <u>Primary</u>	Series: <u>I</u>
-------------------------------------	------------------

Repair Date	Repair ID	DS No	Repair Type	Location				Size			Welder I.D.		QA ID	Non-Destructive Testing				
				Seam	Panel	Distance (ft.)	Offset (ft.)	Length (ft.)	Width (ft.)	Dia. (ft.)	Mach ID	Oper ID		Date	Oper ID	Result (p/f)	Action	QA ID
8/7/2010	1-129		p	70-71-72		INT		2	1		5117	AM	DWH	8/7/2010	RA	p		DWH
8/7/2010	1-130		t	00-70-72		INT		1			5117	AM	DWH	8/7/2010	RA	p		DWH
8/7/2010	1-131		i	00-72-74		INT		1			5117	AM	DWH	8/7/2010	RA	p		DWH
8/7/2010	1-132	29	DS	72-74		67 E		5	2		5117	AM	DWH	8/7/2010	RA	p		DWH
8/7/2010	1-133		p	72-73-74		INT		2	1		5117	AM	DWH	8/7/2010	RA	p		DWH
8/7/2010	1-134		p		74	212 E	9 S	1	1		5117	AM	DWH	8/7/2010	RA	p		DWH
8/7/2010	1-135		p		74	220 E	9 S	1	1		5117	AM	DWH	8/7/2010	RA	p		DWH
8/7/2010	1-136		p		74	227 E	9 S	1	1		5117	AM	DWH	8/7/2010	RA	p		DWH
8/7/2010	1-137		p		74	234 E	9 S	1	1		5117	AM	DWH	8/7/2010	RA	p		DWH
8/7/2010	1-138		p		74	241 E	9 S	1	1		5117	AM	DWH	8/7/2010	RA	p		DWH
8/7/2010	1-139		p		74	241 E	7 N	1	1		5117	AM	DWH	8/7/2010	RA	p		DWH
8/7/2010	1-140		p		74	245 E	7 N	1	1		5117	AM	DWH	8/7/2010	ASM	p		DWH
8/7/2010	1-141		p		74	245	9 S	1	1		5117	AM	DWH	8/7/2010	RA	p		DWH
8/7/2010	1-142		p	00-74		9 S		1	1		5117	AM	DWH	8/7/2010	RA	p		DWH
8/7/2010	1-143	30	DS	00-69		9 N		5	2		5117	AM	DWH	8/7/2010	ASM	p		DWH
8/7/2010	1-144		c	00-57-69		INT		15	2		5117	AM	DWH	8/7/2010	ASM	p		DWH



**Repair Summary Log**

Project: Kekaha Landfill  
 Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752 ProjNo: WG1298 TaskNo: 02  
 Description: Cell 1 C&D Construction  
 Installer: Northwest Linlog & Geotextile, Inc.

Primary / Secondary: Primary Series: 1

Repair Date	Repair ID	DS No	Repair Type	Location				Size			Welder I.D.		QA ID	Non-Destructive Testing				
				Seam	Panel	Distance (ft.)	Offset (ft.)	Length (ft.)	Width (ft.)	Dia. (ft.)	Mnch ID	Oper ID		Date	Oper ID	Result (p/f)	Action	QA ID
8/10/2010	1-145		p	74-75-76		INT		2	1		5117	AM	DWH	8/12/2010	ASM	p		DWH
8/10/2010	1-146	31	DS	74-75		140 E		5	2		5117	AM	DWH	8/12/2010	ASM	p		DWH
8/10/2010	1-147		p	00-74-75		INT		4	1		5117	JM	DWH	8/12/2010	ASM	p		DWH
8/10/2010	1-148		t	00-75-77		INT		1			5117	JM	DWH	8/12/2010	ASM	p		DWH
8/10/2010	1-149		p	75-76-77		INT		2	1		5117	AM	DWH	8/12/2010	ASM	p		DWH
8/10/2010	1-150	32	DS	77-79		100 E		5	2		5117	AM	DWH	8/12/2010	ASM	p		DWH
8/10/2010	1-151		p	77-78-79		INT		2	1		5117	AM	DWH	8/12/2010	ASM	p		DWH
8/10/2010	1-152		t	00-77-78		INT		1			5117	JM	DWH	8/12/2010	ASM	p		DWH
8/10/2010	1-153		t	00-78-80		INT		1			5117	JM	DWH	8/12/2010	ASM	p		DWH
8/10/2010	1-154		p	78-79-80		INT		2	1		5117	AM	DWH	8/12/2010	ASM	p		DWH
8/10/2010	1-155		p	79-80-81		INT		2	1		5117	AM	DWH	8/12/2010	ASM	p		DWH
8/10/2010	1-156	33	DS	79-81		56 E		5	2		5117	AM	DWH	8/12/2010	ASM	p		DWH
8/10/2010	1-157		b	81-82		40 E		12	7		5117	AM	DWH	8/12/2010	ASM	p		DWH
8/10/2010	1-158		p	80-81-82		INT		2	1		5117	AM	DWH	8/12/2010	ASM	p		DWH
8/10/2010	1-159		t	00-80-82		INT		1			5117	JM	DWH	8/12/2010	ASM	p		DWH
8/12/2010	1-160		p	82-83-84		INT		2	1		5117	AM	DWH	8/12/2010	GM	p		DWH



Repair Summary Log

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WG1298</u>	TaskNo: <u>02</u>
Location: <u>6900 D Kaunani Hwy, Kekaha, HI 96752</u>		
Description: <u>Cell C&amp;D Construction</u>		
Installer: <u>Northwest Lining &amp; Geotextile, Inc.</u>		

Primary / Secondary: <u>Primary</u>	Series: <u>I</u>
-------------------------------------	------------------

Repair Date	Repair ID	DS No	Repair Type	Location				Size			Welder I.D.		QA ID	Non-Destructive Testing				
				Seam	Panel	Distance (ft.)	Offset (ft.)	Length (ft.)	Width (ft.)	Dia. (ft.)	Mach ID	Oper ID		Date	Oper ID	Result (p/f)	Action	QA ID
8/12/2010	1-161		p	00-82		6 N		2	1		5117	AM	DWH	8/12/2010	EB	p		DWH
8/12/2010	1-162		t	00-82-83		INT		1			5117	AM	DWH	8/12/2010	EB	p		DWH
8/12/2010	1-163	38	DS	00-80		4 N		5	2		5117	AM	DWH	8/12/2010	EB	p		DWH
8/12/2010	1-164		t	00-83-84		INT		1			5117	AM	DWH	8/12/2010	EB	p		DWH
8/12/2010	1-165	34	DS	83-85		150 E		3	2		5117	AM	DWH	8/12/2010	GM	p		DWH
8/12/2010	1-166		p	83-84-85		INT		2	1		5117	AM	DWH	8/12/2010	GM	p		DWH
8/12/2010	1-167		t	00-85-86		INT		1			5117	AM	DWH	8/12/2010	EB	p		DWH
8/12/2010	1-168		p	00-86-87		INT		2	1		5117	AM	DWH	8/12/2010	EB	p		DWH
8/12/2010	1-169		p	86-87-88		INT		2	1		5117	AM	DWH	8/12/2010	GM	p		DWH
8/12/2010	1-170	35	DS	86-88		102 E		5	2		5117	AM	DWH	8/12/2010	GM	p		DWH
8/12/2010	1-171		p	87-88-89		INT		2	1		5117	AM	DWH	8/12/2010	GM	p		DWH
8/12/2010	1-172	36	DS	87-89		142 E		5	2		5117	AM	DWH	8/12/2010	GM	p		DWH
8/12/2010	1-173		p	00-87-89		INT		2	1		5117	AM	DWH	8/12/2010	EB	p		DWH
8/12/2010	1-174		t	00-89-91		INT		1			5117	AM	DWH	8/12/2010	EB	p		DWH
8/12/2010	1-175		t	00-91-02		INT		1			5117	AM	DWH	8/12/2010	EB	p		DWH
8/12/2010	1-176		t	00-92-93		INT		1			5117	AM	DWH	8/12/2010	EB	p		DWH



## Repair Summary Log

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WGI298</u>	TaskNo: <u>02</u>
Location: <u>6900 D Kaunualii Hwy, Kekaha, HI 96752</u>		
Description: <u>Cell 1 C&amp;D Construction</u>		
Installer: <u>Northwest Lining &amp; Geotextile, Inc.</u>		

Primary / Secondary: <u>Primary</u>	Series: <u>I</u>
-------------------------------------	------------------

Repair Date	Repair ID	DS No	Repair Type	Location				Size			Welder I.D.		QA ID	Non-Destructive Testing				
				Seam	Panel	Distance (ft.)	Offset (ft.)	Length (ft.)	Width (ft.)	Dia. (ft.)	Mach ID	Oper ID		Date	Oper ID	Result (p/f)	Action	QA ID
8/12/2010	1-177		p	102-104		1 N		2	1		5117	AM	DWH	8/12/2010	GM	p		DWH
8/12/2010	1-178		p	102-103-104		INT		2	1		5117	AM	DWH	8/12/2010	GM	p		DWH
8/12/2010	1-179		p	89-102-103		INT		2	1		5117	AM	DWH	8/12/2010	GM	p		DWH
8/12/2010	1-180		p	89-101-102		INT		2	1		5117	AM	DWH	8/12/2010	GM	p		DWH
8/12/2010	1-181		p	89-100-101		INT		2	1		5117	AM	DWH	8/12/2010	GM	p		DWH
8/12/2010	1-182		p	89-99-100		INT		2	1		5117	AM	DWH	8/12/2010	GM	p		DWH
8/12/2010	1-183		p	89-98-99		INT		2	1		5117	AM	DWH	8/12/2010	GM	p		DWH
8/12/2010	1-184		p	89-97-98		INT		2	1		5117	AM	DWH	8/12/2010	EB	p		DWH
8/12/2010	1-185	37	DS	97-98		INT		5	2		5117	AM	DWH	8/12/2010	EB	p		DWH
8/12/2010	1-186		p	89-96-97		INT		2	1		5117	AM	DWH	8/12/2010	EB	p		DWH
8/12/2010	1-187		p	89-95-96		INT		2	1		5117	AM	DWH	8/12/2010	EB	p		DWH
8/12/2010	1-188		p	89-94-95		INT		2	1		5117	AM	DWH	8/12/2010	EB	p		DWH
8/12/2010	1-189		p	89-90-94		INT		2	1		5117	AM	DWH	8/12/2010	EB	p		DWH
8/12/2010	1-190		p	89-90-91		INT		2	1		5117	AM	DWH	8/12/2010	EB	p		DWH
8/12/2010	1-191		p		91	30 N	6 W	3	1		5117	AM	DWH	8/12/2010	EB	p		DWH
8/12/2010	1-192		p		91	24 N	6 W	1	1		5117	AM	DWH	8/12/2010	EB	p		DWH



**Repair Summary Log**

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WQ1298</u>	TaskNo: <u>02</u>
Location: <u>6900 D Kaunualii Hwy, Kekaha, HI 96752</u>		
Description: <u>Cell 1 C&amp;D Construction</u>		
Installer: <u>Northwest Lining &amp; Geotextile, Inc.</u>		

Primary / Secondary: <u>Primary</u>	Series: <u>1</u>
-------------------------------------	------------------

Repair Date	Repair ID	DS No	Repair Type	Location				Size			Welder I.D.		QA ID	Non-Destructive Testing				
				Seam	Panel	Distance (ft.)	Offset (ft.)	Length (ft.)	Width (ft.)	Dia. (ft.)	Mach ID	Oper ID		Date	Oper ID	Result (p/f)	Action	QA ID
8/12/2010	I-193		p		91	17 N	6 W	1	1		5117	AM	DWH	8/12/2010	EB	p		DWH
8/12/2010	I-194		p		91	10 N	6 W	1	1		5117	AM	DWH	8/12/2010	EB	p		DWH

**Appendix I-5**  
**Geomembrane Destructive Sample Logs**





## Destructive Test Log

Project: Kekaha Landfill	ProjNo: <u>WGJ298</u>
Location: <u>6900 D Kaunuaia Hwy, Kekaha, HI 96752</u>	TaskNo: <u>02</u>
Description: <u>Cell 1 C&amp;D Construction</u>	

Test Reqs:	Fusion:	Peel Inside: <u>91</u>	Peel Outside: <u>91</u>	Shear: <u>120</u>
	Extrusion:	Peel: <u>73</u>	Shear: <u>120</u>	

Primary / Secondary: Secondary **SUBBASE** Series: 2      60mil GM MaterialType: 2

Sample Data								Test Data						Re test 1	Re test 2	
Samp No	Weld Type	Track Type	Location		Mach ID	Oper ID	Date Samp	Peel		Shear	Unit ppi/psi	Result (P/F)	QA ID			
			Seam	Dist. (ft.)				Inside	Outside							
2-001	T	d	2-002-003	15-S	20431	AM	4/6/2010	Lab	137	146	159	ppi	P	CAS	-	-
								Field	146	159	160	ppi	P	CAS		
								Field	138	141	157	ppi	P	CAS		
2-002	T	d	2-001-002	30-E	20431	AM	4/6/2010	Lab	146	181	180	ppi	P	CAS	-	-
								Field	133	122	162	ppi	P	CAS		
								Field	131	125	163	ppi	P	CAS		
2-003	T	d	2-003-005	153-E	20431	AM	4/6/2010	Lab	132	118	177	ppi	P	CAS	-	-
								Field	122	132	161	ppi	P	CAS		
								Field	122	127	164	ppi	P	CAS		
2-004	T	d	2-009-010	8-S	1110	GM	4/6/2010	Lab	141	137	133	ppi	P	CAS	-	-
								Field	126	127	156	ppi	P	CAS		
								Field	130	130	138	ppi	P	CAS		
2-005	T	d	2-008-009	45-E	1110	GM	4/6/2010	Lab	128	136	181	ppi	P	CAS	-	-
								Field	128	125	158	ppi	P	CAS		
								Field	126	126	164	ppi	P	CAS		
2-006	T	d	2-011-013	43-E	20431	AM	4/7/2010	Lab	126	125	184	ppi	P	CAS	-	-
								Field	131	127	158	ppi	P	CAS		
								Field	125	139	158	ppi	P	CAS		
2-007	T	d	2-014-016	38-E	1110	GM	4/7/2010	Lab	124	133	179	ppi	P	CAS	-	-
								Field	123	120	152	ppi	P	CAS		
								Field	120	123	138	ppi	P	CAS		



## Destructive Test Log

Project: Kekaha Landfill	ProjNo: WG1298
Location: 5900 D Kaunualii Hwy, Kekaha, HI 96757	TaskNo: 02
Description: Cell 1 C&D Construction	

Test Req:	Fusion:	Peel Inside: 91	Peel Outside: 91	Shear: 120
	Extrusion:	Peel: 78	Shear: 120	

Primary / Secondary: Secondary **SUBBASE** Series: 2      **60mil GM** MaterialType: 2

Sample Data								Test Data					Re test 1	Re test 2		
Samp No	Weld Type	Track Type	Location		Mach ID	Oper ID	Date Samp	Peel		Shear	Unit ppi/psi	Result (P/F)			QA ID	
			Seam	Dist. (ft.)				Inside	Outside							
2-008	e	t	2-000-001	11-S	5117	AM	4/10/2010	Lab	N/A	132	173	ppi	P	CAS	-	-
								Field	N/A	116	154	ppi	P	CAS		
								Field	N/A	107	156	ppi	P	CAS		
2-009	f	d	2-017-018	13-S	1119	AM	4/14/2010	Lab	146	136	155	ppi	P	CAS	-	-
								Field	130	127	152	ppi	P	CAS		
								Field	133	128	150	ppi	P	CAS		
2-010	f	d	2-020-021	16-E	1110	AM	4/14/2010	Lab	131	135	180	ppi	P	CAS	-	-
								Field	128	127	158	ppi	P	CAS		
								Field	125	125	162	ppi	P	CAS		
2-011	f	d	2-023-024	92-W	20664	AM	4/14/2010	Lab	152	122	181	ppi	P	CAS	-	-
								Field	136	139	165	ppi	P	CAS		
								Field	139	140	161	ppi	P	CAS		
2-012	e	s	2-000-022	5-N	5117	AM	4/15/2010	Lab	N/A	119	156	ppi	P	CAS	-	-
								Field	N/A	108	146	ppi	P	CAS		
								Field	N/A	108	153	ppi	P	CAS		
2-013	f	d	2-026-027	92-W	1110	GM	4/15/2010	Lab	137	134	181	ppi	P	CAS	-	-
								Field	127	153	156	ppi	P	CAS		
								Field	127	136	155	ppi	P	CAS		
2-014	f	d	2-031-032	90-W	20664	AM	4/15/2010	Lab	85	130	177	ppi	P	CAS	1-017	1-018
								Field	121	122	156	ppi	P	CAS		
								Field	129	121	160	ppi	P	CAS		



## Destructive Test Log

Project: Kekaha Landfill	ProjNo: WGL298
Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752	TaskNo: 02
Description: Cell 1 C&D Construction	

Test Req:	Fusion:	Peel Inside: 91	Peel Outside: 91	Shear: 120
	Extrusion:	Feet: 78	Shear: 120	

Primary/Secondary: ~~Secondary~~ **SUBBASE** Series: 2 **Gomil GM** MaterialType: 2

Sample Data							Test Data					Re test 1	Re test 2			
Samp No	Weld Type	Track Type	Location		Mach ID	Oper ID	Date Samp	Peel		Shear	Unit ppi/psi			Result (P/F)	QA ID	
			Seam	Dist. (ft.)				Inside	Outside							
2-015	T	d	2-013-034	S-N	1110	GM	4/15/2010	Lab	145	150	155	ppi	P	CAS	-	-
								Field	130	127	152	ppi	P	CAS		
								Field	129	130	149	ppi	P	CAS		
2-016	T	d	2-032-013	35-W	20664	AM	4/15/2010	Lab	131	122	177	ppi	P	CAS	-	-
								Field	128	127	162	ppi	P	CAS		
								Field	132	127	156	ppi	P	CAS		
2-017	T	d	2-031-032	70-W	20664	AM	4/15/2010	Lab	121	117	179	ppi	F	CAS	-	-
								Field	119	121	162	ppi	P	CAS		
								Field	124	118	158	ppi	P	CAS		
2-018	T	d	2-028-029	90-W	20664	AM	4/15/2010	Lab	129	121	181	ppi	P	CAS	-	-
								Field	127	126	192	ppi	P	CAS		
								Field	125	126	168	ppi	P	CAS		
2-019	T	d	2-037-036	6-W	1110	AM	4/21/2010	Lab	121	144	163	ppi	P	CAS	-	-
								Field	128	138	157	ppi	P	CAS		
								Field	125	132	151	ppi	P	CAS		
2-020	T	d	2-001-037	26-E	1110	AM	4/21/2010	Lab	130	149	182	ppi	F	CAS	1-022	1-023
								Field	136	122	156	ppi	P	CAS		
								Field	125	124	151	ppi	P	CAS		
2-021	T	d	2-001-037	16-E	1110	AM	4/21/2010	Lab	128	132	192	ppi	P	CAS	-	-
								Field	-	-	-	-	-	-		
2-023	T	d	2-001-037	36-E	1110	AM	4/21/2010	Lab	127	129	184	ppi	P	CAS	-	-
								Field	-	-	-	-	-	-		



## Destructive Test Log

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WG1298</u>
Location: <u>6900 D Kaunualii Hwy, Kekaha, HI 96752</u>	TaskNo: <u>02</u>
Description: <u>Cell 1 C&amp;D Construction</u>	

Test Reqs:	Fusion:	Peel Inside: <u>91</u>	Peel Outside: <u>91</u>	Shear: <u>120</u>
	Extrusion:	Peel: <u>78</u>	Shear: <u>120</u>	

Primary / Secondary: Secondary SUBBASE Series: 2      60mil GM MaterialType: 2

Sample Data								Test Data					Re test 1	Re test 2		
Samp No	Weld Type	Track Type	Location		Mach ID	Oper ID	Date Samp	Peel		Shear	Unit ppi/psi	Result (P/F)			QA ID	
			Seam	Dist. (ft.)				Inside	Outside							
2-024	f	d	35-80	163 E	20624	AM	7/30/2010	Lab	133	134	178	ppi	P	DWH	-	-
								Field	126	140	152	ppi	P	DWH		
								Field	129	139	157	ppi	P	DWH		
2-025	f	d	62-63	163 E	20624	AM	7/30/2010	Lab	148	125	185	ppi	P	DWH	-	-
								Field	122	116	158	ppi	P	DWH		
								Field	121	114	156	ppi	P	DWH		
2-026	f	d	63-64	X S	1109	GM	7/30/2010	Lab	140	125	153	ppi	F	DWH	2-039	-
								Field	115	126	146	ppi	F	DWH		
								Field	112	120	152	ppi	P	DWH		
2-028	f	d	69-71	164 E	1109	GM	7/30/2010	Lab	133	128	182	ppi	P	DWH	-	-
								Field	140	122	154	ppi	F	DWH		
								Field	132	139	158	ppi	P	DWH		
2-029	f	d	72-74	132 E	20624	AM	7/31/2010	Lab	131	140	182	ppi	P	DWH	-	-
								Field	129	125	151	ppi	P	DWH		
								Field	119	122	158	ppi	P	DWH		
2-030	e	d	75-76	10 S	1109	GM	7/31/2010	Lab	141	127	160	ppi	P	DWH	-	-
								Field	123	136	145	ppi	P	DWH		
								Field	128	129	144	ppi	P	DWH		
2-031	f	d	79-80	165 E	1109	GM	7/31/2010	Lab	-	-	-	-	-	DWH	2-039	2-041
								Field	N/A	N/A	N/A	ppi	F	DWH		
								Field	N/A	N/A	N/A	ppi	F	DWH		



## Destructive Test Log

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WG1298</u>
Location: <u>6900 D Kaunualii Hwy, Kekaha, HI 96752</u>	TaskNo: <u>02</u>
Description: <u>Cell 1 C&amp;D Construction</u>	

Test Req:	Fusion:	Peel Inside: <u>91</u>	Peel Outside: <u>91</u>	Shear: <u>120</u>
	Extrusion:	Peel: <u>78</u>	Shear: <u>120</u>	

Primary / Secondary: Secondary OVBASE Series: 2      Gomil GM Material/Type: 2

Sample Data								Test Data					Re test 1	Re test 2		
Samp No	Weld Type	Track Type	Location		Mach ID	Oper ID	Date Samp	Peel		Shear	Unit ppi/psi	Result (P/F)			QA ID	
			Seam	Dist. (ft.)				Inside	Outside							
2-032	F	d	85-85	17N E	20624	AM	7/31/2010	Lab	162	138	175	ppi	P	DWH	-	-
								Field	133	120	150	ppi	F	DWH		
								Field	128	124	154	ppi	F	DWH		
2-034	F	d	85-89	71 E	20624	AM	8/2/2010	Lab	139	139	185	ppi	P	DWH	-	-
								Field	115	120	140	ppi	F	DWH		
								Field	131	121	136	ppi	F	DWH		
2-035	F	d	91-93	152 E	20624	AM	8/2/2010	Lab	145	140	182	ppi	P	DWH	-	-
								Field	119	139	146	ppi	F	DWH		
								Field	116	136	141	ppi	F	DWH		
2-036	F	d	94-95	177 E	20624	AM	8/3/2010	Lab	147	139	183	ppi	P	DWH	-	-
								Field	129	139	156	ppi	F	DWH		
								Field	127	136	160	ppi	F	DWH		
2-037	F	d	101-102	35 N	20624	AM	8/3/2010	Lab	140	138	182	ppi	P	DWH	-	-
								Field	122	127	147	ppi	F	DWH		
								Field	126	126	149	ppi	F	DWH		
2-038	F	d	95-100	89 E	20624	AM	8/3/2010	Lab	139	138	169	ppi	P	DWH	-	-
								Field	124	128	136	ppi	F	DWH		
								Field	119	111	140	ppi	F	DWH		
2-040	c	i	00-91	10 N	5117	JM	8/3/2010	Lab	N/A	125	167	ppi	P	DWH	-	-
								Field	N/A	92	134	ppi	F	DWH		
								Field	N/A	91	135	ppi	F	DWH		



## Destructive Test Log

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WG1298</u>
Location: <u>6900 D Kaunualii Hwy Kekaha, HI 96752</u>	TaskNo: <u>02</u>
Description: <u>Cell I C&amp;D Construction</u>	

Test Reqs:	Fusion: _____	Peel Inside: <u>91</u>	Peel Outside: <u>91</u>	Shear: <u>120</u>
	Extrusion: _____	Peel: <u>78</u>	Shear: <u>120</u>	

Primary/Secondary: Secondary SUBBASE Series: 2 6mil GM MaterialType: 2

Sample Data							Test Data					Re test 1	Re test 2			
Samp No	Weld Type	Track Type	Location		Mach ID	Oper ID	Date Samp	Peel		Shear	Unit pp/psi			Result (P/F)	QA ID	
			Seam	Disc (ft.)				Inside	Outside							
2-041	f	d	79-80	147 E	1109	GM	8/3/2010	Lab	139	139	180	ppi	P	DWH		
								Field	125	118	145	ppi	P	DWH		
								Field	129	109	140	ppi	P	DWH		
2-042	e	f	80-81	10 N	5117	JM	8/3/2010	Lab	N/A	126	167	ppi	P	DWH		
								Field	N/A	135	130	ppi	P	DWH		
								Field	N/A	104	139	ppi	P	DWH		

Comments: 2-014 Capped seam, 2-017:75% AD-BRK, 2-020:75% AD-BRK



## Destructive Test Log

Project: Kekaha Landfill	ProjNo: WG1298
Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752	TaskNo: 02
Description: Cell I C&D Construction	

Test Reqs:	Fusion:	Peel Inside: 91	Peel Outside: 91	Shear: 120
	Extrusion:	Peel: 78	Shear: 120	

Primary / Secondary:	Severity: <b>SUBBASE</b>	Series: 2	<b>80 mil GM</b>	MaterialType: 3
----------------------	--------------------------	-----------	------------------	-----------------

Sample Data							Test Data						Re test 1	Re test 2		
Samp No	Weld Type	Track Type	Location		Mach ID	Oper ID	Date Samp	Peel		Shear	Unit ppi/psi	Result (P/F)			QA ID	
			Seam	Dist. (ft.)				Inside	Outside							
2-021	T	d	3-038-045	10-S	1110	AM	4/21/2010	Lab	165	131	192	ppi	P	CAS	-	-
								Field	127	120	153	ppi	P	CAS		
								Field	121	122	156	ppi	P	CAS		
2-027	T	d	67-69	66 E	20624	AM	7/30/2010	Lab	130	144	188	ppi	P	DWH		
								Field	118	122	172	ppi	P	DWH		
								Field	121	126	175	ppi	P	DWH		
2-033	T	d	85-86	3 S	1109	GM	7/31/2010	Lab	134	140	165	ppi	P	DWH	-	-
								Field	123	125	156	ppi	P	DWH		
								Field	121	135	152	ppi	P	DWH		
2-039	T	d	57-68	5 N	1109	GM	8/4/2010	Lab	137	141	161	ppi	P	DWH	-	-
								Field	135	131	142	ppi	P	DWH		
								Field	139	131	140	ppi	P	DWH		

Comments: 2-014: Capped seam; 2-017: 75% AD-BRK; 2-020: 75% AD-BRK



## Destructive Test Log

Project: Kekaha Landfill	ProjNo: WG1298
Location: 6900 D Kaimuali Hwy, Kekaha, HI 96752	TaskNo: 02
Description: Cell I C&D Construction	

Test Reqs:	Fusion:	Peel Inside: 91	Peel Outside: 91	Shear: 120
	Extraction:	Peel: 78	Shear: 120	

Primary / Secondary: Primary Series: 1 60 mil GM MaterialType: 2

Sample Data								Test Data					Re test 1	Re test 2	
Samp No	Weld Type	Track Type	Location		Mach ID	Oper ID	Date Samp	Peel		Shear	Unit pp/psi	Result (P/F)			QA ID
			Seam	Dist. (ft.)				Inside	Outside						

1-001	f	d	1-001-003	83-E	20433	AM	4/9/2010	Lab	125	126	195	ppi	P	CAS	-	-
								Field	132	130	161	ppi	P	CAS		
								Field	132	136	159	ppi	P	CAS		

1-002	f	d	1-002-004	166-E	20431	AM	4/9/2010	Lab	119	131	188	ppi	P	CAS	-	-
								Field	126	126	161	ppi	P	CAS		
								Field	124	128	158	ppi	P	CAS		

1-003	f	d	1-003-006	9-N	1110	AM	4/9/2010	Lab	141	132	165	ppi	P	CAS	-	-
								Field	133	136	154	ppi	P	CAS		
								Field	134	137	158	ppi	P	CAS		

1-004	f	d	1-004-007	110-L	1110	AM	4/12/2010	Lab	134	130	186	ppi	P	CAS	-	-
								Field	135	128	161	ppi	P	CAS		
								Field	134	129	155	ppi	P	CAS		

1-005	f	d	1-005-011	115-E	1110	AM	4/12/2010	Lab	123	120	189	ppi	P	CAS	-	-
								Field	123	127	162	ppi	P	CAS		
								Field	124	132	165	ppi	P	CAS		

1-006	f	d	1-013-014	5-S	1110	AM	4/12/2010	Lab	147	146	163	ppi	P	CAS	-	-
								Field	128	131	153	ppi	P	CAS		
								Field	130	129	157	ppi	P	CAS		

1-007	e	a	1-000-013	10-S	5117	AM	4/13/2010	Lab	N/A	100	162	ppi	P	CAS	-	-
								Field	N/A	120	152	ppi	P	CAS		
								Field	N/A	118	149	ppi	P	CAS		





## Destructive Test Log

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WGL208</u>
Location: <u>6900 D Kaunuaiki Hwy, Kekaha, HI 96752</u>	TaskNo: <u>02</u>
Description: <u>Cell 1 C&amp;D Construction</u>	

Test Reqs:	Fusion: _____	Peel Inside: <u>91</u>	Peel Outside: <u>91</u>	Shear: <u>120</u>
	Extrusion: _____	Peel: <u>75</u>	Shear: <u>120</u>	

Primary / Secondary: <u>Primary</u>	Series: <u>1</u>	<u>60mil GM</u>	MaterialType: <u>2</u>
-------------------------------------	------------------	-----------------	------------------------

Sample Data								Test Data					Re test	Re test		
Samp No	Weld Type	Track Type	Location		Mach ID	Oper ID	Date Samp	Peel		Shear	Unit ppl/psi	Result (P/F)	QA ID	1	2	
			Seam	Dist. (ft.)				Inside	Outside							
1-008	f	d	1-015-017	S-W	1110	AM	4/19/2010	Lab	134	127	184	ppi	p	CAS	-	-
								Field	121	119	170	ppi	P	CAS		
								Field	120	126	161	ppi	P	CAS		
1-009	f	d	1-018-019	117-W	1110	AM	4/19/2010	Lab	129	128	185	ppi	p	CAS	-	-
								Field	121	121	168	ppi	P	CAS		
								Field	127	120	158	ppi	P	CAS		
1-010	f	d	1-021-022	25-W	1110	AM	4/19/2010	Lab	126	127	182	ppi	p	CAS	-	-
								Field	129	122	160	ppi	P	CAS		
								Field	125	126	160	ppi	P	CAS		
1-011	e	s	1-000-022	6-N	5117	AM	4/20/2010	Lab	N/A	73	163	ppi	p	CAS	1-014	N/A
								Field	N/A	115	152	ppi	P	CAS		
								Field	N/A	116	148	ppi	P	CAS		
1-012	f	d	1-023-024	188-W	1110	AM	4/22/2010	Lab	124	134	186	ppi	p	CAS	-	-
								Field	-	-	-	-	-	-		
1-013	f	d	1-025-026	5-S	1110	AM	4/22/2010	Lab	146	143	168	ppi	p	CAS	-	-
								Field	-	-	-	-	-	-		
1-014	s	s	1-000-001	10-N	5117	AM	4/10/2010	Lab	N/A	125	177	ppi	p	CAS	-	-
								Field	-	-	-	-	-	-		
1-015	f	d	1-027-028	108-W	1110	AM	4/22/2010	Lab	124	127	190	ppi	p	CAS	-	-
								Field	-	-	-	-	-	-		



## Destructive Test Log

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WG1298</u>
Location: <u>6900 D Kaunani Hwy, Kekaha, HI 96752</u>	TaskNo: <u>02</u>
Description: <u>Cell 1 C&amp;D Construction</u>	

Test Reqs:	Fusion:	Peel Inside: <u>91</u>	Peel Outside: <u>91</u>	Shear: <u>120</u>
	Extrusion:	Peel: <u>78</u>	Shear: <u>120</u>	

Primary / Secondary: <u>Primary</u>	Series: <u>1</u>	<u>60mil GM</u>	MaterialType: <u>2</u>
-------------------------------------	------------------	-----------------	------------------------

Sample Data								Test Data						Re test 1	Re test 2	
Samp No	Weld Type	Truck Type	Location		Mach ID	Oper ID	Date Samp	Peel		Shear	Unit ppi/psi	Result (P/F)	QA ID			
			Seam	Dist. (ft.)				Inside	Outside							
1-016	F	d	1-029-031	34-E	1110	AM	4/23/2010	Lab	127	125	185	ppi	P	CAS	-	-
								Field	128	130	156	ppi	P	CAS		
								Field	125	142	157	ppi	P	CAS		
1-017	F	d	1-031-037	3-E	1110	AM	4/23/2010	Lab	131	153	162	ppi	P	CAS	-	-
								Field	127	128	154	ppi	P	CAS		
								Field	127	129	155	ppi	P	CAS		
1-019	F	d	1-047-048	11-E	1110	AM	5/12/2010	Lab	125	125	183	ppi	P	CAS	-	-
								Field	120	126	152	ppi	P	CAS		
								Field	124	127	158	ppi	P	CAS		
1-021	F	d	1-053-054	16-E	1110	AM	5/12/2010	Lab	128	134	179	ppi	P	CAS	-	-
								Field	119	127	153	ppi	P	CAS		
								Field	125	120	146	ppi	P	CAS		
1-022	F	d	28-57	85-E	20624	AM	8/4/2010	Lab	133	135	181	ppi	P	DWH	-	-
								Field	138	136	143	ppi	P	DWH		
								Field	132	136	147	ppi	P	DWH		
1-023	F	d	59-61	106-E	20624	AM	8/4/2010	Lab	130	137	181	ppi	P	DWH	-	-
								Field	121	120	144	ppi	P	DWH		
								Field	120	124	144	ppi	P	DWH		
1-025	F	d	67-44	177-E	20624	AM	8/5/2010	Lab	146	139	187	ppi	P	DWH	-	-
								Field	116	119	166	ppi	P	DWH		
								Field	119	119	167	ppi	P	DWH		



## Destructive Test Log

Project: Kekaha Landfill	ProjNo: <u>WG1298</u>
Location: <u>6900 D Kaunualii Hwy, Kekaha, HI 96752</u>	TaskNo: <u>02</u>
Description: <u>Cell 1 C&amp;D Construction</u>	

Test Reqs:	Fusion:	Peel Inside: <u>91</u>	Peel Outside: <u>91</u>	Shear: <u>120</u>
	Extrusion:	Peel: <u>78</u>	Shear: <u>120</u>	

Primary / Secondary:	Primary	Series: 1	<u>60mil GM</u>	MaterialType: 2
----------------------	---------	-----------	-----------------	-----------------

Sample Data								Test Data						Re test 1	Re test 2	
Samp No	Weld Type	Track Type	Location		Mach ID	Oper ID	Date Samp	Peel		Shear	Unit ppi/psi	Result (P/F)	QA ID			
			Seam	Dist. (ft.)				Inside	Outside							
1-026	I	d	64-66	131 E	20624	AM	8/6/2010	Lab	127	127	183	ppi	P	DWH	-	-
								Field	121	122	154	ppi	P	DWH		
								Field	127	122	148	ppi	P	DWH		
1-027	F	d	67-69	159 E	20624	AM	8/6/2010	Lab	129	132	184	ppi	P	DWH	-	-
								Field	128	122	155	ppi	P	DWH		
								Field	126	128	150	ppi	P	DWH		
1-028	F	d	70-71	11 S	20624	AM	8/6/2010	Lab	127	124	165	ppi	P	DWH	-	-
								Field	125	131	131	ppi	P	DWH		
								Field	119	127	127	ppi	P	DWH		
1-029	F	d	73-74	57 E	20624	AM	8/7/2010	Lab	136	130	184	ppi	P	DWH	-	-
								Field	124	118	156	ppi	P	DWH		
								Field	133	130	155	ppi	P	DWH		
1-030	-e	s	00-67	9 N	5117	AM	8/7/2010	Lab	N/A	126	163	ppi	P	DWH	-	-
								Field	N/A	91	149	ppi	P	DWH		
								Field	N/A	104	130	ppi	P	DWH		
1-031	F	d	74-75	140 E	20624	AM	8/9/2010	Lab	131	135	176	ppi	P	DWH	-	-
								Field	123	127	157	ppi	P	DWH		
								Field	119	125	156	ppi	P	DWH		
1-032	F	d	77-79	100 E	20624	AM	8/9/2010	Lab	138	139	177	ppi	P	DWH	-	-
								Field	128	112	156	ppi	P	DWH		
								Field	127	124	157	ppi	P	DWH		



## Destructive Test Log

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WG1298</u>
Location: <u>6900 D Kaunualii Hwy, Kekaha, HI 96752</u>	TaskNo: <u>02</u>
Description: <u>Cell 1 C&amp;D Construction</u>	

Test Reqs:	Fusion:	Peel Inside: <u>91</u>	Peel Outside: <u>91</u>	Shear: <u>120</u>
	Extrusion:	Peel: <u>78</u>	Shear: <u>120</u>	

Primary / Secondary: <u>Primary</u>	Series: <u>1</u>	<u>60mil GM</u>	MaterialType: <u>2</u>
-------------------------------------	------------------	-----------------	------------------------

Sample Data								Test Data						Re test 1	Re test 2	
Samp No	Weld Type	Track Type	Location		Mach ID	Oper ID	Date Samp	Peel		Shear	Unit ppf/psi	Result (P/F)	QA ID			
			Seam	Dist. (ft.)				Inside	Outside							
1-034	f	d	83-85	150 E	20624	AM	8/11/2010	Lab	136	143	181	ppf	P	DWH	-	-
								Field	116	122	153	ppf	P	DWH		
								Field	121	137	153	ppf	P	DWH		
1-035	f	d	86-88	102 E	20624	AM	8/11/2010	Lab	138	140	181	ppf	P	DWH	-	-
								Field	120	117	159	ppf	P	DWH		
								Field	116	125	156	ppf	P	DWH		
1-036	f	d	87-89	143 E	20624	AM	8/11/2010	Lab	140	140	181	ppf	P	DWH	-	-
								Field	110	125	127	ppf	P	DWH		
								Field	117	141	155	ppf	P	DWH		
1-037	f	d	97-98	33 E	20624	AM	8/11/2010	Lab	134	141	182	ppf	P	DWH	-	-
								Field	136	138	137	ppf	P	DWH		
								Field	126	122	154	ppf	P	DWH		
1-038	g	a	00-79	4 N	5117	JM	8/11/2010	Lab	N/A	126	168	ppf	P	DWH	-	-
								Field	N/A	97	141	ppf	P	DWH		
								Field	N/A	105	139	ppf	P	DWH		

Comments: 1-011:100% AD-BRK



## Destructive Test Log

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WG1298</u>
Location: <u>6900 D Kaunualii Hwy, Kekaha, HI 96752</u>	TaskNo: <u>02</u>
Description: <u>Cell 1 C&amp;D Construction</u>	

Test Reqs:	Fusion: _____	Peel Inside: <u>21</u>	Peel Outside: <u>21</u>	Shear: <u>120</u>
	Extrusion: _____	Peel: <u>28</u>	Shear: <u>120</u>	

Primary / Secondary: <u>Primary</u>	Series: <u>1</u>	<u>Bowl GM</u>	MaterialType: <u>3</u>
-------------------------------------	------------------	----------------	------------------------

Sample Data								Test Data						Re test 1	Re test 2	
Samp No	Weld Type	Track Type	Location		Mach ID	Oper ID	Date Samp	Peel		Shear	Unit ppi/psi	Result (P/F)	QA ID			
			Seam	Dist. (ft.)				Inside	Outside							
1-018	T	d	1-052-042	5N	1110	AM	4/23/2010	Lab	131	133	162	ppi	P	CAS	-	-
								Field	140	136	160	ppi	P	CAS		
								Field	139	150	157	ppi	P	CAS		
1-020	T	d	1-050-051	16-E	1110	AM	5/12/2010	Lab	146	146	194	ppi	P	CAS	-	-
								Field	145	131	153	ppi	P	CAS		
								Field	145	130	153	ppi	P	CAS		
1-024	T	d	61-63	41 E	20624	AM	8/5/2010	Lab	140	144	190	ppi	P	DWH	-	-
								Field	156	120	168	ppi	P	DWH		
								Field	151	122	169	ppi	P	DWH		
1-033	T	d	79-81	56 E	20624	AM	8/9/2010	Lab	128	133	182	ppi	P	DWH	-	-
								Field	111	129	162	ppi	P	DWH		
								Field	108	111	163	ppi	P	DWH		

Comments: 1-011: 100% AD-BRK



**Appendix J**  
**Geomembrane Destructive Sample Test Results**



# Precision Geosynthetic Laboratories



April 8, 2010

Mike Minch  
**Geosyntec Consultants**  
475 14<sup>th</sup> Street, Suite 400  
Oakland, CA 94612

RE: Kekaha LF Cell 1

Dear Mr. Minch:

Thank you for consulting Precision Geosynthetic Laboratories (PGL) for your material testing needs.

Enclosed is the *final* laboratory report for the testing of seven (7) HDPE Seam samples specified on the proceeding sheet which were received on April 8, 2010.

It shall be noted that the samples tested are believed to be true representatives of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. Precision Geosynthetic Laboratories neither accepts responsibility for nor makes claims to the intended final use and purpose of the material.

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims arising out of the use of this data to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.

The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent entity duly authorized by the respective client or from the client itself.

It is a policy of the company to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. *Failed seam samples are kept for two (2) years and good seam samples are disposed of after two (2) weeks.* On the other hand, should you need us to keep them at longer time, please advise us in writing.

Should you have any questions or if we may be of further service to you, please do not hesitate to contact us at telephone number: 800-522-4599.

Sincerely,

**PRECISION GEOSYNTHETIC LABORATORIES**

Carmelo V. Zantua  
Technical/Laboratory Director

Enclosure: (Job No. G100267)





# Precision Geosynthetic Laboratories



CLIENT: *GEOSYNTEC CONSULTANTS*  
PROJECT: *Kekaha LF Cell 1*

**VERIFICATION OF MATERIAL PROPERTIES**  
(PGL Job No. G100267)

**MATERIAL DESCRIPTION:** HDPE seams

**SAMPLES SENT BY:** Chris Scott, Geosyntec Consultants

**DATE RECEIVED:** April 8, 2010

**DATE REPORTED:** April 8, 2010

**SAMPLE IDENTIFICATIONS:**

SAMPLE ID	PGL CONTROL NUMBER
DS-S1 S2/S3	65390
DS-S2 S2/S1	65391
DS-S3 S5/S3	65392
DS-S4 S9/S10	65393
DS-S5 S9/S8	65394
DS-S6 S13/S11	65395
DS-S7 S16/S14	65396

**TESTS REQUIRED:**

TEST METHOD	DESCRIPTION
ASTM D6392	Shear Bonded Strength
ASTM D6392	Peel Adhesion

**TEST CONDITIONS:** The samples were conditioned for a minimum of one hour in the laboratory at  $22 \pm 2^{\circ}\text{C}$  ( $71.6 \pm 3.6^{\circ}\text{F}$ ) and at  $60 \pm 10\%$  relative humidity prior to test.

**TEST RESULTS:**

The test results are summarized in Tables 1 to 4.

**PRECISION GEOSYNTHETIC LABORATORIES**



Carmelo V. Zanlue  
Technical/Laboratory Director

## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: Geosyntec Consultants  
 PROJECT: Kekaha LF Cell 1  
 DATE RECD: 8-Apr-10

MATERIAL: HDPE SEAM  
 SEAM TYPE: Fusion Weld  
 PGL JOB #: G100267

QC'd By: **B1**  
 TEST METHOD: ASTM D3322  
 DATE REPORT: 8-Apr-10

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min							
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION							
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)			
DS-S1 S2/S3	65390	157	> 50%	BRK		1 Outside	149	0	SE1				
		160	> 50%	BRK		2 Outside	151	0	SE1				
		160	> 50%	BRK		3 Outside	140	0	SE1				
		159	> 50%	BRK		4 Outside	145	0	SE1				
		159	> 50%	BRK		5 Outside	147	0	SE1				
		AVG:		146				AVG:			146		91
		STD. DEV.		4				STD. DEV.			4		
				139			SE1	1 Inside	139		0	SE1	
				137			SE1	2 Inside	137		0	SE1	
				136			SE1	3 Inside	136		0	SE1	
		138		SE1	4 Inside	138	0	SE1					
		134		SE1	5 Inside	134	0	SE1					
AVG:		159			AVG:		137		91				
STD. DEV.		1			STD. DEV.		2						
DS-S2 S2/S1	65391	175	> 50%	BRK		1 Outside	142	0	SE1				
		183	> 50%	BRK		2 Outside	123	0	SE1				
		181	> 50%	BRK		3 Outside	125	0	SE1				
		179	> 50%	BRK		4 Outside	127	0	SE1				
		182	> 50%	BRK		5 Outside	136	0	SE1				
		AVG:		131				AVG:			131		91
		STD. DEV.		8				STD. DEV.			8		
				141			SE1	1 Inside	141		0	SE1	
				146			SE1	2 Inside	146		0	SE1	
				137			SE1	3 Inside	137		0	SE1	
		152		SE1	4 Inside	152	0	SE1					
		152		SE1	5 Inside	152	0	SE1					
AVG:		180			AVG:		146		91				
STD. DEV.		3			STD. DEV.		7						

<p><b>BREAK DESCRIPTION (ASTM D3322 FUSION):</b></p> <p>AD      ADHESION FAILURE</p> <p>BRK     BREAK IN SHEETING</p> <p>SE1     BREAK AT OUTER EDGE OF SEAM</p> <p>SE2     BREAK AT INNER EDGE OF SEAM</p> <p>AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE</p> <p>SIF      SEPARATION IN THE PLANE OF THE SHEET</p>	<p><b>EXTRUSION:</b></p> <p>AD1     ADHESION FAILURE - SPECIMENS DELAMINATED UNDER THE BEAD</p> <p>AD2     ADHESION FAILURE</p> <p>AD-WLD BREAK THROUGH THE FILLET</p> <p>SE1     BREAK AT BOTTOM EDGE OF SEAM</p> <p>SE2     BREAK AT TOP EDGE OF SEAM</p> <p>SE3     BREAK AT BOTTOM EDGE OF SEAM (R/F REEL ONLY)</p> <p>BRK1    BREAK IN BOTTOM SHEETING</p> <p>BRK2    BREAK IN TOP SHEETING</p> <p>AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE</p> <p>HT      BREAK AT EDGE OF HOT TACK</p> <p>SIF      SEPARATION IN THE PLANE OF THE SHEET</p>	
--	--	--

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims on (issued, due to the use of this data, to the extent for the respective tests presented in this report) and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.



### SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **Geosyntec Consultants**  
 PROJECT: **Kekaha LF Cell 1**  
 DATE REC'D: **8-Apr-10**

MATERIAL: **HDPE SEAM**  
 SEAM TYPE: **Fusion Weld**  
 PGL JOB #: **G100267**

QC'd By: **Byeo**  
 TEST METHOD: **ASTM D6392**  
 DATE REPORT: **8-Apr-10**

Crosshead Speed: 2 in/min					Crosshead Speed: 2 in/min					
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION			PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	PEEL EVALUATION			PROJECT SPEC. (lb/in width)
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break			MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	
DS-S3 S5/S3	85392	186	> 50%	BRK		1 Outside	117	0	SE1	
		174	> 50%	BRK		2 Outside	121	0	SE1	
		173	> 50%	BRK		3 Outside	118	0	SE1	
		177	> 50%	BRK		4 Outside	117	0	SE1	
		175	> 50%	BRK		5 Outside	118	0	SE1	
		AVG:	177				121	AVG:	118	
STD. DEV.	5				STD. DEV.	2				
DS-S4 S9/S10	85393	152	> 50%	BRK		1 Inside	130	0	SE1	
		151	> 50%	BRK		2 Inside	143	0	SE1	
		156	> 50%	BRK		3 Inside	129	0	SE1	
		155	> 50%	BRK		4 Inside	129	0	SE1	
		152	> 50%	BRK		5 Inside	131	0	SE1	
		AVG:	153				121	AVG:	132	
STD. DEV.	2				STD. DEV.	6				

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

AD ADHESION FAILURE  
 BRK BREAK IN SHEETING  
 SE1 BREAK AT OUTER EDGE OF SEAM  
 SE2 BREAK AT INNER EDGE OF SEAM  
 AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
 SIP SEPARATION IN THE PLANE OF THE SHEET

**EXTRUSION:**

AD1 ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD.  
 AD3 ADHESION FAILURE  
 AD-WLD BREAK THROUGH THE FILLET  
 SE1 BREAK AT BOTTOM EDGE OF SEAM.  
 SE2 BREAK AT TOP EDGE OF SEAM  
 SE3 BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)  
 BRK1 BREAK IN BOTTOM SHEETING.  
 BRK2 BREAK IN TOP SHEETING.  
 AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
 HT BREAK AT EDGE OF HOT TACK  
 SIP SEPARATION IN THE PLANE OF THE SHEET.

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims or issues, due to the use of this data, to the cost for the respective tests presented in this report, and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.



Precision Geosynthetic Laboratories



### SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **Geosyntec Consultants**  
 PROJECT: **Kekaha LF Cell 1**  
 DATE REC'D: **8-Apr-10**

TRIAL: **HDPE SEAM**  
 SEAM TYPE: **Fusion Weld**  
 PGL JOB #: **G100257**

OC'd By: **By**  
 TEST METHOD: **ASTM D6392**  
 DATE REPORT: **8-Apr-10**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min							
SAMPLE ID	PEEL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION							
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)			
DS-S5 S9/S8	65384	182	> 50%	BRK	121	1 Outside	133	0	SE1	91			
		183	> 50%	BRK		2 Outside	134	0	SE1				
		178	> 50%	BRK		3 Outside	136	0	SE1				
		177	> 50%	BRK		4 Outside	139	0	SE1				
		184	> 50%	BRK		5 Outside	143	0	SE1				
		AVG:							136				
		STD. DEV.							4				
									1 Inside		132	0	SE1
									2 Inside		119	0	SE1
									3 Inside		123	0	SE1
						4 Inside	130	0	SE1				
						5 Inside	136	0	SE1				
AVG:		181				AVG:	128			91			
STD. DEV.		3				STD. DEV.	7						
DS-S6 S10/S11	65395	185	> 50%	BRK	121	1 Outside	125	0	SE1	91			
		182	> 50%	BRK		2 Outside	120	0	SE1				
		186	> 50%	BRK		3 Outside	147	0	SE1				
		181	> 50%	BRK		4 Outside	115	0	SE1				
		185	> 50%	BRK		5 Outside	118	0	SE1				
		AVG:							125				
		STD. DEV.							13				
									1 Inside		124	0	SE1
									2 Inside		126	0	SE1
									3 Inside		125	0	SE1
						4 Inside	123	0	SE1				
						5 Inside	128	0	SE1				
AVG:		184				AVG:	126			91			
STD. DEV.		2				STD. DEV.	2						

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

- AD ADHESION FAILURE
- BRK BREAK IN SHEETING
- SE1 BREAK AT OUTER EDGE OF SEAM
- SE2 BREAK AT INNER EDGE OF SEAM
- AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE
- SIF SEPARATION IN THE PLANE OF THE SHEET

**EXTRUSION:**

- AD1
- AD2
- ADAWLD
- SE1
- SE2
- SE3
- BRK1
- BRK2
- AD-BRK
- HT
- SIF

**ADHESION FAILURE: SPECIMENS DELAMINATED UNDER THE BEAD:**

- ADHESION FAILURE
- BREAK THROUGH THE FILLET
- BREAK AT BOTTOM EDGE OF SEAM
- BREAK AT TOP EDGE OF SEAM
- BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)
- BREAK IN BOTTOM SHEETING
- BREAK IN TOP SHEETING
- BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE
- BREAK AT EDGE OF HOT TACK
- SEPARATION IN THE PLANE OF THE SHEET

By accepting the data and results presented in this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims or issues due to the use of this data, to the cost for the respective tests presented in this report, and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.



Precision Geosynthetic Laboratories



### SEAM PEEL AND SHEAR TEST RESULTS

*Handwritten signature*

CLIENT: **Geosyntec Consultants**  
 PROJECT: **Kekaha LF Cell 1**  
 DATE REC'D: **6-Apr-10**

MATERIAL: **HDPE SEAM**  
 SEAM TYPE: **Fusion Weld**  
 PGL JOB #: **G100267**

QC'd By: **Byee**  
 TEST METHOD: **ASTM D6392**  
 DATE REPORT: **8-Apr-10**

Crosshead Speed: 2 in/min					Crosshead Speed: 2 in/min					
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION			PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	PEEL EVALUATION			PROJECT SPEC. (lb/in width)
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break			MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	
DS-S7 S16/S14	65398	178	> 50%	BRK		1 Outside	129	0	SE1	
		183	> 50%	BRK		2 Outside	137	0	SE1	
		160	> 60%	BRK		3 Outside	138	0	SE1	
		179	> 50%	BRK		4 Outside	135	0	SE1	
		176	> 50%	BRK		5 Outside	127	0	SE1	
								<b>AVG:</b>	<b>133</b> ✓	
					<b>STD. DEV.</b>	<b>5</b>				
						1 Inside	128	0	SE1	
						2 Inside	119	0	SE1	
						3 Inside	123	0	SE1	
						4 Inside	128	0	SE1	
						5 Inside	123	0	SE1	
	<b>AVG:</b>	<b>179</b> ✓			<b>121</b>	<b>AVG:</b>	<b>124</b> ✓			<b>91</b>
	<b>STD. DEV.</b>	<b>3</b>				<b>STD. DEV.</b>	<b>4</b>			

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

- AD           ADHESION FAILURE
- BRK        BREAK IN SHEETING
- SE1        BREAK AT OUTER EDGE OF SEAM
- SE2        BREAK AT INNER EDGE OF SEAM
- AD-BRK    BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE
- SIP        SEPARATION IN THE PLANE OF THE SHEET

**EXTRUSION:**

- AD1       ADHESION FAILURE - SPECIMENS DELAMINATED UNDER THE BEAD
- AD2       ADHESION FAILURE
- AD-WLD   BREAK THROUGH THE FILLET
- SE1       BREAK AT BOTTOM EDGE OF SEAM
- SE2       BREAK AT TOP EDGE OF SEAM
- SE3       BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)
- BRK1      BREAK IN BOTTOM SHEETING
- BRK2      BREAK IN TOP SHEETING
- AD-BRK   BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE
- HT        BREAK AT EDGE OF HOT TACK
- SIP        SEPARATION IN THE PLANE OF THE SHEET

By accepting the data and results presented on this report, the Client agrees to hold the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims or losses, due to the use of this data, for the data for the respective tests presented in this report, and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities or damages of the aforementioned limit.



**Precision Geosynthetic Laboratories**





# Precision Geosynthetic Laboratories



April 13, 2010

Mike Minch  
**Geosyntec Consultants**  
475 14<sup>th</sup> Street, Suite 400  
Oakland, CA 94612

RE: Kekaha LF Cell 1

Dear Mr. Minch:

Thank you for consulting Precision Geosynthetic Laboratories (PGL) for your material testing needs.

Enclosed is the *final* laboratory report for the testing of one (1) HDPE Seam sample specified on the proceeding sheet which was received on April 13, 2010.

It shall be noted that the sample tested is believed to be true representative of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. Precision Geosynthetic Laboratories neither accepts responsibility for nor makes claims to the intended final use and purpose of the material.

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims arising out of the use of this data to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.

The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent entity duly authorized by the respective client or from the client itself.

It is a policy of the company to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. *Failed seam samples are kept for two (2) years and good seam samples are disposed of after two (2) weeks.* On the other hand, should you need us to keep them at longer time, please advise us in writing.

Should you have any questions or if we may be of further service to you, please do not hesitate to contact us at telephone number: 800-522-4599.

Sincerely,

**PRECISION GEOSYNTHETIC LABORATORIES**

Carmelo V. Zantua  
Technical/Laboratory Director

Enclosure: (Job No. G100285)



# Precision Geosynthetic Laboratories



CLIENT: *GEOSYNTEC CONSULTANTS*  
PROJECT: *Kekaha LF Cell 1*

**VERIFICATION OF MATERIAL PROPERTIES**  
(PGL Job No. G100285)

**MATERIAL DESCRIPTION:** HDPE seams

**SAMPLE SENT BY:** Chris Scott, Geosyntec Consultants

**DATE RECEIVED:** April 13, 2010

**DATE REPORTED:** April 13, 2010

**SAMPLE IDENTIFICATIONS:**

**SAMPLE ID**

**PGL CONTROL NUMBER**

DS-S-8 Ext/S1

65489

**TESTS REQUIRED:**

**TEST METHOD**

**DESCRIPTION**

ASTM D6392  
ASTM D6392

Shear Bonded Strength  
Peel Adhesion

**TEST CONDITIONS:** The sample was conditioned for a minimum of one hour in the laboratory at  $22 \pm 2^{\circ}\text{C}$  ( $71.6 \pm 3.6^{\circ}\text{F}$ ) and at  $80 \pm 10\%$  relative humidity prior to test.

**TEST RESULTS:**

The test results are summarized in Table 1.

**PRECISION GEOSYNTHETIC LABORATORIES**



Carmelo V. Zantua  
Technical/Laboratory Director

**TABLE 1.  
SEAM PEEL AND TENSILE TEST RESULTS**

CLIENT: **Geosyntec Consultants**  
PROJECT: **Kekaha LF Cell 1**  
DATE REC'D: **13-Apr-10**

MATERIAL: **HDPE SEAM**  
SEAM TYPE: **Extrusion Weld**  
PGL JOB #: **G100285**

QC'd By: **Bveo**  
TEST METHOD: **ASTM D6392**  
DATE REPORT: **13-Apr-10**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min				
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION				
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)
DS-S-8 Ex/S1	65489	173	> 50%	BRK		1 Outside	163	0	SE3	
		173	> 50%	BRK		2 Outside	102	0	SE3	
		174	> 50%	BRK		3 Outside	138	0	SE3	
		173	> 50%	BRK		4 Outside	138	0	SE3	
		172	> 50%	BRK		5 Outside	117	0	SE3	
								AVG:	132	
					STD. DEV.	23				
					1 Inside	N/A				
					2 Inside					
					3 Inside					
					4 Inside					
					5 Inside					
	AVG.	173				AVG:				
	STD. DEV.	1			121	STD. DEV.				

**BREAK DESCRIPTION (ASTM D6392 FUSION)**

AD ADHESION FAILURE.  
BRK BREAK IN SHEETING.  
SE1 BREAK AT OUTER EDGE OF SEAM.  
SE2 BREAK AT INNER EDGE OF SEAM.  
AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.  
SIP SEPARATION IN THE PLANE OF THE SHEET.

**EXTRUSION:**

AD1 ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAK.  
AD2 ADHESION FAILURE.  
AD-WLD BREAK THROUGH THE FILLET.  
SE1 BREAK AT BOTTOM EDGE OF SEAM.  
SE2 BREAK AT TOP EDGE OF SEAM.  
SE3 BREAK AT BOTTOM EDGE OF SEAM (for PEEL only).  
BRK1 BREAK IN BOTTOM SHEETING.  
BRK2 BREAK IN TOP SHEETING.  
AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.  
HT BREAK AT EDGE OF HOT TACK.  
SIP SEPARATION IN THE PLANE OF THE SHEET.

By entering results and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims or issues due to the use of this data, to the extent of the respective tests presented in this report and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.



Precision Geosynthetic Laboratories







# Precision Geosynthetic Laboratories



April 15, 2010

Mike Minch  
**Geosyntec Consultants**  
475 14<sup>th</sup> Street, Suite 400  
Oakland, CA 94612

RE: **Kekaha LF Cell 1**

Dear Mr. Minch:

Thank you for consulting Precision Geosynthetic Laboratories (PGL) for your material testing needs.

Enclosed is the *final* laboratory report for the testing of eight (8) HDPE Seam samples specified on the proceeding sheet which were received on April 16, 2010.

It shall be noted that the samples tested are believed to be true representative of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. Precision Geosynthetic Laboratories neither accepts responsibility for nor makes claims to the intended final use and purpose of the material.

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims arising out of the use of this data to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.

The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent entity duly authorized by the respective client or from the client itself.

It is a policy of the company to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. *Failed seam samples are kept for two (2) years and good seam samples are disposed of after two (2) weeks.* On the other hand, should you need us to keep them at longer time, please advise us in writing.

Should you have any questions or if we may be of further service to you, please do not hesitate to contact us at telephone number: 800-522-4599

Sincerely,

**PRECISION GEOSYNTHETIC LABORATORIES**

Carmelo V. Zantua  
Technical/Laboratory Director

Enclosure: (Job No. G100318)



# Precision Geosynthetic Laboratories



CLIENT: GEOSYNTEC CONSULTANTS  
PROJECT: Kekaha LF Cell 1

**VERIFICATION OF MATERIAL PROPERTIES**  
(PGL Job No. G100318)

**MATERIAL DESCRIPTION:** HDPE seam

**SAMPLES SENT BY:** Chris Scott, Geosyntec Consultants

**DATE RECEIVED:** April 16, 2010

**DATE REPORTED:** April 16, 2010

**SAMPLE IDENTIFICATIONS:**

SAMPLE ID	PGL CONTROL NUMBER
DS-S-9 S18/S17	65679
DS-S-10 S21/S20	65680
DS-S-11 S24/S23	65681
DS-S-12 Ext/S22	65682
DS-S-13 S27/S26	65683
DS-S-14 S32/S31	65684
DS-S-15 S34/S33	65685
DS-S-16 S32/S33	65686

**TESTS REQUIRED:**

TEST METHOD	DESCRIPTION
ASTM D6392	Shear Bonded Strength
ASTM D6392	Peel Adhesion

**TEST CONDITIONS:** The samples were conditioned for a minimum of one hour in the laboratory at  $22 \pm 2^\circ\text{C}$  ( $71.6 \pm 3.6^\circ\text{F}$ ) and at  $60 \pm 10\%$  relative humidity prior to test.

**TEST RESULTS:**

The test results are summarized in Tables 1 to 4.

**PRECISION GEOSYNTHETIC LABORATORIES**



Carmelo V. Zantua  
Technical/Laboratory Director

**TABLE 1.  
SEAM PEEL AND TACK TEST RESULTS**

CLIENT: Geosyntec Consultants  
PROJECT: Kekaha LF Cell 1  
DATE RECD.: 16-Apr-10

MATERIAL: HDPE SEAM  
SEAM TYPE: Fusion Weld  
PGL JOB #: G100318

OCU By: B.Yeo  
TEST METHOD: ASTM D6392  
DATE REPORT: 16-Apr-10

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min							
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION							
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)			
DS-S-9 S18/S17	65679	158	> 50%	BRK		1 Outside	137	0	SE1				
		160	> 50%	BRK		2 Outside	142	0	SE1				
		158	> 50%	BRK		3 Outside	133	0	SE1				
		157	> 50%	BRK		4 Outside	130	0	SE1				
		155	> 50%	BRK		5 Outside	137	0	SE1				
		AVG:		158				AVG:	136				91
		STD. DEV.		2				STD. DEV.	5				
								1 Inside	138		0	SE1	
								2 Inside	147		0	SE1	
								3 Inside	142		0	SE1	
					4 Inside	153	0	SE1					
					5 Inside	149	0	SE1					
AVG:		168			AVG:	146			91				
STD. DEV.		2			STD. DEV.	6							
DS-S-10 S21/S20	65680	183	> 50%	BRK		1 Outside	134	0	SE1				
		180	> 50%	BRK		2 Outside	139	0	SE1				
		176	> 50%	BRK		3 Outside	132	0	SE1				
		179	> 50%	BRK		4 Outside	134	0	SE1				
		180	> 50%	BRK		5 Outside	137	0	SE1				
		AVG:		180				AVG:	135				91
		STD. DEV.		2				STD. DEV.	3				
								1 Inside	122		0	SE1	
								2 Inside	140		0	SE1	
								3 Inside	124		0	SE1	
					4 Inside	117	0	SE1					
					5 Inside	151	0	SE1					
AVG:		180			AVG:	131			91				
STD. DEV.		2			STD. DEV.	14							

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

AD ADHESION FAILURE.  
BRK BREAK IN SHEETING.  
SE1 BREAK AT OUTER EDGE OF SEAM.  
SE2 BREAK AT INNER EDGE OF SEAM.  
AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.  
SIP SEPARATION IN THE PLANE OF THE SHEET.

**EXTRUSION:**

AD1  
AD2  
AD-WLD  
SE1  
SE2  
SE3  
BRK1  
BRK2  
AD-BRK  
H1  
SIP

**ADHESION FAILURE: SPECIMENS DELAMINATED UNDER THE BEAD:**

ADHESION FAILURE.  
BREAK THROUGH THE FILLET.  
BREAK AT BOTTOM EDGE OF SEAM.  
BREAK AT TOP EDGE OF SEAM.  
BREAK AT BOTTOM EDGE OF SEAM (BI PEEL ONLY)  
BREAK IN BOTTOM SHEETING.  
BREAK IN TOP SHEETING.  
BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.  
BREAK AT EDGE OF HOT TACK.  
SEPARATION IN THE PLANE OF THE SHEET.

By accepting the data and results presented on this report, the Client agrees to the entire liability of Precision Geosynthetic Laboratories from Client and all other parties for claims, processes, due to the use of the data, to the best of the respective tests presented in this report and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.



Precision Geosynthetic Laboratories



**TABLE 2.  
SEAM PEEL AND SHEAR TEST RESULTS**

CLIENT: **Geosyntec Consultants**  
PROJECT: **Kekaha LF Cell 1**  
DATE REC'D: **16-Apr-10**

MATERIAL: **HDPE SEAM**  
SEAM TYPE: **Fusion Weld**  
PGL JOB #: **G100318**

GG's By: **B.Yeo**  
TEST METHOD: **ASTM D6392**  
DATE REPORT: **16-Apr-10**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min							
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION							
		MAXIMUM STRENGTH (lbf/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lbf/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lbf/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lbf/in width)			
DS-S-11 S24/S23	65681	178	> 50%	BRK		1 Outside	119	0	SE1				
		182	> 50%	BRK		2 Outside	126	0	SE1				
		183	> 50%	BRK		3 Outside	120	0	SE1				
		182	> 50%	BRK		4 Outside	123	0	SE1				
		180	> 50%	BRK		5 Outside	121	0	SE1				
		AVG:		122				AVG:			122		91
		STD. DEV.		3				STD. DEV.			3		
								1 Inside	144		0	SE1	
								2 Inside	150		0	SE1	
								3 Inside	153		0	SE1	
								4 Inside	166		0	SE1	
					5 Inside	147	0	SE1					
AVG:		181		121	AVG:		152		91				
STD. DEV.		2			STD. DEV.		8						
DS-S-12 EXT/S22  Extrusion	65682	158	> 50%	BRK		1 Outside	128	0	SE3				
		180	> 50%	BRK		2 Outside	101	0	SE3				
		153	> 50%	BRK		3 Outside	121	0	SE3				
		160	> 50%	BRK		4 Outside	108	0	SE3				
		162	> 50%	BRK		5 Outside	134	0	SE3				
		AVG:		119				AVG:			119		78
		STD. DEV.		14				STD. DEV.			14		
								1 Inside	N/A				
								2 Inside					
								3 Inside					
								4 Inside					
					5 Inside								
AVG:		158		121	AVG:								
STD. DEV.		4			STD. DEV.								

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

AD ADHESION FAILURE  
BRK BREAK IN SHEETING  
SE1 BREAK AT OUTER EDGE OF SEAM  
SE2 BREAK AT INNER EDGE OF SEAM  
AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
SB SEPARATION IN THE PLANE OF THE SHEET

**EXTRUSION:**

AD1  
AD2  
AD-WLD  
SE1  
SE2  
SE3  
BRK1  
BRK2  
AD-BRK  
HT  
MP

**ADHESION FAILURE SPECIMENS DELAMINATED UNDER THE SEAL:**

ADHESION FAILURE  
BREAK THROUGH THE FILLET  
BREAK AT BOTTOM EDGE OF SEAM  
BREAK AT TOP EDGE OF SEAM  
BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)  
BREAK IN BOTTOM SHEETING  
BREAK IN TOP SHEETING  
BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
BREAK AT EDGE OF HOT TACK  
SEPARATION IN THE PLANE OF THE SHEET

By entering the data and results presented on this report, the Client agrees to limit the liability of Precision Diagnostic Laboratories from Client and all other parties for claims in damages, due to the use of this data, to the extent of the respective tests presented in this report and the Client agrees to indemnify and hold harmless Precision Diagnostic Laboratories from and against all liabilities in excess of the above mentioned limit.



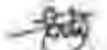
Precision Diagnostic Laboratories



T 3.  
SEAM PEEL AND TAP TEST RESULTS

CLIENT: Geosyntec Consultants  
PROJECT: Kekaha LF Cell 1  
DATE REC'D: 16-Apr-10

MATERIAL: HDPE SEAM  
SEAM TYPE: Fusion Weld  
PGL JOB #: G100318

QC'd By:   
TEST METHOD: ASTM D16392  
DATE REPORT: 16-Apr-10

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min							
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION							
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOGUS OF BREAK	PROJECT SPEC (lb/in width)			
DS-S-13 S27/S26	65683	182	> 50%	BRK		1 Outside	137	0	SE1				
		180	> 50%	BRK		2 Outside	137	0	SE1				
		179	> 50%	BRK		3 Outside	137	0	SE1				
		181	> 50%	BRK		4 Outside	126	0	SE1				
		131	> 50%	BRK		5 Outside	131	0	SE1				
		AVG:						AVG:	134 ✓				91
		STD. DEV.						STD. DEV.	5				
								1 Inside	138		0	SE1	
								2 Inside	139		0	SE1	
								3 Inside	142		0	SE1	
					4 Inside	130	0	SE1					
					5 Inside	137	0	SE1					
AVG:		181 ✓			121	AVG:	137 ✓			91			
STD. DEV.		1				STD. DEV.	5						
DS-S-14 S32/S31	65684	179	> 50%	BRK		1 Outside	131	0	SE1				
		178	> 50%	BRK		2 Outside	143	0	SE1				
		176	> 50%	BRK		3 Outside	135	0	SE1				
		175	> 50%	BRK		4 Outside	112	0	SE1				
		175	> 50%	BRK		5 Outside	131	0	SE1				
		AVG:						AVG:	130 ✓				91
		STD. DEV.						STD. DEV.	12				
								1 Inside	106		50 X	AD-BRK	FAIL
								2 Inside	117		0	SE1	
								3 Inside	85		50 X	AD-BRK	
					4 Inside	116	0	SE1					
					5 Inside	111	0	SE1					
AVG:		177 ✓			121	AVG:	106			91			
STD. DEV.		2				STD. DEV.	12						

**BREAK DESCRIPTION (ASTM D4302 FUSION):**

AD ADHESION FAILURE.  
BRK BREAK IN SHEETING.  
SE1 BREAK AT OUTER EDGE OF SEAM.  
SE2 BREAK AT INNER EDGE OF SEAM.  
AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.  
SIP SEPARATION IN THE PLANE OF THE SHEET.

**EXTRUSION:**

AD1 ADHESION FAILURE, SPECIMENS DELAMINATED UNDER THE BEAD.  
AD2 ADHESION FAILURE.  
AD-WLD BREAK THROUGH THE FILLET.  
SE1 BREAK AT BOTTOM EDGE OF SEAM.  
SE2 BREAK AT TOP EDGE OF SEAM.  
SE4 BREAK AT BOTTOM EDGE OF SEAM (for PEEL only).  
BRK1 BREAK IN BOTTOM SHEETING.  
BRK2 BREAK IN TOP SHEETING.  
AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.  
HT BREAK AT EDGE OF HOT TACK.  
SIP SEPARATION IN THE PLANE OF THE SHEET.

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from claims or issues, due to the use of this data, in the work for the respective party presented in this report, and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.



Precision Geosynthetic Laboratories



**TABLE 4  
SEAM PEEL AND SHEAR TEST RESULTS**

CLIENT: **Geosyntec Consultants**  
PROJECT: **Kekaha LF Cell 1**  
DATE REC'D: **16-Apr-10**

MATERIAL: **HDPE SEAM**  
SEAM TYPE: **Fusion Weld**  
PGL JOB #: **G100318**

QC'd By: **B. Yeo**  
TEST METHOD: **ASTM D6392**  
DATE REPORT: **16-Apr-10**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min							
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION							
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC (lb/in width)			
DS-S-5 S34/S33	65685	162	> 50%	BRK	121	1 Outside	155	0	SE1	91			
		168	> 50%	BRK		2 Outside	152	0	SE1				
		156	> 60%	BRK		3 Outside	145	0	SE1				
		152	> 50%	BRK		4 Outside	154	0	SE1				
		158	> 50%	BRK		5 Outside	145	0	SE1				
		AVG:		155				AVG:	150				
		STD. DEV.		3				STD. DEV.	5				
								1 Inside	147		0	SE1	
								2 Inside	146		0	SE1	
								3 Inside	141		0	SE1	
								4 Inside	147		0	SE1	
					5 Inside	144	0	SE1					
AVG:		155			AVG:	145			91				
STD. DEV.		3			STD. DEV.	3							
DS-S-1B S32/S33	65686	178	> 50%	BRK	121	1 Outside	120	0	SE1	91			
		160	> 50%	BRK		2 Outside	127	0	SE1				
		178	> 50%	BRK		3 Outside	122	0	SE1				
		175	> 50%	BRK		4 Outside	116	0	SE1				
		175	> 50%	BRK		5 Outside	125	0	SE1				
		AVG:		177				AVG:	122				
		STD. DEV.		2				STD. DEV.	4				
								1 Inside	111		0	SE1	
								2 Inside	132		0	SE1	
								3 Inside	134		0	SE1	
								4 Inside	143		0	SE1	
					5 Inside	136	0	SE1					
AVG:		177			AVG:	131			91				
STD. DEV.		2			STD. DEV.	12							

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

AD ADHESION FAILURE  
BRK BREAK IN SHEETING  
OP BREAK AT OUTER EDGE OF SEAM  
SEZ BREAK AT INNER EDGE OF SEAM  
AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
SIP SEPARATION IN THE PLANE OF THE SHEET

**EXTRUSION:**

AD1  
AD2  
AD-WLD  
SE1  
SE2  
SE3  
BRK1  
BRK2  
AD-BRK  
HT  
SIP

ADHESION FAILURE - SPECIMENS DELAMINATED UNDER THE SEAM  
ADHESION FAILURE  
BREAK THROUGH THE FILLET  
BREAK AT BOTTOM EDGE OF SEAM  
BREAK AT TOP EDGE OF SEAM  
BREAK AT BOTTOM EDGE OF SEAM (for FEEU only)  
BREAK IN BOTTOM SHEETING  
BREAK IN TOP SHEETING  
BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
BREAK AT EDGE OF HOT TACK  
SEPARATION IN THE PLANE OF THE SHEET

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims or losses, due to the use of this report, to the extent of the respective tests presented in this report and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limits.



Precision Geosynthetic Laboratories





# Precision Geosynthetic Laboratories



April 20, 2010

Mike Minch  
*Geosyntec Consultants*  
475 14<sup>th</sup> Street, Suite 400  
Oakland, CA 94612

RE: *Kekaha LF Cell 1*

Dear Mr. Minch:

Thank you for consulting Precision Geosynthetic Laboratories (PGL) for your material testing needs.

Enclosed is the *final* laboratory report for the testing of two (2) HDPE Seam samples specified on the proceeding sheet which were received on April 20, 2010.

It shall be noted that the samples tested are believed to be true representative of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. Precision Geosynthetic Laboratories neither accepts responsibility for nor makes claims to the intended final use and purpose of the material.

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims arising out of the use of this data to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.

The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent entity duly authorized by the respective client or from the client itself.

It is a policy of the company to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. *Failed seam samples are kept for two (2) years and good seam samples are disposed of after two (2) weeks.* On the other hand, should you need us to keep them all longer time, please advise us in writing.

Should you have any questions or if we may be of further service to you, please do not hesitate to contact us at telephone number: 800-522-4599.

Sincerely,

**PRECISION GEOSYNTHETIC LABORATORIES**

Carmelo V. Zantua  
Technical/Laboratory Director

Enclosure: (Job No. G100336)



# Precision Geosynthetic Laboratories



CLIENT: *GEOSYNTEC CONSULTANTS*  
PROJECT: *Kekaha LF Cell 1*

**VERIFICATION OF MATERIAL PROPERTIES**  
(PGL Job No. G100336)

**MATERIAL DESCRIPTION:** HDPE seam

**SAMPLES SENT BY:** Chris Scoll, Geosyntec Consultants

**DATE RECEIVED:** April 20, 2010

**DATE REPORTED:** April 20, 2010

**SAMPLE IDENTIFICATIONS:**

SAMPLE ID	PGL CONTROL NUMBER
DS-S-17 S32/S31	65750
DS-S-18 S29/S28	65751

**TESTS REQUIRED:**

TEST METHOD	DESCRIPTION
ASTM D6392	Shear Bonded Strength
ASTM D6392	Peel Adhesion

**TEST CONDITIONS:** The samples were conditioned for a minimum of one hour in the laboratory at  $22 \pm 2^{\circ}\text{C}$  ( $71.6 \pm 3.6^{\circ}\text{F}$ ) and at  $60 \pm 10\%$  relative humidity prior to test.

**TEST RESULTS:**

The test results are summarized in Table 1.

**PRECISION GEOSYNTHETIC LABORATORIES**



Carmelo V. Zantua  
Technical/Laboratory Director



## SEAM PEEL AND 90° TAP TEST RESULTS

CLIENT: **Geosynlec Consultants**  
 PROJECT: **Kekaha LF Cell 1**  
 DATE REC'D: **20-Apr-10**

TRIAL: **HDPE SEAM**  
 SEAM TYPE: **Fusion Weld**  
 PGL JOB #: **G100335**

QC'd By: **B.1**  
 TEST METHOD: **ASTM D6902**  
 DATE REPORT: **20-Apr-10**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min							
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION							
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)			
DS-S-17 S32/S31	65750	175	> 50%	BRK	121	1 Outside	121	0	SE1	91			
		187	> 50%	BRK		2 Outside	121	0	SE1				
		180	> 50%	BRK		3 Outside	121	0	SE1				
		170	> 50%	BRK		4 Outside	119	0	SE1				
		177	> 50%	BRK		5 Outside	122	0	SE1				
		AVG:		178				AVG:	121				
		STD. DEV.		6				STD. DEV.	1				
DS-S-18 S29/S28	85751	178	> 50%	BRK	121	1 Inside	113	75%	AD-BRK	91			
		184	> 50%	BRK		2 Inside	117	75%	AD-BRK				
		181	> 50%	BRK		3 Inside	130	75%	AD-BRK				
		181	> 50%	BRK		4 Inside	114	75%	AD-BRK				
		182	> 50%	BRK		5 Inside	112	75%	AD-BRK				
		AVG:		178				AVG:	117				
		STD. DEV.		6				STD. DEV.	7				
DS-S-18 S29/S28	85751	178	> 50%	BRK	121	1 Outside	116	0	SE1	91			
		184	> 50%	BRK		2 Outside	121	0	SE1				
		181	> 50%	BRK		3 Outside	129	0	SE1				
		181	> 50%	BRK		4 Outside	120	0	SE1				
		182	> 50%	BRK		5 Outside	120	0	SE1				
		AVG:		181				AVG:	121				
		STD. DEV.		2				STD. DEV.	5				
DS-S-18 S29/S28	85751	178	> 50%	BRK	121	1 Inside	125	0	SE1	91			
		184	> 50%	BRK		2 Inside	120	0	SE1				
		181	> 50%	BRK		3 Inside	133	0	SE1				
		181	> 50%	BRK		4 Inside	138	0	SE1				
		182	> 50%	BRK		5 Inside	131	0	SE1				
		AVG:		181				AVG:	129				
		STD. DEV.		2				STD. DEV.	6				

**BREAK DESCRIPTION (ASTM D6902 FUSION):**

AD ADHESION FAILURE.  
 BRK BREAK IN SHEETING.  
 SE1 BREAK AT OUTER EDGE OF SEAM.  
 SE2 BREAK AT INNER EDGE OF SEAM.  
 AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.  
 SIP SEPARATION IN THE PLANE OF THE SHEET.

**EXTRUSION:**

AD1  
 AD2  
 AD-WLD  
 SE1  
 SE2  
 SE3  
 BRK1  
 BRK2  
 AD-BRK  
 XT  
 SIP

**ADHESION FAILURE: SPECIMENS DELAMINATED UNDER THE BEAD.**

ADHESION FAILURE.  
 BREAK THROUGH THE FILLET.  
 BREAK AT BOTTOM EDGE OF SEAM.  
 BREAK AT TOP EDGE OF SEAM.  
 BREAK AT BOTTOM EDGE OF SEAM (for PEEL only).  
 BREAK IN BOTTOM SHEETING.  
 BREAK IN TOP SHEETING.  
 BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.  
 BREAK AT EDGE OF HOT TACK.  
 SEPARATION IN THE PLANE OF THE SHEET.

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims or issues, due to the use of this data, or the cost for the testative fees presented in this report, and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.



Precision Geosynthetic Laboratories





# Precision Geosynthetic Laboratories



April 22, 2010

Mike Minch  
**Geosyntec Consultants**  
475 14<sup>th</sup> Street, Suite 400  
Oakland, CA 94612

RE: **Kekaha LF Cell 1**

Dear Mr. Minch:

Thank you for consulting Precision Geosynthetic Laboratories (PGL) for your material testing needs.

Enclosed is the *final* laboratory report for the testing of three (3) HDPE Seam samples specified on the proceeding sheet which were received on April 22, 2010.

It shall be noted that the samples tested are believed to be true representatives of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. Precision Geosynthetic Laboratories neither accepts responsibility for nor makes claims to the intended final use and purpose of the material.

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims arising out of the use of this data to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.

The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent entity duly authorized by the respective client or from the client itself.

It is a policy of the company to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. **Failed seam samples are kept for two (2) years and good seam samples are disposed of after two (2) weeks.** On the other hand, should you need us to keep them at longer time, please advise us in writing.

Should you have any questions or if we may be of further service to you, please do not hesitate to contact us at telephone number: 800-522-4599.

Sincerely,

**PRECISION GEOSYNTHETIC LABORATORIES**

Belinda Jade R. Yeo  
Quality Assurance

Carmelo V. Zantua  
Technical/Laboratory Director

Enclosure: (Job No. G100350)



# Precision Geosynthetic Laboratories



CLIENT: *GEOSYNTEC CONSULTANTS*  
PROJECT: *Kekaha LF Cell 1*

**VERIFICATION OF MATERIAL PROPERTIES**  
(PGL Job No. G100350)

**MATERIAL DESCRIPTION:** HDPE Seams

**SAMPLES SENT BY:** Chris Scott, Geosyntec Consultants

**DATE RECEIVED:** April 22, 2010

**DATE REPORTED:** April 22, 2010

**SAMPLE IDENTIFICATIONS:**

SAMPLE ID	PGL CONTROL NUMBER
DS-S-19 S38/S37	65839
DS-S-20 S1/S37	65840
DS-S-21 S38/S45	65841

**TESTS REQUIRED:**

TEST METHOD	DESCRIPTION
ASTM D6392	Shear Bond Strength
ASTM D6392	Peel Bond Adhesion

**TEST CONDITIONS:** The samples were conditioned for a minimum of one hour in the laboratory at  $22 \pm 2^{\circ}\text{C}$  ( $71.6 \pm 3.6^{\circ}\text{F}$ ) and at  $60 \pm 10\%$  relative humidity prior to test.

**TEST RESULTS:**

The test results are summarized in Tables 1 to 2.

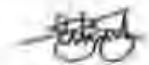
**PRECISION GEOSYNTHETIC LABORATORIES**



Belinda Jade R. Yeo  
Quality Assurance

Carmelo V. Zantua  
Technical/Laboratory Director

**TAB 1  
SEAM PEEL AND TENSILE TEST RESULTS**



CLIENT: **Geosyntec Consultants**  
PROJECT: **Kekaha LF Cell 1**  
DATE REC'D: **22-Apr-10**

MATERIAL: **HDPE SEAM**  
SEAM TYPE: **Fusion Weld**  
PGL JOB #: **G100350**

QC'd By: **B. Yeo**  
TEST METHOD: **ASTM D6392**  
DATE REPORT: **22-Apr-10**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min							
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION							
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)			
DS-S-19 S38/S37	65839	155	> 50%	BRK	121	1 Outside	145	0	SE1	91			
		166	> 50%	BRK		2 Outside	146	0	SE1				
		163	> 50%	BRK		3 Outside	146	0	SE1				
		162	> 50%	BRK		4 Outside	143	0	SE1				
		168	> 50%	BRK		5 Outside	140	0	SE1				
		AVG:		163				AVG:	144				
		STD. DEV.		5				STD. DEV.	3				
								1 Inside	118		0	SE1	
								2 Inside	130		0	SE1	
								3 Inside	122		0	SE1	
								4 Inside	124		0	SE1	
					5 Inside	122	0	SE1					
AVG:		163			AVG:	123			91				
STD. DEV.		5			STD. DEV.	4							
DS-S-20 S1/S37	65840	183	> 50%	BRK	121	1 Outside	149	0	SE1	91			
		186	> 50%	BRK		2 Outside	152	0	SE1				
		182	> 50%	BRK		3 Outside	155	0	SE1				
		176	> 50%	BRK		4 Outside	141	0	SE1				
		182	> 50%	BRK		5 Outside	148	75	AD-BRK				
		AVG:		182				AVG:	149				
		STD. DEV.		4				STD. DEV.	5				
								1 Inside	127		0	SE1	
								2 Inside	127		0	SE1	
								3 Inside	136		0	SE1	
								4 Inside	126		0	SE1	
					5 Inside	135	0	SE1					
AVG:		182			AVG:	130			91				
STD. DEV.		4			STD. DEV.	5							

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

AD ADHESION FAILURE  
BRK BREAK IN SHEETING  
SE1 BREAK AT OUTER EDGE OF SEAM  
SE2 BREAK AT INNER EDGE OF SEAM  
AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
SIF SEPARATION IN THE PLANE OF THE SHEET

**EXTRUSION:**

AD1  
AD2  
AD-WLD  
SE1  
SE2  
SE3  
BRK1  
BRK2  
AD-BRK  
HT  
SIF

**ADHESION FAILURE SPECIMENS DELAMINATED UNDER THE BEAD:**

ADHESION FAILURE  
BREAK THROUGH THE FILLET  
BREAK AT BOTTOM EDGE OF SEAM  
BREAK AT TOP EDGE OF SEAM  
BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)  
BREAK IN BOTTOM SHEETING  
BREAK IN TOP SHEETING  
BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
BREAK AT EDGE OF HOT TACK  
SEPARATION IN THE PLANE OF THE SHEET

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims on (issues, due to the use of the data, to the only) for the respective tests presented in this report and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.



Precision Geosynthetic Laboratories



**TABLE 2  
SEAM PEEL AND SHEAR TEST RESULTS**



CLIENT: **Geosynlec Consultants**  
PROJECT: **Kekaha LF Cell 1**  
DATE REC'D: **22-Apr-10**

MATERIAL: **HDPE SEAM**  
SEAM TYPE: **Fusion Weld**  
PGL JOB #: **G100350**

QC'd By: **B. Yeo**  
TEST METHOD: **ASTM D6392**  
DATE REPORT: **22-Apr-10**

Crosshead Speed: 2 in/min					Crosshead Speed: 2 in/min								
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION			PROJECT SPEC (lb/in width)	PEEL EVALUATION							
		MAXIMUM STRENGTH (lb/in width)	% Elongation	LOCUS of Break		SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC (lb/in width)			
DS-S-21 S38/S45  60ml/60ml	85841	193	> 50%	BRK	121	1 Outside	126	0	SE1	91			
		194	> 50%	BRK		2 Outside	127	0	SE1				
		193	> 50%	BRK		3 Outside	150	0	SE1				
		186	> 50%	BRK		4 Outside	121	0	SE1				
		182	> 50%	BRK		5 Outside	133	0	SE1				
		AVG:		192				AVG:	131				
		STD. DEV:		3				STD. DEV:	11				
								1 Inside	175		0	SE1	
								2 Inside	184		0	SE1	
								3 Inside	123		0	SE1	
					4 Inside	161	0	SE1					
					5 Inside	182	0	SE1					
AVG:		192			AVG:	165			91				
STD. DEV:		3			STD. DEV:	25							

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

AD ADHESION FAILURE.  
BRK BREAK IN SHEETING.  
SE1 BREAK AT OUTER EDGE OF SEAM.  
SE2 BREAK AT INNER EDGE OF SEAM.  
AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.  
SIF SEPARATION IN THE PLANE OF THE SHEET.

**EXTRUSION:**

AD1  
AD2  
AD-WLD  
SE1  
SE2  
SE3  
BRK1  
BRK2  
AD-BRK  
HT  
SIF

ADHESION FAILURE - SPECIMENS DELAMINATED UNDER THE BEAD.  
ADHESION FAILURE.  
BREAK THROUGH THE FILLET.  
BREAK AT BOTTOM EDGE OF SEAM.  
BREAK AT TOP EDGE OF SEAM.  
BREAK AT BOTTOM EDGE OF SEAM (for PEEL only).  
BREAK IN BOTTOM SHEETING.  
BREAK IN TOP SHEETING.  
BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.  
BREAK AT EDGE OF HOT TACK.  
SEPARATION IN THE PLANE OF THE SHEET.

By accepting the data and recommendations contained in this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims or issues, due to the use of this data, to the extent of the respective responsibilities in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.





# Precision Geosynthetic Laboratories



April 23, 2010

Mike Minch  
*Geosyntec Consultants*  
475 14<sup>th</sup> Street, Suite 400  
Oakland, CA 94612

RE: *Kekaha LF Cell 1*

Dear Mr. Minch:

Thank you for consulting Precision Geosynthetic Laboratories (PGL) for your material testing needs.

Enclosed is the *final* laboratory report for the testing of two (2) HDPE Seam samples specified on the proceeding sheet which were received on April 23, 2010.

It shall be noted that the samples tested are believed to be true representatives of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. Precision Geosynthetic Laboratories neither accepts responsibility for nor makes claims to the intended final use and purpose of the material.

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims arising out of the use of this data to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.

The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent entity duly authorized by the respective client or from the client itself.

It is a policy of the company to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. ***Failed seam samples are kept for two (2) years and good seam samples are disposed of after two (2) weeks.*** On the other hand, should you need us to keep them at longer time, please advise us in writing.

Should you have any questions or if we may be of further service to you, please do not hesitate to contact us at telephone number: 800-522-4599

Sincerely,

**PRECISION GEOSYNTHETIC LABORATORIES**

Belinda Jade R. Yee  
Quality Assurance

Carmelo V. Zantua  
Technical/Laboratory Director

Enclosure: (Job No. G100365)



# Precision Geosynthetic Laboratories



CLIENT: *GEOSYNTEC CONSULTANTS*  
PROJECT: *Kekaha LF Cell 1*

**VERIFICATION OF MATERIAL PROPERTIES**  
(PGL Job No. G100365)

**MATERIAL DESCRIPTION:** HDPE Seams

**SAMPLE SENT BY:** Chris Scott, Geosyntec Consultants

**DATE RECEIVED:** April 23, 2010

**DATE REPORTED:** April 23, 2010

**SAMPLE IDENTIFICATIONS:**

SAMPLE ID	PGL CONTROL NUMBER
DS-S-22 S1/S37	85884
DS-S-23 S1/S37	85885

**TESTS REQUIRED:**

TEST METHOD	DESCRIPTION
ASTM D6392	Shear Bond Strength
ASTM D8392	Peel Bond Adhesion

**TEST CONDITIONS:** The samples were conditioned for a minimum of one hour in the laboratory at  $22 \pm 2^{\circ}\text{C}$  ( $71.6 \pm 3.6^{\circ}\text{F}$ ) and at  $60 \pm 10\%$  relative humidity prior to test.

**TEST RESULTS:**

The test results are summarized in Table 1.

**PRECISION GEOSYNTHETIC LABORATORIES**



Belinda Jade R. Yeo  
Quality Assurance

Carmelo V. Zantua  
Technical/Laboratory Director

**TABLE 1,  
SEAM PEEL AND WLR TEST RESULTS**

CLIENT: **Geosynlec Consultants**  
PROJECT: **Kekaha LF Cell 1**  
DATE RECD: **23-Apr-10**

MATERIAL: **HDPE SEAM**  
SEAM TYPE: **Fusion Weld**  
PGL JOB #: **G100365**

QC'd By: **B. Yeo**  
TEST METHOD: **ASTM D6392**  
DATE REPORT: **23-Apr-10**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min							
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION							
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC (lb/in width)			
DS-S-22 S1/S37	65884	191	> 50%	BRK	121	1 Outside	136	0	SE1	91			
		192	> 50%	BRK		2 Outside	131	0	SE1				
		193	> 50%	BRK		3 Outside	131	0	SE1				
		194	> 50%	BRK		4 Outside	134	0	SE1				
		192	> 50%	BRK		5 Outside	127	0	SE1				
		AVG:		192 ✓				AVG:	132 ✓				
		STD. DEV.		1				STD. DEV.	3				
								1 Inside	128		0	SE1	
								2 Inside	131		0	SE1	
								3 Inside	128		0	SE1	
					4 Inside	130	0	SE1					
					5 Inside	124	0	SE1					
AVG:		184 ✓			AVG:	128 ✓			91				
STD. DEV.		3			STD. DEV.	4							
DS-S-23 S1/S37	65885	188	> 50%	BRK	121	1 Outside	131	0	SE1	91			
		181	> 50%	BRK		2 Outside	126	0	SE1				
		182	> 50%	BRK		3 Outside	126	0	SE1				
		184	> 50%	BRK		4 Outside	128	0	SE1				
		183	> 50%	BRK		5 Outside	132	0	SE1				
		AVG:		184 ✓				AVG:	129 ✓				
		STD. DEV.		3				STD. DEV.	2				
								1 Inside	133		0	SE1	
								2 Inside	126		0	SE1	
								3 Inside	123		0	SE1	
					4 Inside	126	0	SE1					
					5 Inside	126	0	SE1					
AVG:		184 ✓			AVG:	127 ✓			91				
STD. DEV.		3			STD. DEV.	4							

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

- AD ADHESION FAILURE
- BRK BREAK IN SHEETING
- SE1 BREAK AT OUTER EDGE OF SEAM
- SE2 BREAK AT INNER EDGE OF SEAM
- AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE
- SIP SEPARATION IN THE PLANE OF THE SHEET

**EXTRUSION:**

- AD1 ADHESION FAILURE, SPECIMENS DELAMINATED UNDER THE BEAD.
- AD2 ADHESION FAILURE.
- AD-WLD BREAK THROUGH THE FILLET
- SE1 BREAK AT BOTTOM EDGE OF SEAM
- SE2 BREAK AT TOP EDGE OF SEAM
- SE3 BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)
- BRK1 BREAK IN BOTTOM SHEETING.
- BRK2 BREAK IN TOP SHEETING.
- AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.
- HT BREAK AT EDGE OF HOT TACK.
- SIP SEPARATION IN THE PLANE OF THE SHEET.

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims or issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.



Precision Geosynthetic Laboratories







# Precision Geosynthetic Laboratories



Mike Minch  
**Geosyntec Consultants**  
475 14<sup>th</sup> Street, Suite 400  
Oakland, CA 94612



Dear Mr. Minch:

Thank you for consulting Precision Geosynthetic Laboratories (PGL) for your material testing needs.

Enclosed is the *final* laboratory report for the seam testing of seven (7) HDPE Seam samples.

**PROJECT NAME:** Kekaha Landfill Cell 1

**REFERENCE PGL JOB NO.:** G100955

**DATE RECEIVED:** August 3, 2010

**DATE REPORTED:** August 3, 2010

**SAMPLE SENT BY:** Doug Hamilton, Geosyntec Consultants

**SAMPLE IDENTIFICATIONS:**

SAMPLE ID	PGL CONTROL NUMBER
DS-S-24 S35/60	68949
DS-S-25 S62/63	68950
DS-S-26 S63/64	68951
DS-S-27 S67/69	68952
DS-S-28 S69/71	68953
DS-S-29 S72/74	68954
DS-S-30 S75/76	68955

**TESTS REQUIRED:**

TEST METHOD	DESCRIPTION
ASTM D6392	Shear Bond Strength
ASTM D6392	Peel Bond Adhesion

**TEST CONDITIONS:** The samples were conditioned for a minimum of one hour in the laboratory at  $22 \pm 2^{\circ}\text{C}$  ( $71.6 \pm 3.6^{\circ}\text{F}$ ) and at  $80 \pm 10\%$  relative humidity prior to test.

**TEST RESULTS:** The test results are summarized in Tables 1 to 4.

**PRECISION GEOSYNTHETIC LABORATORIES**



Camilo V. Zanua  
Technical/Laboratory Director

It shall be noted that the samples tested are believed to be true representatives of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. Precision Geosynthetic Laboratories neither accepts responsibility for nor makes claims to the intended final use and purpose of the material. The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent authority duly authorized by the respective client or from the client itself. It is a policy of the company to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. *Failed seam samples are kept for two (2) years and good seam samples are disposed of after one (1) week.* On the other hand, should you need us to keep them at longer time, please advise us in writing.

**TABLE 1.  
SEAM PEEL AND SHEAR TEST RESULTS**



CLIENT: **Geosyntec Consultants**  
PROJECT: **Kekaha LF Cell 1**  
DATE REC'D: **3-Aug-10**

MATERIAL: **HDPE SEAM**  
SEAM TYPE: **Fusion Weld**  
PGL JOB #: **G100955**

QC'd By: **C. Zantua**  
TEST METHOD: **ASTM D6392**  
DATE REPORT: **3-Aug-10**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min							
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION							
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)			
DS-S-24 S35/60	68949	174	> 50%	BRK	121	1 Outside	130	0	SE1	91			
		181	> 50%	BRK		2 Outside	135	0	SE1				
		174	> 50%	BRK		3 Outside	131	0	SE1				
		178	> 50%	BRK		4 Outside	131	0	SE1				
		181	> 50%	BRK		5 Outside	136	0	SE1				
		AVG:		178				AVG:	133				
		STD. DEV.		3				STD. DEV.	3				
								1 Inside	131		0	SE1	
								2 Inside	138		0	SE1	
								3 Inside	132		0	SE1	
								4 Inside	126		0	SE1	
					5 Inside	145	0	SE1					
AVG:		178			AVG:	134			91				
STD. DEV.		3			STD. DEV.	7							
DS-S-25 S62/63	68950	189	> 50%	BRK	121	1 Outside	152	0	SE1	91			
		186	> 50%	BRK		2 Outside	151	0	SE1				
		187	> 50%	BRK		3 Outside	146	0	SE1				
		179	> 50%	BRK		4 Outside	142	0	SE1				
		183	> 50%	BRK		5 Outside	148	0	SE1				
		AVG:		185				AVG:	146				
		STD. DEV.		6				STD. DEV.	4				
								1 Inside	120		0	SE1	
								2 Inside	123		0	SE1	
								3 Inside	129		0	SE1	
								4 Inside	128		0	SE1	
					5 Inside	123	0	SE1					
AVG:		185			AVG:	125			91				
STD. DEV.		6			STD. DEV.	4							

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

- AD ADHESION FAILURE
- BRK BREAK IN SHEETING
- SE1 BREAK AT OUTER EDGE OF SEAM
- SE2 BREAK AT INNER EDGE OF SEAM
- AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE
- SP SEPARATION IN THE PLANE OF THE SHEET

**EXTRUSION:**

- A01
- A02
- AD-WLD
- SE1
- SE2
- SE3
- BRK1
- BRK2
- AD-BRK
- NT
- SP

**ADHESION FAILURE - SPECIMENS DELAMINATED UNDER THE BEAD:**

- ADHESION FAILURE
- BREAK THROUGH THE FILLET
- BREAK AT BOTTOM EDGE OF SEAM
- BREAK AT TOP EDGE OF SEAM
- BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)
- BREAK IN BOTTOM SHEETING
- BREAK IN TOP SHEETING
- BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE
- BREAK AT EDGE OF HOT TACK
- SEPARATION IN THE PLANE OF THE SHEET

By accepting the data and results presented in this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims or injuries, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.



Precision E

thetic Laboratories



TA 2  
SEAM PEEL AND TAP TEST RESULTS

CLIENT: Geosyntec Consultants  
PROJECT: Kekaha LF Cell 1  
DATE RECD: 3-Aug-10

MATERIAL: HDPE SEAM  
SEAM TYPE: Fusion Weld  
PGL JOB #: G100955

DCR By: C. Zantua  
TEST METHOD: ASTM D6392  
DATE REPORT: 3-Aug-10

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min							
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION							
		MAXIMUM STRENGTH (lb/in width)	% Elongation	LOCUS of Break	PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)			
DS-S-26 563/64	68951	154	> 50%	BRK		1 Outside	144	0	SE1	FAIL			
		153	> 50%	BRK		2 Outside	145	100	AD				
		154	> 50%	BRK		3 Outside	151	0	SE1				
		153	> 50%	BRK		4 Outside	132	100	AD				
		151	> 50%	BRK		5 Outside	129	100	AD				
		AVG:		140				AVG:			140		91
		STD. DEV.		9				STD. DEV.			9		
				127				1 Inside	127		0	SE1	OK
				127				2 Inside	127		0	SE1	
				125				3 Inside	125		0	SE1	
				113				4 Inside	113		25	AD-BRK	
		135			5 Inside	135	0	SE1					
AVG:		125			AVG:		125		91				
STD. DEV.		8			STD. DEV.		8						
DS-S-27 567/69	68952	180	> 50%	BRK		1 Outside	121	0	SE1				
		191	> 50%	BRK		2 Outside	136	0	SE1				
		190	> 50%	BRK		3 Outside	123	0	SE1				
		189	> 50%	BRK		4 Outside	128	0	SE1				
		191	> 50%	BRK		5 Outside	141	0	SE1				
		AVG:		130				AVG:			130		91
		STD. DEV.		9				STD. DEV.			9		
				153				1 Inside	153			SE1	
				158				2 Inside	158			SE1	
				155				3 Inside	155			SE1	
				132				4 Inside	132			SE1	
		125			5 Inside	125		SE1					
AVG:		144			AVG:		144		91				
STD. DEV.		15			STD. DEV.		15						

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

NO ADHESION FAILURE  
BRK BREAK IN SHEETING  
SE1 BREAK AT OUTER EDGE OF SEAM  
SE2 BREAK AT INNER EDGE OF SEAM  
AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
SIP SEPARATION IN THE PLANE OF THE SHEET

**EXTRUSION:**

AD1  
AD2  
AD-WLD  
SE1  
SE2  
SE3  
BRK1  
BRK2  
AD-BRK  
HT  
SIP

**ADHESION FAILURE: SPECIMENS DELAMINATED UNDER THE BEAD.**

ADHESION FAILURE  
BREAK THROUGH THE FILLET  
BREAK AT BOTTOM EDGE OF SEAM  
BREAK AT TOP EDGE OF SEAM  
BREAK AT BOTTOM EDGE OF SEAM (for PIPE ONLY)  
BREAK IN BOTTOM SHEETING  
BREAK IN TOP SHEETING  
BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
BREAK AT EDGE OF HOT TACK  
SEPARATION IN THE PLANE OF THE SHEET

By accepting this data and results presented in this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims or issues, due to the use of this data to the cost for the respective test presented in this report, and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.



Precision Geosynthetic Laboratories



**TABLE 3.  
SEAM PEEL AND SHEAR TEST RESULTS**

CLIENT: **Geosyntec Consultants**  
PROJECT: **Kekaha LF Cell 1**  
DATE REC'D: **3-Aug-10**

MATERIAL: **HDPE SEAM**  
SEAM TYPE: **Fusion Weld**  
PGL JOB #: **G100955**

QC'd By: **C. Zantua**  
TEST METHOD: **ASTM D6392**  
DATE REPORT: **3-Aug-10**



Crosshead Speed: 2 in/min					Crosshead Speed: 2 in/min								
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION			PROJECT SPEC. (lb/in width)	PEEL EVALUATION							
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locust of Break		SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)			
DS-S-28 S69/71	88953	181	> 50%	BRK		1 Outside	131	0	SE1				
		180	> 50%	BRK		2 Outside	136	0	SE1				
		185	> 50%	BRK		3 Outside	128	0	SE1				
		179	> 50%	BRK		4 Outside	140	0	SE1				
		164	> 50%	BRK		5 Outside	129	0	SE1				
		AVG:		182				AVG:	133				91
		STD. DEV.		3			121	STD. DEV.	5				
								1 Inside	127		0	SE1	
								2 Inside	132		0	SE1	
								3 Inside	126		0	SE1	
								4 Inside	121		0	SE1	
					5 Inside	133	0	SE1					
AVG:		182		121	AVG:	128			91				
STD. DEV.		3			STD. DEV.	5							
DS-S-29 S72/74	88954	180	> 50%	BRK		1 Outside	127	0	SE1				
		184	> 50%	BRK		2 Outside	137	0	SE1				
		183	> 50%	BRK		3 Outside	135	0	SE1				
		177	> 50%	BRK		4 Outside	129	0	SE1				
		184	> 50%	BRK		5 Outside	129	0	SE1				
		AVG:		182				AVG:	131				91
		STD. DEV.		3			121	STD. DEV.	4				
								1 Inside	140		0	SE1	
								2 Inside	129		0	SE1	
								3 Inside	143		0	SE1	
								4 Inside	158		0	SE1	
					5 Inside	132	0	SE1					
AVG:		182		121	AVG:	140			91				
STD. DEV.		3			STD. DEV.	11							

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

AD ADHESION FAILURE.  
BRK BREAK IN SHEETING.  
SE1 BREAK AT OUTER EDGE OF SEAM.  
SE2 BREAK AT INNER EDGE OF SEAM.  
AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.  
SIP SEPARATION IN THE PLANE OF THE SHEET.

**EXTRUSION:**

AD1  
AD2  
AD-WLD  
SE1  
SE2  
SE3  
BRK1  
BRK2  
AD-BRK  
HT  
SIP

ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE READ.  
ADHESION FAILURE.  
BREAK THROUGH THE FILLET.  
BREAK AT BOTTOM EDGE OF SEAM.  
BREAK AT TOP EDGE OF SEAM.  
BREAK AT BOTTOM EDGE OF SEAM (for PEEL only).  
BREAK IN BOTTOM SHEETING.  
BREAK IN TOP SHEETING.  
BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.  
BREAK AT EDGE OF HOT TACK.  
SEPARATION IN THE PLANE OF THE SHEET.

By accepting the data and results presented on this report, the Client agrees to indemnify the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims or lawsuits, due to the use of this data, to the extent of the results/figures presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limits.



Precision G


omatic Laboratories



**TAP 4**  
**SEAM PEEL AND TAP TEST RESULTS**

CLIENT: **Geosyntec Consultants**  
PROJECT: **Kekaha LF Cell 1**  
DATE REC'D: **3-Aug-10**

MATERIAL: **HDPE SEAM**  
SEAM TYPE: **Fusion Weld**  
PGL JOB #: **G100955**

  
QC'd By: **C. Zantua**  
TEST METHOD: **ASTM D6392**  
DATE REPORT: **3-Aug-10**

Crosshead Speed: 2 in/min					Crosshead Speed: 2 in/min							
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION			PROJECT SPEC. (in width)	PEEL EVALUATION						
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break		SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (in width)		
DS-S-30 S75/76	88955	170	> 50%	BRK		1 Outside	137	0	SE1			
		156	> 50%	BRK		2 Outside	146	0	SE1			
		161	> 50%	BRK		3 Outside	136	0	SE1			
		158	> 50%	BRK		4 Outside	143	0	SE1			
		154	> 50%	BRK		5 Outside	144	0	SE1			
		AVG:		141				31				
		STD. DEV.		4								
				1 Inside		128	0	SE1				
				2 Inside		132	0	SE1				
				3 Inside		125	0	SE1				
		4 Inside	126	0	SE1							
		5 Inside	124	0	SE1							
AVG.		160			121	AVG:	127			31		
STD. DEV.		6				STD. DEV.	3					

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

AD ADHESION FAILURE.  
BRK BREAK IN SHEETING.  
SE1 BREAK AT OUTER EDGE OF SEAM.  
SE2 BREAK AT INNER EDGE OF SEAM.  
AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.  
SIP SEPARATION IN THE PLANE OF THE SHEET.

**EXTRUSION:**

AD1 ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD.  
AD2 ADHESION FAILURE.  
AD-WLD BREAK THROUGH THE FILLET.  
SE1 BREAK AT BOTTOM EDGE OF SEAM.  
SE2 BREAK AT TOP EDGE OF SEAM.  
SE3 BREAK AT BOTTOM EDGE OF SEAM (for PEEL only).  
BRK1 BREAK IN BOTTOM SHEETING.  
BRK2 BREAK IN TOP SHEETING.  
AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.  
HT BREAK AT EDGE OF HOT TACK.  
SIP SEPARATION IN THE PLANE OF THE SHEET.

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims on (issues due to the use of this data, to the extent of the responsibility presented in this report), and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limits.



Precision Geosynthetic Laboratories





Mike Minch  
**Geosyntec Consultants**  
 475 14<sup>th</sup> Street, Suite 400  
 Oakland, CA 94612

Dear Mr. Minch:

Thank you for consulting Precision Geosynthetic Laboratories (PGL) for your material testing needs.

Enclosed is the **final** laboratory report for the seam testing of eleven (11) HDPE Seam samples.

**PROJECT NAME:** Kekaha Landfill Cell 1

**REFERENCE PGL JOB NO.:** G100973

**DATE RECEIVED:** August 6, 2010

**DATE REPORTED:** August 6, 2010

**SAMPLE SENT BY:** Doug Hamilton, Geosyntec Consultants

**SAMPLE IDENTIFICATIONS:**

SAMPLE ID	PGL CONTROL NUMBER
DS-S-32 S83/85	69087
DS-S-33 S85/86	69088
DS-S-34 S88/89	69089
DS-S-35 S91/93	69090
DS-S-36 S94/95	69091
DS-S-37 S101/102	69092
DS-S-38 S95/100	69093
DS-S-39 S67/68	69094
DS-S-40 S000/91	69095
DS-S-41 S79/80	69096
DS-S-42 S00/81	69097

NOTE : DS-S-31 SAMPLE  
 WAS NOT SENT  
 TO LAB FOR TESTING.

**TESTS REQUIRED:**

TEST METHOD	DESCRIPTION
ASTM D6392	Shear Bond Strength
ASTM D6392	Peel Bond Adhesion

**TEST CONDITIONS:** The samples were conditioned for a minimum of one hour in the laboratory at  $22 \pm 2^{\circ}\text{C}$  ( $71.6 \pm 3.6^{\circ}\text{F}$ ) and at  $60 \pm 10\%$  relative humidity prior to test.

**TEST RESULTS:** The test results are summarized in Tables 1 to 6.

**PRECISION GEOSYNTHETIC LABORATORIES**




Carmelo V. Zantua  
 Technical/Laboratory Director

It shall be noted that the samples tested are believed to be true representatives of the material produced under the designation herein stated. In addition, the attached laboratory test results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. Precision Geosynthetic Laboratories neither accepts responsibility for nor makes claims to the intended final use and purpose of the material. The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from personnel duly authorized by the respective client or from the client itself. It is a policy of the company to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. **Failed seam samples are kept for two (2) years and good seam samples are disposed of after two (2) weeks.** On the other hand, should you need us to keep them at longer time, please advise us in writing.

### SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **Geosyntec Consultants**  
 PROJECT: **Kekaha LF Cell 1**  
 DATE REC'D: **6-Aug-10**

MATERIAL: **HDPE SEAM**  
 SEAM TYPE: **Fusion Weld**  
 PGL JOB #: **G100973**

QC'd By:   
 TEST METHOD: **ASTM D6392**  
 DATE REPORT: **6-Aug-10**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min							
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION							
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)			
DS-S-32 983/85	69087	170	> 50%	BRK		1 Outside	138	0	SE1				
		175	> 50%	BRK		2 Outside	140	0	SE1				
		178	> 50%	BRK		3 Outside	150	0	SE1				
		175	> 50%	BRK		4 Outside	142	0	SE1				
		178	> 50%	BRK		5 Outside	142	0	SE1				
		AVG:						142					81
		STD. DEV.						5					
								1 Inside	142		0	SE1	
								2 Inside	137		0	SE1	
								3 Inside	136		0	SE1	
					4 Inside	136	0	SE1					
					5 Inside	140	0	SE1					
AVG:		175			121	138			81				
STD. DEV.		3				3							
DS-S-33 985/86	69088	165	> 50%	BRK		1 Outside	138	0	SE1				
		166	> 50%	BRK		2 Outside	140	0	SE1				
		165	> 50%	BRK		3 Outside	128	0	SE1				
		168	> 50%	BRK		4 Outside	129	0	SE1				
		162	> 50%	BRK		5 Outside	136	0	SE1				
		AVG:						134					81
		STD. DEV.						6					
								1 Inside	137		0	SE1	
								2 Inside	140		0	SE1	
								3 Inside	142		0	SE1	
					4 Inside	142	0	SE1					
					5 Inside	137	0	SE1					
AVG:		165			121	140			81				
STD. DEV.		2				3							

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

AD ADHESION FAILURE.  
 BRK BREAK IN SHEETING.  
 SE1 BREAK AT OUTER EDGE OF SEAM.  
 SE2 BREAK AT INNER EDGE OF SEAM.  
 AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.  
 SIP SEPARATION IN THE PLANE OF THE SHEET.

**EXTRUSION:**

AD1  
 AD2  
 AD-WLD  
 SE1  
 SE2  
 SE3  
 BRK1  
 BRK2  
 AD-BRK  
 HT  
 SIP

**ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD.**

ADHESION FAILURE.  
 BREAK THROUGH THE FILLET.  
 BREAK AT BOTTOM EDGE OF SEAM.  
 BREAK AT TOP EDGE OF SEAM.  
 BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)  
 BREAK IN BOTTOM SHEETING.  
 BREAK IN TOP SHEETING.  
 BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.  
 BREAK AT EDGE OF HOT TACK.  
 SEPARATION IN THE PLANE OF THE SHEET.

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims or issues, due to the use of this data, or the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.



Precision G

that's Laboratories



# SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **Geosyntec Consultants**  
 PROJECT: **Kekaha LF Cell 1**  
 DATE REC'D: **6-Aug-10**

MATERIAL: **HDPE SEAM**  
 SEAM TYPE: **Fusion Weld**  
 PGL JOB #: **G100973**

QC'd By:   
 TEST METHOD: **ASTM D6392**  
 DATE REPORT: **6-Aug-10**

Crosshead Speed: 2 in/min		SHEAR EVALUATION				Crosshead Speed: 2 in/min							
SAMPLE ID	PGL CONTROL #	MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)			
DS-S-34 S88/89	69089	190	> 50%	BRK		1 Outside	136	0	SE1				
		180	> 50%	BRK		2 Outside	140	0	SE1				
		165	> 50%	BRK		3 Outside	142	0	SE1				
		183	> 50%	BRK		4 Outside	141	0	SE1				
		185	> 50%	BRK		5 Outside	135	0	SE1				
		AVG:		185 ✓				AVG:	139 ✓				91
		STD. DEV.		4				STD. DEV.	3				
								1 Inside	140		0	SE1	
								2 Inside	142		0	SE1	
								3 Inside	137		0	SE1	
					4 Inside	136	0	SE1					
					5 Inside	142	0	SE1					
AVG:		185 ✓			AVG:	139 ✓			91				
STD. DEV.		4			STD. DEV.	3							
DS-S-35 S91/93	69090	180	> 50%	BRK		1 Outside	150	0	SE1				
		183	> 50%	BRK		2 Outside	151	0	SE1				
		180	> 50%	BRK		3 Outside	146	0	SE1				
		183	> 50%	BRK		4 Outside	140	0	SE1				
		184	> 50%	BRK		5 Outside	137	0	SE1				
		AVG:		182 ✓				AVG:	145 ✓				91
		STD. DEV.		2				STD. DEV.	5				
								1 Inside	138		0	SE1	
								2 Inside	142		0	SE1	
								3 Inside	138		0	SE1	
					4 Inside	142	0	SE1					
					5 Inside	140	0	SE1					
AVG:		182 ✓			AVG:	140 ✓			91				
STD. DEV.		2			STD. DEV.	2							

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

- AD ADHESION FAILURE
- BRK BREAK IN SHEETING
- SE1 BREAK AT OUTER EDGE OF SEAM
- SE2 BREAK AT INNER EDGE OF SEAM
- AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE
- SIP SEPARATION IN THE PLANE OF THE SHEET

**EXTRUSION:**

- AD1 ADHESION FAILURE, SPECIMENS DELAMINATED UNDER THE BEAD.
- AD2 ADHESION FAILURE
- AD-WLD BREAK THROUGH THE FILLET
- SE1 BREAK AT BOTTOM EDGE OF SEAM
- SE2 BREAK AT TOP EDGE OF SEAM
- SE1 BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)
- BRK1 BREAK IN BOTTOM SHEETING
- BRK2 BREAK IN TOP SHEETING
- AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE
- HT BREAK AT EDGE OF HOT TACK
- SIP SEPARATION IN THE PLANE OF THE SHEET

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims or losses due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.



Precision Geosynthetic Laboratories






## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **Geosyntec Consultants**  
 PROJECT: **Kekaha LF Cell 1**  
 DATE REC'D: **6-Aug-10**

MATERIAL: **HOPE SEAM**  
 SEAM TYPE: **Fusion Weld**  
 PGL JOB #: **G100973**

CC'd By:   
 TEST METHOD: **ASTM D6392**  
 DATE REPORT: **6-Aug-10**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min							
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION							
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC (lb/in width)			
DS-S-36 S94/95	69091	180	> 50%	BRK		1 Outside	140	0	SE1				
		184	> 50%	BRK		2 Outside	150	0	SE1				
		183	> 50%	BRK		3 Outside	148	0	SE1				
		182	> 50%	BRK		4 Outside	150	0	SE1				
		184	> 50%	BRK		5 Outside	147	0	SE1				
		AVG:						AVG:	147 ✓				91
		STD. DEV.						STD. DEV.	4				
AVG:		183 ✓			121	AVG:	139 ✓		91				
STD. DEV.		2				STD. DEV.	2						
DS-S-37 S101/102	69092	182	> 50%	BRK		1 Outside	141	0	SE1				
		183	> 50%	BRK		2 Outside	138	0	SE1				
		180	> 50%	BRK		3 Outside	140	0	SE1				
		183	> 50%	BRK		4 Outside	140	0	SE1				
		184	> 50%	BRK		5 Outside	141	0	SE1				
		AVG:						AVG:	140 ✓				91
		STD. DEV.						STD. DEV.	1				
AVG:		182 ✓			121	AVG:	138 ✓		91				
STD. DEV.		2				STD. DEV.	2						

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

- AD ADHESION FAILURE.
- BRK BREAK IN SHEETING.
- SE1 BREAK AT OUTER EDGE OF SEAM.
- SE2 BREAK AT INNER EDGE OF SEAM.
- AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.
- SIF SEPARATION IN THE PLANE OF THE SHEET.

**EXTRUSION:**

- AD1 ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD.
- AD2 ADHESION FAILURE.
- AD-WLD BREAK THROUGH THE FILLET.
- SE1 BREAK AT BOTTOM EDGE OF SEAM.
- SE2 BREAK AT TOP EDGE OF SEAM.
- SE3 BREAK AT BOTTOM EDGE OF SEAM (for PEEL only).
- BRK1 BREAK IN BOTTOM SHEETING.
- BRK2 BREAK IN TOP SHEETING.
- AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.
- HT BREAK AT EDGE OF HOT TACK.
- SIF SEPARATION IN THE PLANE OF THE SHEET.

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims or damages, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.



Precision Geosynthetic Laboratories



### SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **Geosyntec Consultants**  
 PROJECT: **Kekaha LF Cell 1**  
 DATE REC'D: **6-Aug-10**

RIAL: **HDPE SEAM**  
 TYPE: **Fusion Weld**  
 PGL JOB #: **G100973**

QC'd By:   
 TEST METHOD: **ASTM D6392**  
 DATE REPORT: **6-Aug-10**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min							
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION							
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)			
DS-S-38 S95/100	69093	170	> 50%	BRK	121	1 Outside	136	0	SE1	91			
		168	> 50%	BRK		2 Outside	140	0	SE1				
		168	> 50%	BRK		3 Outside	142	0	SE1				
		168	> 50%	BRK		4 Outside	142	0	SE1				
		171	> 50%	BRK		5 Outside	137	0	SE1				
		AVG:		169				AVG:	139				
		STD. DEV.		2				STD. DEV.	3				
								1 Inside	138		0	SE1	
								2 Inside	137		0	SE1	
								3 Inside	135		0	SE1	
								4 Inside	140		0	SE1	
					5 Inside	142	0	SE1					
AVG:		169			AVG:	138			91				
STD. DEV.		2			STD. DEV.	3							
DS-S-39 S67/68	69094	160	> 50%	BRK	121	1 Outside	138	0	SE1	91			
		160	> 50%	BRK		2 Outside	140	0	SE1				
		162	> 50%	BRK		3 Outside	129	0	SE1				
		163	> 50%	BRK		4 Outside	136	0	SE1				
		160	> 50%	BRK		5 Outside	142	0	SE1				
		AVG:		161				AVG:	137				
		STD. DEV.		1				STD. DEV.	5				
								1 Inside	142		0	SE1	
								2 Inside	150		0	SE1	
								3 Inside	142		0	SE1	
								4 Inside	137		0	SE1	
					5 Inside	136	0	SE1					
AVG:		161			AVG:	141			91				
STD. DEV.		1			STD. DEV.	6							

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

- AD ADHESION FAILURE
- BRK BREAK IN SHEETING
- SE1 BREAK AT OUTER EDGE OF SEAM
- SE2 BREAK AT INNER EDGE OF SEAM
- AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE
- SIP SEPARATION IN THE PLANE OF THE SHEET

**EXTRUSION:**

- AD1 ADHESION FAILURE SPECIMENS DELAMINATED UNDER THE BEAD.
- AD2 ADHESION FAILURE
- AD-WLD BREAK THROUGH THE FILLET
- SE1 BREAK AT BOTTOM EDGE OF SEAM
- SE2 BREAK AT TOP EDGE OF SEAM
- SE3 BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)
- BRK1 BREAK IN BOTTOM SHEETING
- BRK2 BREAK IN TOP SHEETING
- AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE
- HT BREAK AT EDGE OF HOT TACK
- SIP SEPARATION IN THE PLANE OF THE SHEET

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.




**Precision Geosynthetic Laboratories**



### SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **Geosyntec Consultants**  
 PROJECT: **Kekaha LF Cell 1**  
 DATE REC'D: **6-Aug-10**

MATERIAL: **HDPE SEAM**  
 SEAM TYPE: **Fusion Weld**  
 PGL JOB #: **G100973**

QC'd By:   
 TEST METHOD: **ASTM D6392**  
 DATE REPORT: **6-Aug-10**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min				
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION				
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)
DS-S-40 S000/01  Extrusion	59095	168	> 50%	BRK		1 Outside	130	0	SE3	
		165	> 50%	BRK		2 Outside	126	0	SE3	
		168	> 50%	BRK		3 Outside	120	0	SE3	
		168	> 50%	BRK		4 Outside	124	0	SE3	
		168	> 50%	BRK		5 Outside	126	0	SE3	
		AVG:						AVG:	125 ✓	
STD. DEV.					STD. DEV.	4				
167					121					
1					AVG:					
DS-S-41 S79/80  Fusion	69096	180	> 50%	BRK		1 Outside	134	0	SE1	
		162	> 50%	BRK		2 Outside	140	0	SE1	
		180	> 50%	BRK		3 Outside	142	0	SE1	
		178	> 50%	BRK		4 Outside	137	0	SE1	
		181	> 50%	BRK		5 Outside	140	0	SE1	
		AVG:						AVG:	139 ✓	
STD. DEV.					STD. DEV.	3				
180 ✓					121					
1					AVG:					
139 ✓					121					
2					STD. DEV.					
139 ✓					121					
2					STD. DEV.					
139 ✓					121					
2					STD. DEV.					

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

AD: ADHESION FAILURE  
 BRK: BREAK IN SHEETING  
 SE1: BREAK AT OUTER EDGE OF SEAM  
 SE2: BREAK AT INNER EDGE OF SEAM  
 AD-BRK: BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
 SIP: SEPARATION IN THE PLANE OF THE SHEET

**EXTRUSION:**

AD1: ADHESION FAILURE: SPECIMENS DELAMINATED UNDER THE BEAD.  
 AD2: ADHESION FAILURE  
 AD-WLD: BREAK THROUGH THE FILLET  
 SE1: BREAK AT BOTTOM EDGE OF SEAM  
 SE2: BREAK AT TOP EDGE OF SEAM  
 SE3: BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)  
 BRK1: BREAK IN BOTTOM SHEETING  
 BRK2: BREAK IN TOP SHEETING  
 AD-BRK: BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
 HT: BREAK AT EDGE OF HOT TACK  
 SIP: SEPARATION IN THE PLANE OF THE SHEET

By accepting the data and results presented in this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims or damages, due to the use of this data, on the cost for the respective tests presented in this report and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.




Precision Geosynthetic Laboratories



### SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **Geosyntec Consultants**  
 PROJECT: **Kakaha LF Cell 1**  
 DATE REC'D: **6-Aug-10**

Trial: **HDPE SEAM**  
 TYPE: **Extrusion Weld**  
 PGL JOB #: **G100973**

QC'd By:   
 TEST METHOD: **ASTM D 6392**  
 DATE REPORT: **6-Aug-10**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min				
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION				
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)
DS-S-42 S00/81	69097	168	> 50%	BRK		1 Outside	128	0	SE3	
		167	> 50%	BRK		2 Outside	126	0	SE3	
		165	> 50%	BRK		3 Outside	130	0	SE3	
		168	> 50%	BRK		4 Outside	124	0	SE3	
		155	> 50%	BRK		5 Outside	124	0	SE3	
						AVG:	126			
				STD. DEV.	3					
				1 Inside	N/A					
				2 Inside						
				3 Inside						
				4 Inside						
				5 Inside						
AVG.		167			121	AVG:				
STD. DEV.		1				STD. DEV.				

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

AD           ADHESION FAILURE  
 BRK        BREAK IN SHEETING  
 SE1        BREAK AT OUTER EDGE OF SEAM  
 SE2        BREAK AT INNER EDGE OF SEAM  
 AD-BRK    BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
 SIP        SEPARATION IN THE PLANE OF THE SHEET.

**EXTRUSION:**

AD1	ADHESION FAILURE - SPECIMENS DELAMINATED UNDER THE BEAD.
AD2	ADHESION FAILURE
AD-WLD	BREAK THROUGH THE FILLET.
SE1	BREAK AT BOTTOM EDGE OF SEAM.
SE2	BREAK AT TOP EDGE OF SEAM.
SE3	BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)
BRK1	BREAK IN BOTTOM SHEETING
BRK2	BREAK IN TOP SHEETING.
AD-BRK	BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE
HT	BREAK AT EDGE OF HOT TACK
SIP	SEPARATION IN THE PLANE OF THE SHEET.

By accessing the data and results presented in this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims or issues, due to the use of this data, to the extent for the respective tests described in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.



Precision Geosynthetic Laboratories





# Precision Geosynthetic Laboratories



April 13, 2010

Mike Minch  
**Geosyntec Consultants**  
475 14<sup>th</sup> Street, Suite 400  
Oakland, CA 94612

RE: **Kekaha LF Cell 1**

Dear Mr. Minch:

Thank you for consulting Precision Geosynthetic Laboratories (PGL) for your material testing needs.

Enclosed is the *final* laboratory report for the testing of three (3) HDPE Seam samples specified on the proceeding sheet which were received on April 13, 2010.

It shall be noted that the samples tested are believed to be true representatives of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. Precision Geosynthetic Laboratories neither accepts responsibility for nor makes claims to the intended final use and purpose of the material.

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims arising out of the use of this data to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.

The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent entity duly authorized by the respective client or from the client itself.

It is a policy of the company to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. *Failed seam samples are kept for two (2) years and good seam samples are disposed of after two (2) weeks.* On the other hand, should you need us to keep them at longer time, please advise us in writing.

Should you have any questions or if we may be of further service to you, please do not hesitate to contact us at telephone number: 800-522-4599.

Sincerely,

**PRECISION GEOSYNTHETIC LABORATORIES**

Carmelo V. Zantua  
Technical/Laboratory Director

Enclosure: (Job No. Gt00284)



# Precision Geosynthetic Laboratories



CLIENT: *GEOSYNTEC CONSULTANTS*  
PROJECT: *Kekaha LF Cell 1*

**VERIFICATION OF MATERIAL PROPERTIES**  
(PGL Job No. G100284)

**MATERIAL DESCRIPTION:** HDPE seams

**SAMPLES SENT BY:** Chris Scott, Geosyntec Consultants

**DATE RECEIVED:** April 13, 2010

**DATE REPORTED:** April 13, 2010

**SAMPLE IDENTIFICATIONS:**

SAMPLE ID	PGL CONTROL NUMBER
DS-P1 P3/P1	65486
DS-P2 P4/P2	65487
DS-P3 P6/P5	65488

**TESTS REQUIRED:**

TEST METHOD	DESCRIPTION
ASTM D6392	Shear Bonded Strength
ASTM D6392	Peel Adhesion

**TEST CONDITIONS:** The samples were conditioned for a minimum of one hour in the laboratory at  $22 \pm 2^{\circ}\text{C}$  ( $71.6 \pm 3.6^{\circ}\text{F}$ ) and at  $60 \pm 10\%$  relative humidity prior to test.

**TEST RESULTS:**

The test results are summarized in Tables 1 and 2.

**PRECISION GEOSYNTHETIC LABORATORIES**



Garmelo V. Zantua  
Technical/Laboratory Director

**TAP 1.  
SEAM PEEL AND TENSILE TEST RESULTS**

CLIENT: **Geosyntec Consultants**  
PROJECT: **Kekaha LF Cell 1**  
DATE REC'D: **13-Apr-10**

MATERIAL: **HDPE SEAM**  
SEAM TYPE: **Fusion Weld**  
PGL JOB #: **G100284**

QC'd By: **Byeo**  
TEST METHOD: **ASTM D6392**  
DATE REPORT: **13-Apr-10**

Crosshead Speed: 2 in/min					Crosshead Speed: 2 in/min								
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION			PROJECT SPEC. (lb/in width)	PEEL EVALUATION							
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break		SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)			
DS-P-1 P3/P1	65486	192	> 50%	BRK	121	1 Outside	122	0	SE1	91			
		193	> 50%	BRK		2 Outside	118	0	SE1				
		196	> 50%	BRK		3 Outside	128	0	SE1				
		198	> 50%	BRK		4 Outside	132	0	SE1				
		198	> 50%	BRK		5 Outside	130	0	SE1				
		AVG:		126				AVG:			126		
		STD. DEV.		6				STD. DEV.			7		
		1 Inside	137	0		SE1							
		2 Inside	123	0		SE1							
		3 Inside	120	0		SE1							
		4 Inside	122	0		SE1							
5 Inside	124	0	SE1										
AVG:		125			AVG:		125						
STD. DEV.		3			STD. DEV.		7						
DS-P-2 P4-P2	65487	184	> 50%	BRK	121	1 Outside	126	0	SE1	91			
		188	> 50%	BRK		2 Outside	142	0	SE1				
		188	> 50%	BRK		3 Outside	126	0	SE1				
		189	> 50%	BRK		4 Outside	143	0	SE1				
		191	> 50%	BRK		5 Outside	120	0	SE1				
		AVG:		131				AVG:			131		
		STD. DEV.		10				STD. DEV.			10		
		1 Inside	119	0		SE1							
		2 Inside	120	0		SE1							
		3 Inside	122	0		SE1							
		4 Inside	120	0		SE1							
5 Inside	114	0	SE1										
AVG:		119			AVG:		119						
STD. DEV.		2			STD. DEV.		3						

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

AD: ADHESION FAILURE.  
BRK: BREAK IN SHEETING.  
SE1: BREAK AT OUTER EDGE OF SEAM.  
SE2: BREAK AT INNER EDGE OF SEAM.  
AD-BRK: BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.  
SIF: SEPARATION IN THE PLANE OF THE SHEET.

**EXTRUSION:**

AD1: ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD.  
AD2: ADHESION FAILURE.  
AD-WLD: BREAK THROUGH THE FILLET.  
SE1: BREAK AT BOTTOM EDGE OF SEAM.  
SE2: BREAK AT TOP EDGE OF SEAM.  
SE3: BREAK AT BOTTOM EDGE OF SEAM (IN PEEL ONLY).  
BRK1: BREAK IN BOTTOM SHEETING.  
BRK2: BREAK IN TOP SHEETING.  
AD-BRK: BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.  
HT: BREAK AT EDGE OF HOT TACK.  
SIF: SEPARATION IN THE PLANE OF THE SHEET.

By accepting the data and results presented in this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims or lawsuits, due to the use of this data, as the cost for the respective tests presented in this report and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.



Precision Geosynthetic Laboratories



**TABLE 2.  
SEAM PEEL AND SHEAR TEST RESULTS**

CLIENT: **Geosyntec Consultants**  
PROJECT: **Kekaha LF Cell 1**  
DATE REC'D: **13-Apr-10**

MATERIAL: **HDPE SEAM**  
SEAM TYPE: **Fusion Weld**  
PGL JOB #: **G100284**

QC'd By: **Bveo**  
TEST METHOD: **ASTM D6392**  
DATE REPORT: **13-Apr-10**

Crosshead Speed: 2 in/min					Crosshead Speed: 2 in/min							
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION			PROJECT SPEC. (lb/in width)	PEEL EVALUATION						
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break		SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)		
DS-P-3 P6/P5	65488	167	> 50%	BRK	121	1 Outside	130	0	SE1	81		
		165	> 50%	BRK		2 Outside	134	0	SE1			
		166	> 50%	BRK		3 Outside	132	0	SE1			
		165	> 50%	BRK		4 Outside	132	0	SE1			
		163	> 50%	BRK		5 Outside	131	0	SE1			
		AVG:		132								
		STD. DEV.		1								
								1 Inside	142		0	SE1
								2 Inside	146		0	SE1
								3 Inside	138		0	SE1
					4 Inside	142	0	SE1				
					5 Inside	136	0	SE1				
AVG:		165			AVG:	141			81			
STD. DEV.		1			STD. DEV.	4						

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

AD ADHESION FAILURE  
BRK BREAK IN SHEETING  
SE1 BREAK AT OUTER EDGE OF SEAM  
SE2 BREAK AT INNER EDGE OF SEAM  
AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
SIP SEPARATION IN THE PLANE OF THE SHEET

**EXTRUSION:**

AD1 ADHESION FAILURE (SPECIMENS DELAMINATED UNDER THE BEAD)  
AD2 ADHESION FAILURE  
AD-WLD BREAK THROUGH THE FILLET  
SE1 BREAK AT BOTTOM EDGE OF SEAM  
SE2 BREAK AT TOP EDGE OF SEAM  
SE3 BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)  
BRK1 BREAK IN BOTTOM SHEETING  
BRK2 BREAK IN TOP SHEETING  
AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
HT BREAK AT EDGE OF HOT TACK  
SIP SEPARATION IN THE PLANE OF THE SHEET

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Clients and all other parties for claims or issues, due to the use of this data, or the risk for the respective tests presented in this report and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limits.



Precision G

thetic Laboratories







# Precision Geosynthetic Laboratories



April 15, 2010

Mike Minch  
**Geosyntec Consultants**  
475 14<sup>th</sup> Street, Suite 400  
Oakland, CA 94612

RE: **Kekaha LF Cell 1**

Dear Mr. Minch:

Thank you for consulting Precision Geosynthetic Laboratories (PGL) for your material testing needs.

Enclosed is the *final* laboratory report for the testing of four (4) HDPE Seam samples specified on the proceeding sheet which were received on April 15, 2010.

It shall be noted that the samples tested are believed to be true representative of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. Precision Geosynthetic Laboratories neither accepts responsibility for nor makes claims to the intended final use and purpose of the material.

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims arising out of the use of this data to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.

The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent entity duly authorized by the respective client or from the client itself.

It is a policy of the company to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. *Failed seam samples are kept for two (2) years and good seam samples are disposed of after two (2) weeks.* On the other hand, should you need us to keep them at longer time, please advise us in writing.

Should you have any questions or if we may be of further service to you, please do not hesitate to contact us at telephone number: 800-522-4599.

Sincerely,

**PRECISION GEOSYNTHETIC LABORATORIES**

Carmela V. Zantua  
Technical/Laboratory Director

Enclosure: (Job No. G100304)



# Precision Geosynthetic Laboratories



CLIENT: *GEOSYNTEC CONSULTANTS*  
PROJECT: *Kekaha LF Cell 1*

**VERIFICATION OF MATERIAL PROPERTIES**  
(PGL Job No. G100304)

**MATERIAL DESCRIPTION:** HDPE seam

**SAMPLES SENT BY:** Chris Scott, Geosyntec Consultants

**DATE RECEIVED:** April 15, 2010

**DATE REPORTED:** April 15, 2010

**SAMPLE IDENTIFICATIONS:**

SAMPLE ID	PGL CONTROL NUMBER
DS-P-4 P6/P7	65590
DS-P-5 P11/P9	65591
DS-P-6 P14/P13	65592
DS-P-7 Ext/P13	65593

**TESTS REQUIRED:**

TEST METHOD	DESCRIPTION
ASTM D6392	Shear Bonded Strength
ASTM D6392	Peel Adhesion

**TEST CONDITIONS:** The samples were conditioned for a minimum of one hour in the laboratory at  $22 \pm 2^{\circ}\text{C}$  ( $71.6 \pm 3.6^{\circ}\text{F}$ ) and at  $60 \pm 10\%$  relative humidity prior to test.

**TEST RESULTS:**

The test results are summarized in Tables 1 to 2.

**PRECISION GEOSYNTHETIC LABORATORIES**




Carmelo V. Zantua  
Technical/Laboratory Director

## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **Geosyntec Consultants**  
 PROJECT: **Kekaha LF Cell 1**  
 DATE REC'D: **15-Apr-10**

TRIAL: **HDPE SEAM**  
 SEAL TYPE: **Fusion Weld**  
 PGL JOB #: **G100304**

  
 QC'd By: **B.**  
 TEST METHOD: **ASTM D6392**  
 DATE REPORT: **15-Apr-10**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min							
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION							
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)			
DS-P-4 P6/P7	85590	190	> 50%	BRK		1 Outside	133	0	SE1				
		185	> 50%	BRK		2 Outside	131	0	SE1				
		188	> 50%	BRK		3 Outside	130	0	SE1				
		183	> 50%	BRK		4 Outside	123	0	SE1				
		185	> 50%	BRK		5 Outside	131	0	SE1				
		AVG:						130					91
		STD. DEV.						4					
								1 Inside	126		0	SE1	
								2 Inside	128		0	SE1	
								3 Inside	133		0	SE1	
					4 Inside	138	0	SE1					
					5 Inside	145	0	SE1					
AVG:		186			121	134			91				
STD. DEV.		3				8							
DS-P-5 P11/P9	65591	188	> 50%	BRK		1 Outside	133	0	SE1				
		188	> 50%	BRK		2 Outside	128	0	SE1				
		188	> 50%	BRK		3 Outside	124	0	SE1				
		190	> 50%	BRK		4 Outside	130	0	SE1				
		192	> 50%	BRK		5 Outside	131	0	SE1				
		AVG:						129					91
		STD. DEV.						3					
								1 Inside	124		0	SE1	
								2 Inside	123		0	SE1	
								3 Inside	120		0	SE1	
					4 Inside	129	0	SE1					
					5 Inside	121	0	SE1					
AVG:		189			121	123			91				
STD. DEV.		2				4							

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

AD ADHESION FAILURE.  
 BRK BREAK IN SHEETING.  
 SE1 BREAK AT OUTER EDGE OF SEAM.  
 SE2 BREAK AT INNER EDGE OF SEAM.  
 AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.  
 SIP SEPARATION IN THE PLANE OF THE SHEET.

**EXTRUSION:**

AD1 ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD.  
 AD2 ADHESION FAILURE.  
 AD-WLD BREAK THROUGH THE FILLET.  
 SE1 BREAK AT BOTTOM EDGE OF SEAM.  
 SE2 BREAK AT TOP EDGE OF SEAM.  
 SE3 BREAK AT BOTTOM EDGE OF SEAM (for PEEL ONLY)  
 BRK1 BREAK IN BOTTOM SHEETING.  
 BRK2 BREAK IN TOP SHEETING.  
 AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.  
 HT BREAK AT EDGE OF HOT TACK.  
 SIP SEPARATION IN THE PLANE OF THE SHEET.

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims or issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.



Precision Geosynthetic Laboratories



## SEAM PEEL AND SHEAR TEST RESULTS



CLIENT: **Geosyntec Consultants**  
 PROJECT: **Kekaha LF Cell 1**  
 DATE REC'D: **15-Apr-10**

MATERIAL: **HDPE SEAM**  
 SEAM TYPE: **Fusion Weld**  
 PGL JOB #: **G100304**

QC'd By: **B.Yeo**  
 TEST METHOD: **ASTM D6392**  
 DATE REPORT: **15-Apr-10**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min						
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION						
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)		
DS-P-6 P14/P13  Fusion	65592	162	> 50%	BRK		1 Outside	151	0	SE1			
		162	> 50%	BRK		2 Outside	151	0	SE1			
		163	> 50%	BRK		3 Outside	144	0	SE1			
		163	> 50%	BRK		4 Outside	140	0	SE1			
		165	> 50%	BRK		5 Outside	145	0	SE1			
		AVG:		146				91				
		STD. DEV.		5								
				148		0	SE1					
				149		0	SE1					
				144		0	SE1					
		144	0	SE1								
		149	0	SE1								
AVG:		147			91							
STD. DEV.		3										
DS-P-7 Ext/P13  Extrusion	65593	162	> 50%	BRK		1 Outside	94	0	SE3			
		162	> 50%	BRK		2 Outside	84	0	SE3			
		161	> 50%	BRK		3 Outside	105	0	SE3			
		163	> 50%	BRK		4 Outside	111	0	SE3			
		162	> 50%	BRK		5 Outside	107	0	SE3			
		AVG:		100				78				
		STD. DEV.		11								
				N/A								
AVG:		121										
STD. DEV.		1										

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

AD ADHESION FAILURE  
 BRK BREAK IN SHEETING  
 SE1 BREAK AT OUTER EDGE OF SEAM  
 SE2 BREAK AT INNER EDGE OF SEAM  
 AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
 SIP SEPARATION IN THE PLANE OF THE SHEET

**EXTRUSION:**

AD1 ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD  
 AD2 ADHESION FAILURE  
 AD-WLD BREAK THROUGH THE FILLET  
 SE1 BREAK AT BOTTOM EDGE OF SEAM  
 SE2 BREAK AT TOP EDGE OF SEAM  
 SE3 BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)  
 BRK1 BREAK IN BOTTOM SHEETING  
 BRK2 BREAK IN TOP SHEETING  
 AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
 HT BREAK AT EDGE OF HOT TACK  
 SIP SEPARATION IN THE PLANE OF THE SHEET

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims on issues due to the use of this data, to the cost for the respective tests presented in this report, and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned cost.



**Precision Geosynthetic Laboratories**





# Precision Geosynthetic Laboratories



April 21, 2010

Mike Minch  
**Geosyntec Consultants**  
475 14<sup>th</sup> Street, Suite 400  
Oakland, CA 94612

RE: Kekaha LF Cell 1

Dear Mr. Minch:

Thank you for consulting Precision Geosynthetic Laboratories (PGL) for your material testing needs.

Enclosed is the *final* laboratory report for the testing of three (3) HDPE Seam samples specified on the proceeding sheet which were received on April 21, 2010.

It shall be noted that the samples tested are believed to be true representative of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. Precision Geosynthetic Laboratories neither accepts responsibility for nor makes claims to the intended final use and purpose of the material.

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims arising out of the use of this data to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.

The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent entity duly authorized by the respective client or from the client itself.

It is a policy of the company to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. **Failed seam samples are kept for two (2) years and good seam samples are disposed of after two (2) weeks.** On the other hand, should you need us to keep them at longer time, please advise us in writing.

Should you have any questions or if we may be of further service to you, please do not hesitate to contact us at telephone number: 800-522-4599.

Sincerely,

**PRECISION GEOSYNTHETIC LABORATORIES**

Carmelo V. Zantua  
Technical/Laboratory Director

Enclosure: (Job No. G100342)



# Precision Geosynthetic Laboratories



CLIENT: GEOSYNTEC CONSULTANTS  
PROJECT: Kekaha LF Cell 1

**VERIFICATION OF MATERIAL PROPERTIES**  
(PGL Job No. G100342)

**MATERIAL DESCRIPTION:** HDPE geom

**SAMPLES SENT BY:** Chris Scott, Geosyntec Consultants

**DATE RECEIVED:** April 21, 2010

**DATE REPORTED:** April 21, 2010

**SAMPLE IDENTIFICATIONS:**

SAMPLE ID	PGL CONTROL NUMBER
DS-P-8 P15/P17	65791
DS-P-9 P19/P18	65792
DS-P-10 P22/P21	65793

**TESTS REQUIRED:**

TEST METHOD	DESCRIPTION
ASTM D6392	Shear Bonded Strength
ASTM D6392	Peel Adhesion

**TEST CONDITIONS:** The samples were conditioned for a minimum of one hour in the laboratory at  $22 \pm 2^{\circ}\text{C}$  ( $71.6 \pm 3.6^{\circ}\text{F}$ ) and at  $60 \pm 10\%$  relative humidity prior to test.

**TEST RESULTS:**

The test results are summarized in Tables 1 to 2.

**PRECISION GEOSYNTHETIC LABORATORIES**



Carmelo V. Zantua  
Technical/Laboratory Director

**TABLE 1.  
SEAM PEEL AND TACK TEST RESULTS**

CLIENT: **Geosyntec Consultants**  
PROJECT: **Kekaha LF Cell 1**  
DATE REC'D: **21-Apr-10**

TRIAL: **HOPE SEAM**  
SEAM TYPE: **Fusion Weld**  
PGL JOB #: **G100342**

QC'd By: **B. J.**  
TEST METHOD: **ASTM D6392**  
DATE REPORT: **21-Apr-10**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min				
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION				
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)
DS-P-8 P15/P17	65791	181	> 50%	BRK		1 Outside	128	0	SE1	
		188	> 50%	BRK		2 Outside	132	0	SE1	
		185	> 50%	BRK		3 Outside	125	0	SE1	
		187	> 50%	BRK		4 Outside	126	0	SE1	
		181	> 50%	BRK		5 Outside	122	0	SE1	
		AVG:	184				121	AVG:	127	
STD. DEV.	3				STD. DEV.	4				
DS-P-9 P19/P18	65792	185	> 50%	BRK		1 Inside	119	0	SE1	
		187	> 50%	BRK		2 Inside	132	0	SE1	
		186	> 50%	BRK		3 Inside	140	0	SE1	
		185	> 50%	BRK		4 Inside	141	0	SE1	
		185	> 50%	BRK		5 Inside	140	0	SE1	
		AVG:	184				121	AVG:	134	
STD. DEV.	3				STD. DEV.	9				
DS-P-9 P19/P18	65792	185	> 50%	BRK		1 Outside	130	0	SE1	
		187	> 50%	BRK		2 Outside	127	0	SE1	
		186	> 50%	BRK		3 Outside	130	0	SE1	
		185	> 50%	BRK		4 Outside	126	0	SE1	
		185	> 50%	BRK		5 Outside	129	0	SE1	
		AVG:	186				121	AVG:	128	
STD. DEV.	1				STD. DEV.	2				
DS-P-9 P19/P18	65792	185	> 50%	BRK		1 Inside	127	0	SE1	
		187	> 50%	BRK		2 Inside	133	0	SE1	
		186	> 50%	BRK		3 Inside	125	0	SE1	
		185	> 50%	BRK		4 Inside	134	0	SE1	
		185	> 50%	BRK		5 Inside	125	0	SE1	
		AVG:	186				121	AVG:	129	
STD. DEV.	1				STD. DEV.	4				

<b>BREAK DESCRIPTION (ASTM D6392 FUSION):</b>	<b>EXTRUSION:</b>	AD1	ADHESION FAILURE: SPECIMENS DELAMINATED UNDER THE BEAD.
AD	ADHESION FAILURE	AD2	ADHESION FAILURE
BRK	BREAK IN SHEETING	AD-WLD	BREAK THROUGH THE FILLET.
SE1	BREAK AT OUTER EDGE OF SEAM	SE1	BREAK AT BOTTOM EDGE OF SEAM.
SE2	BREAK AT INNER EDGE OF SEAM	SE2	BREAK AT TOP EDGE OF SEAM
AD-BRK	BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE	SE3	BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)
SIP	SEPARATION IN THE PLANE OF THE SHEET.	BRK1	BREAK IN BOTTOM SHEETING.
		BRK2	BREAK IN TOP SHEETING.
		AD-BRK	BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.
		HT	BREAK AT EDGE OF HOT TACK
		SIP	SEPARATION IN THE PLANE OF THE SHEET.

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.

**TABLE 2,  
SEAM PEEL AND SHEAR TEST RESULTS**



CLIENT: **Geosyntec Consultants**  
PROJECT: **Kekaha LF Cell 1**  
DATE REC'D: **21-Apr-10**

MATERIAL: **HDPE SEAM**  
SEAM TYPE: **Fusion Weld**  
PGL JOB #: **G100342**

QC'd By: **B. Yeo**  
TEST METHOD: **ASTM D6392**  
DATE REPORT: **21-Apr-10**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min				
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION				
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)
DS-P-10 P22/P21	65793	181	> 50%	BRK		1 Outside	124	0	SE1	
		183	> 50%	BRK		2 Outside	123	0	SE1	
		180	> 50%	BRK		3 Outside	127	0	SE1	
		183	> 50%	BRK		4 Outside	124	0	SE1	
		184	> 50%	BRK		5 Outside	137	0	SE1	
		AVG:	127				91			
STD. DEV.	5									
					1 Inside	122	0	SE1		
					2 Inside	123	0	SE1		
					3 Inside	129	0	SE1		
					4 Inside	129	0	SE1		
					5 Inside	126	0	SE1		
	AVG.	182			121	AVG:	126			91
	STD. DEV.	2				STD. DEV.	3			

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

AD ADHESION FAILURE.  
BRK BREAK IN SHEETING.  
SE1 BREAK AT OUTER EDGE OF SEAM  
SE2 BREAK AT INNER EDGE OF SEAM  
AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
SEP SEPARATION IN THE PLANE OF THE SHEET.

**EXTRUSION:**

AD1 ADHESION FAILURE, SPECIMENS DELAMINATED UNDER THE SEAM.  
AD2 ADHESION FAILURE.  
AD-WLD BREAK THROUGH THE FILLET.  
SE1 BREAK AT BOTTOM EDGE OF SEAM  
SE2 BREAK AT TOP EDGE OF SEAM  
SE3 BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)  
BRK1 BREAK IN BOTTOM SHEETING.  
BRK2 BREAK IN TOP SHEETING.  
AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.  
HT BREAK AT EDGE OF HOT TACK  
SEP SEPARATION IN THE PLANE OF THE SHEET.

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims or issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.



Precision Geosynthetic Laboratories







# Precision Geosynthetic Laboratories



April 22, 2010

Mike Minch  
**Geosyntec Consultants**  
475 14<sup>th</sup> Street, Suite 400  
Oakland, CA 94612

RE: **Kekaha LF Cell 1**

Dear Mr. Minch:

Thank you for consulting Precision Geosynthetic Laboratories (PGL) for your material testing needs.

Enclosed is the **final** laboratory report for the testing of one (1) HDPE Seam sample specified on the proceeding sheet which was received on April 22, 2010.

It shall be noted that the sample tested is believed to be true representative of the material produced under the designation herein stated. In addition, the attached laboratory test results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. Precision Geosynthetic Laboratories neither accepts responsibility for nor makes claims to the intended final use and purpose of the material.

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims arising out of the use of this data to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.

The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent entity duly authorized by the respective client or from the client itself.

It is a policy of the company to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. **Failed seam samples are kept for two (2) years and good seam samples are disposed of after two (2) weeks.** On the other hand, should you need us to keep them at longer time, please advise us in writing.

Should you have any questions or if we may be of further service to you, please do not hesitate to contact us at telephone number: 800-522-4599.

Sincerely,

**PRECISION GEOSYNTHETIC LABORATORIES**

Belinda Jade R. Yeo  
Quality Assurance

Carmelo V. Zantua  
Technical/Laboratory Director

Enclosure: (Job No. G100351)



# Precision Geosynthetic Laboratories



CLIENT: *GEOSYNTEC CONSULTANTS*  
PROJECT: *Kekaha LF Cell 1*

**VERIFICATION OF MATERIAL PROPERTIES**  
(PGL Job No. G100351)

**MATERIAL DESCRIPTION:** HDPE Seam

**SAMPLE SENT BY:** Chris Scott, Geosyntec Consultants

**DATE RECEIVED:** April 22, 2010

**DATE REPORTED:** April 22, 2010

**SAMPLE IDENTIFICATIONS:**

SAMPLE ID	PGL CONTROL NUMBER
DS-P-11 Ex/P22	65842

**TESTS REQUIRED:**

TEST METHOD	DESCRIPTION
ASTM D6392	Shear Bond Strength
ASTM D6392	Peel Bond Adhesion

**TEST CONDITIONS:** The sample was conditioned for a minimum of one hour in the laboratory at  $22 \pm 2^\circ\text{C}$  ( $71.6 \pm 3.6^\circ\text{F}$ ) and at  $60 \pm 10\%$  relative humidity prior to test.

**TEST RESULTS:**

The test results are summarized in Table 1.

**PRECISION GEOSYNTHETIC LABORATORIES**



Belinda Jade H. Yeu  
Quality Assurance

Carmelo V. Zantua  
Technical/Laboratory Director

## SEAM PEEL AND TENSILE TEST RESULTS

CLIENT: **Geosyntec Consultants**  
 PROJECT: **Kekaha LF Cell 1**  
 DATE REC'D: **22-Apr-10**

MATERIAL: **HDPE SEAM**  
 SEAM TYPE: **Extrusion Weld**  
 PGL JOB #: **G100351**

QC'd By: **B.1**  
 TEST METHOD: **ASTM D6902**  
 DATE REPORT: **22-Apr-10**

Crosshead Speed: 9 in/min						Crosshead Speed: 2 in/min				
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION				
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC (lb/in width)
DS-P-11 Ext/P22	65842	164	> 50%	BRK		1 Outside	50 X	100 X	AD1	
		163	> 50%	BRK		2 Outside	90	0	SE3	
		165	> 50%	BRK		3 Outside	78	0	SE3	
		163	> 50%	BRK		4 Outside	69	0	SE3	
		163	> 50%	BRK		5 Outside	78 X	100 X	AD1	
				AVG:				AVG:	73	
		STD. DEV.			STD. DEV.	15	<b>FAIL</b>			
						1 Inside	N/A			
						2 Inside				
						3 Inside				
						4 Inside				
						5 Inside				
AVG.		163 ✓			121	AVG:				
STD. DEV.		1				STD. DEV.				

**BREAK DESCRIPTION (ASTM D6902 FUSION):**

AD           ADHESION FAILURE  
 BRK        BREAK IN SHEETING  
 SE1        BREAK AT OUTER EDGE OF SEAM  
 SE2        BREAK AT INNER EDGE OF SEAM  
 AD-BRK    BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
 SIP        SEPARATION IN THE PLANE OF THE SHEET.

**EXTRUSION:**

AD1        ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD.  
 AD2        ADHESION FAILURE.  
 AD-WLD    BREAK THROUGH THE FILLET  
 SE1        BREAK AT BOTTOM EDGE OF SEAM  
 SE2        BREAK AT TOP EDGE OF SEAM.  
 SE3        BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)  
 BRK1      BREAK IN BOTTOM SHEETING.  
 BRK2      BREAK IN TOP SHEETING.  
 AD-BRK    BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
 HT        BREAK AT EDGE OF HOT TACK  
 SIP        SEPARATION IN THE PLANE OF THE SHEET.

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from claims and all other parties for claims (in whole or in part) due to the use of this data, to the cost for the respective tests presented in this report, and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.



# Precision Geosynthetic Laboratories



April 23, 2010

Mike Minch  
Geosyntec Consultants  
475 14<sup>th</sup> Street, Suite 400  
Oakland, CA 94612

RE: Kekaha LF Cell 1

Dear Mr. Minch:

Thank you for consulting Precision Geosynthetic Laboratories (PGL) for your material testing needs.

Enclosed is the *final* laboratory report for the testing of four (4) HDPE Seam samples specified on the proceeding sheet which were received on April 23, 2010.

It shall be noted that the samples tested are believed to be true representatives of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. Precision Geosynthetic Laboratories neither accepts responsibility for nor makes claims to the intended final use and purpose of the material.

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims arising out of the use of this data to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.

The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent entity duly authorized by the respective client or from the client itself.

It is a policy of the company to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. *Failed seam samples are kept for two (2) years and good seam samples are disposed of after two (2) weeks.* On the other hand, should you need us to keep them at longer time, please advise us in writing.

Should you have any questions or if we may be of further service to you, please do not hesitate to contact us at telephone number: 800-522-4599.

Sincerely,

**PRECISION GEOSYNTHETIC LABORATORIES**

Belinda Jade R. Yeo  
Quality Assurance

Carmelo V. Zantua  
Technical/Laboratory Director

Enclosure: (Job No. G100364)



# Precision Geosynthetic Laboratories



CLIENT: **GEOSYNTEC CONSULTANTS**  
PROJECT: *Kekaha LF Cell 1*

**VERIFICATION OF MATERIAL PROPERTIES**  
(PGL Job No. G100364)

**MATERIAL DESCRIPTION:** HDPE Seams

**SAMPLE SENT BY:** Chris Scott, Geosyntec Consultants

**DATE RECEIVED:** April 23, 2010

**DATE REPORTED:** April 23, 2010

**SAMPLE IDENTIFICATIONS:**

SAMPLE ID	PGL CONTROL NUMBER
DS-P-12 P24/P23	65880
DS-P-13 P25/P26	65881
DS-P-14 Ext/P1	65882
DS-P-15 P28/P27	65883

**TESTS REQUIRED:**

TEST METHOD	DESCRIPTION
ASTM D6392	Shear Bond Strength
ASTM D6392	Peel Bond Adhesion

**TEST CONDITIONS:** The samples were conditioned for a minimum of one hour in the laboratory at  $22 \pm 2^{\circ}\text{C}$  ( $71.6 \pm 3.6^{\circ}\text{F}$ ) and at  $60 \pm 10\%$  relative humidity prior to test.

**TEST RESULTS:**

The test results are summarized in Tables 1 and 2.

**PRECISION GEOSYNTHETIC LABORATORIES**



Belinda Jade R. Yeo  
Quality Assurance

Carmelo V. Zantua  
Technical/Laboratory Director

**TABLE 1:  
SEAM PEEL AND TIR TEST RESULTS**

CLIENT: **Geosyntec Consultants**  
PROJECT: **Kekaha LF Cell 1**  
DATE REC'D: **23-Apr-10**

TRIAL: **HDPE SEAM**  
SEAM TYPE: **Fusion Weld**  
PGL JOB #: **G100364**

QC'd By: **B.Y.**  
TEST METHOD: **ASTM D6392**  
DATE REPORT: **23-Apr-10**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min							
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION							
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC (lb/in width)			
DS-P-12 P24/P23	65880	190	> 50%	BRK	121	1 Outside	137	0	SE1	91			
		185	> 50%	BRK		2 Outside	136	0	SE1				
		186	> 50%	BRK		3 Outside	136	0	SE1				
		185	> 50%	BRK		4 Outside	130	0	SE1				
		187	> 50%	BRK		5 Outside	129	0	SE1				
		AVG:		186 ✓				AVG:	134 ✓				
		STD. DEV.		2				STD. DEV.	4				
DS-P-13 P25/P26	85881	167	> 50%	BRK	121	1 Inside	121	0	SE1	91			
		168	> 50%	BRK		2 Inside	124	0	SE1				
		168	> 50%	BRK		3 Inside	120	0	SE1				
		168	> 50%	BRK		4 Inside	128	0	SE1				
		169	> 50%	BRK		5 Inside	127	0	SE1				
		AVG:		168 ✓				AVG:	124 ✓				
		STD. DEV.		1				STD. DEV.	4				
AVG:		168 ✓			AVG:	146 ✓			91				
STD. DEV.		1			STD. DEV.	4							

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

AD ADHESION FAILURE  
BRK BREAK IN SHEETING  
SE1 BREAK AT OUTER EDGE OF SEAM  
SE2 BREAK AT INNER EDGE OF SEAM  
AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
SIP SEPARATION IN THE PLANE OF THE SHEET

**EXTRUSION:**

AD1 ADHESION FAILURE - SPECIMENS DELAMINATED UNDER THE BEAD  
AD2 ADHESION FAILURE  
AD-WLD BREAK THROUGH THE FILLLET  
SE1 BREAK AT BOTTOM EDGE OF SEAM  
SE2 BREAK AT TOP EDGE OF SEAM  
SE3 BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)  
BRK1 BREAK IN BOTTOM SHEETING  
BRK2 BREAK IN TOP SHEETING  
AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
HT BREAK AT EDGE OF HOT TACK  
SIP SEPARATION IN THE PLANE OF THE SHEET

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims or issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.



**Precision Geosynthetic Laboratories**



**TABLE 2.  
SEAM PEEL AND SHEAR TEST RESULTS**



CLIENT: **Geosyntec Consultants**  
PROJECT: **Kekaha LF Cell 1**  
DATE REC'D: **23-Apr-10**

MATERIAL: **HDPE SEAM**  
SEAM TYPE: **Fusion Weld**  
PGL JOB #: **G100364**

QC'd By: **B.Yeo**  
TEST METHOD: **ASTM D6392**  
DATE REPORT: **23-Apr-10**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min				
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION				
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)
DS-P-14 Ext/P1  Extrusion	65882	176	> 50%	BRK		1 Outside	111	0	SE3	
		178	> 50%	BRK		2 Outside	142	0	SE3	
		177	> 50%	BRK		3 Outside	119	0	SE3	
		175	> 50%	BRK		4 Outside	128	0	SE3	
		178	> 50%	BRK		5 Outside	126	0	SE2	
		<b>AVG:</b>	<b>125</b>				<b>78</b>			
		<b>STD. DEV.</b>	<b>12</b>							
				1 Inside	N/A					
				2 Inside						
				3 Inside						
				4 Inside						
				5 Inside						
<b>AVG:</b>		<b>177</b>			<b>121</b>	<b>AVG:</b>				
<b>STD. DEV.</b>		<b>1</b>				<b>STD. DEV.</b>				
DS-P-15 P28/P27  Fusion	65883	189	> 50%	BRK		1 Outside	126	0	SE1	
		187	> 50%	BRK		2 Outside	126	0	SE1	
		190	> 50%	BRK		3 Outside	132	0	SE1	
		192	> 50%	BRK		4 Outside	125	0	SE1	
		190	> 50%	BRK		5 Outside	126	0	SE1	
		<b>AVG:</b>	<b>127</b>				<b>91</b>			
		<b>STD. DEV.</b>	<b>3</b>							
				1 Inside	116	0	SE1			
				2 Inside	126	0	SE1			
				3 Inside	127	0	SE1			
				4 Inside	124	0	SE1			
				5 Inside	125	0	SE1			
<b>AVG:</b>		<b>190</b>			<b>121</b>	<b>AVG:</b>	<b>124</b>			<b>91</b>
<b>STD. DEV.</b>		<b>2</b>				<b>STD. DEV.</b>	<b>4</b>			

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

AD ADHESION FAILURE.  
BRK BREAK IN SHEETING.  
SE1 BREAK AT OUTER EDGE OF SEAM.  
SE2 BREAK AT INNER EDGE OF SEAM.  
AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.  
SIP SEPARATION IN THE PLANE OF THE SHEET.

**EXTRUSION:**

AD1  
AD2  
AD-WLD  
SE1  
SE2  
SE3  
BRK1  
BRK2  
AD-BRK  
HT  
SIP

**ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD.**

ADHESION FAILURE.  
BREAK THROUGH THE FILLET.  
BREAK AT BOTTOM EDGE OF SEAM.  
BREAK AT TOP EDGE OF SEAM.  
BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)  
BREAK IN BOTTOM SHEETING.  
BREAK IN TOP SHEETING.  
BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.  
BREAK AT EDGE OF HOT TACK.  
SEPARATION IN THE PLANE OF THE SHEET.

By accepting the test and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims on issues due to the use of this data, to the cost for the respective tests presented in this report) and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.



Precision Geosynthetic Laboratories





# Precision Geosynthetic Laboratories



Mike Minch  
Geosyntec Consultants  
475 14<sup>th</sup> Street, Suite 400  
Oakland, CA 94612



Dear Mr. Minch:

Thank you for consulting Precision Geosynthetic Laboratories (PGL) for your material testing needs.

Enclosed is the *final* laboratory report for the seam testing of three (3) HDPE Seam samples.

**PROJECT NAME:** Kekaha Landfill Cell 1

**REFERENCE PGL JOB NO.:** G100384

**DATE RECEIVED:** April 27, 2010

**DATE REPORTED:** April 27, 2010

**SAMPLES SENT BY:** Chris Scott, Geosyntec Consultants

**SAMPLE IDENTIFICATIONS:**

SAMPLE ID	PGL CONTROL NUMBER
DS-P-18 P29/P31	65931
DS-P-17 P37/P31	65932
DS-P-18 P42/P18 80mil/60mil	65933

**TESTS REQUIRED:**

TEST METHOD	DESCRIPTION
ASTM D6392	Shear Bond Strength
ASTM D6392	Peel Bond Adhesion

**TEST CONDITIONS:** The samples were conditioned for a minimum of one hour in the laboratory at  $22 \pm 2^{\circ}\text{C}$  ( $71.6 \pm 3.6^{\circ}\text{F}$ ) and at  $60 \pm 10\%$  relative humidity prior to test.

**TEST RESULTS:** The test results are summarized in Tables 1 to 2.

**PRECISION GEOSYNTHETIC LABORATORIES**

Belinda Jade R. Yeo  
Quality Assurance

Carmelo V. Zantua  
Technical/Laboratory Director

It shall be noted that the samples tested are believed to be true representations of the material produced under the designation herein stated. In addition, the attached laboratory test results are considered indicative only of the quality of samples/specimens that were actually tested. The equipment and methods hereby employed are based on the current and accepted industry practices. Precision Geosynthetic Laboratories neither accepts responsibility for nor makes claims to the intended final use and purpose of the material. The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent entity duly authorized by the respective client or from the client itself. It is a policy of the company to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. Failed seam samples are kept for two (2) years and good seam samples are disposed of after two (2) weeks. On the other hand, should you need us to keep them at longer time, please advise us in writing.



**TABLE 1.  
SEAM PEEL AND SHEAR TEST RESULTS**



CLIENT: **Geosyntec Consultants**  
PROJECT: **Kekaha LF Cell 1**  
DATE RECD: **27-Apr-10**

MATERIAL: **HDPE SEAM**  
SEAM TYPE: **Fusion Weld**  
PGL JOB #: **G100384**

QC'd By: **B. Yao**  
TEST METHOD: **ASTM D6392**  
DATE REPORT: **27-Apr-10**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min					
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION					
		MAXIMUM STRENGTH (lbf/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lbf/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lbf/in width)	% INCURSION	LOCUS OF BREAK	PROJECT SPEC. (lbf/in width)	
DS-P-16 P29/P31	65931	184	> 50%	BRK	121	1 Outside	125	0	SE1	81	
		157	> 50%	BRK		2 Outside	135	0	SE1		
		186	> 50%	BRK		3 Outside	128	0	SE1		
		184	> 50%	BRK		4 Outside	114	0	SE1		
		187	> 50%	BRK		5 Outside	125	0	SE1		
		AVG:	185				AVG:	125			
		STD. DEV.	7				STD. DEV.	8			
DS-P-17 R37/R31	65932	154	> 50%	BRK	121	1 Inside	123	0	SE1	81	
		154	> 50%	BRK		2 Inside	152	0	SE1		
		101	> 50%	BRK		3 Inside	121	0	SE1		
		183	> 50%	BRK		4 Inside	111	0	SE1		
		158	> 50%	BRK		5 Inside	126	0	SE1		
		AVG:	152				AVG:	127			
		STD. DEV.	2				STD. DEV.	15			

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

AD: ADHESION FAILURE  
BRK: BREAK IN SHEETING  
SE1: BREAK AT OUTER EDGE OF SEAM  
SE2: BREAK AT INNER EDGE OF SEAM  
AD-BRK: BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
SIF: SEPARATION IN THE PLANE OF THE SHEET

**EXTRUSION:**

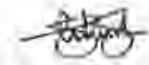
AD1  
AD2  
AD-WLD  
SE1  
SE2  
SE3  
BRK1  
BRK2  
AD-BRK  
HT  
SIF

**ADHESION FAILURE: SPECIMENS DELAMINATED UNDER THE BEAD.**

ADHESION FAILURE  
BREAK THROUGH THE FILLET  
BREAK AT BOTTOM EDGE OF SEAM  
BREAK AT TOP EDGE OF SEAM  
BREAK AT BOTTOM EDGE OF SEAM (for PEEL, only)  
BREAK IN BOTTOM SHEETING  
BREAK IN TOP SHEETING  
BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
BREAK AT EDGE OF HOT TACK  
SEPARATION IN THE PLANE OF THE SHEET

By accepting the data and results presented in this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims or losses, due to the use of the data, in the performance of the tests presented in this report, and the Client agrees to, indemnify and hold harmless Precision Geosynthetic Laboratories, here and against all liabilities in excess of the aforementioned limits.

TA -  
**SEAM PEEL AND SHEAR TEST RESULTS**



CLIENT: **Geosyntec Consultants**  
PROJECT: **Kekaha LF Cell 1**  
DATE REC'D: **27-Apr-10**

MATERIAL: **HDPE SEAM**  
SEAM TYPE: **Fusion Weld**  
PGL JOB #: **G100384**

QC'd By: **B. Yeo**  
TEST METHOD: **ASTM D6392**  
DATE REPORT: **27-Apr-10**

Crosshead Speed: 2 in/min					Crosshead Speed: 2 in/min								
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION			PROJECT SPEC. (lb/in width)	PEEL EVALUATION							
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break		SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)			
DS-P-18 P42/P18 80mil/60mil	65933	170	> 50%	BRK		1 Outside	159	0	SE1				
		170	> 50%	BRK		2 Outside	157	0	SE1				
		170	> 50%	BRK		3 Outside	153	0	SE1				
		167	> 50%	BRK		4 Outside	166	0	SE1				
		169	> 50%	BRK		5 Outside	147	0	SE1				
		AVG:		169				AVG:	156				91
		STD. DEV.		1				STD. DEV.	7				
								1 Inside	166		0	SE1	
								2 Inside	154		0	SE1	
								3 Inside	156		0	SE1	
					4 Inside	167	0	SE1					
					5 Inside	152	0	SE1					
AVG:		169		121	AVG:	159			91				
STD. DEV.		1			STD. DEV.	7							

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

AD ADHESION FAILURE.  
BRK BREAK IN SHEETING.  
SE1 BREAK AT OUTER EDGE OF SEAM.  
SE2 BREAK AT INNER EDGE OF SEAM.  
AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.  
SIP SEPARATION IN THE PLANE OF THE SHEET.

**EXTRUSION:**

AD1 ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD.  
AD2 ADHESION FAILURE.  
AD-WLD BREAK THROUGH THE FILLET.  
SE1 BREAK AT BOTTOM EDGE OF SEAM.  
SE2 BREAK AT TOP EDGE OF SEAM.  
SE3 BREAK AT BOTTOM EDGE OF SEAM (for PEEL only).  
BRK1 BREAK IN BOTTOM SHEETING.  
BRK2 BREAK IN TOP SHEETING.  
AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.  
HT BREAK AT EDGE OF HOT TACK.  
SIP SEPARATION IN THE PLANE OF THE SHEET.

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims or issues, due to the use of this data to the best of its knowledge and belief, and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.



# Precision Geosynthetic Laboratories



Mike Minch  
Geosyntec Consultants  
475 14<sup>th</sup> Street, Suite 400  
Oakland, CA 94612



Dear Mr. Minch:

Thank you for consulting Precision Geosynthetic Laboratories (PGL) for your material testing needs.

Enclosed is the *final* laboratory report for the seam testing of three (3) HDPE Seam samples.

**PROJECT NAME:** Kekaha Landfill Cell 1

**REFERENCE PGL JOB NO.:** G100482

**DATE RECEIVED:** May 13, 2010

**DATE REPORTED:** May 13, 2010

**SAMPLES SENT BY:** Chris Scott, Geosyntec Consultants

**SAMPLE IDENTIFICATIONS:**

SAMPLE ID	PGL CONTROL NUMBER
DS-P-19 P48/P47	66449
DS-P-20 P51/P50	66450
DS-P-21 P54/P53	66451

**TESTS REQUIRED:**

TEST METHOD	DESCRIPTION
ASTM D6392	Shear Bond Strength
ASTM D6392	Peel Bond Adhesion

**TEST CONDITIONS:** The samples were conditioned for a minimum of one hour in the laboratory at  $22 \pm 2^{\circ}\text{C}$  ( $71.6 \pm 3.6^{\circ}\text{F}$ ) and at  $60 \pm 10\%$  relative humidity prior to test.

**TEST RESULTS:** The test results are summarized in Tables 1 to 2.

**PRECISION GEOSYNTHETIC LABORATORIES**

Balinda Jade R. Yeon  
Quality Assurance

Carmelo V. Zanitua  
Technical/Laboratory Director

*It shall be noted that the samples tested are believed to be true representatives of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. Precision Geosynthetic Laboratories neither accepts responsibility for nor makes claims to the intended final use and purpose of the material. The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent entity duly authorized by the respective client or from the client itself. It is a policy of this company to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. Failed seam samples are kept for two (2) years and good seam samples are disposed of after two (2) weeks. On the other hand, should you need us to keep them at longer time, please advise us in writing.*

**TABLE 1.  
SEAM PEEL AND SHEAR TEST RESULTS**



CLIENT: **Geosyntec Consultants**  
PROJECT: **Kekaha LF Cell 1**  
DATE REC'D: **13-May-10**

MATERIAL: **HDPE SEAM**  
SEAM TYPE: **Fusion Weld**  
PSL JOB #: **G100482**

QC'd By: **B. Yeo**  
TEST METHOD: **ASTM D6392**  
DATE REPORT: **13-May-10**

Crosshead Speed: 2 in/min					Crosshead Speed: 2 in/min							
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION			PROJECT SPEC. (lb/in width)	PEEL EVALUATION						
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break		SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)		
DS-P-19 P48/P47	66449	184	> 50%	BRK		1 Outside	124	0	SE1			
		183	> 50%	BRK		2 Outside	124	0	SE1			
		181	> 50%	BRK		3 Outside	124	0	SE1			
		183	> 80%	BRK		4 Outside	128	0	SE1			
		183	> 50%	BRK		5 Outside	123	0	SE1			
		<b>AVG:</b>					<b>125</b> ✓					91
		<b>STD. DEV.</b>					<b>2</b>					
					1 Inside	126	0	SE1				
					2 Inside	128	0	SE1				
					3 Inside	124	0	SE1				
					4 Inside	124	0	SE1				
					5 Inside	126	0	SE1				
<b>AVG:</b>		<b>183</b> ✓			<b>125</b> ✓				91			
<b>STD. DEV.</b>		<b>1</b>			<b>1</b>							
DS-P-20 P51/P50	66450	196	> 50%	BRK		1 Outside	146	0	SE1			
		193	> 50%	BRK		2 Outside	146	0	SE1			
		194	> 50%	BRK		3 Outside	159	0	SE1			
		194	> 60%	BRK		4 Outside	148	0	SE1			
		195	> 50%	BRK		5 Outside	130	0	SE1			
		<b>AVG:</b>					<b>148</b> ✓					91
		<b>STD. DEV.</b>					<b>10</b>					
					1 Inside	161	0	SE1				
					2 Inside	162	0	SE1				
					3 Inside	163	0	SE1				
					4 Inside	122	0	SE1				
					5 Inside	122	0	SE1				
<b>AVG:</b>		<b>194</b> ✓			<b>148</b> ✓				91			
<b>STD. DEV.</b>		<b>1</b>			<b>22</b>							

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

AD ADHESION FAILURE  
BRK BREAK IN SHEETING  
SE1 BREAK AT OUTER EDGE OF SEAM  
SE2 BREAK AT INNER EDGE OF SEAM  
AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
SIF SEPARATION IN THE PLANE OF THE SHEET

**EXTRUSION:**

AD1  
AD2  
AD-WLD  
SE1  
SE2  
SE3  
BRK1  
BRK2  
AD-BRK  
HT  
SIF

**ADHESION FAILURE: SPECIMENS DELAMINATED UNDER THE BEAD**

ADHESION FAILURE  
BREAK THROUGH THE FILLET  
BREAK AT BOTTOM EDGE OF SEAM  
BREAK AT TOP EDGE OF SEAM  
BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)  
BREAK IN BOTTOM SHEETING  
BREAK IN TOP SHEETING  
BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
BREAK AT EDGE OF HOT TACK  
SEPARATION IN THE PLANE OF THE SHEET

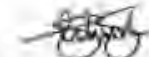
By accepting the data and results presented in this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims or issues, due to the use of this data, to the cost for the investigative tests presented in this report and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned cost.



Precision Geosynthetic Laboratories



**TAP  
SEAM PEEL AND TACK TEST RESULTS**



CLIENT: **Geosyntec Consultants**  
PROJECT: **Kekaha LF Cell 1**  
DATE REC'D: **13-May-10**

MATERIAL: **HDPE SEAM**  
SEAM TYPE: **Fusion Weld**  
PGL JOB #: **G100482**

GC's By: **B. Yeo**  
TEST METHOD: **ASTM D6392**  
DATE REPORT: **13-May-10**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min				
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION				
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)
DS-P-21 P54/P53	66451	179	> 50%	BRK		1 Outside	131	0	SE1	
		178	> 50%	BRK		2 Outside	136	0	SE1	
		178	> 50%	BRK		3 Outside	134	0	SE1	
		180	> 50%	BRK		4 Outside	140	0	SE1	
		179	> 50%	BRK		5 Outside	128	0	SE1	
AVG.		179			121	AVG:	134			91
STD. DEV.		1				STD. DEV.	5			
						1 Inside	128	0	SE1	
						2 Inside	130	0	SE1	
						3 Inside	120	0	SE1	
						4 Inside	129	0	SE1	
						5 Inside	124	0	SE1	
AVG.		179			121	AVG:	128			91
STD. DEV.		1				STD. DEV.	2			

**BREAK DESCRIPTION (ASTM D6392 FUSION)**

AD ADHESION FAILURE  
BRK BREAK IN SHEETING  
SE1 BREAK AT OUTER EDGE OF SEAM  
SE2 BREAK AT INNER EDGE OF SEAM  
AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
SIP SEPARATION IN THE PLANE OF THE SHEET

**EXTRUSION:**

AD1 ADHESION FAILURE SPECIMENS DELAMINATED UNDER THE BEAD  
AD2 ADHESION FAILURE  
AD-WLD BREAK THROUGH THE FILLET  
SE1 BREAK AT BOTTOM EDGE OF SEAM  
SE2 BREAK AT TOP EDGE OF SEAM  
SE3 BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)  
BRK1 BREAK IN BOTTOM SHEETING  
BRK2 BREAK IN TOP SHEETING  
AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
HT BREAK AT EDGE OF HOT TACK  
SIP SEPARATION IN THE PLANE OF THE SHEET

By accepting this report and results presented in this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims in excess, due to the use of this data, to the extent of the respective liability positions in this report and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.



Precision Geosynthetic Laboratories





# Precision Geosynthetic Laboratories



April 13, 2010

Mike Minch  
*Geosyntec Consultants*  
475 14<sup>th</sup> Street, Suite 400  
Oakland, CA 94612

RE: *Kekaha LF Cell 1*

Dear Mr. Minch:

Thank you for consulting Precision Geosynthetic Laboratories (PGL) for your material testing needs.

Enclosed is the *final* laboratory report for the testing of one (1) 80mil HDPE Seam sample specified on the proceeding sheet which was received on April 13, 2010.

It shall be noted that the sample tested is believed to be true representative of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. Precision Geosynthetic Laboratories neither accepts responsibility for nor makes claims to the intended final use and purpose of the material.

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims arising out of the use of this data to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.

The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent entity duly authorized by the respective client or from the client itself.

It is a policy of the company to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. *Failed seam samples are kept for two (2) years and good seam samples are disposed of after two (2) weeks.* On the other hand, should you need us to keep them at longer time, please advise us in writing.

Should you have any questions or if we may be of further service to you, please do not hesitate to contact us at telephone number: 800-522-4599.

Sincerely,

**PRECISION GEOSYNTHETIC LABORATORIES**

Carmelo V. Zanlua  
Technical/Laboratory Director

Enclosure: (Job No. G100286)



# Precision Geosynthetic Laboratories



CLIENT: *GEOSYNTEC CONSULTANTS*  
PROJECT: *Kekaha LF Cell 1*

**VERIFICATION OF MATERIAL PROPERTIES**  
(PGL Job No. G100286)

**MATERIAL DESCRIPTION:** 80mil HDPE seam

**SAMPLE SENT BY:** Chris Scott, Geosyntec Consultants

**DATE RECEIVED:** April 13, 2010

**DATE REPORTED:** April 13, 2010

**SAMPLE IDENTIFICATIONS:**

SAMPLE ID	PGL CONTROL NUMBER
1/2 Plate AM/5117	65490

**TESTS REQUIRED:**

TEST METHOD	DESCRIPTION
ASTM D6392	Shear Bonded Strength
ASTM D6392	Peel Adhesion

**TEST CONDITIONS:** The sample was conditioned for a minimum of one hour in the laboratory at  $22 \pm 2^{\circ}\text{C}$  ( $71.6 \pm 3.6^{\circ}\text{F}$ ) and at  $60 \pm 10\%$  relative humidity prior to test.

**TEST RESULTS:**


The test results are summarized in Table 1.

**PRECISION GEOSYNTHETIC LABORATORIES**



Carmelo V. Zantua  
Technical/Laboratory Director

**TAB 1  
SEAM PEEL AND TENSILE TEST RESULTS**



CLIENT: **Geosyntec Consultants**  
PROJECT: **Kekaha LF Cell 1**  
DATE REC'D: **13-Apr-10**

NUM. TRIALS: **80mil HDPE SEAM**  
SEAM TYPE: **Fusion Weld**  
PGL JOB #: **G100286**

QC'd By: **Byec**  
TEST METHOD: **ASTM D6392**  
DATE REPORT: **13-Apr-10**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min				
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION				
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)
1/2 Plate AM/5117	65490	238	> 50%	BRK		1 Outside	228	0	SE1	
		238	> 50%	BRK		2 Outside				
		(Limited Sample - See Note)		3 Outside						
		4 Outside								
		5 Outside								
		AVG:	228							
		STD. DEV.	0							
					1 Inside	223	0	SE1		
					2 Inside					
					3 Inside					
					4 Inside					
					5 Inside					
					AVG:	223				
					STD. DEV.					

Note: Five Specimens are required to be tested per standard for Shear and Peel evaluation. However, only two samples were tested due to the limited samples received from the client

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

AD ADHESION FAILURE.  
BRK BREAK IN SHEETING.  
SE1 BREAK AT OUTER EDGE OF SEAM.  
SE2 BREAK AT INNER EDGE OF SEAM.  
AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.  
SIP SEPARATION IN THE PLANE OF THE SHEET.

**EXTRUSION:**

AD1 ADHESION FAILURE- SPECIMENS DELAMINATED UNDER THE BEAD.  
AD2 ADHESION FAILURE.  
AD-WLD BREAK THROUGH THE FILLET.  
SE1 BREAK AT BOTTOM EDGE OF SEAM.  
SE2 BREAK AT TOP EDGE OF SEAM.  
SE3 BREAK AT BOTTOM EDGE OF SEAM (5% PEEL ONLY)  
BRK1 BREAK IN BOTTOM SHEETING.  
BRK2 BREAK IN TOP SHEETING.  
AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.  
HT BREAK AT EDGE OF HOT TACK.  
SIP SEPARATION IN THE PLANE OF THE SHEET.

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims or issues, due to the use of this data, to the cost for the respective tests presented in this report, and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.



Precision Geosynthetic Laboratories







# Precision Geosynthetic Laboratories



Mike Minch  
**Geosyntec Consultants**  
475 14<sup>th</sup> Street, Suite 400  
Oakland, CA 94612



Dear Mr. Minch:

Thank you for consulting Precision Geosynthetic Laboratories (PGL) for your material testing needs.

Enclosed is the *final* laboratory report for the seam testing of two (2) HDPE Seam samples.

**PROJECT NAME:** Kekaha Landfill Cell 1

**REFERENCE PGL JOB NO.:** G100974

**DATE RECEIVED:** August 6, 2010

**DATE REPORTED:** August 6, 2010

**SAMPLE SENT BY:** Doug Hamilton, Geosyntec Consultants

**SAMPLE IDENTIFICATIONS:**

SAMPLE ID	PGL CONTROL NUMBER
DS-P22 SMP28/57	69098
DS-P23 SMP59/61	69099

**TESTS REQUIRED:**

TEST METHOD	DESCRIPTION
ASTM D6392	Shear Bond Strength
ASTM D6392	Peel Bond Adhesion

**TEST CONDITIONS:** The samples were conditioned for a minimum of one hour in the laboratory at  $22 \pm 2^{\circ}\text{C}$  ( $71.6 \pm 3.6^{\circ}\text{F}$ ) and at  $60 \pm 10\%$  relative humidity prior to test.

**TEST RESULTS:** The test results are summarized in Table 1.

**PRECISION GEOSYNTHETIC LABORATORIES**


Carmelo V. Zantua  
Technical/Laboratory Director

It shall be noted that the samples tested are believed to be true representatives of the material produced under the designation herein stated. In addition, the attached laboratory test results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. Precision Geosynthetic Laboratories neither accepts responsibility for nor makes claims to the intended final use and purpose of the material. The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent entity duly authorized by the (respective client or from the client itself). It is a policy of the company to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. *Failed seam samples are kept for two (2) years and good seam samples are disposed of after two (2) weeks.* On the other hand, should you need us to keep them at longer time, please advise us in writing.

## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **Geosyntec Consultants**  
 PROJECT: **Kekaha LF Cell 1**  
 DATE REC'D: **6-Aug-10**

MATERIAL: **HDPE SEAM**  
 SEAM TYPE: **Fusion Weld**  
 PGL JOB #: **G100974**

QC'd By:   
 TEST METHOD: **ASTM D6392**  
 DATE REPORT: **6-Aug-10**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min							
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION							
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)			
DS-P22 SMP28/57	69098	180	> 50%	BRK		1 Outside	130	0	SE1				
		182	> 50%	BRK		2 Outside	127	0	SE1				
		183	> 50%	BRK		3 Outside	128	0	SE1				
		180	> 50%	BRK		4 Outside	140	0	SE1				
		182	> 50%	BRK		5 Outside	142	0	SE1				
		AVG:		181 ✓				AVG:	133 ✓				81
		STD. DEV.		1			121	STD. DEV.	7				
DS-P23 SMP59/61	69099	180	> 50%	BRK		1 Inside	141	0	SE1				
		183	> 50%	BRK		2 Inside	128	0	SE1				
		180	> 50%	BRK		3 Inside	131	0	SE1				
		183	> 50%	BRK		4 Inside	138	0	SE1				
		180	> 50%	BRK		5 Inside	140	0	SE1				
		AVG:		181 ✓				AVG:	135 ✓				91
		STD. DEV.		2			121	STD. DEV.	8				
AVG:		181 ✓			AVG:	137 ✓			91				
STD. DEV.		2		121	STD. DEV.	5							

<b>BREAK DESCRIPTION (ASTM D6392 FUSION):</b> AD ADHESION FAILURE BRK BREAK IN SHEETING SE1 BREAK AT OUTER EDGE OF SEAM SE2 BREAK AT INNER EDGE OF SEAM AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE SIP SEPARATION IN THE PLANE OF THE SHEET	<b>EXTRUSION:</b> AD1 AD2 AD-WLD SE1 SE2 SE3 BRK1 BRK2 AD-BRK HT SIP	<b>ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD.</b> ADHESION FAILURE. BREAK THROUGH THE FILLET. BREAK AT BOTTOM EDGE OF SEAM. BREAK AT TOP EDGE OF SEAM. BREAK AT BOTTOM EDGE OF SEAM (NOT PEEL ONLY) BREAK IN BOTTOM SHEETING. BREAK IN TOP SHEETING. BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE. BREAK AT EDGE OF HOT TACK. SEPARATION IN THE PLANE OF THE SHEET.
---	---	---

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims on issues, due to the use of this data, in the past for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.



# Precision Geosynthetic Laboratories



Mike Minch  
**Geosyntec Consultants**  
475 14<sup>th</sup> Street, Suite 400  
Oakland, CA 94612



Dear Mr. Minch:

Thank you for consulting Precision Geosynthetic Laboratories (PGL) for your material testing needs.

Enclosed is the *final* laboratory report for the seam testing of two (2) HDPE Seam samples.

**PROJECT NAME:** Kekaha Landfill Cell 1

**REFERENCE PGL JOB NO.:** G100992

**DATE RECEIVED:** August 9, 2010

**DATE REPORTED:** August 9, 2010

**SAMPLE SENT BY:** Doug Hamilton, Geosyntec Consultants

**SAMPLE IDENTIFICATIONS:**

SAMPLE ID	PGL CONTROL NUMBER
DS-P24 SMP61/63	69148
DS-P25 SMP62/64	69149

**TESTS REQUIRED:**

TEST METHOD	DESCRIPTION
ASTM D6392	Shear Bond Strength
ASTM D6392	Peel Bond Adhesion

**TEST CONDITIONS:** The samples were conditioned for a minimum of one hour in the laboratory at  $22 \pm 2^{\circ}\text{C}$  ( $71.6 \pm 3.6^{\circ}\text{F}$ ) and at  $60 \pm 10\%$  relative humidity prior to test.

**TEST RESULTS:** The test results are summarized in Table 1.

**PRECISION GEOSYNTHETIC LABORATORIES**


Carmelo V. Zantua  
Technical/Laboratory Director

It shall be noted that the samples tested are believed to be true representatives of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. Precision Geosynthetic Laboratories neither accepts responsibility for nor makes claims to the intended final use and purpose of the material. The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent entity duly authorized by the respective client or from the client itself. It is a policy of the company to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. *Failed seam samples are kept for two (2) years and good seam samples are disposed of after two (2) weeks.* On the other hand, should you need us to keep them of longer time, please advise us in writing.

## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **Geosyntec Consultants**  
 PROJECT: **Kekaha LF Cell 1**  
 DATE RECD: **9-Aug-10**

MATERIAL: **HDPE SEAM**  
 SEAM TYPE: **Fusion Weld**  
 PGL JOB #: **G100992**

QC'd By:   
 TEST METHOD: **ASTM D6392**  
 DATE REPORT: **9-Aug-10**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min				
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION				
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)
DS-P24 SMP61/63	69148	189	> 50%	BRK		1 Outside	141	0	SE1	
		188	> 50%	BRK		2 Outside	138	0	SE1	
		191	> 50%	BRK		3 Outside	140	0	SE1	
		192	> 50%	BRK		4 Outside	142	0	SE1	
		191	> 50%	BRK		5 Outside	140	0	SE1	
		AVG:		190 ✓				AVG:	140 ✓	
STD. DEV:		1			STD. DEV:	1				
DS-P25 SMP62/64	69149	188	> 50%	BRK		1 Inside	142	0	SE1	
		188	> 50%	BRK		2 Inside	150	0	SE1	
		189	> 50%	BRK		3 Inside	146	0	SE1	
		185	> 50%	BRK		4 Inside	143	0	SE1	
		184	> 50%	BRK		5 Inside	139	0	SE1	
		AVG:		190 ✓				AVG:	144 ✓	
STD. DEV:		1			STD. DEV:	4				
		188	> 50%	BRK		1 Outside	142	0	SE1	
		188	> 50%	BRK		2 Outside	144	0	SE1	
		189	> 50%	BRK		3 Outside	150	0	SE1	
		185	> 50%	BRK		4 Outside	151	0	SE1	
		184	> 50%	BRK		5 Outside	142	0	SE1	
		AVG:		187 ✓				AVG:	146 ✓	
STD. DEV:		2			STD. DEV:	4				
AVG:		187 ✓			AVG:	139 ✓			91	
STD. DEV:		2			STD. DEV:	2				

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

AD ADHESION FAILURE  
 BRK BREAK IN SHEETING  
 SE1 BREAK AT OUTER EDGE OF SEAM  
 SE2 BREAK AT INNER EDGE OF SEAM  
 AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
 SIP SEPARATION IN THE PLANE OF THE SHEET

**EXTRUSION:**

AD1 ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD.  
 AD2 ADHESION FAILURE.  
 AD-WLD BREAK THROUGH THE FILLET.  
 SE1 BREAK AT BOTTOM EDGE OF SEAM  
 SE2 BREAK AT TOP EDGE OF SEAM  
 SE3 BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)  
 BRK1 BREAK IN BOTTOM SHEETING.  
 BRK2 BREAK IN TOP SHEETING.  
 AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.  
 HT BREAK AT EDGE OF HOT TACK.  
 SIP SEPARATION IN THE PLANE OF THE SHEET.

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims or issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.



Precision Geosynthetic Laboratories





# Precision Geosynthetic Laboratories



Mike Minch  
Geosyntec Consultants  
475 14<sup>th</sup> Street, Suite 400  
Oakland, CA 94612



Dear Mr. Minch:

Thank you for consulting Precision Geosynthetic Laboratories (PGL) for your material testing needs.

Enclosed is the *final* laboratory report for the seam testing of five (5) HDPE Seam samples.

**PROJECT NAME:** Kekaha Landfill Cell 1

**REFERENCE PGL JOB NO.:** G101000

**DATE RECEIVED:** August 10, 2010

**DATE REPORTED:** August 10, 2010

**SAMPLE SENT BY:** Doug Hamilton, Geosyntec Consultants

**SAMPLE IDENTIFICATIONS:**

SAMPLE ID	PGL CONTROL NUMBER
DS-P26 SMP64/65	69211
DS-P27 SMP67/69	69212
DSP-28 SMP70/71	69213
DSP-29 SMP72/74	69214
DSP-30 SMP00/67	69215

**TESTS REQUIRED:**

TEST METHOD	DESCRIPTION
ASTM D6392	Shear Bond Strength
ASTM D6392	Peel Bond Adhesion

**TEST CONDITIONS:** The samples were conditioned for a minimum of one hour in the laboratory at  $22 \pm 2^{\circ}\text{C}$  ( $71.6 \pm 3.6^{\circ}\text{F}$ ) and at  $60 \pm 10\%$  relative humidity prior to test.

**TEST RESULTS:** The test results are summarized in Tables 1 to 3.

**PRECISION GEOSYNTHETIC LABORATORIES**

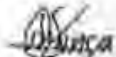
Carmelo V. Zanlua  
Technical/Laboratory Director

It shall be noted that the samples tested are believed to be true representatives of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. Precision Geosynthetic Laboratories neither accepts responsibility for nor makes claims to the intended final use and purpose of the material. The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent entity duly authorized by the respective client or from the client itself. It is a policy of the company to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. *Failed seam samples are kept for two (2) years and good seam samples are disposed of after two (2) weeks.* On the other hand, should you need us to keep them at longer time, please advise us in writing.

### SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **Geosyntec Consultants**  
 PROJECT: **Kekaha LF Cell 1**  
 DATE REC'D: **10-Aug-10**

MATERIAL: **HDPE SEAM**  
 SEAM TYPE: **Fusion Weld**  
 PGL JOB #: **G101000**

  
 QC'd By: \_\_\_\_\_  
 TEST METHOD: **ASTM D6392**  
 DATE REPORT: **10-Aug-10**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min				
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION				
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)
DSP-26 SMP64/66	69211	180	> 50%	BRK		1 Outside	136	0	SE1	
		182	> 50%	BRK		2 Outside	125	0	SE1	
		182	> 50%	BRK		3 Outside	124	0	SE1	
		180	> 50%	BRK		4 Outside	126	0	SE1	
		185	> 50%	BRK		5 Outside	125	0	SE1	
		AVG:		183				AVG:	127	
STD. DEV:		3			STD. DEV:	5				
DSP-27 SMP67/68	69212	185	> 50%	BRK		1 Inside	124	0	SE1	
		186	> 50%	BRK		2 Inside	126	0	SE1	
		183	> 50%	BRK		3 Inside	130	0	SE1	
		184	> 50%	BRK		4 Inside	126	0	SE1	
		182	> 50%	BRK		5 Inside	127	0	SE1	
		AVG:		183				AVG:	127	
STD. DEV:		3			STD. DEV:	2				
DSP-27 SMP67/68	69212	185	> 50%	BRK		1 Outside	126	0	SE1	
		186	> 50%	BRK		2 Outside	127	0	SE1	
		183	> 50%	BRK		3 Outside	120	0	SE1	
		184	> 50%	BRK		4 Outside	135	0	SE1	
		182	> 50%	BRK		5 Outside	136	0	SE1	
		AVG:		129				AVG:	129	
STD. DEV:		7			STD. DEV:	7				
DSP-27 SMP67/68	69212	185	> 50%	BRK		1 Inside	141	0	SE1	
		186	> 50%	BRK		2 Inside	120	0	SE1	
		183	> 50%	BRK		3 Inside	127	0	SE1	
		184	> 50%	BRK		4 Inside	136	0	SE1	
		182	> 50%	BRK		5 Inside	135	0	SE1	
		AVG:		132				AVG:	132	
STD. DEV:		8			STD. DEV:	8				

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

AD ADHESION FAILURE.  
 BRK BREAK IN SHEETING.  
 SE1 BREAK AT OUTER EDGE OF SEAM.  
 SE2 BREAK AT INNER EDGE OF SEAM.  
 AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.  
 SIP SEPARATION IN THE PLANE OF THE SHEET.

**EXTRUSION:**

AD1  
 AD2  
 AD-WLD  
 SE1  
 SE2  
 SE3  
 BRK1  
 BRK2  
 AD-BRK  
 HT  
 SIP

**ADHESION FAILURE: SPECIMENS DELAMINATED UNDER THE BEAD.**

ADHESION FAILURE.  
 BREAK THROUGH THE FILLET.  
 BREAK AT BOTTOM EDGE OF SEAM.  
 BREAK AT TOP EDGE OF SEAM.  
 BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)  
 BREAK IN BOTTOM SHEETING.  
 BREAK IN TOP SHEETING.  
 BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.  
 BREAK AT EDGE OF HOT TACK.  
 SEPARATION IN THE PLANE OF THE SHEET.

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report, and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.



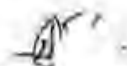
Precision Geosynthetic Laboratories



## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **Geosyntec Consultants**  
 PROJECT: **Kekaha LP Cell 1**  
 DATE REC'D: **10-Aug-10**

R/L: **HDPE SEAM**  
 S.L. TYPE: **Fusion Weld**  
 PGL JOB #: **G101000**

QC'd By:   
 TEST METHOD: **ASTM D6622**  
 DATE REPORT: **10-Aug-10**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min							
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION							
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)			
DSP-28 SMP70/71	69213	166	> 50%	BRK		1 Outside	130	0	SE1				
		165	> 50%	BRK		2 Outside	126	0	SE1				
		167	> 50%	BRK		3 Outside	129	0	SE1				
		165	> 50%	BRK		4 Outside	129	0	SE1				
		168	> 50%	BRK		5 Outside	122	0	SE1				
		AVG:						AVG:	127				91
		STD. DEV.						STD. DEV.	3				
								1 Inside	126		0	SE1	
								2 Inside	125		0	SE1	
								3 Inside	125		0	SE1	
					4 Inside	125	0	SE1					
					5 Inside	121	0	SE1					
AVG:		166			121	AVG:	124			91			
STD. DEV.		1				STD. DEV.	2						
DSP-29 SMP72/74	69214	180	> 50%	BRK		1 Outside	141	0	SE1				
		182	> 50%	BRK		2 Outside	129	0	SE1				
		187	> 50%	BRK		3 Outside	137	0	SE1				
		185	> 50%	BRK		4 Outside	136	0	SE1				
		185	> 50%	BRK		5 Outside	135	0	SE1				
		AVG:						AVG:	136				91
		STD. DEV.						STD. DEV.	4				
								1 Inside	135		0	SE1	
								2 Inside	129		0	SE1	
								3 Inside	124		0	SE1	
					4 Inside	129	0	SE1					
					5 Inside	132	0	SE1					
AVG:		184			121	AVG:	130			91			
STD. DEV.		3				STD. DEV.	4						

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

AD ADHESION FAILURE  
 BRK BREAK IN SHEETING.  
 SE1 BREAK AT OUTER EDGE OF SEAM.  
 SE2 BREAK AT INNER EDGE OF SEAM.  
 AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.  
 SIP SEPARATION IN THE PLANE OF THE SHEET.

**EXTRUSION:**

AD1 ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD.  
 AD2 ADHESION FAILURE.  
 AD-WLD BREAK THROUGH THE FILLET.  
 SE1 BREAK AT BOTTOM EDGE OF SEAM.  
 SE2 BREAK AT TOP EDGE OF SEAM.  
 SE3 BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)  
 BRK1 BREAK IN BOTTOM SHEETING.  
 BRK2 BREAK IN TOP SHEETING.  
 AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.  
 HT BREAK AT EDGE OF HOT TACK.  
 SIP SEPARATION IN THE PLANE OF THE SHEET.

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.



Precision Geosynthetic Laboratories



## SEAM PEEL AND SHEAR TEST RESULTS



CLIENT: **Geosyntec Consultants**  
 PROJECT: **Kekaha LF Cell 1**  
 DATE REC'D: **10-Aug-10**

MATERIAL: **HDPE SEAM**  
 SEAM TYPE: **Extrusion Weld**  
 PGL JOB #: **G101000**

QC'd By:  
 TEST METHOD: **ASTM D6392**  
 DATE REPORT: **10-Aug-10**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min				
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION				
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)
DSP-30 SMP00/67	69215	162	> 50%	BRK		1 Outside	129	0	SE3	
		162	> 50%	BRK		2 Outside	131	0	SE3	
		165	> 50%	BRK		3 Outside	122	0	SE3	
		163	> 50%	BRK		4 Outside	124	0	SE3	
		162	> 50%	BRK		5 Outside	122	0	SE3	
		AVG:		163 ✓				126 ✓		
STD. DEV.		1			4					
AVG:						N/A				
STD. DEV.										
AVG:					121					
STD. DEV.										

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

AD           ADHESION FAILURE  
 BRK        BREAK IN SHEETING  
 SE1        BREAK AT OUTER EDGE OF SEAM  
 SE2        BREAK AT INNER EDGE OF SEAM  
 AD-BRK    BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
 SIP        SEPARATION IN THE PLANE OF THE SHEET

**EXTRUSION:**

AD1	ADHESION FAILURE - SPECIMENS DELAMINATED UNDER THE BEAD.
AD2	ADHESION FAILURE
AD-WLD	BREAK THROUGH THE FILLET.
SE1	BREAK AT BOTTOM EDGE OF SEAM
SE2	BREAK AT TOP EDGE OF SEAM
SE3	BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)
BRK1	BREAK IN BOTTOM SHEETING.
BRK2	BREAK IN TOP SHEETING.
AD-BRK	BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.
HT	BREAK AT EDGE OF HOT TACK
SIP	SEPARATION IN THE PLANE OF THE SHEET.

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.



Precision Geosynthetic Laboratories







# Precision Geosynthetic Laboratories



Mike Minch  
Geosyntec Consultants  
475 14<sup>th</sup> Street, Suite 400  
Oakland, CA 94612



Dear Mr. Minch:

Thank you for consulting Precision Geosynthetic Laboratories (PGL) for your material testing needs.

Enclosed is the *final* laboratory report for the seam testing of three (3) HDPE Seam samples.

**PROJECT NAME:** Kekaha Landfill Cell 1

**REFERENCE PGL JOB NO.:** G101012

**DATE RECEIVED:** August 11, 2010

**DATE REPORTED:** August 11, 2010

**SAMPLE SENT BY:** Doug Hamilton, Geosyntec Consultants

**SAMPLE IDENTIFICATIONS:**

SAMPLE ID	PGL CONTROL NUMBER
DS-P31 SMP74/75	69265
DS-P32 SMP77/78	69266
DS-P33 SMP79/81	69267

**TESTS REQUIRED:**

TEST METHOD	DESCRIPTION
ASTM D6392	Shear Bond Strength
ASTM D6392	Peel Bond Adhesion

**TEST CONDITIONS:** The samples were conditioned for a minimum of one hour in the laboratory at 22 ± 2°C (71.6 ± 3.6°F) and at 60 ± 10% relative humidity prior to test.

**TEST RESULTS:** The test results are summarized in Tables 1 to 2.

**PRECISION GEOSYNTHETIC LABORATORIES**


Carmelo V. Zantua  
Technical/Laboratory Director

It shall be noted that the samples tested are believed to be true representatives of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. Precision Geosynthetic Laboratories neither accepts responsibility for nor makes claims to the intended final use and purpose of the material. The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties *except* in full and with prior written approval from pertinent entity duly authorized by the respective client or from the client itself. It is a policy of the company to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. *Failed seam samples are kept for two (2) years and good seam samples are disposed of after two (2) weeks.* On the other hand, should you need us to keep them at longer time, please advise us in writing.

## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **Geosyntec Consultants**  
 PROJECT: **Kekaha LF Cell 1**  
 DATE RECD: **11-Aug-10**

MATERIAL: **HDPE SEAM**  
 SEAM TYPE: **Fusion Weld**  
 PGL JOB #: **G101012**

QC'd By:   
 TEST METHOD: **ASTM D6392**  
 DATE REPORT: **11-Aug-10**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min							
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION							
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)			
DS-P31 SMP74/75	59295	175	> 50%	BRK		1 Outside	130	0	SE1				
		176	> 50%	BRK		2 Outside	128	0	SE1				
		175	> 50%	BRK		3 Outside	127	0	SE1				
		178	> 50%	BRK		4 Outside	141	0	SE1				
		176	> 50%	BRK		5 Outside	129	0	SE1				
		AVG:		176 ✓				AVG:	131 ✓				91
		STD. DEV.		1			121	STD. DEV.	6				
DS-P32 SMP77/78	59295	178	> 50%	BRK		1 Inside	131	0	SE1				
		178	> 50%	BRK		2 Inside	129	0	SE1				
		176	> 50%	BRK		3 Inside	134	0	SE1				
		176	> 50%	BRK		4 Inside	141	0	SE1				
		175	> 50%	BRK		5 Inside	140	0	SE1				
		AVG:		177 ✓			121	AVG:	135 ✓				91
		STD. DEV.		1				STD. DEV.	5				
DS-P32 SMP77/78	59295	178	> 50%	BRK		1 Outside	139	0	SE1				
		178	> 50%	BRK		2 Outside	136	0	SE1				
		176	> 50%	BRK		3 Outside	137	0	SE1				
		176	> 50%	BRK		4 Outside	138	0	SE1				
		175	> 50%	BRK		5 Outside	142	0	SE1				
		AVG:		177 ✓			121	AVG:	138 ✓				91
		STD. DEV.		1				STD. DEV.	2				
DS-P32 SMP77/78	59295	178	> 50%	BRK		1 Inside	141	0	SE1				
		178	> 50%	BRK		2 Inside	138	0	SE1				
		176	> 50%	BRK		3 Inside	137	0	SE1				
		176	> 50%	BRK		4 Inside	141	0	SE1				
		175	> 50%	BRK		5 Inside	140	0	SE1				
		AVG:		177 ✓			121	AVG:	139 ✓				91
		STD. DEV.		1				STD. DEV.	2				

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

AD ADHESION FAILURE  
 BRK BREAK IN SHEETING  
 SE1 BREAK AT OUTER EDGE OF SEAM  
 SE2 BREAK AT INNER EDGE OF SEAM  
 AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
 SEP SEPARATION IN THE PLANE OF THE SHEET

**EXTRUSION:**

AD1 ADHESION FAILURE - SPECIMENS DELAMINATED UNDER THE BEAD  
 AD2 ADHESION FAILURE  
 AD-WLD BREAK THROUGH THE FILLET  
 SE1 BREAK AT BOTTOM EDGE OF SEAM  
 SE2 BREAK AT TOP EDGE OF SEAM  
 SE3 BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)  
 BRK1 BREAK IN BOTTOM SHEETING  
 BRK2 BREAK IN TOP SHEETING  
 AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
 HT BREAK AT EDGE OF HOT TACK  
 SEP SEPARATION IN THE PLANE OF THE SHEET

By accepting the data and results presented in this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims or issues, due to the use of this data, to the extent for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.



Precision G.


Intelli: Laboratories



### SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **Geosyntec Consultants**  
 PROJECT: **Kekaha LF Cell 1**  
 DATE REC'D: **11-Aug-10**

TRIAL: **HDPE SEAM**  
 SEAM TYPE: **Fusion Weld**  
 PGL JOB #: **G101012**

QC'd By:   
 TEST METHOD: **ASTM D6392**  
 DATE REPORT: **11-Aug-10**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min						
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION						
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)		
<b>DS-P33 SMP79/81</b>	<b>69297</b>	185	> 50%	BRK		1 Outside	130	0	SE1			
		182	> 50%	BRK		2 Outside	124	0	SE1			
		180	> 50%	BRK		3 Outside	126	0	SE1			
		182	> 50%	BRK		4 Outside	129	0	SE1			
		181	> 50%	BRK		5 Outside	131	0	SE1			
		<b>AVG:</b>	<b>128</b>				<b>91</b>					
<b>STD. DEV.</b>	<b>3</b>											
		134	0	SE1		135	0	SE1		136	0	SE1
		129	0	SE1		132	0	SE1				
<b>AVG:</b>	<b>133</b>				<b>91</b>							
<b>STD. DEV.</b>	<b>3</b>											
<b>AVG:</b>	<b>182</b>				<b>121</b>							
<b>STD. DEV.</b>	<b>2</b>											

**BREAK DESCRIPTION (ASTM D6392 FUSION)**

- AD ADHESION FAILURE.
- BRK BREAK IN SHEETING.
- SE1 BREAK AT OUTER EDGE OF SEAM.
- SE2 BREAK AT INNER EDGE OF SEAM.
- AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.
- SIP SEPARATION IN THE PLANE OF THE SHEET.

**EXTRUSION:**

- AD1 ADHESION FAILURE. SPECIMENS DELAMINATED UNDER THE BEAD.
- AD2 ADHESION FAILURE.
- AD-WLD BREAK THROUGH THE FILLET.
- SE1 BREAK AT BOTTOM EDGE OF SEAM.
- SE2 BREAK AT TOP EDGE OF SEAM.
- SE3 BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)
- BRK1 BREAK IN BOTTOM SHEETING.
- BRK2 BREAK IN TOP SHEETING.
- AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE.
- HT BREAK AT EDGE OF HOT TACK
- SIP SEPARATION IN THE PLANE OF THE SHEET.

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims or issues, due to the use of this data, to the cost for the respective tests presented in this report, and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.



Precision Geosynthetic Laboratories





# Precision Geosynthetic Laboratories



Mike Minch  
**Geosyntec Consultants**  
475 14<sup>th</sup> Street, Suite 400  
Oakland, CA 94612



Dear Mr. Minch:

Thank you for consulting Precision Geosynthetic Laboratories (PGL) for your material testing needs.

Enclosed is the *final* laboratory report for the seam testing of five (5) HDPE Seam samples.

**PROJECT NAME:** Kekaha Landfill Cell 1

**REFERENCE PGL JOB NO.:** G101092

**DATE RECEIVED:** August 13, 2010

**DATE REPORTED:** August 13, 2010

**SAMPLE SENT BY:** Doug Hamilton, Geosyntec Consultants

**SAMPLE IDENTIFICATIONS:**

SAMPLE ID	PGL CONTROL NUMBER
DS-P34 P83/85	69351
DS-P35 P86/88	69352
DS-P36 P87/89	69353
DS-P37 P97/98	69354
DS-P38 P00/79	69355

**TESTS REQUIRED:**

TEST METHOD	DESCRIPTION
ASTM D6392	Shear Bond Strength
ASTM D6392	Peel Bond Adhesion

**TEST CONDITIONS:** The samples were conditioned for a minimum of one hour in the laboratory at  $22 \pm 2^{\circ}\text{C}$  ( $71.6 \pm 3.6^{\circ}\text{F}$ ) and at  $60 \pm 10\%$  relative humidity prior to test.

**TEST RESULTS:** The test results are summarized in Tables 1 to 3.

**PRECISION GEOSYNTHETIC LABORATORIES**


Carmelo V. Zantua  
Technical/Laboratory Director

It shall be noted that the samples tested are believed to be true representatives of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. Precision Geosynthetic Laboratories neither accepts responsibility for nor makes claims to the intended final use and purpose of the material. The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from personnel duly authorized by the respective client or from the client itself. It is a policy of the company to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. *Failed seam samples are kept for two (2) years and good seam samples are disposed of after two (2) weeks.* On the other hand, should you need us to keep them a longer time, please advise us in writing.

# SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **Geosyntec Consultants**  
 PROJECT: **Kekaha LF Cell 1**  
 DATE REC'D: **13-Aug-10**

MATERIAL: **HDPE SEAM**  
 SEAM TYPE: **Fusion Weld**  
 PGL JOB #: **G101032**

QC'd By:   
 TEST METHOD: **ASTM D6392**  
 DATE REPORT: **13-Aug-10**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min							
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION							
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)			
DS-P34 P83/85	69351	180	> 50%	BRK		1 Outside	130	0	SE1				
		179	> 50%	BRK		2 Outside	127	0	SE1				
		183	> 50%	BRK		3 Outside	141	0	SE1				
		182	> 50%	BRK		4 Outside	140	0	SE1				
		182	> 50%	BRK		5 Outside	142	0	SE1				
		AVG:		181				121	138				91
		STD. DEV.		2					7				
DS-P35 P86/85	69352	180	> 50%	BRK		1 Inside	143	0	SE1				
		182	> 50%	BRK		2 Inside	142	0	SE1				
		182	> 50%	BRK		3 Inside	150	0	SE1				
		182	> 50%	BRK		4 Inside	142	0	SE1				
		180	> 50%	BRK		5 Inside	137	0	SE1				
		AVG:		181				121	143				91
		STD. DEV.		2					5				
		180	> 50%	BRK		1 Outside	138	0	SE1				
		182	> 50%	BRK		2 Outside	135	0	SE1				
		182	> 50%	BRK		3 Outside	140	0	SE1				
		182	> 50%	BRK		4 Outside	142	0	SE1				
		180	> 50%	BRK		5 Outside	137	0	SE1				
		AVG:		181				121	138				91
		STD. DEV.		1					3				
AVG:		181			121	140			91				
STD. DEV.		1				2							

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

- AD ADHESION FAILURE
- BRK BREAK IN SHEETING
- SE1 BREAK AT OUTER EDGE OF SEAM
- SE2 BREAK AT INNER EDGE OF SEAM
- AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE
- SIP SEPARATION IN THE PLANE OF THE SHEET

**EXTRUSION:**

- AD1 ADHESION FAILURE, SPECIMENS DELAMINATED UNDER THE BEAD.
- AD2 ADHESION FAILURE
- AD-WLD BREAK THROUGH THE FILLET.
- SE1 BREAK AT BOTTOM EDGE OF SEAM
- SE2 BREAK AT TOP EDGE OF SEAM
- SE3 BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)
- BRK1 BREAK IN BOTTOM SHEETING
- BRK2 BREAK IN TOP SHEETING
- AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE
- HT BREAK AT EDGE OF HOT TACK
- SIP SEPARATION IN THE PLANE OF THE SHEET

By accepting the data and results provided on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.




Precision Geosynthetic Laboratories



## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **Geosyntec Consultants**  
 PROJECT: **Kekaha LF Cell 1**  
 DATE REQ'D: **13-Aug-10**

RIAL: **HDPE SEAM**  
 SEAM TYPE: **Fusion Weld**  
 PGL JOB #: **G101032**

QC'd By:   
 TEST METHOD: **ASTM D6392**  
 DATE REPORT: **13-Aug-10**

Crosshead Speed: 2 in/min					Crosshead Speed: 2 in/min								
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION			PEEL EVALUATION								
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)			
DS-P36 P87/88	69353	181	> 50%	BRK	121	1 Outside	138	0	SE1	91			
		180	> 50%	BRK		2 Outside	142	0	SE1				
		180	> 50%	BRK		3 Outside	142	0	SE1				
		182	> 50%	BRK		4 Outside	142	0	SE1				
		183	> 50%	BRK		5 Outside	137	0	SE1				
		AVG:		140 ✓				AVG:			140 ✓		
		STD. DEV.		3				STD. DEV.			2		
		1 Inside	138	0		SE1							
		2 Inside	138	0		SE1							
		3 Inside	142	0		SE1							
		4 Inside	142	0		SE1							
5 Inside	142	0	SE1										
AVG:		181 ✓			AVG:		140 ✓						
STD. DEV.		1			STD. DEV.		2						
DS-P37 P97/98	69354	184	> 50%	BRK	121	1 Outside	137	0	SE1	91			
		182	> 50%	BRK		2 Outside	138	0	SE1				
		183	> 50%	BRK		3 Outside	130	0	SE1				
		180	> 50%	BRK		4 Outside	129	0	SE1				
		182	> 50%	BRK		5 Outside	136	0	SE1				
		AVG:		134 ✓				AVG:			134 ✓		
		STD. DEV.		4				STD. DEV.			4		
		1 Inside	138	0		SE1							
		2 Inside	141	0		SE1							
		3 Inside	140	0		SE1							
		4 Inside	142	0		SE1							
5 Inside	142	0	SE1										
AVG:		182 ✓			AVG:		141 ✓						
STD. DEV.		1			STD. DEV.		2						

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

AD ADHESION FAILURE  
 BRK BREAK IN SHEETING  
 SE1 BREAK AT OUTER EDGE OF SEAM  
 SE2 BREAK AT INNER EDGE OF SEAM  
 AD-BRK BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
 SIP SEPARATION IN THE PLANE OF THE SHEET

**EXTRUSION:**

AD1  
 AD2  
 AD-WLD  
 SE1  
 SE2  
 SE3  
 BRK1  
 BRK2  
 AD-BRK  
 HT  
 SIP

**ADHESION FAILURE: SPECIMENS DELAMINATED UNDER THE BEAD**

ADHESION FAILURE  
 BREAK THROUGH THE FILLET  
 BREAK AT BOTTOM EDGE OF SEAM  
 BREAK AT TOP EDGE OF SEAM  
 BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)  
 BREAK IN BOTTOM SHEETING  
 BREAK IN TOP SHEETING  
 BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
 BREAK AT EDGE OF HOT TACK  
 SEPARATION IN THE PLANE OF THE SHEET

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims or issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.




Precision Geosynthetic Laboratories



## SEAM PEEL AND SHEAR TEST RESULTS

CLIENT: **Geosyntec Consultants**  
 PROJECT: **Kekaha LF Cell 1**  
 DATE REC'D: **13-Aug-10**

MATERIAL: **HDPE SEAM**  
 SEAM TYPE: **Extrusion Weld**  
 PGL JOB #: **G101032**

CC# By:   
 TEST METHOD: **ASTM D6392**  
 DATE REPORT: **13-Aug-10**

Crosshead Speed: 2 in/min						Crosshead Speed: 2 in/min				
SAMPLE ID	PGL CONTROL #	SHEAR EVALUATION				PEEL EVALUATION				
		MAXIMUM STRENGTH (lb/in width)	% Elongation	Locus of Break	PROJECT SPEC. (lb/in width)	SPECIMEN NUMBER	MAXIMUM STRENGTH (lb/in width)	% INCURSION (%)	LOCUS OF BREAK	PROJECT SPEC. (lb/in width)
DS-P38 P0079	69355	168	>50%	BRK		1 Outside	129	0	SE3	
		167	>50%	BRK		2 Outside	127	0	SE3	
		168	>50%	BRK		3 Outside	126	0	SE3	
		167	>50%	BRK		4 Outside	121	0	SE3	
		168	>50%	BRK		5 Outside	125	0	SE3	
						AVG: 126 ✓				
				STD. DEV. 1						
AVG. STD. DEV.		168 1				121				
				AVG: 126 ✓				78		
				STD. DEV. 1						

**BREAK DESCRIPTION (ASTM D6392 FUSION):**

AD           ADHESION FAILURE  
 BRK        BREAK IN SHEETING  
 SE1        BREAK AT OUTER EDGE OF SEAM  
 SE2        BREAK AT INNER EDGE OF SEAM  
 AD-BRK    BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE  
 SIP        SEPARATION IN THE PLANE OF THE SHEET

**EXTRUSION:**

AD1	ADHESION FAILURE SPECIMENS DELAMINATED UNDER THE BEAD.
AD2	ADHESION FAILURE
AD-W/LI	BREAK THROUGH THE FILLET
SE1	BREAK AT BOTTOM EDGE OF SEAM
SE2	BREAK AT TOP EDGE OF SEAM
SE3	BREAK AT BOTTOM EDGE OF SEAM (for PEEL only)
BRK1	BREAK IN BOTTOM SHEETING
BRK2	BREAK IN TOP SHEETING
AD-BRK	BREAK IN FIRST SEAM AFTER SOME ADHESION FAILURE
HT	BREAK AT EDGE OF HOT TACK
SIP	SEPARATION IN THE PLANE OF THE SHEET

By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims or issues, due to the use of this data, to the extent for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.



Precision Geosynthetic Laboratories







**Appendix K**  
**Manufacturer's Roll Certificates**  
**and Roll Inventory**



## Material Inventory

Project: Kekaha Landfill	ProjNo: WG1298
Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752	TaskNo: 02
Description: <u>New Leachate Evaporation Pond Construction</u>	

Material Type: gcl - 1	Manufacturer: CETCO	Product Type: Bentomat FLW
------------------------	---------------------	----------------------------

Inventory					Q.A. Conformance				Q.C. Documents			
Inv Date	Batch-Roll	Width (ft.)	Length (ft.)	QA ID	Date	Samp No	Result	QAID	Date Rec	Date Ckk	Result	QAID

Accepted Rolls

3/2/2010	201004CV-257	15	150	CAS	1/29/2010	257	p	KH	1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-258	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-260	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-261	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-262	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-263	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/1/2010	201004CV-264	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-265	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-266	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-267	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-268	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-269	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/1/2010	201004CV-270	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-271	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-272	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-273	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-274	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-275	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-276	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/1/2010	201004CV-277	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/1/2010	201004CV-278	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-279	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/1/2010	201004CV-280	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/1/2010	201004CV-281	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/1/2010	201004CV-282	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-283	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-284	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-285	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/1/2010	201004CV-286	15	150	CAS					1/29/2010	1/31/2010	p	MM



## Material Inventory

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WG1298</u>
Location: <u>6900 D Kaunualii Hwy, Kekaha, HI 96752</u>	TaskNo: <u>02</u>
Description: <u>New Leachate Evaporation Pond Construction</u>	

Material Type: <u>gcl 1</u>	Manufacturer: <u>CETCO</u>	Product Type: <u>Bentonite FLW</u>
-----------------------------	----------------------------	------------------------------------

Inventory					Q.A. Conformance				Q.C. Documents			
Inv Date	Batch-Roll	Width (ft.)	Length (ft.)	QA ID	Date	Samp No	Result	QAID	Date Rec	Date Ck	Result	QAID
3/1/2010	201004CV-287	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-288	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/1/2010	201004CV-289	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-290	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-291	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-292	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-293	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-294	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/1/2010	201004CV-296	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-297	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/1/2010	201004CV-298	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/1/2010	201004CV-299	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/1/2010	201004CV-300	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-301	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-302	15	150	CAS	1/29/2010	302	p	KH	1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-303	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/1/2010	201004CV-304	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-305	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-306	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-307	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-308	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-309	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-310	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-312	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-313	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-314	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-315	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/1/2010	201004CV-316	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-317	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-318	15	150	CAS					1/29/2010	1/31/2010	p	MM



## Material Inventory

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WG1298</u>
Location: <u>6900 D Kaunualii Hwy, Kekaha, HI 96752</u>	TaskNo: <u>02</u>
Description: <u>New Leachate Evaporation Pond Construction</u>	

Material Type: <u>gcl 1</u>	Manufacturer: <u>CETCO</u>	Product Type: <u>Bentomat FLW</u>
-----------------------------	----------------------------	-----------------------------------

Inventory					Q.A. Conformance				Q.C. Documents			
Inv Date	Batch-Roll	Width (ft.)	Length (ft.)	QA ID	Date	Samp No	Result	QAID	Date Rec	Date Ckk	Result	QAID
3/4/2010	201004CV-319	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/1/2010	201004CV-320	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-321	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-322	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-324	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-325	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-326	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/1/2010	201004CV-327	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-328	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/1/2010	201004CV-329	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/1/2010	201004CV-330	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-331	15	150	CAS					1/29/2010	1/31/2010	p	MM
2/22/2010	201004CV-332	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-333	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-334	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/1/2010	201004CV-335	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/1/2010	201004CV-336	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-337	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/1/2010	201004CV-338	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-339	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/1/2010	201004CV-340	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-341	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/1/2010	201004CV-342	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-343	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-344	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/1/2010	201004CV-345	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-346	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/1/2010	201004CV-347	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-348	15	150	CAS	1/29/2010	348	p	KH	1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-349	15	150	CAS					1/29/2010	1/31/2010	p	MM



## Material Inventory

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WG1298</u>
Location: <u>6900 D Kaunualii Hwy, Kekaha, HI 96752</u>	TaskNo: <u>02</u>
Description: <u>New Leachate Evaporation Pond Construction</u>	

Material Type: <u>gcl: 1</u>	Manufacturer: <u>CETCO</u>	Product Type: <u>Bentomat FLW</u>
------------------------------	----------------------------	-----------------------------------

Inventory					Q.A. Conformance				Q.C. Documents			
Inv Date	Batch-Roll	Width (ft.)	Length (ft.)	QA ID	Date	Samp No	Result	QAID	Date Rec	Date Ckk	Result	QAID

3/2/2010	201004CV-350	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-351	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-352	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/1/2010	201004CV-353	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/1/2010	201004CV-354	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/1/2010	201004CV-356	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/1/2010	201004CV-357	15	150	CAS					1/29/2010	1/31/2010	p	MM
2/22/2010	201004CV-358	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-359	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-360	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-361	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-362	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-364	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-365	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-366	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-367	15	150	CAS					1/29/2010	1/31/2010	p	MM
2/22/2010	201004CV-368	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-369	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-370	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-371	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-372	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-373	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-374	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-375	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-376	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-377	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-378	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-379	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-380	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-381	15	150	CAS					1/29/2010	1/31/2010	p	MM



## Material Inventory

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WGI298</u>
Location: <u>6900 D Kaunualii Hwy, Kekaha, HI 96752</u>	TaskNo: <u>02</u>
Description: <u>New Leachate Evaporation Pond Construction</u>	

Material Type: <u>gcl-1</u>	Manufacturer: <u>CETCO</u>	Product Type: <u>Benotmat FLW</u>
-----------------------------	----------------------------	-----------------------------------

Inventory					Q.A. Conformance				Q.C. Documents			
Inv Date	Batch-Roll	Width (ft.)	Length (ft.)	QA ID	Date	Samp No	Result	QAID	Date Rec	Date Ckk	Result	QAID
3/4/2010	201004CV-382	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-383	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-386	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-387	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-388	15	150	CAS					1/29/2010	1/31/2010	p	MM
2/22/2010	201004CV-389	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-392	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-396	15	150	CAS	1/29/2010	396	p	KH	1/29/2010	1/31/2010	p	MM
2/22/2010	201004CV-398	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-399	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-400	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-401	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-402	15	150	CAS					1/29/2010	1/31/2010	p	MM
2/22/2010	201004CV-403	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-404	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-405	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-406	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-407	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-408	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-409	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-410	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-411	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-412	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-413	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-414	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-415	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-416	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-417	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-418	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-419	15	150	CAS					1/29/2010	1/31/2010	p	MM



## Material Inventory

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WG1298</u>
Location: <u>6900 D Kaunaloa Hwy, Kekaha, HI 96752</u>	TaskNo: <u>02</u>
Description: <u>New Leachate Evaporation Pond Construction</u>	

Material Type: <u>gcl</u>	Manufacturer: <u>CETCO</u>	Product Type: <u>Bentomat FLW</u>
---------------------------	----------------------------	-----------------------------------

Inventory					Q.A. Conformance				Q.C. Documents			
Inv Date	Batch-Roll	Width (ft.)	Length (ft.)	QA ID	Date	Samp No	Result	QAID	Date Rec	Date Ck	Result	QAID
3/2/2010	201004CV-420	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-421	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-422	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-423	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/22/2010	201004CV-424	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-425	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-426	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-427	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-428	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-429	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-430	15	150	CAS					1/29/2010	1/31/2010	p	MM
2/22/2010	201004CV-431	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-432	15	150	CAS					1/29/2010	1/31/2010	p	MM
2/22/2010	201004CV-433	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-434	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-435	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-436	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-437	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-438	15	150	CAS	1/29/2010	438	p	KH	1/31/2010	1/31/2010	p	MM
2/22/2010	201004CV-439	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-440	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-441	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-442	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-443	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-444	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-445	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-446	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-447	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-448	15	150	CAS					1/29/2010	1/31/2010	p	MM
2/22/2010	201004CV-449	15	150	CAS					1/29/2010	1/31/2010	p	MM



## Material Inventory

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WG1298</u>
Location: <u>6900 D Kaunua'ili Hwy, Kekaha, HI 96752</u>	TaskNo: <u>12</u>
Description: <u>New Leachate Evaporation Pond Construction</u>	

Material Type: <u>gcl</u>	Manufacturer: <u>CETCO</u>	Product Type: <u>Biocumal FLW</u>
---------------------------	----------------------------	-----------------------------------

Inventory					Q.A. Conformance				Q.C. Documents			
Inv Date	Batch-Roll	Width (ft.)	Length (ft.)	QA ID	Date	Samp No	Result	QAID	Date Rec	Date Ckk	Result	QAID
3/2/2010	201004CV-450	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-451	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-452	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-453	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-454	15	150	CAS					1/29/2010	1/31/2010	p	MM
2/22/2010	201004CV-455	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-456	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-457	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-458	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-459	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-460	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-461	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-462	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-463	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-464	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-465	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-466	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-467	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-468	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-469	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-472	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-475	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-474	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-475	15	150	CAS					1/29/2010	1/31/2010	p	MM
2/22/2010	201004CV-476	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-477	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-478	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-479	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-480	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-481	15	150	CAS					1/29/2010	1/31/2010	p	MM





**Material Inventory**

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WG1298</u>
Location: <u>6900 D Kaunualii Hwy, Kekaha, HI 96752</u>	TaskNo: <u>02</u>
Description: <u>New Leachate Evaporation Pond Construction</u>	

Material Type: <u>gd. 1</u>	Manufacturer: <u>CEICO</u>	Product Type: <u>Bentonit FLW</u>
-----------------------------	----------------------------	-----------------------------------

Inventory					Q.A. Conformance				Q.C. Documents			
Inv Date	Batch-Roll	Width (ft.)	Length (ft.)	QA ID	Date	Samp No	Result	QAID	Date Rec	Date Ck	Result	QAID
3/3/2010	201004CV-483	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-484	15	150	CAS	1/29/2010	484	p	KH	1/31/2010	1/31/2010	p	MM
3/3/2010	201004CV-485	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-486	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-487	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-488	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-490	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-491	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-492	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-493	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-494	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-495	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-496	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/4/2010	201004CV-497	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-498	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-499	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-500	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-501	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-502	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-503	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-504	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-505	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-506	15	150	CAS					1/29/2010	1/31/2010	p	MM
2/22/2010	201004CV-507	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-508	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-509	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-510	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-511	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/2/2010	201004CV-512	15	150	CAS					1/29/2010	1/31/2010	p	MM
3/3/2010	201004CV-513	15	150	CAS					1/29/2010	1/31/2010	p	MM



**Material Inventory**

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WG1298</u>
Location: <u>6900 D Kaunualii Hwy, Kekaha, HI 96752</u>	TaskNo: <u>02</u>
Description: <u>New Leachate Evaporation Pond Construction</u>	

Material Type: gol 1      Manufacturer: CEICO      Product Type: Bentomat FLW

Inventory					Q.A. Conformance				Q.C. Documents			
Invt Date	Batch-Roll	Width (ft.)	Length (ft.)	QA ID	Date	Samp No	Result	QAID	Date Rec	Date CkA	Result	QAID

<i>Average Roll Width(ft.): 15</i>	<i>Average Roll Length(ft.): 150</i>
<i>Total Number of Rolls: 239</i>	<i>Cumulative Area(sq.ft.): 537750</i>
<i>Total Number of Conformance Tests: 6</i>	

Comments:



## Material Inventory

Project: Kekaha Landfill	ProjNo: WGI295
Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752	TaskNo: 02
Description: New Leachate Evaporation Pond Construction	

Material Type: gml 2	Manufacturer: Agru	Product Type: @-mol DST
----------------------	--------------------	-------------------------

Inventory					Q.A. Conformance				Q.C. Documents			
Inv Date	Batch-Roll	Width (ft.)	Length (ft.)	QA ID	Date	Samp No	Result	QAID	Date Rec	Date CRk	Result	QAID

Accepted Rolls

2/24/2010	7291454-802119.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291454-802120.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291454-802221.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291454-802222.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291454-802223.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802224.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802225.10	23	410	CAS	1/18/2010	2225	p	MM	1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802226.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802227.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802228.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802229.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802230.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802231.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802232.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802233.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802234.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802235.10	23	410	CAS	1/19/2010	2235	p	MM	1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802236.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802237.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802238.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802239.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802240.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802341.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802342.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802343.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802344.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802345.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802346.10	23	410	CAS	1/19/2010	2346	p	MM	1/26/2010	1/26/2010	p	MM



## Material Inventory

Project: Kekaha Landfill	ProjNo: WGI298
Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752	TaskNo: 02
Description: New Leachate Evaporation Pond Construction	

Material Type: gml - 2	Manufacturer: Agro	Product Type: 60-mil DST
------------------------	--------------------	--------------------------

Inventory					Q.A. Conformance				Q.C. Documents			
Inv Date	Batch-Roll	Width (ft.)	Length (ft.)	Q# ID	Date	Samp No	Result	QAID	Date Rec	Date Ck	Result	QAID
3/1/2010	7291454-802347.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802348.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802349.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802350.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802351.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802352.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802353.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802354.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802355.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802356.10	23	410	CAS	1/20/2010	2356	p	MM	1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802357.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802358.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802359.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802360.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802461.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802462.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802463.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291454-802464.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802465.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/1/2010	7291454-802466.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/23/2010	7291454-802467.10	23	410	CAS	1/20/2010	2467	p	MM	1/26/2010	1/26/2010	p	MM
3/10/2010	7291454-802468.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/10/2010	7291454-802469.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/10/2010	7291454-802470.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/10/2010	7291454-802471.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291454-802472.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291454-802473.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/16/2010	7291454-802474.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
3/10/2010	7291454-802475.10	23	410	CAS					1/26/2010	1/26/2010	p	MM



**Material Inventory**

Project: Kekaha Landfill	ProjNo: WG1298
Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752	TaskNo: 02
Description: New Leachate Evaporation Pond Construction	

Material Type: gmi: 2      Manufacturer: Agru      Product Type: 60-mil DST

Inventory					Q.A. Conformance				Q.C. Documents			
Inv Date	Batch-Roll	Width (ft.)	Length (ft.)	QA ID	Date	Samp No	Result	QAID	Date Rec	Date Ckr	Result	QAID
2/24/2010	7291467-801613.10	23	410	CAS	1/18/2010	1613	p	MM	1/26/2010	1/26/2010	p	MM
2/24/2010	7291467-801614.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291467-801615.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291467-801616.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291467-801617.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291467-801618.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291467-801619.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291467-801620.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291467-801721.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291467-801722.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291467-801723.10	23	410	CAS	1/18/2010	1723	p	MM	1/26/2010	1/26/2010	p	MM
2/24/2010	7291467-801724.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/23/2010	7291467-801725.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/23/2010	7291467-801726.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/23/2010	7291467-801727.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/23/2010	7291467-801728.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/23/2010	7291467-801729.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/23/2010	7291467-801730.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/23/2010	7291467-801731.10	32	410	CAS					1/26/2010	1/26/2010	p	MM
2/23/2010	7291467-801732.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/23/2010	7291467-801733.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/23/2010	7291467-801734.10	23	410	CAS	1/18/2010	1734	p	MM	1/26/2010	1/26/2010	p	MM
2/23/2010	7291467-801735.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/23/2010	7291467-801736.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/23/2010	7291467-801737.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291467-801738.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291467-801739.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291467-801740.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291467-801741.10	23	410	CAS					1/26/2010	1/26/2010	p	MM



## Material Inventory

Project: Kekaha Landfill Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752 Description: New Leachate Evaporation Pond Construction	ProjNo: WG1298 TaskNo: 02
---	------------------------------

Material Type: gml: 2	Manufacturer: Agri	Product Type: 60-mil DST
-----------------------	--------------------	--------------------------

Inventory					Q.A. Conformance				Q.C. Documents			
Inv Date	Batch-Roll	Width (ft.)	Length (ft.)	QA ID	Date	Samp No	Result	QAID	Date Rec	Date Ck	Result	QAID
2/24/2010	7291467-802101.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291467-802102.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291467-802103.10	23	410	CAS	1/18/2010	2103	p	MM	1/26/2010	1/26/2010	p	MM
2/24/2010	7291467-802104.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291467-802105.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291467-802106.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291467-802107.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291467-802108.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291467-802109.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291467-802110.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291467-802111.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291467-802112.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291467-802113.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291467-802114.10	23	410	CAS	1/18/2010	2114	p	MM	1/26/2010	1/26/2010	p	MM
2/24/2010	7291467-802115.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291467-802116.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291467-802117.10	23	410	CAS					1/26/2010	1/26/2010	p	MM
2/24/2010	7291467-802118.10	23	410	CAS					1/26/2010	1/26/2010	p	MM

Average Roll Width(ft.): 23	Average Roll Length(ft.): 410
Total Number of Rolls: 104	Cumulative Area(sq.ft.): <del>90440</del> 980,720
Total Number of Conformance Tests: 10	

Comments:



## Material Inventory

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WG1298</u>
Location: <u>6900 D Kaunualii Hwy, Kekaha, HI 96752</u>	TaskNo: <u>02</u>
Description: <u>New Leachate Evaporation Pond Construction</u>	

<i>Material Type:</i> <u>gml: 3</u>	<i>Manufacturer:</i> <u>Agro</u>	<i>Product Type:</i> <u>80-mil LST</u>
-------------------------------------	----------------------------------	--

<i>Inventory</i>					<i>Q.A. Conformance</i>				<i>Q.C. Documents</i>			
<i>Inv Date</i>	<i>Batch-Roll</i>	<i>Width (ft.)</i>	<i>Length (ft.)</i>	<i>QA ID</i>	<i>Date</i>	<i>Samp No</i>	<i>Result</i>	<i>QAID</i>	<i>Date Rec</i>	<i>Date Ck</i>	<i>Result</i>	<i>QAID</i>

Accepted Rolls

1/10/2010	7291467-801611.10	23	328	CAS	1/18/2010	1611	p	MM	1/26/2010	1/26/2010	p	MM
5/10/2010	7291467-801612.10	23	328	CAS					1/26/2010	1/26/2010	p	MM

<i>Average Roll Width(ft.):</i> <u>23</u>	<i>Average Roll Length(ft.):</i> <u>328</u>
<i>Total Number of Rolls:</i> <u>2</u>	<i>Cumulative Area(sq.ft.):</i> <u>15088</u>
<i>Total Number of Conformance Tests:</i> <u>1</u>	

Comments:



## Material Inventory

Project: Kekaha Landfill	ProjNo: WG1298
Location: 6900 D Kamehamehi Hwy, Kekaha, HI 96757	TaskNo: 02
Description: New Leachate Evaporation Pond Construction	

Material Type: gt-4	Manufacturer:	Product Type: 6-oz geotextile
---------------------	---------------	-------------------------------

Inventory					Q.A. Conformance				Q.C. Documents			
Inv Date	Batch-Roll	Width (ft.)	Length (ft.)	QA ID	Date	Samp No	Result	QAID	Date Rec	Date Ckk	Result	QAID

Accepted Rolls

2/22/2010	E060-300293929	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300293930	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300293931	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300293932	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300293938	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300293939	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300293940	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300293941	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300293942	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300294086	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300294087	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300294088	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300294089	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300294090	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300294607	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300294613	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300294614	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300294615	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300294616	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300294617	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300294618	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300294619	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300294620	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300294621	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300294622	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300294623	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300294624	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300294625	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300294626	12	360	CAS					1/26/2010	1/26/2010	p	CS





**Material Inventory**

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WG1298</u>
Location: <u>6900 D Kaulaali Hwy, Kekaha, HI 96752</u>	TaskNo: <u>02</u>
Description: <u>New Leachate Evaporation Pond Construction</u>	

Material Type: <u>gr 4</u>	Manufacturer: _____	Product Type: <u>6-oz geotextile</u>
----------------------------	---------------------	--------------------------------------

Inventory					Q.A. Conformance				Q.C. Documents			
Inv Date	Batch-Roll	Width (ft.)	Length (ft.)	QA ID	Date	Samp No	Result	QAID	Date Rec	Date Ckk	Result	QAID

2/22/2010	E060-300294627	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295419	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295420	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295421	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295422	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295423	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295424	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295425	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295426	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295427	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295428	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295429	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295430	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295431	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295432	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295433	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295434	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295435	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295436	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295440	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295441	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295442	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295443	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295444	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295445	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295446	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295447	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295448	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295449	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295450	12	360	CAS					1/26/2010	1/26/2010	p	CS



**Material Inventory**

Project: Kekaha Landfill	ProjNo: WG1298
Location: 6900 D Kaunualii Hwy, Kekaha, HI 96752	TaskNo: 02
Description: <u>New Leachate Evaporation Pond Construction</u>	

Material Type: <u>gt. 4</u>	Manufacturer:	Product Type: <u>6-oz geotextile</u>
-----------------------------	---------------	--------------------------------------

Inventory					Q.A. Conformance				Q.C. Documents			
Inv Date	Batch-Roll	Width (ft.)	Length (ft.)	QA ID	Date	Samp No	Resub	QAID	Date Rec	Date CMA	Result	QAID

2/22/2010	E060-300295451	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295452	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295453	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295454	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295455	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295456	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295457	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295458	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295459	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295460	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295461	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295462	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295463	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295464	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295465	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295466	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295467	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295468	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295469	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295470	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295471	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295472	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295473	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295474	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E060-300295475	12	360	CAS					1/26/2010	1/26/2010	p	CS

<b>Average Roll Width(ft.): 12</b>	<b>Average Roll Length(ft.): 360</b>
<b>Total Number of Rolls: 84</b>	<b>Cumulative Area(sq.ft.): 362880</b>
<b>Total Number of Conformance Tests: 0</b>	



## Material Inventory

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WG129E</u>
Location: <u>6900 D Kaunualii Hwy, Kekaha, HI 96752</u>	TaskNo: <u>02</u>
Description: <u>New Leachate Evaporation Pond Construction</u>	

Material Type: <u>g. 1</u>	Manufacturer: _____	Product Type: <u>6-oz geotextile</u>
----------------------------	---------------------	--------------------------------------

Inventory					Q.A. Conformance				Q.C. Documents			
Inv Date	Batch-Roll	Width (ft.)	Length (ft.)	QA ID	Date	Samp No	Result	QAID	Date Rec	Date Ckk	Result	QAID

Comments:



## Material Inventory

Project: Kekaha Landfill	ProjNo: WG1298
Location: 6900 D Kaunahu Hwy, Kekaha, HI 96733	TaskNo: 02
Description: New Leachate Evaporation Pond Construction	

Material Type: gl. 5	Manufacturer:	Product Type: 16-oz geotextile
----------------------	---------------	--------------------------------

Inventory					Q.A. Conformance				Q.C. Documents			
Inv Date	Batch-Roll	Width (ft.)	Length (ft.)	QA ID	Date	Samp No.	Result	QAID	Date Rec	Date CMA	Result	QAID

Accepted Rolls

2/23/2010	E160-2020174353	12	360	CAS					1/26/2010	1/26/2010	p	CS
3/10/2010	E160-2020579616	12	360	CAS					1/26/2010	1/26/2010	p	CS
3/10/2010	E160-2020579618	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/23/2010	E160-2020626841	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E160-2020626842	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E160-2020626848	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E160-2020626852	12	360	CAS					1/26/2010	1/26/2010	p	CS
3/10/2010	E160-2020626853	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/23/2010	E160-2020626855	12	360	CAS					1/26/2010	1/26/2010	p	CS
3/10/2010	E160-2020626856	12	360	CAS					1/26/2010	1/26/2010	p	CS
3/10/2010	E160-2020626857	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/23/2010	E160-2020626860	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/23/2010	E160-2020626867	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/23/2010	E160-2020626868	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/23/2010	E160-2020626870	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/23/2010	E160-2020626872	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E160-2020626873	12	360	CAS					1/26/2010	1/26/2010	p	CS
3/10/2010	E160-2020626875	12	360	CAS					1/26/2010	1/26/2010	p	CS
3/10/2010	E160-2020626877	12	360	CAS					1/26/2010	1/26/2010	p	CS
3/10/2010	E160-2020626878	12	360	CAS					1/26/2010	1/26/2010	p	CS
3/10/2010	E160-2020626880	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/23/2010	E160-2020626881	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/23/2010	E160-2020626882	12	360	CAS					1/26/2010	1/26/2010	p	CS
3/10/2010	E160-2020626883	12	360	CAS					1/26/2010	1/26/2010	p	CS
3/10/2010	E160-2020626885	12	360	CAS					1/26/2010	1/26/2010	p	CS
3/10/2010	E160-2020626886	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/23/2010	E160-2020626887	12	360	CAS					1/26/2010	1/26/2010	p	CS
3/10/2010	E160-2020626888	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/23/2010	E160-2020626893	12	360	CAS					1/26/2010	1/26/2010	p	CS



## Material Inventory

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WG1298</u>
Location: <u>6900 D Kaunualii Hwy, Kekaha, HI 96752</u>	TaskNo: <u>02</u>
Description: <u>New Leachate Evaporation Pond Construction</u>	

Material Type: <u>gt - 5</u>	Manufacturer: _____	Product Type: <u>16-oz geotextile</u>
------------------------------	---------------------	---------------------------------------

Inventory					Q.A. Conformance				Q.C. Documents			
Inv Date	Batch-Roll	Width (ft.)	Length (ft.)	QA ID	Date	Samp No	Result	QAID	Date Rec	Date Ck	Result	QAID

3/10/2010	E160-2020626895	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/23/2010	E160-2020626898	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/23/2010	E160-2020626899	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E160-2020626900	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E160-2020626901	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E160-2020626902	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/23/2010	E160-2020626903	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E160-2020626904	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E160-2020626905	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E160-2020626906	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E160-2020626907	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/23/2010	E160-2020626908	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/23/2010	E160-2020626909	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E160-2020626910	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/23/2010	E160-2020626911	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/23/2010	E160-2020626912	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E160-2020626913	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E160-2020626914	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E160-2020626915	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E160-2020626916	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E160-2020626917	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E160-2020626918	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E160-2020626919	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E160-2020626920	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E160-2020626921	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E160-2020626922	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E160-2020626923	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/23/2010	E160-2020626924	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E160-2020626925	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/23/2010	E160-2020626926	12	360	CAS					1/26/2010	1/26/2010	p	CS



## Material Inventory

Project: <u>Kekaha Landfill</u>	ProjNo: <u>WG1298</u>
Location: <u>5900 D Kaunualii Hwy, Kekaha, HI 96752</u>	TaskNo: <u>02</u>
Description: <u>New Leachate Evaporation Pond Construction</u>	

Material Type: <u>gr 5</u>	Manufacturer: _____	Product Type: <u>16-oz geotextile</u>
----------------------------	---------------------	---------------------------------------

Inventory					Q.A. Conformance				Q.C. Documents			
Inv Date	Batch-Roll	Width (ft.)	Length (ft.)	QA ID	Date	Samp No	Result	QAID	Date Rec	Date Ck	Result	QAID

2/23/2010	E160-2020626927	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/23/2010	E160-2020626928	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/23/2010	E160-2020626929	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/23/2010	E160-2020626930	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/23/2010	E160-2020626931	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/23/2010	E160-2020626932	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E160-2020626933	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E160-2020626934	12	360	CAS					1/26/2010	1/26/2010	p	CS
2/22/2010	E160-2020626935	12	360	CAS					1/26/2010	1/26/2010	p	CS
3/30/2010	E160-2020656819	12	360	CAS					4/5/2010	4/5/2010	p	LKH
3/30/2010	E160-2020656821	12	360	CAS					4/5/2010	4/5/2010	p	LKH
3/30/2010	E160-2020656825	12	360	CAS					4/5/2010	4/5/2010	p	LKH
3/30/2010	E160-2020656828	12	360	CAS					4/5/2010	4/5/2010	p	LKH
3/30/2010	E160-2020656829	12	360	CAS					4/5/2010	4/5/2010	p	LKH
3/30/2010	E160-2020656831	12	360	CAS					4/5/2010	4/5/2010	p	LKH
3/30/2010	E160-2020656832	12	360	CAS					4/5/2010	4/5/2010	p	LKH
3/30/2010	E160-2020656833	12	360	CAS					4/5/2010	4/5/2010	p	LKH
3/30/2010	E160-2020656834	12	360	CAS					4/5/2010	4/5/2010	p	LKH
3/30/2010	E160-2020660913	12	360	CAS					4/5/2010	4/5/2010	p	LKH
3/30/2010	E160-2020660914	12	360	CAS					4/5/2010	4/5/2010	p	LKH
3/30/2010	E160-2020660915	12	360	CAS					4/5/2010	4/5/2010	p	LKH
3/30/2010	E160-2020660917	12	360	CAS					4/5/2010	4/5/2010	p	LKH
3/30/2010	E160-2020660918	12	360	CAS					4/5/2010	4/5/2010	p	LKH
3/30/2010	E160-2020660919	12	360	CAS					4/5/2010	4/5/2010	p	LKH
3/30/2010	E160-2020660920	12	360	CAS					4/5/2010	4/5/2010	p	LKH
3/30/2010	E160-2020660921	12	360	CAS					4/5/2010	4/5/2010	p	LKH
3/30/2010	E160-2020660922	12	360	CAS					4/5/2010	4/5/2010	p	LKH
3/30/2010	E160-2020660923	12	360	CAS					4/5/2010	4/5/2010	p	LKH
3/30/2010	E160-2020660924	12	360	CAS					4/5/2010	4/5/2010	p	LKH
3/30/2010	E160-2020660925	12	360	CAS					4/5/2010	4/5/2010	p	LKH



**Material Inventory**

Project: <u>Kekaha Landfill</u> Location: <u>6900 D Kaunualii Hwy, Kekaha, HI 96757</u> Description: <u>New Leachate Evaporation Pond Construction</u>	ProjNo: <u>WG1298</u> TaskNo: <u>02</u>
--	--

Material Type: <u>g1 5</u>	Manufacturer: _____	Product Type: <u>16-oz geotextile</u>
----------------------------	---------------------	---------------------------------------

Inventory					Q.A. Conformance				Q.C. Documents			
Inv Date	Batch-Roll	Width (ft.)	Length (ft.)	QA ID	Date	Samp No	Result	QAID	Date Rec	Date Ckk	Result	QAID

3/30/2010	E160-2020660929	12	360	CAS					4/5/2010	4/5/2010	p	LKH
3/30/2010	E160-2020660930	12	360	CAS					4/5/2010	4/5/2010	p	LKH
3/30/2010	E160-2020660931	12	360	CAS					4/5/2010	4/5/2010	p	LKH
3/30/2010	E160-2020660932	12	360	CAS					4/5/2010	4/5/2010	p	LKH
3/30/2010	E160-2020660958	12	360	CAS					4/5/2010	4/5/2010	p	LKH
3/30/2010	E160-2020660960	12	360	CAS					4/5/2010	4/5/2010	p	LKH

Average Roll Width(ft.): <u>12</u>	Average Roll Length(ft.): <u>360</u>
Total Number of Rolls: <u>95</u>	Cumulative Area(sq.ft.): <u>410400</u>
Total Number of Conformance Tests: <u>0</u>	

Comments:

# NORTHWEST LININGS & GEOTEXTILE PRODUCTS, INC.

• 21000 77<sup>th</sup> Avenue South • Kent, WA 98032 •

Phone: (253) 872-0244 • Fax: (253) 872-0245

www.northwestlinings.com

## LETTER OF TRANSMITTAL

TO: MMinch@Geosyntec.com  
CC: jeffg@goodfellowbros.com  
JFrey@wm.com

DATE: 1/29/2010	JOB NO.: N09150
ATTENTION: : Geosyntec	
RE: Kekaha LP Phase II Lateral Expansion Cell 1 - CETCO Geosynthetic Clay Liner MQC	

WE ARE SENDING YOU:  Attached  Under Separate Cover via \_\_\_\_\_ the following items:

- Shop Drawings  Prints  Plans  Specifications  Samples  
 Copy of Letter  Change Order  Submittals  Warranties  Other

Copies	Specification #	Description
1	Sec. 02074-1.02	CETCO - Geosynthetic Clay Liner Packing Slips & MQC Certificates

These are transmitted as checked below:

- For Approval  Approved as submitted  Resubmit  Copies for Approval  
 For your use  Approved as noted  Submit  Copies for distribution  
 For review and comment  Returned for corrections  Return  Corrected Prints  
 For bids due \_\_\_\_\_  Other \_\_\_\_\_

Remarks:

COPY TO: FILE SIGNED: Richard Kamienski





Date: 1/29/2010  
Purchase Order: C-4089  
ORDER NUMBER: 000258164

Kirk and Karen  
Northwest Linings  
21000 77th Ave. South  
Kent, WA 98032  
kirkk@northwestlinings.com cc. karen@northwestlinings.com

To Whom it May Concern:

Please find enclosed the MQA/MQC test data package for Geosynthetic Clay Liner shipments to Northwest Linings.

The enclosed data package includes results of all the MQC tests required by ASTM D5889, with the exception of index flux/hydraulic conductivity. This test, which is run according to ASTM D5887, is normally performed once per production lot (once per week), unless a higher frequency is required by the project specifications. Because of the GCL's low permeability, this test can take several weeks to complete. The index flux/hydraulic conductivity results associated with this lot of material will be provided under separate cover as soon as they are available.

Although the index flux/hydraulic conductivity test results are not yet available, CETCO accepts responsibility for our GCL should the index flux/hydraulic conductivity tests produce unacceptable results. If, upon delivery and prior to installation, individual rolls of GCL are found to be nonconforming to accepted project specifications, CETCO will replace the nonconforming material at no charge.

Questions regarding this information should be directed to Chris Athanassopoulos, Technical Support Engineer, at (847) 851-1831.

Sincerely,

Melanie King  
Quality Assurance Coordinator  
CETCO Cartersville Plant



**GEOSYNTHETIC CLAY LINER  
MANUFACTURING QUALITY ASSURANCE DATA PACKAGE**

PROJECT NAME: Kekaha Sanitary LF  
CUSTOMER P.O.: C-4089  
ORDER NUMBER: 000258364  
PREPARED FOR: Northwest Linings

**CONTENTS:**

- Product Certifications
- GCL Order packing list and MQA tracking form
- GCL manufacturing quality control test data
- Bentonite clay certification
- Raw material test results

PREPARED BY: Melanie King  
Quality Assurance Coordinator  
CETCO  
218 Industrial Park

Cartersville, GA 30121  
Telephone: (770) 387-7773  
E-Mail: melanie.king@cetco.com

239 ROLLS TOTAL

537,750 SF = 59,750 SY

GCL PACKING LIST AND MQA TRACKING FORM

Listing of finished and raw materials used to produce certification package number 000258364

Order #	GCL Lot #	GCL Box #	Length	Width	Weight	sq ft	Roll # Total	NON-WOVEN			WOVEN		Alt. Net - 21 #/06	City Lot #
								Cap. Lin #	Cap. Roll #	Roll # Total	Inner Box Roll #	Outer Box Roll #		
238264	201004CV	217 *	150	15	2736	2250	217	201004CV	193	192	2020514739	2011147335	942539A	
238264	201004CV	218	150	15	2650	2250	217	201004CV	193	192	2020514739	2011147335	942539A	
238264	201004CV	260	150	15	2856	2250	217	201004CV	196	192	2020514739	2011147335	942539A	
238264	201004CV	261	150	15	2756	2250	217	201004CV	196	192	2020514739	2011147335	942539A	
238264	201004CV	262	150	15	2940	2250	217	201004CV	196	192	2020514739	2011147335	942539A	
238264	201004CV	263	150	15	2758	2250	217	201004CV	196	192	2020514739	2011147335	942539A	
238264	201004CV	264	150	15	2710	2250	217	201004CV	196	192	2020514739	2011147335	942539A	
238264	201004CV	265	150	15	2719	2250	217	201004CV	196	192	2020514739	2011147335	942539A	
238264	201004CV	266	150	15	2716	2250	217	201004CV	196	192	2020514739	2011147335	942539A	
238264	201004CV	267	150	15	2738	2250	217	201004CV	216	215	2020514739	2011147335	942539A	
238264	201004CV	268	150	15	2736	2250	217	201004CV	216	215	2020514739	2011147335	942539A	
238264	201004CV	269	150	15	2728	2250	217	201004CV	216	215	2020514739	2011147335	942539A	
238264	201004CV	270	150	15	2728	2250	217	201004CV	216	215	2020514739	2011147335	942539A	
238264	201004CV	271	150	15	2732	2250	217	201004CV	216	215	2020514739	2011147335	942539B	
238264	201004CV	272 *	150	15	2982	2250	217	201004CV	216	215	2020514739	2011147335	942539B	
238264	201004CV	273	150	15	2758	2250	217	201004CV	216	215	2020514739	2020542836	942539B	
238264	201004CV	274	150	15	2702	2250	217	201004CV	215	215	2020514739	2020542836	942539B	
238264	201004CV	275	150	15	2798	2250	217	201004CV	215	215	2020514739	2020542836	942539B	
238264	201004CV	276	150	15	2790	2250	217	201004CV	215	215	2020514739	2020542836	942539B	
238264	201004CV	277	150	15	2694	2250	217	201004CV	215	215	2020514739	2020542836	942539B	
238264	201004CV	278	150	15	2699	2250	217	201004CV	215	215	2020514739	2020542836	942539B	
238264	201004CV	279	150	15	2698	2250	217	201004CV	215	215	2020514739	2020542836	942539B	
238264	201004CV	280	150	15	2766	2250	217	201004CV	215	215	2020514739	2020542836	942539B	
238264	201004CV	281	150	15	2708	2250	217	201004CV	217	215	2020514739	2020542836	942539B	
238264	201004CV	282	150	15	2768	2250	217	201004CV	217	215	2020514739	2020542836	942539B	
238264	201004CV	283	150	15	2694	2250	217	201004CV	217	215	2020514739	2020542836	942539B	
238264	201004CV	284	150	15	2934	2250	217	201004CV	217	215	WEA013043-2	2020541834	942539B	
238264	201004CV	285	150	15	2724	2250	217	201004CV	217	215	WEA013043-2	2020541834	942539B	
238264	201004CV	286	150	15	2746	2250	217	201004CV	217	215	WEA013043-2	2020541834	942539B	
238264	201004CV	287 *	150	15	2730	2250	217	201004CV	217	215	WEA013043-2	2020541834	942539B	
238264	201004CV	288	150	15	2734	2250	217	201004CV	218	215	WEA013043-2	2020541834	942539B	
238264	201004CV	289	150	15	2934	2250	217	201004CV	218	215	WEA013043-2	2020541834	942539B	
238264	201004CV	290	150	15	2748	2250	217	201004CV	218	215	WEA013043-2	2020541834	942539B	
238264	201004CV	291	150	15	2740	2250	217	201004CV	218	215	WEA013043-2	2020541834	942539B	
238264	201004CV	292	150	15	2738	2250	217	201004CV	218	215	WEA013043-2	2020541834	942539B	
238264	201004CV	293	150	15	2740	2250	217	201004CV	218	215	WEA013043-2	2020541834	942539B	
238264	201004CV	294	150	15	2912	2250	217	201004CV	218	215	WEA013043-2	2020541834	942539B	
238264	201004CV	296	150	15	2730	2250	217	201004CV	204	200	WEA013043-2	2020541834	942539B	
238264	201004CV	297	150	15	2726	2250	217	201004CV	204	200	WEA013043-2	2020541834	942539B	
238264	201004CV	298	150	15	2744	2250	217	201004CV	204	200	WEA013043-2	2020541834	942539B	
238264	201004CV	299	150	15	2702	2250	217	201004CV	204	200	WEA013043-2	2020541834	942539B	
238264	201004CV	300	150	15	2748	2250	217	201004CV	204	200	WEA013043-2	2020541834	942539B	

(42)

DWG#	CRCL Code	QCL Ref #	Length	Width	Height	Area	Roll # Tensid	Dir Lot #	Coil Ref #	Roll # Tensid	Inner Base Ref #	Outer Base Ref #	Dir Lot #
2516A	201004CV	301	150	15	2146	2250	281	201004CV	204	200	WEA013043-2	2020542764	942398
2517A	201004CV	302 *	150	15	2140	2250	302	201004CV	204	200	WEA013043-2	2020542764	942398
2518A	201004CV	303	150	15	2154	2250	303	201004CV	213	215	WEA013043-2	2020542764	942398
2519A	201004CV	304	150	15	2144	2250	301	201004CV	213	215	WEA013043-2	2020542764	942398
2520A	201004CV	305	150	15	2148	2250	302	201004CV	213	215	WEA013043-2	2020542764	942398
2521A	201004CV	306	150	15	2152	2250	303	201004CV	213	215	WEA013043-2	2020542764	942398
2522A	201004CV	307	150	15	2146	2250	302	201004CV	213	215	WEA013043-2	2020542764	942398
2523A	201004CV	308	150	15	2146	2250	302	201004CV	213	215	WEA013043-2	2020542764	942398
2524A	201004CV	309	150	15	2160	2250	303	201004CV	213	215	WEA013043-2	2020542764	942398
2525A	201004CV	310	150	15	2154	2250	302	201004CV	210	215	WEA013043-2	2020542764	942398
2526A	201004CV	312	150	15	2144	2250	302	201004CV	220	215	WEA011199-6	2020541827	942398
2527A	201004CV	313	150	15	2146	2250	302	201004CV	220	215	WEA011199-6	2020541827	942398
2528A	201004CV	314	150	15	2162	2250	303	201004CV	220	215	WEA011199-6	2020541827	942398
2529A	201004CV	315	150	15	2156	2250	302	201004CV	220	215	WEA011199-6	2020541827	942398
2530A	201004CV	316	150	15	2170	2250	303	201004CV	220	215	WEA011199-6	2020541827	942398
2531A	201004CV	317	150	15	2148	2250	302	201004CV	220	215	WEA011199-6	2020541827	942398
2532A	201004CV	318 *	150	15	2162	2250	303	201004CV	221	215	WEA011199-6	2020541827	942398
2533A	201004CV	319	150	15	2146	2250	311E	201004CV	221	215	WEA011199-6	2020541827	942398
2534A	201004CV	320	150	15	2150	2250	311	201004CV	221	215	WEA011199-6	2020541827	942398
2535A	201004CV	321	150	15	2164	2250	312	201004CV	221	215	WEA011199-6	2020541827	942398
2536A	201004CV	322	150	15	2158	2250	311	201004CV	221	215	WEA011199-6	2020541827	942398
2537A	201004CV	323	150	15	2162	2250	312	201004CV	221	215	WEA011199-6	2020541827	942398
2538A	201004CV	324	150	15	2156	2250	311	201004CV	221	215	WEA011199-6	2020541827	942398
2539A	201004CV	325	150	15	2170	2250	312	201004CV	221	215	WEA011199-6	2020541827	942398
2540A	201004CV	326	150	15	2154	2250	311	201004CV	222	215	WEA011199-6	2020541827	942398
2541A	201004CV	327	150	15	2168	2250	312	201004CV	222	215	WEA011199-6	2020541827	942398
2542A	201004CV	328	150	15	2162	2250	311	201004CV	222	215	WEA011199-6	2020541827	942398
2543A	201004CV	329	150	15	2166	2250	312	201004CV	222	215	WEA011199-6	2020541827	942398
2544A	201004CV	330	150	15	2160	2250	311	201004CV	222	215	WEA011199-6	2020541827	942398
2545A	201004CV	331	150	15	2174	2250	312	201004CV	222	215	WEA011199-6	2020541827	942398
2546A	201004CV	332	150	15	2168	2250	311	201004CV	222	215	WEA011199-6	2020541827	942398
2547A	201004CV	333	150	15	2172	2250	312	201004CV	224	215	WEA011199-6	2020541827	942398
2548A	201004CV	334 *	150	15	2166	2250	311	201004CV	224	215	WEA011199-6	2020541827	942398
2549A	201004CV	335	150	15	2180	2250	312	201004CV	224	215	WEA011199-6	2020541827	942398
2550A	201004CV	336	150	15	2174	2250	311	201004CV	224	215	WEA011199-6	2020541827	942398
2551A	201004CV	337	150	15	2188	2250	312	201004CV	224	215	WEA011199-6	2020541827	942398
2552A	201004CV	338	150	15	2182	2250	311	201004CV	224	215	WEA011199-6	2020541827	942398
2553A	201004CV	339	150	15	2186	2250	312	201004CV	224	215	WEA011199-6	2020541827	942398
2554A	201004CV	340	150	15	2180	2250	311	201004CV	224	215	WEA011199-6	2020541827	942398
2555A	201004CV	341	150	15	2194	2250	312	201004CV	224	215	WEA011199-6	2020541827	942398
2556A	201004CV	342	150	15	2188	2250	311	201004CV	224	215	WEA011199-6	2020541827	942398
2557A	201004CV	343	150	15	2202	2250	312	201004CV	224	215	WEA011199-6	2020541827	942398
2558A	201004CV	344	150	15	2196	2250	311	201004CV	224	215	WEA011199-6	2020541827	942398
2559A	201004CV	345	150	15	2210	2250	312	201004CV	224	215	WEA011199-6	2020541827	942398
2560A	201004CV	346	150	15	2204	2250	311	201004CV	224	215	WEA011199-6	2020541827	942398
2561A	201004CV	347	150	15	2218	2250	312	201004CV	224	215	WEA011199-6	2020541827	942398

(45)

Order	UCL Part	UCL Part P	Length	Width	Height	Wt	Roll # Total	Cap Lin #	Cap Roll #	Roll # Total	Lower Bar Roll #	Upper Bar Roll #	Cap Lin #
258364	201004CV	348 *	130	15	2760	2210	348	201004CV	225	225	WEA013043-15	2020541832	942541A
258364	201004CV	348	130	15	2778	2250	348	201004CV	225	225	WEA013043-15	2020541832	942541A
258364	201004CV	350	150	15	2730	2230	348	201004CV	225	225	WEA013043-15	2020541832	942541A
258364	201004CV	351	150	15	2734	2230	348	201004CV	225	225	WEA013043-15	2020541832	942541A
258364	201004CV	351	150	15	2734	2250	348	201004CV	225	225	WEA013043-15	2020541832	942541A
258364	201004CV	351	150	15	2740	2250	348	201004CV	225	225	WEA013043-15	2020541832	942541A
258364	201004CV	354	150	15	2720	2250	348	201004CV	225	225	WEA013043-15	2020541832	942541A
258364	201004CV	356	130	15	2744	2250	348	201004CV	225	225	WEA013043-15	2020541839	942541A
258364	201004CV	357	130	15	2758	2250	348	201004CV	225	225	WEA013043-15	2020541839	942541A
258364	201004CV	358	150	15	2745	2250	348	201004CV	225	225	WEA013043-15	2020541839	942541A
258364	201004CV	359	130	15	2730	2250	348	201004CV	225	225	WEA013043-15	2020541839	942541A
258364	201004CV	360	150	15	2744	2250	348	201004CV	225	225	WEA013043-15	2020541839	942541A
258364	201004CV	361	150	15	2742	2250	348	201004CV	225	225	WEA013043-15	2020541839	942541A
258364	201004CV	362	150	15	2594	2250	348	201004CV	225	225	WEA013043-15	2020541839	942541A
258364	201004CV	364	150	15	2640	2250	363	201004CV	225	225	WEA013043-15	2020541839	942541A
258364	201004CV	365	150	15	2702	2250	363	201004CV	225	225	WEA013043-15	2020541839	942541A
258364	201004CV	366	150	15	2716	2250	363	201004CV	225	225	WEA013043-15	2020541839	942541A
258364	201004CV	367	150	15	2730	2250	363	201004CV	225	225	WEA013043-15	2020541839	942541A
258364	201004CV	368	150	15	2734	2250	363	201004CV	225	225	WEA013043-15	2020541839	942541A
258364	201004CV	369	150	15	2744	2250	363	201004CV	225	225	WEA013043-15	2020541839	942541A
258364	201004CV	370	150	15	2736	2250	363	201004CV	225	225	WEA013043-15	2020541839	942541A
258364	201004CV	371	150	15	2590	2250	363	201004CV	225	225	WEA013043-15	2020541839	942541A
258364	201004CV	372	150	15	2748	2250	363	201004CV	225	225	WEA013043-15	2020631896	942541B
258364	201004CV	373	150	15	2738	2250	363	201004CV	225	225	WEA013043-15	2020631896	942541B
258364	201004CV	374	150	15	2744	2250	363	201004CV	225	225	WEA013043-15	2020631896	942541B
258364	201004CV	375	150	15	2744	2250	363	201004CV	225	225	WEA013043-15	2020631896	942541B
258364	201004CV	376	150	15	2756	2250	363	201004CV	225	225	WEA013043-15	2020631896	942541B
258364	201004CV	377	150	15	2744	2250	363	201004CV	225	225	WEA013043-15	2020631896	942541B
258364	201004CV	378 *	150	15	2586	2250	378	201004CV	225	225	WEA013043-15	2020631896	942541B
258364	201004CV	379	150	15	2746	2250	378	201004CV	225	225	WEA013043-15	2020631896	942541B
258364	201004CV	380	150	15	2706	2250	378	201004CV	225	225	WEA013043-15	2020631896	942541B
258364	201004CV	381	150	15	2746	2250	378	201004CV	225	225	WEA013043-15	2020631896	942541B
258364	201004CV	382	110	15	2744	2250	378	201004CV	225	225	WEA013043-15	2020631896	942541B
258364	201004CV	383	150	15	2738	2250	378	201004CV	225	225	WEA013043-15	2020631896	942541B
258364	201004CV	384	150	15	2740	2250	378	201004CV	225	225	WEA013043-15	2020631896	942541B
258364	201004CV	387	150	15	2742	2250	378	201004CV	225	225	WEA013043-15	2020631896	942541B
258364	201004CV	388	150	15	2590	2250	378	201004CV	225	225	WEA013043-15	2020631897	942541B
258364	201004CV	389	150	15	2744	2250	378	201004CV	225	225	WEA013043-15	2020631897	942541B
258364	201004CV	392	150	15	2852	2250	392	201004CV	225	225	WEA012196-5	2020631897	942541B
258364	201004CV	396	150	15	2750	2250	396	201004CV	225	225	WEA012196-5	2020631897	942541B
258364	201004CV	398	150	15	2848	2250	396	201004CV	225	225	WEA012196-5	2020631897	942541B
258364	201004CV	399	150	15	2794	2250	396	201004CV	225	225	WEA012196-5	2020631897	942541B
258364	201004CV	400	150	15	2778	2250	396	201004CV	225	225	WEA012196-5	2020631897	942541B
258364	201004CV	401	150	15	2708	2250	396	201004CV	225	225	WEA012196-5	2020631897	942541B
258364	201004CV	402	150	15	2784	2250	396	201004CV	225	225	WEA012196-5	2020631897	942541B

(45)

Order	Order #	Part #	Length	Width	Depth	Vol	Roll #	Line #	Cap #	Roll #	Line #	Order #	Clay Lot #
24954	2010ACV	405	100	11	2780	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	406	100	11	2772	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	407	100	11	2770	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	408	100	11	2990	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	409	100	11	2742	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	410	100	11	2700	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	405 +	100	11	2733	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	410	100	11	2771	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	411	100	11	2714	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	412	100	11	2692	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	413	100	11	2704	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	414	100	11	2710	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	415	100	11	2712	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	416	100	11	2704	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	417	100	11	2704	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	418	100	11	2692	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	419	100	11	2729	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	420	100	11	2700	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	421	100	11	2702	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	422	100	11	2698	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	423	100	11	2708	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	424 +	100	11	2746	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	425	100	11	2700	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	426	100	11	2720	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	427	100	11	2712	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	428	100	11	2714	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	429	100	11	2716	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	430	100	11	2721	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	431	100	11	2715	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	432	100	11	2714	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	433	100	11	2704	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	434	100	11	2710	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	435	100	11	2716	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	436	100	11	2719	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	437	100	11	2700	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	438 +	100	11	2730	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	439	100	11	2722	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	440	100	11	2697	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	441	100	11	2688	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	442	100	11	2710	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	443	100	11	2693	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	444	100	11	2690	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	445	100	11	2700	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	446	100	11	2694	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B
24954	2010ACV	447	100	11	2692	2250	194	2010ACV	229	211	WEA01194-5	2020631897	942540B

(15)

Order	CCP Lot #	GCL Roll #	Length	Width	Weight	WT	Roll #/Yds	CCP Lot #	CCP Roll #	Top FT/roll	Lower Roll Roll #	Outer Roll Roll #	City Lot #
28734	201004CV	448	150	15	2090	2250	436	201004CV	211	210	WEA012199-4	2020631895	942544A
28734	201004CV	448	150	15	2094	2250	436	201004CV	211	210	WEA012199-4	2020631895	942544A
28736	201004CV	450	150	15	2098	2250	436	201004CV	211	210	WEA012199-4	2020631895	942544A
28736	201004CV	451	150	15	2082	2250	436	201004CV	211	210	WEA012199-4	2020631895	942544A
28736	201004CV	452	150	15	2080	2250	436	201004CV	211	210	WEA012199-4	2020631895	942544A
28736	201004CV	453	150	15	2090	2250	436	201004CV	211	210	WEA012199-4	2020631895	942544A
28736	201004CV	454	150	15	2028	2250	437	201004CV	215	212	WEA012199-4	2020631895	942544A
28736	201004CV	455	150	15	2110	2250	437	201004CV	215	212	WEA012199-4	2020631892	942544A
28736	201004CV	456	150	15	2085	2250	437	201004CV	215	212	WEA012199-4	2020631892	942544A
28736	201004CV	457	150	15	2082	2250	437	201004CV	215	212	WEA012199-4	2020631892	942544A
28736	201004CV	458	150	15	2064	2250	437	201004CV	215	212	WEA012199-4	2020631892	942544A
28736	201004CV	459	150	15	2075	2250	437	201004CV	215	212	WEA012199-4	2020631892	942544A
28736	201004CV	460	150	15	2080	2250	437	201004CV	215	212	WEA012199-4	2020631892	942544A
28736	201004CV	461	150	15	2064	2250	437	201004CV	215	212	WEA012199-4	2020631892	942544A
28736	201004CV	462	150	15	2067	2250	437	201004CV	215	212	WEA012199-4	2020631892	942544A
28736	201004CV	463	150	15	2068	2250	437	201004CV	215	212	WEA012199-4	2020631892	942544A
28736	201004CV	464	150	15	2062	2250	437	201004CV	215	212	WEA012199-4	2020631892	942544A
28736	201004CV	465	150	15	2064	2250	437	201004CV	215	212	WEA012199-4	2020631892	942544A
28736	201004CV	466	150	15	2062	2250	437	201004CV	215	212	WEA012199-4	2020631892	942544A
28736	201004CV	467	150	15	2063	2250	437	201004CV	215	212	WEA012199-4	2020631892	942544B
28736	201004CV	468	150	15	2064	2250	437	201004CV	215	212	WEA012199-4	2020631892	942544B
28736	201004CV	472	150	15	2098	2250	438	201004CV	218	212	WEA012043-10	2020632003	942544B
28736	201004CV	473	150	15	2078	2250	438	201004CV	217	212	WEA012043-10	2020632003	942544B
28736	201004CV	475	150	15	2067	2250	438	201004CV	214	212	WEA012043-10	2020632003	942544B
28736	201004CV	475	150	15	2074	2250	438	201004CV	214	212	WEA012043-10	2020632003	942544B
28736	201004CV	476	150	15	2078	2250	438	201004CV	214	212	WEA012043-10	2020632003	942544B
28736	201004CV	477	150	15	2078	2250	438	201004CV	214	212	WEA012043-10	2020632003	942544B
28736	201004CV	478	150	15	2078	2250	438	201004CV	214	212	WEA012043-10	2020632003	942544B
28736	201004CV	479	150	15	2078	2250	438	201004CV	214	212	WEA012043-10	2020632003	942544B
28736	201004CV	480	150	15	2072	2250	438	201004CV	214	212	WEA012043-10	2020632003	942544B
28736	201004CV	481	150	15	2064	2250	438	201004CV	213	212	WEA012043-10	2020632003	942544B
28736	201004CV	483	150	15	2060	2250	438	201004CV	213	212	WEA012043-10	2020632003	942544B
28736	201004CV	484	150	15	2094	2250	438	201004CV	213	212	WEA012043-10	2020632003	942544B
28736	201004CV	485	150	15	2046	2250	438	201004CV	213	212	WEA012043-10	2020632003	942544B
28736	201004CV	486	150	15	2078	2250	438	201004CV	213	212	WEA012043-10	2020632003	942544B
28736	201004CV	487	150	15	2034	2250	438	201004CV	213	212	WEA012043-10	2020632003	942544B
28736	201004CV	488	150	15	2032	2250	444	201004CV	213	212	WEA012043-10	2020632003	942544B
28736	201004CV	490	150	15	2069	2250	434	201004CV	211	210	WEA012043-10	2020631895	942544B
28736	201004CV	491	150	15	2069	2250	434	201004CV	211	210	WEA012043-10	2020631895	942544B
28736	201004CV	492	150	15	2060	2250	434	201004CV	211	210	WEA012043-10	2020631895	942544B
28736	201004CV	493	150	15	2068	2250	434	201004CV	211	210	WEA012043-10	2020631895	942544B
28736	201004CV	494	150	15	2068	2250	434	201004CV	211	210	WEA012043-10	2020631895	942544B
28736	201004CV	495	150	15	2068	2250	434	201004CV	211	210	WEA012043-10	2020631895	942544B
28736	201004CV	496	150	15	2070	2250	434	201004CV	211	210	WEA012043-10	2020631895	942544B

(45)

Order	JCL Line	REQD (Rolls)	Length	WBA	Weight	in 3	Roll # Type	Cap Roll #	Cap Roll #	Roll # Type	Uniq Roll #	Order Roll #	Qty
24554	20100CV	497	15	11	1670	1150	114	20100CV	260	259	WEA013043-10	2020631885	942540
24554	20100CV	498	15	15	2080	2250	114	20100CV	260	259	WEA013043-16	2020631885	942540
24554	20100CV	499	15	13	2080	2250	114	20100CV	260	259	WEA013043-18	2020631885	942540
24554	20100CV	500	15	15	2703	2250	114	20100CV	260	259	WEA013043-19	2020631885	942540
24554	20100CV	501	15	15	2688	2250	114	20100CV	260	259	WEA013043-10	2020631885	942540
24554	20100CV	502	15	15	2704	2250	114	20100CV	260	259	WEA013043-16	2020631885	942540
24554	20100CV	503	15	15	2694	2250	114	20100CV	260	259	WEA013043-18	2020631885	942540
24554	20100CV	504	15	13	2710	2250	114	20100CV	260	259	WEA013043-19	2020631885	942540
24554	20100CV	505	15	15	2655	2250	114	20100CV	260	259	WEA013043-10	2020632005	942540
24554	20100CV	506	15	15	2704	2250	114	20100CV	260	259	WEA013043-16	2020632005	942540
24554	20100CV	507	15	15	2684	2250	114	20100CV	260	259	WEA013043-18	2020632005	942540
24554	20100CV	508	15	15	2708	2250	114	20100CV	260	259	WEA013043-19	2020632005	942540
24554	20100CV	509	15	15	2690	2250	114	20100CV	260	259	WEA013043-10	2020632005	942540
24554	20100CV	510	15	13	2700	2250	114	20100CV	260	259	WEA013043-18	2020632005	942540
24554	20100CV	511	15	13	2706	2250	114	20100CV	260	259	WEA013043-19	2020632005	942540
24554	20100CV	512	15	15	2712	2250	114	20100CV	260	259	WEA013043-10	2020632005	942540
24554	20100CV	513	15	13	2722	2250	114	20100CV	260	259	WEA013043-18	2020632005	942540
Total eq. 3						53750	Total Number of Rolls Certified: 239 ✓						

(7)





**PRODUCT CERTIFICATIONS**

PROJECT NAME: Kekaha Sanitary LF  
CUSTOMER P.O.: C-4089  
ORDER NUMBERS: 000258364  
PREPARED FOR: Northwest Linings

The GCL manufactured for the above-referenced order number(s) is certified to meet the values listed in the tables below:

**GCL PROPERTY SPECIFICATIONS FOR BENTOMAT FLW**

Test Method	Test Method Property	Test Frequency	Certified Value
ASTM D 5891	Bentonite Fluid Loss	1 per 50 Tons ✓	18 ml Max ✓
ASTM D 5993	Bentonite Mass/Area	40,000 sq ft (4000 sq m) ✓	0.75 lb /sq ft Min ✓
ASTM D 5890	Bentonite Swell Index	1 per 50 Tons ✓	24 ml/2g Min ✓
ASTM D 6768	GCL Grab Strength	200,000 sq ft (20,000 sq m)	45 lbs/in MARV ✓
ASTM D 6243	GCL Hydrated Internal Shear Strength	Periodic	500 psf typ @ 200 psf normal load
ASTM D 5887	GCL Hydraulic Conductivity	Weekly	5.0E-9 cm/s Max ✓
ASTM D 5887	GCL Index Flux	Weekly	1.0E-8 m3/m2/s Max
ASTM D 6496	GCL Peel Strength	40,000 sq ft (4000 sq m) ✓	3.5 lb/in min ✓

**SPECIALY REQUESTED CERTIFIED PROPERTIES FOR THIS ORDER OF BENTOMAT FLW**

Test Method	Test Method Property	Requested Frequency	Requested Value	Requested Conditions
ASTM D 5887	GCL Hydraulic Conductivity	1/270,000sf ✓	5x10-9cm/sec ✓	Standard
ASTM D 5993	Bentonite Mass/Area	1/40,000sf ✓	.82lb/sf ✓	Standard

Bentonite property tests are performed at a bentonite processing facility before shipment to CETCO's production facility. All tensile testing is in the machine direction using ASTM D 6768. All peel strength testing is performed using ASTM D 6496. Upon request tensile and peel results can be reported per modified ASTM D 4632 using 4 inch grips.

**NEEDLE DETECTION AND REMOVAL PROCEDURE**

CETCO hereby affirms that all Bentomat<sup>®</sup> geosynthetic clay liner material manufactured for this project is continually passed under a magnet for needle removal and then screened with a metal detection device. CETCO certifies Bentomat<sup>®</sup> to be essentially free of broken needles and fragments of needles that would negatively effect the performance of the final product.

Melanie King  
Quality Assurance Coordinator



**GCL MANUFACTURING QUALITY CONTROL TEST DATA**

The following rolls in GCL certification package number 000258364 have been tested in our production facility lab.

Product	Lot # Tested	Roll # Tested	Tens Area	Tens Strength	Peel Strength D6496
ASTM Test Method:			D 5993 ✓	D 6768 ✓	D 6496
Required Value:			0.82 lb /sq ft Min	45 lbs/in MARV	3.5 lb/in min
CV-BENTOMAT FLW	201004CV	157	0.85 ✓	63.0 ✓	11.1 ✓
CV-BENTOMAT FLW	201004CV	252	0.83 ✓	63.0 ✓	6.7 ✓
CV-BENTOMAT FLW	201004CV	287	0.85 ✓	63.0 ✓	5.8 ✓
CV-BENTOMAT FLW	201004CV	302	0.83 ✓	63.0 ✓	5.4 ✓
CV-BENTOMAT FLW	201004CV	313	0.87 ✓	63.0 ✓	5.4 ✓
CV-BENTOMAT FLW	201004CV	334	0.85 ✓	63.0 ✓	4.7 ✓
CV-BENTOMAT FLW	201004CV	348	0.82 ✓	88.2 ✓	4.1 ✓
<del>CV-BENTOMAT FLW</del>	<del>201004CV</del>	<del>363</del>	<del>1.02</del>	<del>88.2</del>	<del>5.6</del>
CV-BENTOMAT FLW	201004CV	378	0.95 ✓	88.2 ✓	6.2 ✓
<del>CV-BENTOMAT FLW</del>	<del>201004CV</del>	<del>394</del>	<del>0.83</del>	<del>88.2</del>	<del>12.7</del>
CV-BENTOMAT FLW	201004CV	409	0.83 ✓	88.2 ✓	11.5 ✓
CV-BENTOMAT FLW	201004CV	424	0.84 ✓	88.2 ✓	8.2 ✓
CV-BENTOMAT FLW	201004CV	438	0.99 ✓	96.7 ✓	5.9 ✓
CV-BENTOMAT FLW	201004CV	453	0.85 ✓	96.7 ✓	5.1 ✓
CV-BENTOMAT FLW	201004CV	468	0.84 ✓	96.7 ✓	5.5 ✓
CV-BENTOMAT FLW	201004CV	483	0.84 ✓	96.7 ✓	5.5 ✓
CV-BENTOMAT FLW	201004CV	500	0.82 ✓	96.7 ✓	6.2 ✓

NOT IN ORDER

NOT IN ORDER

(15 TOTAL)



### BENTONITE CLAY CERTIFICATION

The Bentonite Clay used to produce package 000258364

has been tested by American Colloid Company and yielded the following test results:

Clay Lot #	Moist	Swell	Fluid Loss
ASTM Test Method:	D 2216	D 5890 ✓	D 5891 ✓
Required Value:	12% Max	24 ml/2g Min	18 ml Max
942544A ✓	11.60	26.00 ✓	15.60 ✓
942544B ✓	11.60	24.00 ✓	15.80 ✓
942543A ✓	11.60	25.00 ✓	15.00 ✓
942543B ✓	11.20	24.00 ✓	15.40 ✓
942539A ✓	12.00	26.00 ✓	14.60 ✓
942539B ✓	11.60	27.00 ✓	15.00 ✓

**GEOTEXTILE TEST RESULTS FROM MATERIAL SUPPLIER**

The GCL in certification package number 060258364 was manufactured with geotextiles which were tested with the following results:

INNER BASE GEOTEXTILE				COVER GEOTEXTILE (N/W-WHITE)				INNER BASE GEOTEXTILE (BLK N/W-2.7 WIDE)				
Qty. order	Lot Number	Width (mm)	Thickness (mm)	Material	TSR (kN/m <sup>2</sup> )	Tensile Strength (kN/m)	Comp. Strength (kN/m <sup>2</sup> )	Qty. order	Lot Number	Width (mm)	Thickness (mm)	
PPX 811C	2020504738-4	3.6	151.1	CV-NON-WOVEN	281 ✓	7.5 ✓	42	PPX 811C	2020547388-4	3.6	151.1	85.51
MTX 1213	WEAD11198-4	3.6	155.5	CV-NON-WOVEN	281 ✓	6.7 ✓	44.8	PPX 311C	2020541877	3.6	155.5	77.77
MTX 1213	WEAD11199-5	3.6	155.5	CV-NON-WOVEN	282 ✓	6.9 ✓	45.4	PPX 311C	2020541882	3.6	155.5	74.89
MTX 1213	WEAD11199-6	3.6	155.5	CV-NON-WOVEN	277 ✓	6.8 ✓	44.2	PPX 311C	2020541838	3.6	155.5	83.72
MTX 1213	WEAD12043-10	3.6	180.8	CV-NON-WOVEN	250 ✓	5.8 ✓	42.3	PPX 311C	2020541839	3.6	180.8	68.18
MTX 1113	WEAD12043-14	3.6	178.1	CV-NON-WOVEN	230 ✓	6.7 ✓	42.3	PPX 311C	2020542764	3.6	178.1	89.41
MTX 1113	WEAD13045-05	3.6	178.1	CV-NON-WOVEN	215 ✓	6.6 ✓	43.3	PPX 311C	2020541836	3.6	178.1	106.52
MTX 1113	WEAD13045-15	3.6	178.9	CV-NON-WOVEN	225 ✓	6.8 ✓	41.3	PPX 311C	2020611885	3.6	178.9	130.91
MTX 1213	WEAD13048-2	3.6	170.1	CV-NON-WOVEN	231 ✓	6.6 ✓	37.7	PPX 311C	2020611889	3.6	170.1	90.28
MTX 1213	WEAD13048-3	3.6	170.1	CV-NON-WOVEN	242 ✓	6.7 ✓	41.7	PPX 311C	2020631892	3.6	170.1	92.85
				CV-NON-WOVEN	234 ✓	6.5 ✓	44.3	PPX 311C	2020631895	3.6	170.1	92.80
								PPX 311C	2020631896	3.6	170.1	92.95
								PPX 311C	2020631897	3.6	170.1	92.96
								PPX 311C	2020631903	3.6	170.1	89.33
								PPX 311C	2020632005	3.6	170.1	54.50

(11 TOTAL)

**NORTHWEST LININGS & GEOTEXTILE PRODUCTS, INC.**

• 21000 77<sup>th</sup> Avenue South • Kent, WA 98032 •

Phone: (253) 872-0244 • Fax: (253) 872-0245

[www.northwestlinings.com](http://www.northwestlinings.com)

**LETTER OF TRANSMITTAL**

TO: MMinch@Geosyntec.com  
 CC: jeffg@goodfellowbros.com  
 JFrey@wm.com

DATE: 2/3/2010	JOB NO.: N09150
ATTENTION: : Geosyntec	
RE: Kekaha LF Phase II Lateral Expansion Cell 1 - CETCO Geosynthetic Clay Liner Index Flux / Perm Test Results	

WE ARE SENDING YOU:  Attached  Under Separate Cover via \_\_\_\_\_ the following items:

Shop Drawings  Prints  Plans  Specifications  Samples

Copy of Letter  Change Order  Submittals  Warranties  Other

Copies	Specification #	Description
1	Sec. 02074-1.02	CETCO - Geosynthetic Clay Liner Index Flux / Permeability Test Results

These are transmitted as checked below:

For Approval  Approved as submitted  Resubmit  Copies for Approval

For your use  Approved as noted  Submit  Copies for distribution

For review and comment  Returned for corrections  Return  Corrected Prints

For bids due \_\_\_\_\_  Other \_\_\_\_\_

Remarks:

COPY TO: FILE SIGNED: Richard Kamienski

**INDEX FLUX AND PERMEABILITY OF GCL's**  
**TEST RESULTS**  
 ASTM D-5887 / D-5084



Client	: CETCO	Date	: 02/03/10
Project Location	: Kekaha Landfill	Job No.	: 10LG2078.01
Sample Number	: Roll 363	Tested By	: RL
Description	: Bentonite FLW	Checked By	: JB
Permeant Fluid	: De-Aired Water		

Physical Property Data

	Total Sample		Total Sample
Initial Clay Height ( in )	: 0.21	Final Height of Clay ( in )	: 0.27
Initial Diameter ( in )	: 4.00	Final Diameter of Clay ( in )	: 4.00
Initial Wet Weight ( g )	: 62.40	Final Wet Weight(Clay) (g)	: 81.70
Wet Density ( pcf )	: 90.00	Wet Density ( pcf )	: 91.65
Moisture Content %	: 39.50	Moisture Content %	: 92.30
Dry Density ( pcf )	: 64.52	Dry Density ( pcf )	: 47.66

Test Parameters

Fluid	: De-Aired Water	Average Effective	
Cell Pressure ( psi )	: 80.00	Confining Pressure (psi)	: 4
Head Water ( psi )	: 77.00	Gradient	: 204.44
Tail Water ( psi )	: 75.00	Effective Stress at Base	: 5

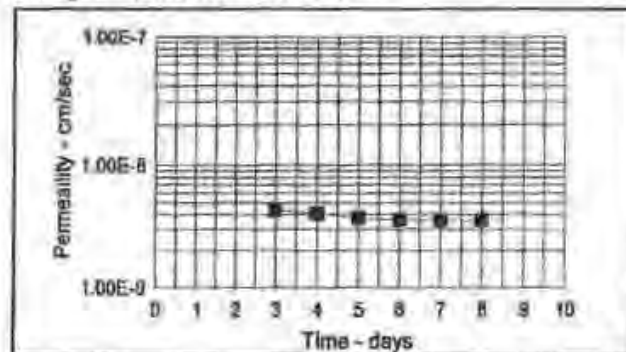
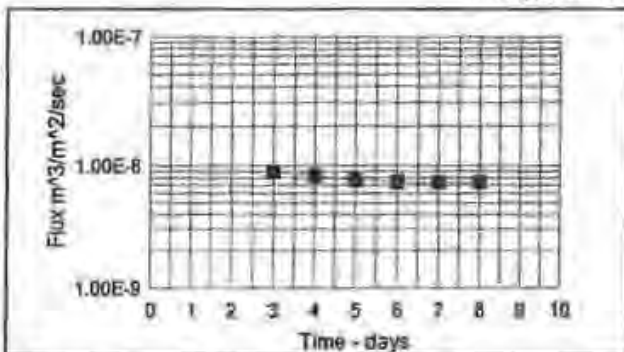
Flux and Permeability Input Data

Minimum Saturation Time is 48 hours

Area, A = 0.00811 m<sup>2</sup>  
 Thickness, l = 0.27 in

Days	Date	Flow	Time	Elapsed	Flux	k	
		cc	min	Time (sec)	(m <sup>3</sup> /m <sup>2</sup> /sec)	cm/sec	
1	01/27/2010	48 hours of hydration per ASTM					
2	01/28/2010						
3	01/29/2010	6.30	1440	86400	8.96E-009	4.40E-009	
4	01/30/2010	5.90	1444	86440	8.40E-009	4.11E-009	
5	01/31/2010	5.40	1436	86160	7.73E-009	3.78E-009	
6	02/01/2010	5.20	1429	86540	7.43E-009	3.63E-009	
7	02/02/2010	5.20	1441	86480	7.42E-009	3.63E-009	
8	02/03/2010	5.20	1442	86320	7.41E-009	3.63E-009	

Average of Last 3 Test Readings : 7.42E-009 3.63E-009 ✓



JLT Laboratories, Inc.

938 S Central Ave., Canonsburg, Pa. 15317 Tel 724-746-4411, Fax 724-745-4261

**INDEX FLUX AND PERMEABILITY OF GCL's  
TEST RESULTS  
ASTM D-5837 / D-5084**



Client	: CETCO	Date	: 02/03/10
Project Location	: Kekaha Landfill	Job No.	: 10LG2078.01
Sample Number	: Roll 453 ✓	Tested By	: RL
Description	: Bentomat FLW	Checked By	: JB
Permeant Fluid	: De-Aired Water		

Physical Property Data

	Total Sample		Total Sample
Initial Clay Height ( in )	: 0.18	Final Height of Clay ( in )	: 0.27
Initial Diameter ( in )	: 4.00	Final Diameter of Clay ( in )	: 4.00
Initial Wet Weight ( g )	: 50.10	Final Wet Weight(Clay) (g)	: 79.70
Wet Density ( pcf )	: 84.30	Wet Density ( pcf )	: 89.41
Moisture Content %	: 36.10	Moisture Content %	: 117.20
Dry Density ( pcf )	: 61.94	Dry Density ( pcf )	: 41.16

Test Parameters

Fluid	: De-Aired Water	Average Effective	
Cell Pressure ( psi )	: 80.00	Confining Pressure (psi)	: 4
Head Water ( psi )	: 77.00	Gradient	: 204.44
Tail Water ( psi )	: 75.00	Effective Stress at Base	: 5

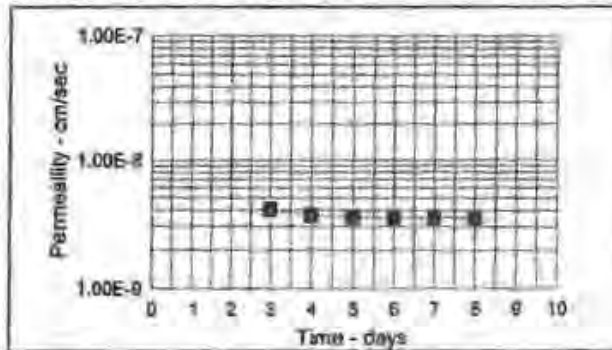
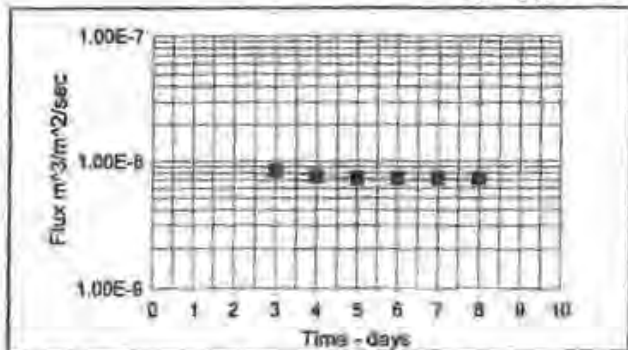
Flux and Permeability Input Data

Minimum Saturation Time is 48 hours

Area, A = 0.00811 m<sup>2</sup>  
Thickness, l = 0.27 in

Days	Date	Flow cc	Time min	Elapsed Time (sec)	Flux (m <sup>3</sup> /m <sup>2</sup> /sec)	k cm/sec
1	01/27/2010	48 hours of hydration per ASTM				
2	01/28/2010					
3	01/29/2010	5.90	1440	86400	5.42E-009	4.12E-009
4	01/30/2010	5.30	1448	86940	7.59E-009	3.69E-009
5	01/31/2010	5.10	1436	86180	7.30E-009	3.57E-009
6	02/01/2010	5.10	1439	86340	7.29E-009	3.56E-009
7	02/02/2010	6.30	1441	86460	7.28E-009	3.56E-009
8	02/03/2010	5.10	1442	86520	7.27E-009	3.56E-009

Average of Last 3 Test Readings: 7.28E-009 3.56E-009 ✓



JLT Laboratories, Inc.

938 S Central Ave, Canonsburg, Pa. 15317 Tel 724-746-4441, Fax 724-745-4263

**NORTHWEST LININGS & GEOTEXTILE PRODUCTS, INC.**

• 21000 77<sup>th</sup> Avenue South • Kent, WA 98032 •

Phone: (253) 872-0244 • Fax: (253) 872-0245

[www.northwestlinings.com](http://www.northwestlinings.com)

**LETTER OF TRANSMITTAL**

TO: MMinch@Geosyntec.com  
CC: jeffg@goodfellowbros.com  
JFrey@wm.com

DATE: 1/25/2010	JOB NO.: N09150
ATTENTION: c Geosyntec	
RE: Kekaha LF Phase II Lateral Expansion Cell 1 - AGRU 60 & 80 mil HD Microspike Submittals	

WE ARE SENDING YOU:  Attached  Under Separate Cover via \_\_\_\_\_ the following items:  
 Shop Drawings  Prints  Plans  Specifications  Samples  
 Copy of Letter  Change Order  Submittals  Warranties  Other

Copies	Specification #	Description
1	Sec. 02072-1.02A.2,3	<b>AGRU America</b> - 60 & 80 mil HD Microspike QC certificates issued by resin supplier
1	Sec. 02072-1.02A.8	<b>AGRU America</b> - 60 & 80 mil HD Microspike QC certificates and test results

These are transmitted as checked below:

For Approval  Approved as submitted  Resubmit  Copies for Approval  
 For your use  Approved as noted  Submit  Copies for distribution  
 For review and comment  Returned for corrections  Return  Corrected Prints  
 For bids due \_\_\_\_\_  Other \_\_\_\_\_

Remarks:

COPY TO: FILE SIGNED: Richard Kamienski



HDPE

CPU, HI

METRIC DIMENSIONS

2 rolls 80 HD microspike	2	left
104 rolls 60 HD microspike	104	left

$23' \times 410' \times 104 = 980,720 \text{ SF}$

ROLL #	wid	len	AREA		wgt		lot #
(K)801611 .10	7	100	700.0	80HD micro	2 tot 1	3154	sqg + 2ft fric
(K)801612 .10	7	100	700.0	80HD micro	2 tot 2	3163	7291467
(K)801613 .10	7	125	875.0	60HD micro	104 tot 1	2974	sqg + 2ft fric
(K)801614 .10	7	125	875.0	60HD micro	104 tot 2	3007	7291467
(K)801615 .10	7	125	875.0	60HD micro	104 tot 3	3010	7291467
(K)801616 .10	7	125	875.0	60HD micro	104 tot 4	3009	7291467
(K)801617 .10	7	125	875.0	60HD micro	104 tot 5	3012	7291467
(K)801618 .10	7	125	875.0	60HD micro	104 tot 6	3015	7291467
(K)801619 .10	7	125	875.0	60HD micro	104 tot 7	3016	7291467
(K)801620 .10	7	125	875.0	60HD micro	104 tot 8	3018	7291467
(K)801721 .10	7	125	875.0	60HD micro	104 tot 9	3022	7291467
(K)801722 .10	7	125	875.0	60HD micro	104 tot 10	3022	7291467
(K)801723 .10	7	125	875.0	60HD micro	104 tot 11	3019	sqg
(K)801724 .10	7	125	875.0	60HD micro	104 tot 12	3020	7291467
(K)801725 .10	7	125	875.0	60HD micro	104 tot 13	3020	7291467
(K)801726 .10	7	125	875.0	60HD micro	104 tot 14	3022	7291467
(K)801727 .10	7	125	875.0	60HD micro	104 tot 15	3024	7291467
(K)801728 .10	7	125	875.0	60HD micro	104 tot 16	3018	7291467
(K)801729 .10	7	125	875.0	60HD micro	104 tot 17	3021	7291467
(K)801730 .10	7	125	875.0	60HD micro	104 tot 18	3025	7291467
(K)801731 .10	7	125	875.0	60HD micro	104 tot 19	3029	7291467
(K)801732 .10	7	125	875.0	60HD micro	104 tot 20	3027	7291467
(K)801733 .10	7	125	875.0	60HD micro	104 tot 21	3025	7291467
(K)801734 .10	7	125	875.0	60HD micro	104 tot 22	3022	sqg
(K)801735 .10	7	125	875.0	60HD micro	104 tot 23	3023	7291467
(K)801736 .10	7	125	875.0	60HD micro	104 tot 24	3023	7291467
(K)801737 .10	7	125	875.0	60HD micro	104 tot 25	3024	7291467
(K)801738 .10	7	125	875.0	60HD micro	104 tot 26	3023	7291467
(K)801739 .10	7	125	875.0	60HD micro	104 tot 27	3025	7291467
(K)801740 .10	7	125	875.0	60HD micro	104 tot 28	3021	7291467
(K)801741 .10	7	125	875.0	60HD micro	104 tot 29	3023	7291467
(K)802101 .10	7	125	875.0	60HD micro	104 tot 30	3023	7291467
(K)802102 .10	7	125	875.0	60HD micro	104 tot 31	3027	7291467
(K)802103 .10	7	125	875.0	60HD micro	104 tot 32	3026	sqg
(K)802104 .10	7	125	875.0	60HD micro	104 tot 33	3023	7291467
(K)802105 .10	7	125	875.0	60HD micro	104 tot 34	3038	7291467
(K)802106 .10	7	125	875.0	60HD micro	104 tot 35	3056	7291467
(K)802107 .10	7	125	875.0	60HD micro	104 tot 36	3054	7291467
(K)802108 .10	7	125	875.0	60HD micro	104 tot 37	3056	7291467
(K)802109 .10	7	125	875.0	60HD micro	104 tot 38	3048	7291467
(K)802110 .10	7	125	875.0	60HD micro	104 tot 39	3040	7291467
(K)802111 .10	7	125	875.0	60HD micro	104 tot 40	3041	7291467
(K)802112 .10	7	125	875.0	60HD micro	104 tot 41	3042	7291467
(K)802113 .10	7	125	875.0	60HD micro	104 tot 42	3037	7291467
(K)802114 .10	7	125	875.0	60HD micro	104 tot 43	3038	sqg
(K)802115 .10	7	125	875.0	60HD micro	104 tot 44	3037	7291467
(K)802116 .10	7	125	875.0	60HD micro	104 tot 45	3037	7291467
(K)802117 .10	7	125	875.0	60HD micro	104 tot 46	3037	7291467
(K)802118 .10	7	125	875.0	60HD micro	104 tot 47	3043	7291467
(K)802119 .10	7	125	875.0	60HD micro	104 tot 48	3039	7291454
(K)802120 .10	7	125	875.0	60HD micro	104 tot 49	3044	7291454
(K)802221 .10	7	125	875.0	60HD micro	104 tot 50	3041	7291454
(K)802222 .10	7	125	875.0	60HD micro	104 tot 51	3042	7291454
(K)802223 .10	7	125	875.0	60HD micro	104 tot 52	3038	7291454

HDPE

CPU, HI

METRIC DIMENSIONS

2 rolls 80 HD microspike	2	left
104 rolls 60 HD microspike	104	left

ROLL #	wld	len	AREA		wgt	lot #
(K)802224 .10	7	125	875.0	60HD micro 104 tot 53	3038	7291454
(K)802225 .10	7	125	875.0	60HD micro 104 tot 54	3042	7291454
(K)802226 .10	7	125	875.0	60HD micro 104 tot 55	3041	7291454
(K)802227 .10	7	125	875.0	60HD micro 104 tot 56	3041	7291454
(K)802228 .10	7	125	875.0	60HD micro 104 tot 57	3040	7291454
(K)802229 .10	7	125	875.0	60HD micro 104 tot 58	3039	7291454
(K)802230 .10	7	125	875.0	60HD micro 104 tot 59	3037	7291454
(K)802231 .10	7	125	875.0	60HD micro 104 tot 60	3034	7291454
(K)802232 .10	7	125	875.0	60HD micro 104 tot 61	3030	7291454
(K)802233 .10	7	125	875.0	60HD micro 104 tot 62	3029	7291454
(K)802234 .10	7	125	875.0	60HD micro 104 tot 63	3028	7291454
(K)802235 .10	7	125	875.0	60HD micro 104 tot 64	3030	7291454
(K)802236 .10	7	125	875.0	60HD micro 104 tot 65	3036	7291454
(K)802237 .10	7	125	875.0	60HD micro 104 tot 66	3034	7291454
(K)802238 .10	7	125	875.0	60HD micro 104 tot 67	3035	7291454
(K)802239 .10	7	125	875.0	60HD micro 104 tot 68	3029	7291454
(K)802240 .10	7	125	875.0	60HD micro 104 tot 69	3036	7291454
(K)802341 .10	7	125	875.0	60HD micro 104 tot 70	3036	7291454
(K)802342 .10	7	125	875.0	60HD micro 104 tot 71	3036	7291454
(K)802343 .10	7	125	875.0	60HD micro 104 tot 72	3035	7291454
(K)802344 .10	7	125	875.0	60HD micro 104 tot 73	3033	7291454
(K)802345 .10	7	125	875.0	60HD micro 104 tot 74	3032	7291454
(K)802346 .10	7	125	875.0	60HD micro 104 tot 75	3030	7291454
(K)802347 .10	7	125	875.0	60HD micro 104 tot 76	3032	7291454
(K)802348 .10	7	125	875.0	60HD micro 104 tot 77	3033	7291454
(K)802349 .10	7	125	875.0	60HD micro 104 tot 78	3039	7291454
(K)802350 .10	7	125	875.0	60HD micro 104 tot 79	3037	7291454
(K)802351 .10	7	125	875.0	60HD micro 104 tot 80	3037	7291454
(K)802352 .10	7	125	875.0	60HD micro 104 tot 81	3037	7291454
(K)802353 .10	7	125	875.0	60HD micro 104 tot 82	3035	7291454
(K)802354 .10	7	125	875.0	60HD micro 104 tot 83	3015	7291454
(K)802355 .10	7	125	875.0	60HD micro 104 tot 84	3024	7291454
(K)802356 .10	7	125	875.0	60HD micro 104 tot 85	3030	7291454
(K)802357 .10	7	125	875.0	60HD micro 104 tot 86	3029	7291454
(K)802358 .10	7	125	875.0	60HD micro 104 tot 87	3029	7291454
(K)802359 .10	7	125	875.0	60HD micro 104 tot 88	3035	7291454
(K)802360 .10	7	125	875.0	60HD micro 104 tot 89	3032	7291454
(K)802461 .10	7	125	875.0	60HD micro 104 tot 90	3035	7291454
(K)802462 .10	7	125	875.0	60HD micro 104 tot 91	3033	7291454
(K)802463 .10	7	125	875.0	60HD micro 104 tot 92	3031	7291454
(K)802464 .10	7	125	875.0	60HD micro 104 tot 93	3033	7291454
(K)802465 .10	7	125	875.0	60HD micro 104 tot 94	3034	7291454
(K)802466 .10	7	125	875.0	60HD micro 104 tot 95	3032	7291454
(K)802467 .10	7	125	875.0	60HD micro 104 tot 96	3030	7291454
(K)802468 .10	7	125	875.0	60HD micro 104 tot 97	3030	7291454
(K)802469 .10	7	125	875.0	60HD micro 104 tot 98	3027	7291454
(K)802470 .10	7	125	875.0	60HD micro 104 tot 99	3025	7291454
(K)802471 .10	7	125	875.0	60HD micro 104 tot 100	3025	7291454
(K)802472 .10	7	125	875.0	60HD micro 104 tot 101	3027	7291454
(K)802473 .10	7	125	875.0	60HD micro 104 tot 102	3047	7291454
(K)802474 .10	7	125	875.0	60HD micro 104 tot 103	3058	7291454
(K)802475 .10	7	125	875.0	60HD micro 104 tot 104	3057	7291454



# quality certificate

ROLL# **801613-10** Lot #: **7291467** Liner Type: **MICROSPIKE™ HDPE**

Measurement	METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN: 1.39 mm	55 ✓ mil	Length.....	125 m	410.1 feet
	MAX: 1.51 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 31 ✓ mil	AVE: 1.46 mm	57 ✓ mil	<b>TEST RESULTS</b>		
ODD #: TOP EVEN #: BOTTOM			Off(Standard) ASTM D3895 minutes	206 ✓	

Specific Gravity ASTM D792	Density	g/cc	.945 ✓
-------------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.35 ✓
------------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
---------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	27 N/mm	152 ppi ✓	2,642 psi
	Average Strength @ Break	33 N/mm	190 ppi ✓	3,298 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.08 ✓
	Average Elongation @ Break	%	507.2 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.24
--	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	215.0 N	✓48.334 lbs
---	-------------------------	---------	-------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	411.4 N	92.500 lbs
--	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	595.2 N	✓133.80 lbs
--	------	---------	-------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
--------------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
---	-------------------	---------	---------

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination **CPU, (HI)**

Date: **1/9/2010**  
 Signature: *[Handwritten Signature]*  
 Quality Control Department

EOHDMc.FRM  
 REV 03  
 12/23/99



# quality certificate

ROLL # **801614-10** Lot #: **7291467** Liner Type: **MICROSPIKE™ HDPE**

Measurement	METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN: <b>1.44</b> mm	57 ✓ mil	Length.....	125 m	410.1 feet
	MAX: <b>1.58</b> mm	62 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: <b>31</b> ✓ mil	AVE: <b>1.50</b> mm	59 ✓ mil	<b>TEST RESULTS</b>		
ODD # TOP EVEN # BOTTOM			OT(Standard) ASTM D3895 minutes	206 ✓	

Specific Gravity ASTM D792	Density	g/cc	<b>.945</b> ✓
-------------------------------	---------	------	---------------

MFI ASTM D1238 COND. E GRADE <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	<b>.23</b>
--	-------------------------------	----------	------------

Carbon Black Content ASTM D4218	Range	%	<b>2.35</b> ✓
------------------------------------	-------	---	---------------

Carbon Black Dispersion ASTM D5596	Category		<b>10 IN CAT 1</b> ✓
---------------------------------------	----------	--	----------------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	27 N/mm	156 pli ✓	2,642 psi
	Average Strength @ Break	34 N/mm	195 pli ✓	3,298 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	<b>16.08</b> ✓
	Average Elongation @ Break	%	<b>507.2</b> ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	<b>-0.24</b>
--	----------------------------	---	--------------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	215.0 N	✓ 48.334 lbs
---	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	411.4 N	92.500 lbs
--	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	595.2 N	✓ 133.80 lbs
--	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
--------------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
---	-------------------	---------	---------

Customer: **Northwest Linings**  
PO: **C-4083 Kekaha LF**  
Destination **CPU, (HI)**

Date: **1/9/2010**  
Signature: *[Handwritten Signature]*  
Quality Control Department

90HDMC.FRM  
REV 03  
12/2005



# quality certificate

ROLL # **801615-10** Lot #: **7291467** Liner Type: **MICROSPIKE™ HDPE**

Measurement	METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN: 1.46 mm	57 ✓ mil	Length.....	125 m	410.1 feet
	MAX: 1.56 mm	61 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 35 ✓ mil	AVE: 1.49 mm	59 ✓ mil	<b>TEST RESULTS</b>		
ODD # TOP EVEN # BOTTOM			OIT(Standard) ASTM D3895 minutes	206 ✓	

Specific Gravity ASTM D792	Density	g/cc	.945 ✓
----------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.35 ✓
---------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5598	Category		10 IN CAT 1 ✓
------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	27 N/mm	155 ppi ✓	2,642 psi
	Average Strength @ Break	34 N/mm	193 ppi ✓	3,298 psi

Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.08 ✓
	Average Elongation @ Break	%	507.2 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.24
---	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	215.0 N	✓ 48.334 lbs
--	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	411.4 N	92.500 lbs
---	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	595.2 N	✓ 133.80 lbs
---	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
-----------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
--	-------------------	---------	---------

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination: **CPU, (HI)**

Date: **1/9/2010**  
 Signature: *[Handwritten Signature]*  
 Quality Control Department

EDHDmLFRM  
 REV 03  
 12/29/05



# quality certificate

ROLL # **801616-10**

Lot #: **7291467**

Liner Type: **MICROSPIKE™ HDPE**

Measurement	METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN: 1.43 mm	56 ✓ mil	Length.....	125 m	410.1 feet
	MAX: 1.54 mm	61 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 30 ✓ mil DDD # TOP EVEN # BOTTOM	AVE: 1.48 mm	58 ✓ mil			
			DT(Standard) ASTM D3895 minutes	206 ✓	TEST RESULTS

Specific Gravity ASTM D792	Density	g/cc	.945 ✓
-------------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.35 ✓
------------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5696	Category		10 IN CAT 1 ✓
---------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	27 N/mm	154 ppi ✓	2,642 psi
	Average Strength @ Break	34 N/mm	192 ppi ✓	3,298 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.08 ✓
	Average Elongation @ Break	%	507.2 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.24
--	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	215.0 N	✓ 48.334 lbs
---	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	411.4 N	92.500 lbs
--	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	595.2 N	✓ 133.80 lbs
--	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
--------------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
---	-------------------	---------	---------

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination: **CPU, (HI)**

Date: **1/9/2010**  
 Signature: *[Handwritten Signature]*  
 Quality Control Department  
 BONDING FROM  
 REV 00  
 12/23/00



# quality certificate

ROLL # **801617-10**

Lot #: **7291467**

Liner Type: **MICROSPIKE™ HDPE**

Measurement ASTM D5994 (Modified)		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
	MIN:	1.45 mm	57 mil	Length.....	125 m	410.1 feet
	MAX:	1.50 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: <b>32</b> ✓ mil	AVE:	1.47 mm	58 mil			
ODD #: TOP EVEN # BOTTOM				OIT(Standard) ASTM D3895 minutes	206	✓ TEST RESULTS

Specific Gravity ASTM D792	Density	g/cc	.945	✓
-------------------------------	---------	------	------	---

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23	
---	-------------------------------	----------	-----	--

Carbon Black Content ASTM D4218	Range	%	2.35	✓
------------------------------------	-------	---	------	---

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1	✓
---------------------------------------	----------	--	-------------	---

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	27 N/mm	153 ppi	✓	2,642 psi
	Average Strength @ Break	33 N/mm	191 ppi	✓	3,298 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.08	✓
	Average Elongation @ Break	%	507.2	✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.24	
--	----------------------------	---	-------	--

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	215.0 N	✓	48.334 lbs
---	-------------------------	---------	---	------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	411.4 N		92.500 lbs
--	------	---------	--	------------

Puncture Resistance ASTM D4833 (Modified)	Load	595.2 N	✓	133.80 lbs
--	------	---------	---	------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs		CERTIFIED
--------------------	--------------------------	----------	--	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs		ONGOING
---	-------------------	---------	--	---------

Customer: **Northwest Linings**  
PO: **C-4083 Kekaha LF**  
Destination: **CPU, (HI)**

Date: **1/9/2010**  
Signature: *[Handwritten Signature]*  
Quality Control Department

SD/DMC Form  
REV 03  
12/23/05



# quality certificate

ROLL# **801618-10** Lot #: **7291467** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.45 mm	57 ✓ mil	Length.....	125 m	410.1 feet
	MAX:	1.49 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 30 ✓ mil	AVE:	1.47 mm	58 ✓ mil			
ODD# TOP EVEN# BOTTOM				DIT(Standard) ASTM D3895 minutes:	206 ✓	<b>TEST RESULTS</b>

Specific Gravity ASTM D792	Density	g/cc.	.945 ✓
-------------------------------	---------	-------	--------

MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g	g/10 min	.23
--	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.32 ✓
------------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
---------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	149 ppi ✓	2,583 psi
	Average Strength @ Break	31 N/mm	175 ppi ✓	3,018 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	15.78 ✓
	Average Elongation @ Break	%	455.4 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.24
--	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	215.0 N	✓ 48.334 lbs
---	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	411.4 N	92.500 lbs
--	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	595.2 N	✓ 133.80 lbs
--	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
--------------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
---	-------------------	---------	---------

Customer: Northwest Linings  
PO: C-4083 Kekaha LF  
Destination CPU, (HI)

Date: 1/9/2010  
Signature: *JH Palmer*  
Quality Control Department  
BONDING-FRM  
REV 03  
12/23/05





# quality certificate

ROLL # **801619-10** Lot # **7291467** Liner Type: **MICROSPIKE™ HDPE**

Measurement	METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN: 1.46 mm	57 ✓ mil	Length.....	125 m	410.1 feet
	MAX: 1.53 mm	60 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 32 ✓ mil	AVE: 1.48 mm	58 ✓ mil	OTT(Standard) ASTM D3895 minutes 206 ✓		

**TEST RESULTS**

Specific Gravity ASTM D792	Density	g/cc	.945 ✓
----------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.32 ✓
---------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	25 N/mm	151 ppi ✓	2,583 psi
	Average Strength @ Break	31 N/mm	176 ppi ✓	3,018 psi

Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	15.78 ✓
	Average Elongation @ Break	%	455.4 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.24
---	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	215.0 N	48.334 lbs ✓
--	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	411.4 N	92.500 lbs
---	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	595.2 N	133.80 lbs ✓
---	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
-----------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
--	-------------------	---------	---------

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination: **CPU, (HI)**

Date: **1/9/2010**  
 Signature: *[Handwritten Signature]*  
 Quality Control Department

6010mc.FRM  
 REV 03  
 12/2005



# quality certificate

ROLL # **801620-10** Lot # **7291467** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.45 mm	57 mil	Length.....	125 m	410.1 feet
(Modified)	MAX:	1.49 mm	59 mil	Width.....	7.00 m	23.0 feet
Asparty GRI GM12: 29 mil	AVE:	1.48 mm	58 mil			
ODD# TOP EVEN# BOTTOM				QTT(Standard) ASTM D3895 minutes	206	TEST RESULTS

Specific Gravity ASTM D792	Density	g/cc	.945	✓
MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23	
Carbon Black Content ASTM D4218	Range	%	2.32	✓
Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1	✓
Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	151 pli	✓ 2,583 psi
	Average Strength @ Break	31 N/mm	176 pli	✓ 3,018 psi
Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	15.78	✓
	Average Elongation @ Break	%	455.4	✓
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.24	
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	215.0 N	48.334	✓ lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	411.4 N	92.500	lbs
Puncture Resistance ASTM D4833 (Modified)	Load	595.2 N	133.80	✓ lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED	
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING	

Customer: Northwest Linings  
PO: C-4083 Kekaha LF  
Destination: CPU, (HI)

Date: 1/9/2010  
Signature: *[Handwritten Signature]*  
Quality Control Department

GDH/mc/FRM  
REV 03  
12/23/05



# quality certificate

ROLL # **801721-10**

Lot #: **7291467**

Liner Type: **MICROSPIKE™ HDPE**

Measurement ASTM D5994 (Modified)		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
	MIN:	1.43 mm	56 mil	Length.....	125 m	410.1 feet
	MAX:	1.56 mm	61 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 35 mil ✓	AVE:	1.48 mm	58 mil ✓	OIT(Standard) ASTM D3895 minutes		206 ✓
OOD #: TOP EVEN #: BOTTOM						<b>TEST RESULTS</b>

Specific Gravity ASTM D792	Density	g/cc	.945 ✓
MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
Carbon Black Content ASTM D4218	Range	%	2.32 ✓
Carbon Black Dispersion ASTM D5598	Category		10 IN CAT 1 ✓
Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	151 ppi ✓ 2,583 psi
	Average Strength @ Break	31 N/mm	176 ppi ✓ 3,018 psi
Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	15.78 ✓
	Average Elongation @ Break	%	455.4 ✓
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.24
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	215.0 N	✓ 48.334 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	411.4 N	92.500 lbs
Puncture Resistance ASTM D4833 (Modified)	Load	595.2 N	✓ 133.80 lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination **CPU, (HI)**

Date: **1/10/2010**  
 Signature: *[Handwritten Signature]*  
 Quality Control Department

60HDmc FRM  
 REV 03  
 12/2/05



# quality certificate

ROLL # **801722-10** Lot #: **7291467** Liner Type: **MICROSPIKE™ HDPE**

Measurement	METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN: 1.44 mm	57 ✓ mil	Length.....	125 m	410.1 feet
	MAX: 1.52 mm	60 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 30 ✓ mil ODD #: TOP EVEN #: BOTTOM	AVE: 1.47 mm	58 ✓ mil	DIT(Standard) ASTM D3895 minutes 206 ✓		
Specific Gravity ASTM D792	Density	g/cc	.945 ✓		
MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23		
Carbon Black Content ASTM D4218	Range	%	2.32 ✓		
Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓		
Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	149 ppi ✓	2,583 psi	
	Average Strength @ Break	31 N/mm	175 ppi ✓	3,018 psi	
Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	15.78 ✓		
	Average Elongation @ Break	%	455.4 ✓		
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.24		
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	215.0 N	✓ 48.334 lbs		
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	411.4 N	92.500 lbs		
Puncture Resistance ASTM D4833 (Modified)	Load	595.2 N	✓ 133.80 lbs		
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED		
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING		

Customer: Northwest Linings  
PO: C-4083 Kekaha LF  
Destination CPU, (HI)

Date: 1/10/2010  
Signature: *[Handwritten Signature]*  
Quality Control Department  
0010mic.FRM  
REV US  
12/23/06



# quality certificate

ROLL # **801723-10**

Lot #: **7291467**

Liner Type: **MICROSPIKE™ HDPE**

Measurement ASTM D5994 (Modified)		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
	MIN:	1.38 mm	54 mil	Length.....	125 m	410.1 feet
	MAX:	1.49 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: <b>34</b> mil	AVE:	1.45 mm	57 mil	TEST RESULTS		
ODD #: TOP EVEN #: BOTTOM				ORT(Standard) ASTM D3895 minutes	206	✓

Specific Gravity ASTM D792	Density	g/cc	.943	✓
MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23	
Carbon Black Content ASTM D4218	Range	%	2.29	✓
Carbon Black Dispersion ASTM D5696	Category		10 IN CAT 1	✓
Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	150 ppl	✓ 2,635 psi
	Average Strength @ Break	33 N/mm	186 ppl	✓ 3,255 psi
Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	15.62	✓
	Average Elongation @ Break	%	495.4	✓
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.24	
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	217.6 N	48.913	✓ lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	398.5 N	89.593	lbs
Puncture Resistance ASTM D4833 (Modified)	Load	610.6 N	137.28	✓ lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED	
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING	

Customer  
PO  
Destination

Date: **1/10/2010**  
Signature: *[Handwritten Signature]*  
Quality Control Department

6010mic.FRM  
REV 03  
12/23/05



# quality certificate

ROLL # **801724-10**

Lot #: **7291467**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.39 mm	55 ✓ mil	Length.....	125 m	410.1 feet
	MAX:	1.51 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 29 ✓ mil	AVE:	1.45 mm	57 ✓ mil	<b>TEST RESULTS</b>		

ODD #: TDP EVEN #: BOTTOM OIT(Standard) ASTM D3895 minutes **206 ✓**

Specific Gravity ASTM D792	Density	g/cc	<b>.943 ✓</b>
-------------------------------	---------	------	---------------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	<b>.23</b>
---	-------------------------------	----------	------------

Carbon Black Content ASTM D4218	Range	%	<b>2.29 ✓</b>
------------------------------------	-------	---	---------------

Carbon Black Dispersion ASTM D5596	Category		<b>10 IN CAT 1 ✓</b>
---------------------------------------	----------	--	----------------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	150 ppi ✓	2,635 psi
	Average Strength @ Break	33 N/mm	186 ppi ✓	3,255 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	<b>15.62 ✓</b>
	Average Elongation @ Break	%	<b>495.4 ✓</b>

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	<b>-0.24</b>
--	----------------------------	---	--------------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	217.6 N	✓ 48.913 lbs
---	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	398.5 N	89.593 lbs
--	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	610.6 N	✓ 137.28 lbs
--	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	<b>CERTIFIED</b>
--------------------	--------------------------	----------	------------------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	<b>ONGOING</b>
---	-------------------	---------	----------------

Customer: **Northwest Linings**  
PO: **C-4083 Kekaha LF**  
Destination **CPU, (HI)**

Date: **1/10/2010**  
Signature: *[Handwritten Signature]*  
Quality Control Department  
EOT/DMC/FRM  
REV 03  
1/22/05



# quality certificate

ROLL # **801725-10**

Lot # **7291467**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.42 mm	56 ✓ mil	Length.....	125 m	410.1 feet
(Modified)	MAX:	1.51 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12	33 ✓ mil	AVE:	1.48 mm	58 ✓ mil	TEST RESULTS	
DDD # TOP EVEN # BOTTOM				OIT(Standard) ASTM D3895	minutes	206 ✓

Specific Gravity ASTM D792	Density	g/cc		.943 ✓
MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min		.23
Carbon Black Content ASTM D4218	Range	%		2.29 ✓
Carbon Black Dispersion ASTM D5596	Category			10 IN CAT 1 ✓
Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	27 N/mm	154 ppi ✓	2,635 psi
	Average Strength @ Break	33 N/mm	190 ppi ✓	3,255 psi
Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%		15.62 ✓
	Average Elongation @ Break	%		495.4 ✓
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%		-0.24
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	217.6 N		✓ 48.913 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	398.5 N		89.593 lbs
Puncture Resistance ASTM D4833 (Modified)	Load	610.6 N		✓ 137.28 lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs		CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs		ONGOING

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination: **CPU, (HI)**

Date: **1/10/2010**  
 Signature: *[Handwritten Signature]*  
 Quality Control Department

60HDmic-FRM  
 REV 03  
 12/23/05



# quality certificate

ROLL# **801726-10**

Lot# **7291467**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.40 mm	55 mil	Length.....	125 m	410.1 feet
	MAX:	1.50 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: <b>32</b> mil ✓ ODD #: TOP EVEN #: BOTTOM	AVE:	1.47 mm	58 mil	TEST RESULTS		
				OTT(Standard) ASTM D3895 minutes	206 ✓	

Specific Gravity ASTM D792	Density			g/cc		.943 ✓
-------------------------------	---------	--	--	------	--	--------

MFI ASTM D1238 COND E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g			g/10 min		23
--	-------------------------------	--	--	----------	--	----

Carbon Black Content ASTM D4218	Range			%		2.29 ✓
------------------------------------	-------	--	--	---	--	--------

Carbon Black Dispersion ASTM D5596	Category					10 IN CAT 1 ✓
---------------------------------------	----------	--	--	--	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	27 N/mm	152 ppi ✓	2,635 psi
	Average Strength @ Break	33 N/mm	188 ppi ✓	3,255 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%		15.62 ✓
	Average Elongation @ Break	%		495.4 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change			%		-0.24
--	----------------------------	--	--	---	--	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	217.6 N		48.913 lbs
---	-------------------------	---------	--	------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	398.5 N		89.593 lbs
--	------	---------	--	------------

Puncture Resistance ASTM D4833 (Modified)	Load	610.6 N		137.28 lbs
--	------	---------	--	------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs		CERTIFIED
--------------------	--------------------------	----------	--	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs		ONGOING
---	-------------------	---------	--	---------

Customer: Northwest Linings  
 PO: C-4083 Kekaha LF  
 Destination CPU, (HI)

Date: 1/10/2010  
 Signature: *[Handwritten Signature]*  
 Quality Control Department

60HDmc.FRM  
 REV 05  
 12/2005





# quality certificate

ROLL # **801727-10** Lot #: **7291467** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.43 mm	56 ✓ mil	Length.....	125 m	410.1 feet
(Modified)	MAX:	1.51 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12:	32 ✓ mil	AVE:	1.47 mm	58 ✓ mil		
ODD #: TOP EVEN #: BOTTOM				OIT(Standard) ASTM D3895 minutes	206 ✓	<b>TEST RESULTS</b>

Specific Gravity	Density	g/cc	.943 ✓
ASTM D792			

MFI ASTM D1238	Melt Flow Index 190°C /2160 g	g/10 min	.23
COND E			
GRADE:	<b>K307</b>		

Carbon Black Content	Range	%	2.29 ✓
ASTM D4218			

Carbon Black Dispersion	Category	10 IN CAT 1 ✓
ASTM D5596		

Tensile Strength	Average Strength @ Yield	27 N/mm	152 ppi ✓	2,635 psi
ASTM D6693				
ASTM D638 (Modified)				
( 2 Inches / minute )	Average Strength @ Break	33 N/mm	188 ppi ✓	3,255 psi

Elongation ASTM D6693	Average Elongation @ Yield	%	15.62 ✓
ASTM D638 (Modified)			
( 2 inches / minute )	Average Elongation @ Break	%	495.4 ✓
Lo = 1.3" Yield			
Lo = 2.0" Break			

Dimensional Stability	Average Dimensional change	%	-0.24
ASTM D1204 (Modified)			

Tear Resistance	Average Tear Resistance	217.6 N	✓ 48.913 lbs
ASTM D-1004 (Modified)			

Puncture Resistance	Load	398.5 N	89.593 lbs
FTMS 101 Method 2065 (Modified)			

Puncture Resistance	Load	610.6 N	✓ 137.28 lbs
ASTM D4833 (Modified)			

ESCR	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
ASTM D1693			

Notched Constant Tensile Load	pass / fail @ 30%	300 hrs	ONGOING
ASTM D5397			

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination: **CPU, (HI)**

Date: **1/10/2010**  
 Signature: *[Handwritten Signature]*  
 Quality Control Department  
 5010mk FRM  
 REV 03  
 12/23/08



# quality certificate

ROLL # **801728-10** Lot # **7291467** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.42 mm	56 mil	Length.....	125 m	410.1 feet
(Modified)	MAX:	1.51 mm	59 mil	Width.....	7.00 m	23.0 feet

Asperity GRI GM12: **31** mil AVE **1.48 mm 58 mil** **TEST RESULTS**  
 ODD # TOP EVEN # BOTTOM DIT(Standard) ASTM D3895 minutes **206**

Specific Gravity	Density	g/cc	<b>943</b> ✓
ASTM D792			

MFI ASTM D1238	Melt Flow Index 190°C /2160 g	g/10 min	<b>.23</b>
COND. E			
GRADE: <b>K307</b>			

Carbon Black Content	Range	%	<b>2.33</b> ✓
ASTM D4218			

Carbon Black Dispersion	Category	<b>10 IN CAT 1</b> ✓
ASTM D5596		

Tensile Strength	Average Strength @ Yield	<b>25 N/mm</b>	<b>145 ppi</b> ✓	<b>2,495 psi</b>
ASTM D6693				
ASTM D638 (Modified)				
( 2 inches / minute )	Average Strength @ Break	<b>33 N/mm</b>	<b>186 ppi</b> ✓	<b>3,187 psi</b>

Elongation ASTM D6693	Average Elongation @ Yield	%	<b>15.24</b> ✓
ASTM D638 (Modified)			
( 2 inches / minute )			
Lo = 1.3" Yield	Average Elongation @ Break	%	<b>505.8</b> ✓
Lo = 2.0" Break			

Dimensional Stability	Average Dimensional change	%	<b>-0.24</b>
ASTM D1204 (Modified)			

Tear Resistance	Average Tear Resistance	<b>217.6 N</b>	<b>48.913 lbs</b> ✓
ASTM D-1004 (Modified)			

Puncture Resistance	Load	<b>398.5 N</b>	<b>89.593 lbs</b>
FTMS 101 Method 2065 (Modified)			

Puncture Resistance	Load	<b>610.6 N</b>	<b>137.28 lbs</b> ✓
ASTM D4833 (Modified)			

ESCR	Minimum Hrs w/o Failures	1500 hrs	<b>CERTIFIED</b>
ASTM D1693			

Notched Constant Tensile Load	pass / fail @ 30%	300 hrs	<b>ONGOING</b>
ASTM D5397			

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination **CPU, (HI)**

Date: **1/10/2010**  
 Signature: *[Handwritten Signature]*  
 Quality Control Department

GRD Inc. Form  
 REV 03  
 12/20/05



# quality certificate

ROLL # **801729-10** Lot #: **7291467** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.42 mm	56 ✓ mil	Length.....	125 m	410.1 feet
	MAX:	1.49 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 33 ✓ mil	AVE:	1.46 mm	57 ✓ mil			
ODD # TOP EVEN # BOTTOM				OIT(Standard) ASTM D3895 minutes	206 ✓	<b>TEST RESULTS</b>

Specific Gravity ASTM D792	Density	g/cc	.943 ✓
-------------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.33 ✓
------------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category	10 IN CAT 1 ✓
---------------------------------------	----------	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	25 N/mm	143 ppi ✓	2,495 psi
	Average Strength @ Break	32 N/mm	193 ppi ✓	3,187 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.24 ✓
	Average Elongation @ Break	%	505.8 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.24
--	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	217.6 N	✓ 48.913 lbs
---	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	398.5 N	89.593 lbs
--	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	610.6 N	✓ 137.28 lbs
--	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
--------------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
---	-------------------	---------	---------

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination **CPU, (HI)**

Date: **1/10/2010**  
 Signature: *[Handwritten Signature]*  
 Quality Control Department

60HDrec.FRM  
 REV 03  
 12/29/05



# quality certificate

ROLL # **801730-10**

Lot # **7291467**

Liner Type: **MICROSPIKE™ HDPE**

Measurement	METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN: 1.43 mm	56 ✓ mil	Length.....	125 m	410.1 feet
	MAX: 1.47 mm	58 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 31 ✓ mil	AVE: 1.45 mm	57 ✓ mil	<b>TEST RESULTS</b>		
ODD # : TOP EVEN # : BOTTOM			OIT(Standard) ASTM D3895 minutes <b>206 ✓</b>		

Specific Gravity ASTM D792	Density	g/cc	<b>.943 ✓</b>
-------------------------------	---------	------	---------------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	<b>.23</b>
---	-------------------------------	----------	------------

Carbon Black Content ASTM D421B	Range	%	<b>2.26 ✓</b>
------------------------------------	-------	---	---------------

Carbon Black Dispersion ASTM D5596	Category		<b>10 IN CAT 1 ✓</b>
---------------------------------------	----------	--	----------------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	25 N/mm	142 ppi ✓	2,495 psi
	Average Strength @ Break	32 N/mm	182 ppi ✓	3,187 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	<b>15.24 ✓</b>
	Average Elongation @ Break	%	<b>505.8 ✓</b>

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	<b>-0.24</b>
--	----------------------------	---	--------------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	217.6 N	<b>48.913 lbs ✓</b>
---	-------------------------	---------	---------------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	398.5 N	<b>89.593 lbs</b>
--	------	---------	-------------------

Puncture Resistance ASTM D4833 (Modified)	Load	610.6 N	<b>137.28 lbs ✓</b>
--	------	---------	---------------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	<b>CERTIFIED</b>
--------------------	--------------------------	----------	------------------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	<b>ONGOING</b>
---	-------------------	---------	----------------

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination **CPU, (HI)**

Date: **1/10/2010**  
 Signature: *[Handwritten Signature]*  
 Quality Control Department

©ORInc.FRM  
 REV 03  
 12/23/05



# quality certificate

ROLL # **801731-10** Lot # **7291467** Liner Type: **MICROSPIKE™ HDPE**

Measurement	METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN: 1.44 mm	57 ✓ mil	Length.....	125 m	410.1 feet
	MAX: 1.48 mm	58 ✓ mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 33 ✓ mil	AVE: 1.47 mm	58 ✓ mil	TEST RESULTS		
ODD #: TOP EVEN #: BOTTOM			Off(Standard) ASTM D3895 minutes	206 ✓	

Specific Gravity ASTM D792	Density	g/cc	.943 ✓
-------------------------------	---------	------	--------

MFI ASTM D1235 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.26 ✓
------------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
---------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	25 N/mm	144 ppi ✓	2,495 psi
	Average Strength @ Break	32 N/mm	184 ppi ✓	3,187 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	15.24 ✓
	Average Elongation @ Break	%	505.8 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.24
--	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	217.6 N	✓ 48.913 lbs
---	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	398.5 N	89.593 lbs
--	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	610.6 N	✓ 137.28 lbs
--	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures:	1500 hrs	CERTIFIED
--------------------	---------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
---	-------------------	---------	---------

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination: **CPU, (HI)**

Date: **1/10/2010**  
 Signature: *[Handwritten Signature]*  
 Quality Control Department

6010-001 PRM  
 REV 03  
 12/23/05



# quality certificate

ROLL # **801732-10** Lot #: **7291467** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.40 mm	55 ✓ mil	Length.....	125 m	410.1 feet
	MAX:	1.50 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 31 ✓ mil	AVE:	1.47 mm	58 ✓ mil	<b>TEST RESULTS</b>		
ODD #: TOP EVEN #: BOTTOM				OIT(Standard) ASTM D3895 minutes <b>206 /</b>		

Specific Gravity ASTM D792	Density	g/cc	<b>.943 ✓</b>
-------------------------------	---------	------	---------------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	<b>.23</b>
---	-------------------------------	----------	------------

Carbon Black Content ASTM D4218	Range	%	<b>2.26 ✓</b>
------------------------------------	-------	---	---------------

Carbon Black Dispersion ASTM D5596	Category		<b>10 IN CAT 1 ✓</b>
---------------------------------------	----------	--	----------------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	25 N/mm	144 ppl ✓	2,495 psi
	Average Strength @ Break	32 N/mm	184 ppl ✓	3,187 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	<b>15.24 ✓</b>
	Average Elongation @ Break	%	<b>505.8 ✓</b>

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	<b>-0.24</b>
--	----------------------------	---	--------------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	217.6 N	✓	48.913 lbs
---	-------------------------	---------	---	------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	398.5 N		89.593 lbs
--	------	---------	--	------------

Puncture Resistance ASTM D4833 (Modified)	Load	610.6 N	✓	137.28 lbs
--	------	---------	---	------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs		<b>CERTIFIED</b>
--------------------	--------------------------	----------	--	------------------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs		<b>ONGOING</b>
---	-------------------	---------	--	----------------

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination: **CPU, (HI)**

Date: **1/10/2010**  
 Signature: *[Handwritten Signature]*  
 Quality Control Department  
 EOMDinc.FRM  
 REV 03  
 12/23/05



# quality certificate

ROLL # **801733-10**

Lot #: **7291467**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.44 mm	57 ✓ mil	Length.....	125 m	410.1 feet
	MAX:	1.49 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: ODD #: TOP EVEN #: BOTTOM	31 ✓ mil	AVE:	1.46 mm 57 ✓ mil	<b>TEST RESULTS</b>		
				OT(Standard) ASTM D3895 minutes	206 ✓	

Specific Gravity ASTM D792	Density	g/cc	.945 ✓
-------------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.24 ✓
------------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
---------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	147 ppi ✓	2,556 psi
	Average Strength @ Break	33 N/mm	188 ppi ✓	3,277 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	15.26 ✓
	Average Elongation @ Break	%	502.0 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.24
--	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	218.3 N	✓ 49.077 lbs
---	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	409.7 N	92.100 lbs
--	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	619.1 N	✓ 139.18 lbs
--	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
--------------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
---	-------------------	---------	---------

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination: **CPU, (HI)**

Date: **1/11/2010**  
 Signature: *[Handwritten Signature]*  
 Quality Control Department  
 6010mic.FRM  
 REV 03  
 7/23/05



# quality certificate

ROLL # **801734-10**

Lot #. **7291467**

Liner Type: **MICROSPIKE™ HDPE**

Measurement	METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN: 1.46 mm	57 mil	Length.....	125 m	410.1 feet
	MAX: 1.50 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 30 mil	AVE: 1.48 mm	58 mil	<b>TEST RESULTS</b>		
ODD #: TOP EVEN #: BOTTOM			OIT(Standard) ASTM D3895 minutes	206	

Specific Gravity ASTM D792	Density	g/cc	.945	✓
-------------------------------	---------	------	------	---

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23	
---	-------------------------------	----------	-----	--

Carbon Black Content ASTM D4218	Range	%	2.24	✓
------------------------------------	-------	---	------	---

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1	✓
---------------------------------------	----------	--	-------------	---

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	149 ppi	✓	2,556 psi
	Average Strength @ Break	33 N/mm	191 ppi	✓	3,277 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	15.26	✓
	Average Elongation @ Break	%	502.0	✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.24	
--	----------------------------	---	-------	--

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	218.3 N	✓	49.077 lbs
---	-------------------------	---------	---	------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	409.7 N		92.100 lbs
--	------	---------	--	------------

Puncture Resistance ASTM D4833 (Modified)	Load	619.1 N	✓	139.18 lbs
--	------	---------	---	------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs		CERTIFIED
--------------------	--------------------------	----------	--	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs		ONGOING
---	-------------------	---------	--	---------

Customer: Northwest Linings  
PO: C-4083 Kekaha LF  
Destination CPU, (HI)

Date: 1/11/2010  
Signature: *JH Palmer*  
Quality Control Department  
AGRU America FRM  
REV 03  
1/22/05





# quality certificate

ROLL # **801735-10** Lot # **7291467** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	80 mil
ASTM D5994 (Modified)	MIN:	1.44 mm	57 ✓ mil	Length.....	125 m	410.1 feet
	MAX:	1.49 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 32 ✓ mil	AVE:	1.46 mm	57 ✓ mil	<b>TEST RESULTS</b>		
ODD # TOP EVEN # BOTTOM				OIT(Standard) ASTM D3895 - minutes	206 ✓	

Specific Gravity ASTM D792	Density			g/cc		.945 ✓
MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g			g/10 min		.23
Carbon Black Content ASTM D4218	Range			%		2.24 ✓
Carbon Black Dispersion ASTM D5596	Category					10 IN CAT 1 ✓
Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield			25 N/mm	147 ppi ✓	2,556 psi
	Average Strength @ Break			33 N/mm	188 ppi ✓	3,277 psi
Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield			%		15.26 ✓
	Average Elongation @ Break			%		502.0 ✓
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change			%		-0.24
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance			218.3 N		✓ 49.077 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load			409.7 N		92.100 lbs
Puncture Resistance ASTM D4833 (Modified)	Load			619.1 N		✓ 139.18 lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures			1500 hrs		CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%			300 hrs		ONGOING

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination: **CPU, (HI)**

Date: **1/11/2010**  
 Signature: *[Handwritten Signature]*  
 Quality Control Department

5010mic-FRM  
 REV 03  
 12/23/05



# quality certificate

ROLL # **801736-10**

Lot #: **7291467**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.46 mm	57 ✓ mil	Length.....	125 m	410.1 feet
(Modified)	MAX:	1.49 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12	29 ✓ mil	AVE:	1.48 mm	58 ✓ mil		
ODD # TOP EVEN # BOTTOM						

DIT(Standard) ASTM D3895 minutes **206 ✓** **TEST RESULTS**

Specific Gravity  
ASTM D792      Density      g/cc      .945 ✓

MFI ASTM D1238  
COND. E      Melt Flow Index 190°C /2160 g      g/10 min      .23  
GRADE      **K307**

Carbon Black Content  
ASTM D4218      Range      %      2.24 ✓

Carbon Black Dispersion  
ASTM D5596      Category      10 IN CAT 1 ✓

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	149 ppi ✓	2,556 psi
	Average Strength @ Break	33 N/mm	191 ppi ✓	3,277 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	15.26 ✓
	Average Elongation @ Break	%	502.0 ✓

Dimensional Stability  
ASTM D1204 (Modified)      Average Dimensional change      %      -0.24

Tear Resistance  
ASTM D-1004 (Modified)      Average Tear Resistance      218.3 N      ✓ 49.077 lbs

Puncture Resistance  
FTMS 101 Method 2065 (Modified)      Load      409.7 N      92.100 lbs

Puncture Resistance  
ASTM D4833 (Modified)      Load      619.1 N      ✓ 139.18 lbs

ESCR  
ASTM D1693      Minimum Hrs w/o Failures      1500 hrs      CERTIFIED

Notched Constant Tensile Load  
ASTM D5397      pass / fail @ 30%      300. hrs      ONGOING

Customer: **Northwest Linings**  
PO: **C-4083 Kekaha LF**  
Destination **GPU, (HI)**

Date: **1/11/2010**  
Signature: *[Handwritten Signature]*  
Quality Control Department

50HDmc Form  
REV 03  
1/23/05



# quality certificate

ROLL # **801737-10**

Lot #: **7291467**

Liner Type: **MICROSPIKE™ HDPE**

Measurement	METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN: 1.45 mm	57 ✓ mil	Length.....	125 m	410.1 feet
	MAX: 1.49 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 31 ✓ mil	AVE: 1.47 mm	58 ✓ mil	OIT(Standard) ASTM D3895 minutes 206 ✓		
ODD # TOP EVEN # BOTTOM	<b>TEST RESULTS</b>				

Specific Gravity ASTM D792	Density	g/cc	.945 ✓
----------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.24 ✓
---------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category	10 IN CAT 1 ✓	
------------------------------------	----------	---------------	--

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	148 ppi ✓	2,556 psi
	Average Strength @ Break	33 N/mm	190 ppi ✓	3,277 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	15.26 ✓
	Average Elongation @ Break	%	502.0 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.24
--	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	218.3 N	✓ 49.077 lbs
---	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	409.7 N	92.100 lbs
--	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	619.1 N	✓ 139.18 lbs
--	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
--------------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
---	-------------------	---------	---------

Customer: Northwest Linings  
 PO: C-4083 Kekaha LF  
 Destination CPU, (HI)

Date: 1/11/2010  
 Signature: *[Handwritten Signature]*  
 Quality Control Department  
 DOH/mic.FRM  
 REV 03  
 12/2006



# quality certificate

ROLL # **801738-10**

Lot # **7291467**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.45 mm	57 ✓ mil	Length.....	125 m	410.1 feet
(Modified)	MAX:	1.49 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 29 ✓ mil	AVE:	1.47 mm	58 ✓ mil	<b>TEST RESULTS</b>		
ODD # TOP EVEN # BOTTOM				OIT(Standard) ASTM D3895 minutes	206 ✓	

Specific Gravity ASTM D792	Density	g/cc	.945 ✓		
MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23		
Carbon Black Content ASTM D4218	Range	%	2.24 ✓		
Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓		
Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	150 ppi ✓	2,597 psi	
	Average Strength @ Break	33 N/mm	188 ppi ✓	3,242 psi	
Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.62 ✓		
	Average Elongation @ Break	%	503.3 ✓		
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.24		
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	218.3 N	✓ 49.077 lbs		
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	409.7 N	92.100 lbs		
Puncture Resistance ASTM D4833 (Modified)	Load	619.1 N	✓ 139.18 lbs		
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED		
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING		

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination: **CPU, (HI)**

Date: **1/11/2010**  
 Signature: *[Handwritten Signature]*  
 Quality Control Department

6010mic.FRM  
 REV 03  
 12/23/05



# quality certificate

ROLL # **801739-10** Lot #: **7291467** Liner Type: **MICROSPIKE™ HDPE**

Measurement ASTM D5994 (Modified)		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
	MIN:	1.40 mm	55 ✓ mil	Length.....	125 m	410.1 feet
	MAX:	1.52 mm	60 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 31 ✓ mil	AVE:	1.48 mm	58 ✓ mil	TEST RESULTS		
ODD #: TOP EVEN #: BOTTOM				OTT(Standard) ASTM D3895 minutes	206 ✓	

Specific Gravity ASTM D792	Density	g/cc	.945 ✓
-------------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.24 ✓
------------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
---------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	151 ppi ✓	2,597 psi
	Average Strength @ Break	33 N/mm	189 ppi ✓	3,242 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.62 ✓
	Average Elongation @ Break	%	503.3 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.24
--	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	218.3 N	✓ 49.077 lbs
---	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	409.7 N	92.100 lbs
--	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	619.1 N	✓ 139.18 lbs
--	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
--------------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
---	-------------------	---------	---------

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination: **CPU, (HI)**

Date: **1/11/2010**  
 Signature: *[Handwritten Signature]*  
 Quality Control Department

EQH/Chris FRM  
 REV 03  
 12/23/05



# quality certificate

ROLL# **801740-10** Lot# **7291467** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.45 mm	57 ✓ mil	Length.....	125 m	410.1 feet
	MAX:	1.50 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12- 30 mil ✓ ODD# : TOP EVEN# : BOTTOM	AVE:	1.47 mm	58 ✓ mil	<b>TEST RESULTS</b>		
				OIT(Standard) ASTM D3895 minutes	206 ✓	

Specific Gravity ASTM D792	Density	g/cc	.945 ✓
-------------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.24 ✓
------------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
---------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	150 ppi ✓	2,597 psi
	Average Strength @ Break	33 N/mm	188 ppi ✓	3,242 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.62 ✓
	Average Elongation @ Break	%	503.3 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.24
--	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	218.3 N	✓	49.077 lbs
---	-------------------------	---------	---	------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	409.7 N		92.100 lbs
--	------	---------	--	------------

Puncture Resistance ASTM D4833 (Modified)	Load	619.1 N	✓	139.18 lbs
--	------	---------	---	------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs		CERTIFIED
--------------------	--------------------------	----------	--	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs		ONGOING
---	-------------------	---------	--	---------

Customer: Northwest Linings  
PO: C-4083 Kekaha LF  
Destination CPU, (HI)

Date: 1/11/2010  
Signature: *[Handwritten Signature]*  
Quality Control Department  
60-HD-m-FRM  
REV 03  
12/20/05



# quality certificate

ROLL # **801741-10** Lot # **7291467** Liner Type: **MICROSPIKE™ HDPE**

Measurement ASTM D5994 (Modified)		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
	MIN:	1.44 mm	57 ✓ mil	Length.....	125 m	410.1 feet
	MAX:	1.51 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 35 ✓ mil	AVE:	1.48 mm	58 ✓ mil	OIT (Standard) ASTM D3895 minutes 206 ✓		
ODD # TOP EVEN # BOTTOM	<b>TEST RESULTS</b>					

Specific Gravity ASTM D792	Density	g/cc	.945 ✓		
MFI ASTM D1238 COND. E GRADE <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23		
Carbon Black Content ASTM D4218	Range	%	2.26 ✓		
Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓		
Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	151 ppi ✓	2,597 psi	
	Average Strength @ Break	33 N/mm	189 ppi ✓	3,242 psi	
Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.62 ✓		
	Average Elongation @ Break	%	503.3 ✓		
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.24		
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	218.3 N	✓ 49.077 lbs		
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	409.7 N	92.100 lbs		
Puncture Resistance ASTM D4833 (Modified)	Load	619.1 N	✓ 139.18 lbs		
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED		
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING		

Customer: Northwest Linings  
PO: C-4083 Kekaha LF  
Destination CPU, (HI)

Date: 1/11/2010  
Signature: *[Handwritten Signature]*  
Quality Control Department

00HDMicFRM  
REV 03  
12/23/05



# quality certificate

ROLL # **802101-10** Lot # **7291467** Liner Type: **MICROSPIKE™ HDPE**

Measurement	METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN: 1.46 mm	57 mil ✓	Length.....	125 m	410.1 feet
	MAX: 1.50 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GMT2: 33 mil ✓	AVE: 1.48 mm	58 mil ✓	OIT(Standard) ASTM D3895 minutes 206 ✓		

### TEST RESULTS

Specific Gravity ASTM D792	Density	g/cc	.945 ✓
----------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g	g/10 min	.23
------------------------------------	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.26 ✓
---------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	151 ppi ✓	2,597 psi
	Average Strength @ Break	33 N/mm	189 ppi ✓	3,242 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.62 ✓
	Average Elongation @ Break	%	503.3 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.24
---	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	218.3 N	✓ 49.077 lbs
--	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	409.7 N	92.100 lbs
---	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	619.1 N	✓ 139.18 lbs
---	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
-----------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
--	-------------------	---------	---------

Customer: Northwest Linings  
 PO: C-4083 Kekaha LF  
 Destination CPU, (HI)

Date: 1/11/2010  
 Signature: *[Handwritten Signature]*  
 Quality Control Department  
 601-616-1700  
 REV 03  
 12/2005





# quality certificate

ROLL # **802102-10** Lot #: **7291467** Liner Type: **MICROSPIKE™ HDPE**

Measurement	METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN: 1.46 mm	57 ✓ mil	Length.....	125 m	410.1 feet
	MAX: 1.50 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 33 ✓ mil	AVE: 1.43 mm	58 ✓ mil	OIT(Standard) ASTM D3895 minutes: 206 ✓		
ODD # TOP EVEN # BOTTOM					

Specific Gravity ASTM D792	Density	g/cc	.944 ✓
----------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g	g/10 min	.23
------------------------------------	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.18 ✓
---------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category	10 IN CAT 1 ✓
------------------------------------	----------	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	148 ppl ✓	2,536 psi
	Average Strength @ Break	31 N/mm	180 ppl ✓	3,086 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	15.90 ✓
	Average Elongation @ Break	%	497.6 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.24
---	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	222.9 N	✓ 50.120 lbs
--	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	411.9 N	92.606 lbs
---	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	610.1 N	✓ 137.16 lbs
---	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
-----------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
--	-------------------	---------	---------

Customer: Northwest Linings  
PO: C-4083 Kekaha LF  
Destination CPU, (HI)

Date: 1/12/2010  
Signature: *[Handwritten Signature]*  
Quality Control Department

SQMDmLFRM  
REV 03  
12/2005



# quality certificate

ROLL # **802103-10** Lot # **7291467** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.44 mm	57 ✓ mil	Length.....	125 m	410.1 feet
	MAX:	1.47 mm	58 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 32 ✓ mil	AVE:	1.46 mm	57 ✓ mil	<b>TEST RESULTS</b>		
ODD # TOP EVEN # BOTTOM				OIT(Standard) ASTM D3895 minutes	206 ✓	

Specific Gravity ASTM D792	Density	g/cc	.944 ✓
-------------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g	g/10 min	.23
--	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.18 ✓
------------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
---------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	146 ppi ✓	2,536 psi
	Average Strength @ Break	31 N/mm	177 ppi ✓	3,086 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	15.90 ✓
	Average Elongation @ Break	%	497.6 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.24
--	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	222.9 N	✓ 50.120 lbs
---	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	411.9 N	92.606 lbs
--	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	610.1 N	✓ 137.16 lbs
--	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
--------------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
---	-------------------	---------	---------

Customer: Northwest Linings  
PO: C-4083 Kekaha LF  
Destination CPU, (HI)

Date: 1/12/2010  
Signature: *[Signature]*  
Quality Control Department  
504Dmic.FRM  
REV 03  
12/23/05



# quality certificate

ROLL # **802104-10** Lot #: **7291467** Liner Type: **MICROSPIKE™ HDPE**

Measurement	METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN: 1.45 mm	57 ✓ mil	Length.....	125 m	410.1 feet
	MAX: 1.52 mm	60 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 27 ✓ mil	AVE: 1.48 mm	58 ✓ mil	OIT(Standard) ASTM D3895 minutes 206 ✓		
DDO# TOP EVEN# BOTTOM	<b>TEST RESULTS</b>				

Specific Gravity ASTM D792	Density	g/cc	0.944 ✓
-------------------------------	---------	------	---------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	23
---	-------------------------------	----------	----

Carbon Black Content ASTM D4218	Range	%	2.18 ✓
------------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
---------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	148 ppi ✓	2,536 psi
	Average Strength @ Break	31 N/mm	180 ppi ✓	3,086 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	15.90 ✓
	Average Elongation @ Break	%	497.6 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.24
--	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	222.9 N	50.120 lbs ✓
---	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	411.9 N	92.606 lbs
--	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	610.1 N	137.16 lbs ✓
--	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
--------------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
---	-------------------	---------	---------

Customer: **Northwest Linings**  
PO: **C-4083 Kekaha LF**  
Destination: **GPU, (HI)**

Date: **1/12/2010**  
Signature: *[Handwritten Signature]*  
Quality Control Department  
SUNDRINC.FRM  
REV 03  
12/29/05



# quality certificate

ROLL # **802105-10**

Lot # **7291467**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.40 mm	55 ✓ mil	Length.....	125 m	410.1 feet
	MAX:	1.47 mm	58 mil	Width.....	7.00 m	23.0 feet
Aspeny GRI GM12: 31 ✓ mil ODD #: TOP EVEN #, BOTTOM	AVE:	1.44 mm	57 ✓ mil	DIT(Standard) ASTM D3895 minutes 206 ✓		

**TEST RESULTS**

Specific Gravity ASTM D792	Density	g/cc	.944 ✓
-------------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.29 ✓
------------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
---------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	25 N/mm	144 ppi ✓	2,536 psi
	Average Strength @ Break:	31 N/mm	175 ppi ✓	3,086 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	15.90 ✓
	Average Elongation @ Break	%	497.6 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.24
--	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	222.9 N	✓ 50.120 lbs
---	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	411.9 N	92.606 lbs
--	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	610.1 N	✓ 137.16 lbs
--	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
--------------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
---	-------------------	---------	---------

Customer: **Northwest Linings**  
PO: **C-4083 Kekaha LF**  
Destination **GPU, (HI)**

Date: **1/12/2010**  
Signature: *[Handwritten Signature]*  
Quality Control Department

SDQDmc.FRM  
REV 03  
12/2/05



# quality certificate

ROLL # **802106-10** Lot # **7291467** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.42 mm	56 mil	Length.....	125 m	410.1 feet
(Modified)	MAX:	1.52 mm	60 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12:	30 mil ✓	AVE:	1.49 mm	59 mil ✓		
ODD #: TOP	EVEN #: BOTTOM			QIT (Standard) ASTM D3895	minutes	206 ✓

## TEST RESULTS

Specific Gravity	Density	g/cc	.944 ✓
ASTM D792			

MFI ASTM D1238	Melt Flow Index 190°C /2160 g	g/10 min	.23
COND. E			
GRADE:	<b>K307</b>		

Carbon Black Content	Range	%	2.29 ✓
ASTM D4218			

Carbon Black Dispersion	Category	10 IN CAT 1 ✓
ASTM D5596		

Tensile Strength	Average Strength @ Yield	26 N/mm	149 ppi ✓	2,536 psi
ASTM D6693				
ASTM D638 (Modified)				
( 2 inches / minute )	Average Strength @ Break	32 N/mm	181 ppi ✓	3,086 psi

Elongation ASTM D6693	Average Elongation @ Yield	%	15.90 ✓
ASTM D638 (Modified)			
( 2 inches / minute )	Average Elongation @ Break	%	497.6 ✓
Lo = 1.3" Yield			
Lo = 2.0" Break			

Dimensional Stability	Average Dimensional change	%	-0.24
ASTM D1204 (Modified)			

Tear Resistance	Average Tear Resistance	222.9 N	✓	50,120 lbs
ASTM D-1004 (Modified)				

Puncture Resistance	Load	411.9 N		92.606 lbs
FTMS 101 Method 2065 (Modified)				

Puncture Resistance	Load	610.1 N	✓	137.16 lbs
ASTM D4833 (Modified)				

ESCR	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
ASTM D1693			

Notched Constant Tensile Load	pass / fail @ 30%	300 hrs	ONGOING
ASTM D5397			

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination: **CPU, (HI)**

Date: **1/12/2010**  
 Signature: *[Handwritten Signature]*  
 Quality Control Department

6010mic.FRM  
 REV 03  
 12/23/06



# quality certificate

ROLL # **802107-10** Lot # **7291467** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.45 mm	57 mil	Length.....	125 m	410.1 feet
(Modified)	MAX:	1.49 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12:	31 mil	AVE:	1.48 mm	58 mil		
ODD # - TOP						

OIT(Standard) ASTM D3895 minutes **206** ✓ **TEST RESULTS**

Specific Gravity	Density	g/cc	<b>.944</b> ✓
ASTM D792			

MFI ASTM D1238	Melt Flow Index 190°C /2160 g	g/10 min	<b>.23</b>
COND. E			
GRADE: <b>K307</b>			

Carbon Black Content	Range	%	<b>2.23</b> ✓
ASTM D4218			

Carbon Black Dispersion	Category	<b>10 IN CAT 1</b> ✓
ASTM D5598		

Tensile Strength	Average Strength @ Yield	26 N/mm	151 ppl ✓	2,587 psi
ASTM D6693				
ASTM D638 (Modified)				
( 2 inches / minute )				
	Average Strength @ Break	34 N/mm	192 ppl ✓	3,298 psi

Elongation ASTM D6693	Average Elongation @ Yield	%	<b>15.12</b> ✓
ASTM D638 (Modified)			
( 2 inches / minute )			
Lo = 1.3" Yield			
Lo = 2.0" Break	Average Elongation @ Break	%	<b>508.0</b> ✓

Dimensional Stability	Average Dimensional change	%	<b>-0.24</b>
ASTM D1204 (Modified)			

Tear Resistance	Average Tear Resistance	222.9 N	✓	50.120 lbs
ASTM D-1004 (Modified)				

Puncture Resistance	Load	411.9 N		92.606 lbs
FTMS 101 Method 2065 (Modified)				

Puncture Resistance	Load	610.1 N	✓	137.16 lbs
ASTM D4833 (Modified)				

ESCR	Minimum Hrs w/o Failures	1500 hrs	<b>CERTIFIED</b>
ASTM D1693			

Notched Constant Tensile Load	pass / fail @ 30%	300 hrs	<b>ONGOING</b>
ASTM D5397			

Customer: **Northwest Linings**  
PO: **C-4083 Kekaha LF**  
Destination: **CPU, (HI)**

Date: **1/12/2010**  
Signature: *[Signature]*  
Quality Control Department

60110mic.FRM  
REV 03  
12/23/05



# quality certificate

ROLL # **802108-10**

Lot #: **7291467**

Liner Type: **MICROSPIKE™ HDPE**

Measurement ASTM D5994 (Modified)		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil	
	MIN:	1.45 mm	57 ✓ mil	Length.....	125 m	410.1 feet	
	MAX:	1.51 mm	59 mil	Width.....	7.00 m	23.0 feet	
Asperity GRI GM12: <b>32</b> ✓ mil	AVE:	1.48 mm	58 ✓ mil	OTT(Standard) ASTM D3895 minutes		206 /	
ODD #: TOP	EVEN #: BOTTOM					<b>TEST RESULTS</b>	

Specific Gravity ASTM D792	Density	g/cc	<b>.944</b> ✓
-------------------------------	---------	------	---------------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	<b>.23</b>
---	-------------------------------	----------	------------

Carbon Black Content ASTM D4218	Range	%	<b>2.23</b> ✓
------------------------------------	-------	---	---------------

Carbon Black Dispersion ASTM D5596	Category		<b>10 IN CAT 1</b> ✓
---------------------------------------	----------	--	----------------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	151 ppi ✓	2,587 psi
	Average Strength @ Break	34 N/mm	192 ppi ✓	3,298 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	<b>15.12</b> ✓
	Average Elongation @ Break	%	<b>508.0</b> ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	<b>-0.24</b>
--	----------------------------	---	--------------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	222.9 N	✓	50.120 lbs
---	-------------------------	---------	---	------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	411.9 N		92.606 lbs
--	------	---------	--	------------

Puncture Resistance ASTM D4833 (Modified)	Load	610.1 N	✓	137.16 lbs
--	------	---------	---	------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs		<b>CERTIFIED</b>
--------------------	--------------------------	----------	--	------------------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs		<b>ONGOING</b>
---	-------------------	---------	--	----------------

Customer: **Northwest Linings**  
PO: **C-4083 Kekaha LF**  
Destination: **CPU, (HI)**

Date: **1/12/2010**  
Signature: *[Signature]*  
Quality Control Department

60HDmic.FRM  
REV 03  
12/23/05



# quality certificate

ROLL # **802109-10** Lot #: **7291467** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	80 mil
ASTM D5994 (Modified)	MIN:	1.47 mm	58 mil ✓	Length.....	125 m	410.1 feet
	MAX:	1.56 mm	61 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: ODD # TOP EVEN # BOTTOM	AVE:	1.51 mm	59 mil ✓	OIT(Standard) ASTM D3895 minutes <b>206</b> ✓		

Specific Gravity ASTM D792	Density			g/cc		<b>.944</b> ✓
-------------------------------	---------	--	--	------	--	---------------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g			g/10 min		<b>.23</b>
---	-------------------------------	--	--	----------	--	------------

Carbon Black Content ASTM D4218	Range			%		<b>2.23</b> ✓
------------------------------------	-------	--	--	---	--	---------------

Carbon Black Dispersion ASTM D5596	Category					<b>10 IN CAT 1</b> ✓
---------------------------------------	----------	--	--	--	--	----------------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield			27 N/mm	154 ppi ✓	2,587 psi
	Average Strength @ Break			34 N/mm	196 ppi ✓	3,298 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield			%		<b>15.12</b> ✓
	Average Elongation @ Break			%		<b>508.0</b> ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change			%		<b>-0.24</b>
--	----------------------------	--	--	---	--	--------------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance			222.9 N		✓ 50.120 lbs
---	-------------------------	--	--	---------	--	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load			411.9 N		92.606 lbs
--	------	--	--	---------	--	------------

Puncture Resistance ASTM D4833 (Modified)	Load			810.1 N		✓ 137.16 lbs
--	------	--	--	---------	--	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures			1500 hrs		<b>CERTIFIED</b>
--------------------	--------------------------	--	--	----------	--	------------------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%			300 hrs		<b>ONGOING</b>
---	-------------------	--	--	---------	--	----------------

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination **CPU, (HI)**

Date: **1/12/2010**  
 Signature: *[Handwritten Signature]*  
 Quality Control Department

QC Form FRM  
 REV 05  
 12/23/05





# quality certificate

ROLL # **802110-10** Lot # **7291467** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5984 (Modified)	MIN:	1.45 mm	57 mil ✓	Length.....	125 m	410.1 feet
	MAX:	1.50 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 32 mil ✓ ODD # TOP EVEN # BOTTOM	AVE:	1.48 mm	58 mil ✓	Off(Standard) ASTM D3895 minutes	206 ✓	<b>TEST RESULTS</b>

Specific Gravity ASTM D792	Density	g/cc	.944 ✓
-------------------------------	---------	------	--------

MFI ASTM D1238 COND E GRADE <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.23 ✓
------------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
---------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	151 ppi ✓	2,587 psi
	Average Strength @ Break	34 N/mm	192 ppi ✓	3,298 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	15.12 ✓
	Average Elongation @ Break	%	508.0 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.24
--	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	222.9 N	✓ 50.120 lbs
---	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	411.9 N	92.606 lbs
--	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	610.1 N	✓ 137.16 lbs
--	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
--------------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
---	-------------------	---------	---------

Customer: Northwest Linings  
PO: C-4083 Kekaha LF  
Destination CPU, (HI)

Date: 1/12/2010  
Signature: *[Handwritten Signature]*  
Quality Control Department

60HDmic.FRM  
REV 03  
12/23/05



# quality certificate

ROLL # **802111-10**

Lot # **7291467**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.47 mm	58 ✓ mil	Length.....	125 m	410.1 feet
	MAX:	1.50 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 32 mil ✓ ODD # TOP EVEN # BOTTOM	AVE	1.48 mm	58 ✓ mil	OIT(Standard) ASTM D3895 minutes 206 ✓		

## TEST RESULTS

Specific Gravity ASTM D792	Density	g/cc	.944 ✓
MFI ASTM D1238 COND. E GRADE <b>K307</b>	Melt Flow Index 180°C /2160 g	g/10 min	.23
Carbon Black Content ASTM D4218	Range	%	2.23 ✓
Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	151 ppi ✓ 2,587 psi
	Average Strength @ Break	34 N/mm	192 ppi ✓ 3,298 psi
Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	15.12 ✓
	Average Elongation @ Break	%	508.0 ✓
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.24
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	222.9 N	✓ 50.120 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	411.9 N	92.606 lbs
Puncture Resistance ASTM D4833 (Modified)	Load	610.1 N	✓ 137.16 lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING

Customer: Northwest Linings  
 PO: C-4083 Kekaha LF  
 Destination CPU, (HI)

Date: 1/12/2010  
 Signature: *JH Palmer*  
 Quality Control Department

6010mic.FRM  
 REV 03  
 12/23/05



# quality certificate

ROLL # **802112-10** Lot #: **7291467** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.46 mm	57 ✓ mil	Length.....	125 m	410.1 feet
	MAX:	1.50 mm	59 ✓ mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 34 ✓ mil	AVE:	1.48 mm	58 ✓ mil	DIT(Standard) ASTM D3895 minutes 206 ✓		
ODD # TOP EVEN # BOTTOM	<b>TEST RESULTS</b>					

Specific Gravity ASTM D792	Density	g/cc	.944 ✓
-------------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.33 ✓
------------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
---------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	151 ppi ✓	2,592 psi
	Average Strength @ Break	32 N/mm	182 ppi ✓	3,127 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) L <sub>0</sub> = 1.3" Yield L <sub>0</sub> = 2.0" Break	Average Elongation @ Yield	%	15.60 ✓
	Average Elongation @ Break	%	480.7 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.24
--	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	222.4 N	✓ 50.008 lbs
---	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	416.7 N	93.687 lbs
--	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	612.0 N	✓ 137.58 lbs
--	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
--------------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
---	-------------------	---------	---------

Customer: Northwest Linings  
 PO: C-4083 Kekaha LF  
 Destination: CPU, (HI)

Date: 1/12/2010

Signature: *[Handwritten Signature]*

Quality Control Department

60HDmic.FRM  
REV 03  
12/23/05



# quality certificate

ROLL # **802113-10** Lot #: **7291467** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.44 mm	57 / mil	Length.....	125 m	410.1 feet
(Modified)	MAX:	1.52 mm	60 mil	Width.....	7.00 m	23.0 feet

Asperity GRI GM12: **33** mil ✓  
 ODD # TOP EVEN # BOTTOM AVE: **1.48** mm **58** ✓ mil  
 OIT(Standard) ASTM D3895 minutes **206** ✓ **TEST RESULTS**

Specific Gravity ASTM D792 Density g/cc **.944** ✓

MFI ASTM D1238 COND. E GRADE: **K307** Melt Flow Index 190°C /2160 g g/10 min **.23**

Carbon Black Content ASTM D4218 Range % **2.33** ✓

Carbon Black Dispersion ASTM D5596 Category **10 IN CAT 1** ✓

Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute ) Average Strength @ Yield **26** N/mm **151** ppi ✓ **2,592** psi  
 Average Strength @ Break **32** N/mm **182** ppi ✓ **3,127** psi

Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break Average Elongation @ Yield % **15.60** ✓  
 Average Elongation @ Break % **480.7** ✓

Dimensional Stability ASTM D1204 (Modified) Average Dimensional change % **-0.24**

Tear Resistance ASTM D-1004 (Modified) Average Tear Resistance **222.4** N ✓ **50.008** lbs

Puncture Resistance FTMS 101 Method 2065 (Modified) Load **416.7** N **93.687** lbs

Puncture Resistance ASTM D4833 (Modified) Load **612.0** N ✓ **137.58** lbs

ESCR ASTM D1693 Minimum Hrs w/o Failures 1500 hrs **CERTIFIED**

Notched Constant Tensile Load ASTM D5397 pass / fail @ 30% 300 hrs **ONGOING**

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination: **CPU, (HI)**

Date: **1/12/2010**  
 Signature: *[Signature]*  
 Quality Control Department

0040mic.FRM  
 REV 03  
 1/2005



# quality certificate

ROLL # **802114-10**

Lot #: **7291467**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.43 mm	56 ✓ mil	Length.....	125 m	410.1 feet
(Modified)	MAX:	1.48 mm	58 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12:	33 ✓ mil	AVE:	1.46 mm	57 ✓ mil		
ODD #, TOP						
EVEN #, BOTTOM						

OT(Standard) ASTM D3895 minutes **206 ✓** **TEST RESULTS**

Specific Gravity ASTM D792	Density	g/cc		<b>.944 ✓</b>
MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min		<b>.23</b>
Carbon Black Content ASTM D4218	Range	%		<b>2.33 ✓</b>
Carbon Black Dispersion ASTM D5596	Category			<b>10 IN CAT 1 ✓</b>
Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	149 ppi ✓	2,692 psi
	Average Strength @ Break	31 N/mm	180 ppi ✓	3,127 psi
Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%		<b>15.60 ✓</b>
	Average Elongation @ Break	%		<b>480.7 ✓</b>
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%		<b>-0.24</b>
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	222.4 N		<b>50.008 lbs ✓</b>
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	416.7 N		<b>93.687 lbs</b>
Puncture Resistance ASTM D4833 (Modified)	Load	612.0 N		<b>137.58 lbs ✓</b>
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs		<b>CERTIFIED</b>
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs		<b>ONGOING</b>

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination: **CPU, (HI)**

Date: **1/12/2010**  
 Signature: *[Handwritten Signature]*  
 Quality Control Department  
 RDH-Cmic-FRM  
 REV. 03  
 1/22/05



# quality certificate

ROLL # **802115-10** Lot #: **7291467** Liner Type: **MICROSPIKE™ HDPE**

Measurement ASTM D5994 (Modified)		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
	MIN:	1.42 mm	56 ✓ mil	Length.....	125 m	410.1 feet
	MAX:	1.49 mm	59 ✓ mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 31 ✓ mil	AVE:	1.47 mm	58 ✓ mil	OIT(Standard) ASTM D3895 minutes 206 ✓		
ODD # TOP	EVEN # BOTTOM	<b>TEST RESULTS</b>				

Specific Gravity ASTM D792	Density	g/cc	.944 ✓
-------------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.33 ✓
------------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category	10 IN CAT 1 ✓
---------------------------------------	----------	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	150 ppi ✓	2,592 psi
	Average Strength @ Break	32 N/mm	181 ppi ✓	3,127 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield	Average Elongation @ Yield	%	15.60 ✓
Lo = 2.0" Break	Average Elongation @ Break	%	480.7 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.24
--	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	222.4 N	✓ 50.008 lbs
---	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	416.7 N	93.687 lbs
--	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	612.0 N	✓ 137.58 lbs
--	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
--------------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
---	-------------------	---------	---------

Customer: Northwest Linings  
PO: C-4083 Kekaha LF  
Destination CPU, (HI)

Date: 1/12/2010  
Signature: *[Handwritten Signature]*  
Quality Control Department  
SPH/Dmc F104  
REV 02  
12/2005



# quality certificate

ROLL # **802116-10** Lot #: **7291467** Liner Type: **MICROSPIKE™ HDPE**

Measurement ASTM D5994 (Modified)		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
	MIN:	1.42 mm	56 ✓ mil	Length.....	125 m	410.1 feet
	MAX:	1.49 mm	59 ✓ mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: <b>30</b> ✓ mil	AVE:	1.47 mm	58 ✓ mil	OIT(Standard) ASTM D3895 minutes <b>206</b> ✓		
ODD # TOP	EVEN # BOTTOM	<b>TEST RESULTS</b>				

Specific Gravity  
ASTM D792      Density      g/cc      **944** ✓

MFI ASTM D1238  
COND. E      Melt Flow Index 190°C /2160 g      g/10 min      **.23**  
GRADE: **K307**

Carbon Black Content  
ASTM D4218      Range      %      **2.33** ✓

Carbon Black Dispersion  
ASTM D5596      Category      **10 IN CAT 1** ✓

Tensile Strength  
ASTM D6693  
ASTM D638 (Modified)  
( 2 inches / minute )

Average Strength @ Yield	<b>26</b> N/mm	<b>150</b> ppi ✓	<b>2,592</b> psi
Average Strength @ Break	<b>32</b> N/mm	<b>181</b> ppi ✓	<b>3,127</b> psi

Elongation ASTM D6693  
ASTM D638 (Modified)  
( 2 inches / minute )  
Lo = 1.3" Yield  
Lo = 2.0" Break

Average Elongation @ Yield	%	<b>15.60</b> ✓
Average Elongation @ Break	%	<b>480.7</b> ✓

Dimensional Stability  
ASTM D1204 (Modified)      Average Dimensional change      %      **-0.24**

Tear Resistance  
ASTM D-1004 (Modified)      Average Tear Resistance      **222.4** N      ✓ **50.008** lbs

Puncture Resistance  
FTMS 101 Method 2065 (Modified)      Load      **416.7** N      **93.687** lbs

Puncture Resistance  
ASTM D4833 (Modified)      Load      **612.0** N      ✓ **137.58** lbs

ESCR  
ASTM D1693      Minimum Hrs w/o Failures      1500 hrs      **CERTIFIED**

Notched Constant Tensile Load  
ASTM D5397      pass / fail @ 30%      300 hrs      **ONGOING**

Customer: **Northwest Linings**  
PO: **C-4083 Kekaha LF**  
Destination **CPU, (HI)**

Date: **1/12/2010**  
Signature: *[Signature]*  
Quality Control Department

62HDmic.FRM  
REV 03  
12/23/05



# quality certificate

ROLL # **802117-10** Lot #: **7291467** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.40 mm	55 mil	Length.....	125 m	410.1 feet
	MAX:	1.54 mm	61 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 31 mil	AVE:	1.49 mm	59 mil	DFT(Standard) ASTM D3895 minutes 206 ✓ <b>TEST RESULTS</b>		
ODD # TOP EVEN # BOTTOM						

Specific Gravity ASTM D792	Density	g/cc	.944 ✓
-------------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.32 ✓
------------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
---------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	27 N/mm	157 ppi ✓	2,674 psi
	Average Strength @ Break	34 N/mm	193 ppi ✓	3,283 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.38 ✓
	Average Elongation @ Break	%	501.8 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.24
--	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	222.4 N	✓ 50,008 lbs
---	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	416.7 N	93,687 lbs
--	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	612.0 N	✓ 137.58 lbs
--	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
--------------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
---	-------------------	---------	---------

Customer: Northwest Linings  
 PO: C-4083 Kekaha LF  
 Destination: CPU, (HI)

Date: 1/12/2010  
 Signature: *[Handwritten Signature]*  
 Quality Control Department

6010mc.FRM  
 REV 03  
 12/23/05





# quality certificate

ROLL # **802118-10** Lot # **7291467** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.43 mm	56 ✓ mil	Length.....	125 m	410.1 feet
(Modified)	MAX:	1.50 mm	59 ✓ mil	Width.....	7.00 in	23.0 feet
Asperity GRI GM12:	29 ✓ mil	AVE:	1.46 mm	57 ✓ mil		
ODD # - TOP	EVEN #	BOTTOM				

TEST RESULTS  
 OIT (Standard) ASTM D3895 minutes **208 ✓**

Specific Gravity ASTM D792	Density	g/cc	<b>.944 ✓</b>	
MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	<b>.23</b>	
Carbon Black Content ASTM D4218	Range	%	<b>2.32 ✓</b>	
Carbon Black Dispersion ASTM D5596	Category		<b>10 IN CAT 1 ✓</b>	
Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	27 N/mm	154 ppi ✓	2,674 psi
	Average Strength @ Break	33 N/mm	189 ppi ✓	3,283 psi
Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	<b>16.38 ✓</b>	
	Average Elongation @ Break	%	<b>501.8 ✓</b>	
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	<b>-0.24</b>	
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	222.4 N	<b>✓ 50.008 lbs</b>	
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	416.7 N	<b>93.687 lbs</b>	
Puncture Resistance ASTM D4833 (Modified)	Load	612.0 N	<b>✓ 137.58 lbs</b>	
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	<b>CERTIFIED</b>	
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs.	<b>ONGOING</b>	

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination: **CPU, (HI)**

Date: **1/12/2010**  
 Signature: *[Handwritten Signature]*  
 Quality Control Department

50HD (inc. FRM)  
 REV 03  
 12/23/05



# quality certificate

ROLL # **802119-10**

Lot #: **7291454**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.46 mm	57 ✓ mil	Length.....	125 m	410.1 feet
	MAX:	1.50 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 31 (rel) ✓	AVE:	1.48 mm	58 ✓ mil			
000# TOP				Off(Standard) ASTM D3895 minutes	205 ✓	<b>TEST RESULTS</b>

Specific Gravity ASTM D792	Density	g/cc	<b>.944 ✓</b>
-------------------------------	---------	------	---------------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow index 190°C /2160 g	g/10 min	<b>.23</b>
---	-------------------------------	----------	------------

Carbon Black Content ASTM D4218	Range	%	<b>2.32 ✓</b>
------------------------------------	-------	---	---------------

Carbon Black Dispersion ASTM D5596	Category		<b>10 IN CAT 1 ✓</b>
---------------------------------------	----------	--	----------------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	27 N/mm	156 ppi ✓	2,674 psi
	Average Strength @ Break	33 N/mm	191 ppi ✓	3,283 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	<b>16.38 ✓</b>
	Average Elongation @ Break	%	<b>501.8 ✓</b>

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	<b>-0.31</b>
--	----------------------------	---	--------------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	222.4 N	✓	50,008 lbs
---	-------------------------	---------	---	------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	416.7 N		93,687 lbs
--	------	---------	--	------------

Puncture Resistance ASTM D4833 (Modified)	Load	612.0 N	✓	137.58 lbs
--	------	---------	---	------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs		<b>CERTIFIED</b>
--------------------	--------------------------	----------	--	------------------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs		<b>ONGOING</b>
---	-------------------	---------	--	----------------

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination: **CPU, (HI)**

Date: **1/12/2010**  
 Signature: *[Handwritten Signature]*  
 Quality Control Department

AGRU Dms-1102  
 REV 03  
 02/05



# quality certificate

ROLL # **802120-10**

Lot # **7291454**

Liner Type: **MICROSPIKE™ HDPE**

Measurement  
ASTM D5994  
(Modified)

	METRIC	ENGLISH
MIN:	1.45 mm	57 ✓ mil
MAX:	1.53 mm	60 mil
AVE:	1.48 mm	58 ✓ mil

Thickness.....	1.5 mm	60 mil
Length.....	125 m	410.1 feet
Width.....	7.00 m	23.0 feet

Asperity GRI GM12: **30** ✓ mil  
ODD #: TOP EVEN #: BOTTOM

OIT(Standard) ASTM D3895 minutes **205** ✓ **TEST RESULTS**

Specific Gravity ASTM D792	Density	g/cc	<b>.944</b> ✓
MFI ASTM D1238 COND. E GRADE <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	<b>.23</b>
Carbon Black Content ASTM D4218	Range	%	<b>2.32</b> ✓
Carbon Black Dispersion ASTM D5596	Category		<b>10 IN CAT 1</b> ✓
Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	<b>27 N/mm</b>	<b>156 ppi</b> ✓ <b>2,674 psi</b>
	Average Strength @ Break	<b>33 N/mm</b>	<b>191 ppi</b> ✓ <b>3,283 psi</b>
Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	<b>16.38</b> ✓
	Average Elongation @ Break	%	<b>501.8</b> ✓
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	<b>-0.31</b>
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	<b>222.4 N</b>	✓ <b>50.008 lbs</b>
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	<b>416.7 N</b>	<b>93.687 lbs</b>
Puncture Resistance ASTM D4833 (Modified)	Load	<b>612.0 N</b>	✓ <b>137.58 lbs</b>
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	<b>CERTIFIED</b>
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	<b>ONGOING</b>

Customer: **Northwest Linings**  
PO. **C-4083 Kekaha LF**  
Destination **GPU, (HI)**

Date: **1/12/2010**

Signature: *[Signature]*  
Quality Control Department

SOHDm: FRM  
REV 05  
12/23/05



# quality certificate

ROLL # **802221-10** Lot #: **7291454** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.47 mm	58 ✓ mil	Length.....	125 m	410.1 feet
	MAX:	1.50 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 37 ✓ mil	AVE:	1.49 mm	59 ✓ mil			
ODD #: TOP EVEN #: BOTTOM				DIT(Standard) ASTM D3895 minutes	205 ✓	<b>TEST RESULTS</b>

Specific Gravity ASTM D792	Density			g/cc		.944 ✓
MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g			g/10 min		.23
Carbon Black Content ASTM D4218	Range			%		2.32 ✓
Carbon Black Dispersion ASTM D5596	Category					10 IN CAT 1 ✓
Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield			27 N/mm	157 ppi ✓	2,674 psi
	Average Strength @ Break			34 N/mm	193 ppi ✓	3,283 psi
Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield			%		16.38 ✓
	Average Elongation @ Break			%		501.8 ✓
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change			%		-0.31
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance			222.4 N		✓ 50.008 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load			416.7 N		93.687 lbs
Puncture Resistance ASTM D4833 (Modified)	Load			612.0 N		✓ 137.58 lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures			1500 hrs		CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%			300 hrs		ONGOING

Customer: Northwest Linings  
PO: C-4083 Kekaha LF  
Destination CPU, (HI)

Date: 1/12/2010  
Signature: *[Handwritten Signature]*  
Quality Control Department  
ISO-9001:2008  
100% OK



# quality certificate

ROLL # **802222-10**

Lot #: **7291454**

Liner Type: **MICROSPIKE™ HDPE**

Measurement  
ASTM D5994  
(Modified)

	METRIC	ENGLISH
MIN:	1.45 mm	57 ✓ mil
MAX:	1.52 mm	60 mil
AVE:	1.47 mm	58 ✓ mil

Thickness.....	1.5 mm	60 mil
Length.....	125 m	410.1 feet
Width.....	7.00 m	23.0 feet

Asperity GRI GM12: **33** ✓ mil  
ODD #: TOP EVEN #: BOTTDN

OIT(Standard) ASTM D3895 minutes **205** ✓ **TEST RESULTS**

Specific Gravity ASTM D792	Density	g/cc	<b>.942</b> ✓
MFI ASTM D1238 COND. E GRADE <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	<b>.23</b>
Carbon Black Content ASTM D4218	Range	%	<b>2.21</b> ✓
Carbon Black Dispersion ASTM D5596	Category		<b>10 IN CAT 1</b> ✓
Tensile Strength ASTM D8693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	<b>26 N/mm</b>	<b>147 ppi</b> ✓ <b>2,538 psi</b>
	Average Strength @ Break	<b>31 N/mm</b>	<b>177 ppi</b> ✓ <b>3,061 psi</b>
Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	<b>16.16</b> ✓
	Average Elongation @ Break	%	<b>488.4</b> ✓
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	<b>-0.31</b>
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	<b>224.4 N</b>	✓ <b>50.447 lbs</b>
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	<b>419.7 N</b>	<b>94.368 lbs</b>
Puncture Resistance ASTM D4833 (Modified)	Load	<b>628.7 N</b>	✓ <b>141.33 lbs</b>
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	<b>CERTIFIED</b>
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	<b>ONGOING</b>

Customer: **Northwest Linings**  
PO: **C-4083 Kekaha LF**  
Destination: **CPU, (HI)**

Date:..... **1/12/2010**  
Signature: *[Handwritten Signature]*  
Quality Control Department

EDHDMS FRM  
REV 03  
12/23/09



# quality certificate

ROLL #

**802223-10**

Lot #:

**7291454**

Liner Type: **MICROSPIKE™ HDPE**

Measurement  
ASTM D5994  
(Modified)

	METRIC	ENGLISH
MIN:	1.45 mm	57 <input checked="" type="checkbox"/> mil
MAX:	1.50 mm	59 <input checked="" type="checkbox"/> mil
AVE:	1.47 mm	58 <input checked="" type="checkbox"/> mil

Thickness.....	1.5 mm	60 mil
Length.....	125 m	410.1 feet
Width.....	7.00 m	23.0 feet

Asperity GRI GM12: **35** mil  
ODD #: TOP EVEN #: BOTTOM

OTT(Standard) ASTM D3895 minutes **205**  **TEST RESULTS**

Specific Gravity ASTM D792	Density	g/cc	<b>.942</b> <input checked="" type="checkbox"/>
-------------------------------	---------	------	---

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	<b>.23</b>
---	-------------------------------	----------	------------

Carbon Black Content ASTM D4218	Range	%	<b>2.21</b> <input checked="" type="checkbox"/>
------------------------------------	-------	---	---

Carbon Black Dispersion ASTM D5596	Category		<b>10 IN CAT 1</b> <input checked="" type="checkbox"/>
---------------------------------------	----------	--	--

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	147 ppi <input checked="" type="checkbox"/>	2,538 psi
	Average Strength @ Break	31 N/mm	177 ppi <input checked="" type="checkbox"/>	3,061 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	<b>16.16</b> <input checked="" type="checkbox"/>
	Average Elongation @ Break	%	<b>488.4</b> <input checked="" type="checkbox"/>

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	<b>-0.31</b>
--	----------------------------	---	--------------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	224.4 N	<input checked="" type="checkbox"/> <b>50.447</b> lbs
---	-------------------------	---------	---

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	419.7 N	<b>94.368</b> lbs
--	------	---------	-------------------

Puncture Resistance ASTM D4833 (Modified)	Load	628.7 N	<input checked="" type="checkbox"/> <b>141.33</b> lbs
--	------	---------	---

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	<b>CERTIFIED</b>
--------------------	--------------------------	----------	------------------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	<b>ONGOING</b>
---	-------------------	---------	----------------

Customer: **Northwest Linings**  
PO: **C-4083 Kekaha LF**  
Destination: **CPU, (HI)**

Date:..... **1/12/2010**  
Signature: *[Signature]*  
Quality Control Department

GQHDmic.FRM  
REV 04  
12/2/05



# quality certificate

ROLL # **802224-10** Lot # **7291454** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.46 mm	57 mil	Length.....	125 m	410.1 feet
	MAX:	1.52 mm	60 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 28 mil ✓ ODD # TOP EVEN # BOTTOM	AVE:	1.49 mm	59 mil	TEST RESULTS		
				OIT(Standard) ASTM D3895 minutes	205 ✓	

Specific Gravity ASTM D792	Density	g/cc	.942 ✓
-------------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.21 ✓
------------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
---------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	149 ppi ✓	2,538 psi
	Average Strength @ Break	31 N/mm	180 ppi ✓	3,061 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.16 ✓
	Average Elongation @ Break	%	488.4 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31
--	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	224.4 N	50.447 lbs ✓
---	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	419.7 N	94.368 lbs
--	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	628.7 N	141.33 lbs ✓
--	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
--------------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
---	-------------------	---------	---------

Customer Northwest Linings  
PO: C-4083 Kekaha LF  
Destination CPU, (HI)

Date: 1/12/2010  
Signature: *[Signature]*  
Quality Control Department

601Dmic.FRM  
REV 03  
12/23/05



# quality certificate

ROLL # **802225-10**

Lot #: **7291454**

Liner Type: **MICROSPIKE™ HDPE**

Measurement ASTM D5994 (Modified)		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
	MIN:	1.45 mm	57 mil	Length.....	125 m	410.1 feet
	MAX:	1.52 mm	60 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: <b>34</b> mil ✓	AVE:	1.48 mm	58 mil ✓			
ODD#: TOP EVEN#: BOTTOM				OIT(Standard) ASTM D3895 minutes	205 ✓	<b>TEST RESULTS</b>

Specific Gravity ASTM D792	Density	g/cc	<b>.942</b> ✓
MFI ASTM D1238 COND. E GRADE <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	<b>.23</b>
Carbon Black Content ASTM D4218	Range	%	<b>2.21</b> ✓
Carbon Black Dispersion ASTM D5596	Category		<b>10 IN CAT 1</b> ✓
Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	148 ppi ✓ 2,538 psi
	Average Strength @ Break	31 N/mm	178 ppi ✓ 3,061 psi
Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	<b>16.16</b> ✓
	Average Elongation @ Break	%	<b>488.4</b> ✓
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	<b>-0.31</b>
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	224.4 N	✓ 50.447 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	419.7 N	94.368 lbs
Puncture Resistance ASTM D4833 (Modified)	Load	628.7 N	✓ 141.33 lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	<b>CERTIFIED</b>
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	<b>ONGOING</b>

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination **CPU, (HI)**

Date: **1/12/2010**

Signature: *[Handwritten Signature]*  
 Quality Control Department

60HDmic-FRM  
 REV 03  
 1/22/05





# quality certificate

ROLL# **802226-10** Lot# **7291454** Liner Type: **MICROSPIKE™ HDPE**

Measurement	METRIC	ENGLISH	Thickness	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN: 1.43 mm	56 ✓ mil	Length	125 m	410.1 feet
	MAX: 1.51 mm	59 ✓ mil	Width	7.00 m	23.0 feet
Asperity GRI GM12: 33 ✓ mil	AVE: 1.48 mm	58 ✓ mil	<b>TEST RESULTS</b>		
DDD #: TOP / EVEN #: BOTTOM			OT (Standard) ASTM D3895 minutes 205 ✓		

Specific Gravity ASTM D792	Density	g/cc	.942 ✓
-------------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.21 ✓
------------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
---------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	148 ppi ✓	2,538 psi
	Average Strength @ Break	31 N/mm	178 ppi ✓	3,061 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.16 ✓
	Average Elongation @ Break	%	488.4 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31
--	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	224.4 N	✓ 50.447 lbs
---	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	419.7 N	94.368 lbs
--	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	628.7 N	✓ 141.33 lbs
--	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
--------------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
---	-------------------	---------	---------

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination: **CPU, (HI)**

Date: **1/12/2010**  
 Signature: *[Handwritten Signature]*  
 Quality Control Department  
 6010MIC.FRM  
 REV 01  
 1/12/2010



# quality certificate

ROLL # **802227-10** Lot #: **7291454** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.42 mm	56 mil ✓	Length.....	125 m	410.1 feet
	MAX:	1.50 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: <b>31</b> ✓ mil DDD #: TOP EVEN # BOTTOM	AVE:	1.47 mm	58 mil ✓	<b>TEST RESULTS</b>		
				DIT(Standard) ASTM D3895 minutes	205 ✓	

Specific Gravity ASTM D792	Density	g/cc	.942 ✓
-------------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.36 ✓
------------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
---------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	147 ppl ✓	2,547 psi
	Average Strength @ Break	33 N/mm	188 ppl ✓	3,243 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	15.40 ✓
	Average Elongation @ Break	%	509.1 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31
--	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	224.4 N	50.447 lbs ✓
---	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	419.7 N	94.368 lbs
--	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	628.7 N	141.33 lbs ✓
--	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
--------------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
---	-------------------	---------	---------

Customer: Northwest Linings  
PO: C-4083 Kekaha LF  
Destination CPU, (HI)

Date: 1/12/2010  
Signature: *[Handwritten Signature]*  
Quality Control Department

ISO 9001:2008  
REV 03  
12/25/05



# quality certificate

ROLL # **802228-10**

Lot # **7291454**

Liner Type: **MICROSPIKE™ HDPE**

Measurement  
ASTM D5994  
(Modified)

	METRIC	ENGLISH
MIN:	1.45 mm	57 ✓ mil
MAX:	1.53 mm	60 mil
AVE:	1.48 mm	58 ✓ mil

Thickness.....	1.5 mm	60 mil
Length.....	125 m	410.1 feet
Width.....	7.00 m	23.0 feet

Asperity GRI GM12: **32** ✓ mil  
ODD #: TOP EVEN #: BOTTOM

TEST RESULTS  
CIT(Standard) ASTM D3895 minutes **205** ✓

Specific Gravity  
ASTM D792

Density

g/cc

**.942** ✓

MFI ASTM D1238  
COND. E  
GRADE: **K307**

Melt Flow Index 190°C /2160 g

g/10 min

**.23**

Carbon Black Content  
ASTM D4218

Range

%

**2.36** ✓

Carbon Black Dispersion  
ASTM D5596

Category

**10 IN CAT 1** ✓

Tensile Strength  
ASTM D6693  
ASTM D638 (Modified)  
( 2 inches / minute )

Average Strength @ Yield

**26** N/mm

**148** ppi ✓

**2,547** psi

Average Strength @ Break

**33** N/mm

**189** ppi ✓

**3,243** psi

Elongation ASTM D6693  
ASTM D638 (Modified)  
( 2 inches / minute )  
Lo = 1.3" Yield  
Lo = 2.0" Break

Average Elongation @ Yield

%

**15.40** ✓

Average Elongation @ Break

%

**509.1** ✓

Dimensional Stability  
ASTM D1204 (Modified)

Average Dimensional change

%

**-0.31**

Tear Resistance  
ASTM D-1004 (Modified)

Average Tear Resistance

**224.4** N

**50.447** lbs ✓

Puncture Resistance  
FTMS 101 Method 2065 (Modified)

Load

**419.7** N

**94.368** lbs

Puncture Resistance  
ASTM D4833 (Modified)

Load

**628.7** N

**141.33** lbs ✓

ESCR  
ASTM D1693

Minimum Hrs w/o Failures

1500 hrs

**CERTIFIED**

Notched Constant Tensile Load  
ASTM D5397

pass / fail @ 30%

300 hrs

**ONGOING**

Customer: **Northwest Linings**  
PO: **C-4083 Kekaha LF**  
Destination: **CPU, (HI)**

Date: **1/12/2010**

Signature:   
Quality Control Department

3010mic.FRM  
REV 03  
12/2005



# quality certificate

ROLL # **802229-10**

Lot #: **7291454**

Liner Type: **MICROSPIKE™ HDPE**

Measurement	METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN: 1.46 mm	57 mil ✓	Length.....	125 m	410.1 feet
	MAX: 1.51 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 32 mil ✓	AVE: 1.49 mm	59 mil ✓	<b>TEST RESULTS</b>		
ODD # TOP EVEN # BOTTOM			OIT(Standard) ASTM D3895 minutes	205 ✓	

Specific Gravity ASTM D792	Density	g/cc	.942 ✓
-------------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g	g/10 min	.23
--	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.36 ✓
------------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
---------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	149 ppi ✓	2,547 psi
	Average Strength @ Break	33 N/mm	190 ppi ✓	3,243 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	15.40 ✓
	Average Elongation @ Break	%	509.1 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31
--	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	224.4 N	✓ 50.447 lbs
---	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	419.7 N	94.368 lbs
--	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	628.7 N	✓ 141.33 lbs
--	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
--------------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
---	-------------------	---------	---------

Customer: Northwest Linings  
PO: C-4083 Kekaha LF  
Destination CPU, (HI)

Date: 1/12/2010

Signature: *[Handwritten Signature]*  
Quality Control Department

60HDME.FRM  
REV 03  
12/23/05



# quality certificate

TOLL #

**802230-10**

Lot #

**7291454**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.46 mm	57 ✓ mil	Length.....	125 m	410.1 feet
	MAX:	1.50 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRJ GM12: ODD #: TOP EVEN #: BOTTOM	AVE	1.48 mm	58 ✓ mil			

Off(Standard) ASTM D3895 minutes **205** / **TEST RESULTS**

Specific Gravity ASTM D792	Density	g/cc	<b>.942</b> ✓	
MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	<b>.23</b>	
Carbon Black Content ASTM D4218	Range	%	<b>2.22</b> ✓	
Carbon Black Dispersion ASTM D5596	Category		<b>10 IN CAT 1</b> ✓	
Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	148 ppi ✓	2,547 psi
	Average Strength @ Break	33 N/mm	189 ppi ✓	3,243 psi
Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	<b>15.40</b> ✓	
	Average Elongation @ Break	%	<b>509.1</b> ✓	
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	<b>-0.31</b>	
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	224.4 N	✓ <b>50.447</b> lbs	
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	419.7 N	<b>94.368</b> lbs	
Puncture Resistance ASTM D4833 (Modified)	Load	628.7 N	✓ <b>141.33</b> lbs	
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	<b>CERTIFIED</b>	
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	<b>ONGOING</b>	

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination **CPU, (HI)**

Date: **1/12/2010**  
 Signature: *[Handwritten Signature]*  
 Quality Control Department

Q/C Dmic: FRM  
 REV 03  
 12/23/05



# quality certificate

ROLL # **802231-10**

Lot #: **7291454**

Liner Type: **MICROSPIKE™ HDPE**

Measurement	METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN: 1.47 mm	58 mil ✓	Length.....	125 m	410.1 feet
	MAX: 1.50 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12 <b>32</b> mil ODD #: TOP EVEN #: BOTTOM	AVE: 1.49 mm	59 mil ✓			
			OIT(Standard) ASTM D3895 minutes	205 ✓	<b>TEST RESULTS</b>
Specific Gravity ASTM D792	Density		g/cc		.942 ✓
MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g		g/10 min		.23
Carbon Black Content ASTM D4218	Range		%		2.22 ✓
Carbon Black Dispersion ASTM D5598	Category				10 IN CAT 1 ✓
Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield		26 N/mm	149 psi ✓	2,547 psi
	Average Strength @ Break		33 N/mm	190 psi ✓	3,243 psi
Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield		%		15.40 ✓
	Average Elongation @ Break		%		509.1 ✓
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change		%		-0.31
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance		224.4 N		✓ 50.447 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load		419.7 N		94.368 lbs
Puncture Resistance ASTM D4833 (Modified)	Load		628.7 N		✓ 141.33 lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures		1500 hrs		CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%		300 hrs		ONGOING

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination: **CPU, (HI)**

Date: **1/12/2010**  
 Signature: *[Handwritten Signature]*  
 Quality Control Department

604504c.FRM  
 REV 03  
 12/23/05



# quality certificate

ROLL # **802232-10**

Lot #: **7291454**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.43 mm	56 mil	Length.....	125 m	410.1 feet
(Modified)	MAX:	1.48 mm	58 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12	32 mil	AVE:	1.46 mm	57 mil		
ODD#: TOP	EVEN #	BOTTOM				
				OTI(Standard) ASTM D3895	minutes	205

**TEST RESULTS**

Specific Gravity ASTM D792	Density		g/cc		.944	✓
MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g		g/10 min		.23	
Carbon Black Content ASTM D4218	Range		%		2.23	✓
Carbon Black Dispersion ASTM D5596	Category				10 IN CAT 1	✓
Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield		25 N/mm	145 ppi	2,514	psi ✓
	Average Strength @ Break		33 N/mm	187 ppi	3,261	psi ✓
Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield		%		16.22	✓
	Average Elongation @ Break		%		493.6	✓
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change		%		-0.31	
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance		222.5 N		50.029	lbs ✓
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load		407.0 N		91.507	lbs
Puncture Resistance ASTM D4833 (Modified)	Load		608.4 N		136.77	lbs ✓
ESCR ASTM D1693	Minimum Hrs w/o Failures		1500 hrs		CERTIFIED	
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%		300 hrs		ONGOING	

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination: **CPU, (HI)**

Date: **1/12/2010**  
 Signature: *[Signature]*  
 Quality Control Department

6040mic.FRM  
 REV 03  
 12/23/05



# quality certificate

ROLL # **802233-10**

Lot #: **7291454**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.44 mm	57 ✓ mil	Length.....	125 m	410.1 feet
	MAX:	1.49 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 31 ✓ mil	AVE:	1.47 mm	58 ✓ mil			
ODD #: TOP EVEN #: BOTTOM				OIT(Standard) ASTM D3895 minutes	205 ✓	<b>TEST RESULTS</b>

Specific Gravity ASTM D792	Density	g/cc	.944 ✓
-------------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.23 ✓
------------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
---------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	25 N/mm	145 pli ✓	2,514 psi
	Average Strength @ Break	33 N/mm	189 pli ✓	3,261 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.22 ✓
	Average Elongation @ Break	%	493.6 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31
--	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	222.5 N	✓ 50.029 lbs
---	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	407.0 N	91.507 lbs
--	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	608.4 N	✓ 136.77 lbs
--	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
--------------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
---	-------------------	---------	---------

Customer: Northwest Linings  
PO: C-4083 Kekaha LE  
Destination: CPU, (HI)

Date: 1/12/2010  
Signature: *[Handwritten Signature]*  
Quality Control Department

SOHmic:PRM  
REV 03  
12/23/05





# quality certificate

ROLL # **802234-10**

Lot # **7291454**

Liner Type: **MICROSPIKE™ HDPE**

Measurement  
ASTM D5994  
(Modified)

	METRIC	ENGLISH
MIN:	1.45 mm	57 ✓ mil
MAX:	1.51 mm	59 mil
AVE:	1.48 mm	58 ✓ mil

Thickness.....	1.5 mm	60 mil
Length.....	125 m	410.1 feet
Width.....	7.00 m	23.0 feet

Asperity GRI GM12: **29** ✓ mil  
 ODD # TOP EVEN # BOTTOM

Off (Standard) ASTM D3895 minutes **205** ✓ **TEST RESULTS**

Specific Gravity ASTM D792	Density	g/cc	<b>.944</b> ✓
MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	<b>.23</b>
Carbon Black Content ASTM D4218	Range	%	<b>2.23</b> ✓
Carbon Black Dispersion ASTM D5586	Category		<b>10 IN CAT 1</b> ✓
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	26 N/mm	146 ppi ✓ <b>2,514</b> psi
	Average Strength @ Break	33 N/mm	190 ppi ✓ <b>3,261</b> psi
Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	<b>16.22</b> ✓
	Average Elongation @ Break	%	<b>493.6</b> ✓
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	<b>-0.31</b>
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	222.5 N	✓ <b>50.029</b> lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	407.0 N	<b>91.507</b> lbs
Puncture Resistance ASTM D4833 (Modified)	Load	608.4 N	✓ <b>136.77</b> lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	<b>CERTIFIED</b>
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	<b>ONGOING</b>

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination **CPU, (HI)**

Date: **1/12/2010**

Signature: *[Handwritten Signature]*  
 Quality Control Department

50HDMic.FRM  
 REV 03  
 12/23/05



# quality certificate

ROLL # **802235-10**

Lot #: **7291454**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.46 mm	57 ✓ mil	Length.....	125 m	410.1 feet
	MAX:	1.50 mm	59 mil	Width.....	7.00 m	23.0 feet

Asperity GRI GM12: **32** ✓ mil  
 ODD #: TOP EVEN #: BOTTOM

DIT(Standard) ASTM D3895 minutes **205** ✓ **TEST RESULTS**

Specific Gravity ASTM D792	Density		g/cc			<b>.944</b> ✓
MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g		g/10 min			<b>.23</b>
Carbon Black Content ASTM D4218	Range		%			<b>2.23</b> ✓
Carbon Black Dispersion ASTM D5596	Category					<b>10 IN CAT 1</b> ✓
Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	<b>26</b> N/mm	<b>147</b> ppi ✓			<b>2,514</b> psi
	Average Strength @ Break	<b>34</b> N/mm	<b>191</b> ppi ✓			<b>3,261</b> psi
Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield		%			<b>16.22</b> ✓
	Average Elongation @ Break		%			<b>493.6</b> ✓
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change		%			<b>-0.31</b>
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	<b>222.5</b> N				✓ <b>50.029</b> lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	<b>407.0</b> N				<b>91.507</b> lbs
Puncture Resistance ASTM D4833 (Modified)	Load	<b>608.4</b> N				✓ <b>136.77</b> lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs				<b>CERTIFIED</b>
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs				<b>ONGOING</b>

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination **CPU, (HI)**

Date: **1/12/2010**

Signature: *[Handwritten Signature]*  
 Quality Control Department

ISO 9001:2008  
 REV 03  
 12/23/05



# quality certificate

ROLL# **802236-10** Lot#: **7291454** Liner Type: **MICROSPIKE™ HDPE**

Measurement	METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN: 1.44 mm	57 ✓ mil	Length.....	125 m	410.1 feet
	MAX: 1.49 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 29 ✓ mil	AVE: 1.47 mm	58 ✓ mil	TEST RESULTS		
ODD# TOP EVEN# BOTTOM			Ort(Standard) ASTM D3895 minutes	205 ✓	

Specific Gravity ASTM D792	Density	g/cc	.944 ✓
-------------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
--	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.23 ✓
------------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
---------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	25 N/mm	145 ppi ✓	2,514 psi
	Average Strength @ Break	33 N/mm	189 ppi ✓	3,261 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.22 ✓
	Average Elongation @ Break	%	493.6 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31
--	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	222.5 N	✓	50.029 lbs
---	-------------------------	---------	---	------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	407.0 N		91.507 lbs
--	------	---------	--	------------

Puncture Resistance ASTM D4833 (Modified)	Load	608.4 N	✓	136.77 lbs
--	------	---------	---	------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs		CERTIFIED
--------------------	--------------------------	----------	--	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs		ONGOING
---	-------------------	---------	--	---------

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination: **CPU, (HI)**

Date: **1/12/2010**  
 Signature: *[Handwritten Signature]*  
 Quality Control Department

FORM 1000-1  
 REV 02-10  
 1/02/00



# quality certificate

ROLL # **802237-10** Lot #: **7291454** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.44 mm	57 mil ✓	Length.....	125 m	410.1 feet
	MAX:	1.48 mm	58 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12.32 ✓ mil	AVE:	1.46 mm	57 mil ✓			
ODD # TOP EVEN # BOTTOM				OIT (Standard) ASTM D3895 minutes	205 ✓	<b>TEST RESULTS</b>

Specific Gravity ASTM D792	Density	g/cc	.944 ✓
----------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE. <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.29 ✓
---------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	26 N/mm	146 psi ✓	2,548 psi
	Average Strength @ Break	32 N/mm	185 psi ✓	3,218 psi

Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.78 ✓
	Average Elongation @ Break	%	506.5 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31
---	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	222.5 N	✓	50.029 lbs
--	-------------------------	---------	---	------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	407.0 N		91.507 lbs
---	------	---------	--	------------

Puncture Resistance ASTM D4833 (Modified)	Load	608.4 N	✓	136.77 lbs
---	------	---------	---	------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs		<b>CERTIFIED</b>
-----------------	--------------------------	----------	--	------------------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs		<b>ONGOING</b>
--	-------------------	---------	--	----------------

Customer: **Northwest Linings**  
 PO. **C-4083 Kekaha LF**  
 Destination: **GPU, (HI)**

Date: **1/12/2010**  
 Signature: *[Handwritten Signature]*  
 Quality Control Department  
 SH/MS/11M  
 REV 03  
 (2/2009)



# quality certificate

ROLL # **802238-10**

Lot # **7291454**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.44 mm	57 ✓ mil	Length.....	125 m	410.1 feet
	MAX:	1.51 mm	59 mil	Width.....	7.00 ft	23.0 feet
Asperity GRI GM12: 32 ✓ mil	AVE:	1.48 mm	58 ✓ mil			
ODD # - TOP EVEN # - BOTTOM				OIT(Standard) ASTM D3895 minutes	205 ✓	<b>TEST RESULTS</b>

Specific Gravity ASTM D792	Density	g/cc	.944 ✓
-------------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.29 ✓
------------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
---------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	148 ppi ✓	2,548 psi
	Average Strength @ Break	33 N/mm	188 ppi ✓	3,219 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.78 ✓
	Average Elongation @ Break	%	506.5 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31
--	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	222.5 N	✓	50.029 lbs
---	-------------------------	---------	---	------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	407.0 N		91.507 lbs
--	------	---------	--	------------

Puncture Resistance ASTM D4833 (Modified)	Load	608.4 N	✓	136.77 lbs
--	------	---------	---	------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs		<b>CERTIFIED</b>
--------------------	--------------------------	----------	--	------------------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs		<b>ONGOING</b>
---	-------------------	---------	--	----------------

Customer: **Northwest Linings**  
 PO: **C-4083 Kakaha LF**  
 Destination **CPU, (HI)**

Date: **1/12/2010**  
 Signature: *[Signature]*  
 Quality Control Department

©2006 GRI  
 REV 03  
 12/23/05



# quality certificate

ROLL # **802239-10** Lot #: **7291454** Liner Type: **MICROSPIKE™ HDPE**

Measurement	METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN: 1.44 mm	57 ✓ mil	Length.....	125 m	410.1 feet
	MAX: 1.51 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 32 ✓ mil	AVE: 1.48 mm	58 ✓ mil	TEST RESULTS		
ODD #: TOP EVEN #: BOTTOM					

Off (Standard) ASTM D3895 minutes **205** /

Specific Gravity ASTM D792	Density	g/cc	.944 ✓
----------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.29 ✓
---------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	148 ppi ✓	2,548 psi
	Average Strength @ Break	33 N/mm	188 ppi ✓	3,219 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.78 ✓
	Average Elongation @ Break	%	506.5 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31
---	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	222.5 N	50.029 lbs ✓
--	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	407.0 N	91.507 lbs
---	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	608.4 N	136.77 lbs ✓
---	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
-----------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
--	-------------------	---------	---------

Customer: Northwest Linings  
 PO: C-4083 Kekaha LF  
 Destination: CPU, (HI)

Date: 1/12/2010  
 Signature: *[Handwritten Signature]*  
 Quality Control Department

6010micFRM  
 REV 03  
 11/2/05



# quality certificate

ROLL # **802240-10**

Lot #: **7291454**

Liner Type: **MICROSPIKE™ HDPE**

Measurement	METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN: 1.46 mm	57 ✓ mil	Length.....	125 m	410.1 feet
	MAX: 1.50 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 32 ✓ mil	AVE: 1.48 mm	58 ✓ mil	OIT(Standard) ASTM D3895 minutes: 205 ✓		
ODD #: TOP EVEN #: BOTTOM	<b>TEST RESULTS</b>				

Specific Gravity ASTM D792	Density	g/cc	.944 ✓
----------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.29 ✓
---------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	148 ppi ✓	2,548 psi
	Average Strength @ Break	33 N/mm	188 ppi ✓	3,219 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.78 ✓
	Average Elongation @ Break	%	506.5 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31
---	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	222.5 N	50.029 lbs ✓
--	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	407.0 N	91.507 lbs
---	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	608.4 N	136.77 lbs ✓
---	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
-----------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
--	-------------------	---------	---------

Customer: Northwest Linings  
 PO: C-4083 Kekaha LF  
 Destination CPU, (HI)

Date: 1/12/2010  
 Signature: *[Handwritten Signature]*  
 Quality Control Department

0040mm Form  
 REV 03  
 12/2009



# quality certificate

ROLL # **802341-10** Lot #: **7291454** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5984	MIN:	1.43 mm	56 ✓ mil	Length.....	125 m	410.1 feet
(Modified)	MAX:	1.59 mm	63 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12:	35 ✓ mil	AVE:	1.48 mm	58 ✓ mil	OIT(Standard) ASTM D3895 minutes <b>205 ✓</b>	
ODD #: TOP	EVEN #: BOTTOM	<b>TEST RESULTS</b>				

Specific Gravity ASTM D792	Density	g/cc	<b>.944 ✓</b>
-------------------------------	---------	------	---------------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	<b>.23</b>
---	-------------------------------	----------	------------

Carbon Black Content ASTM D4218	Range	%	<b>2.29 ✓</b>
------------------------------------	-------	---	---------------

Carbon Black Dispersion ASTM D5596	Category		<b>10 IN CAT 1 ✓</b>
---------------------------------------	----------	--	----------------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	148 ppi ✓	2,548 psi
	Average Strength @ Break	33 N/mm	188 ppi ✓	3,219 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	<b>16.78 ✓</b>
	Average Elongation @ Break	%	<b>506.5 ✓</b>

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	<b>-0.31</b>
--	----------------------------	---	--------------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	222.5 N	<b>50.029 lbs ✓</b>
---	-------------------------	---------	---------------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	407.0 N	<b>91.507 lbs</b>
--	------	---------	-------------------

Puncture Resistance ASTM D4833 (Modified)	Load	608.4 N	<b>136.77 lbs ✓</b>
--	------	---------	---------------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	<b>CERTIFIED</b>
--------------------	--------------------------	----------	------------------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	<b>ONGOING</b>
---	-------------------	---------	----------------

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination: **CPU, (HI)**

Date: **1/12/2010**  
 Signature: *[Signature]*  
 Quality Control Department

60RDmic.FRM  
 REV 03  
 12/2005





# quality certificate

ROLL # **802342-10** Lot #: **7291454** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.43 mm	56 ✓ mil	Length.....	125 m	410.1 feet
	MAX:	1.49 mm	59 ✓ mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: <b>33</b> mil	AVE:	1.46 mm	57 ✓ mil	<b>TEST RESULTS</b>		
ODD #: TOP EVEN #: BOTTOM						
				OIT(Standard) ASTM D3895 minutes	205 ✓	

Specific Gravity ASTM D792	Density	g/cc	.943 ✓
-------------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
--	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.20 ✓
------------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
---------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	25 N/mm	144 ppi ✓	2,506 psi
	Average Strength @ Break	31 N/mm	180 ppi ✓	3,123 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	15.77 ✓
	Average Elongation @ Break	%	491.7 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31
--	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	219.1 N	✓ 49.268 lbs
---	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	411.6 N	92.544 lbs
--	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	603.4 N	✓ 135.65 lbs
--	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
--------------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
---	-------------------	---------	---------

Customer: Northwest Linings  
PO: C-4083 Kekaha LF  
Destination CPU, (HI)

Date: 1/13/2010  
Signature: *[Handwritten Signature]*  
Quality Control Department

SDHQmm FDM  
REV 03  
12/2005



# quality certificate

ROLL # **802343-10** Lot # **7291454** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.45 mm	57 / mil	Length.....	125 m	410.1 feet
	MAX:	1.51 mm	59 / mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: <b>33</b> ✓ mil	AVE:	1.47 mm	58 / mil	<b>TEST RESULTS</b>		
ODD #: TOP: EVEN #: BOTTOM						

OIT(Standard) ASTM D3895 minutes **205** ✓

Specific Gravity ASTM D792	Density	g/cc	<b>.943</b> ✓	
MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	<b>.23</b>	
Carbon Black Content ASTM D4218	Range	%	<b>2.20</b> ✓	
Carbon Black Dispersion ASTM D5596	Category		<b>10 IN CAT 1</b> ✓	
Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	25 N/mm	145 ppi ✓	2,506 psi
	Average Strength @ Break	32 N/mm	181 ppi ✓	3,123 psi
Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	<b>15.77</b> ✓	
	Average Elongation @ Break	%	<b>491.7</b> ✓	
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	<b>-0.31</b>	
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	219.1 N	<b>49.268</b> lbs ✓	
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	411.6 N	<b>92.544</b> lbs	
Puncture Resistance ASTM D4833 (Modified)	Load	603.4 N	<b>135.65</b> lbs ✓	
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	<b>CERTIFIED</b>	
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	<b>ONGOING</b>	

Customer: **Northwest Linings**  
PO: **C-4083 Kekaha LF**  
Destination: **CPU, (HI)**

Date: **1/13/2010**  
Signature: *[Handwritten Signature]*  
Quality Control Department

601Dmic,FKM  
REV 03  
12/23/05



# quality certificate

ROLL # **802344-10**

Lot #: **7291454**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.44 mm	57 ✓ mil	Length.....	125 m	410.1 feet
(Modified)	MAX:	1.50 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 30 ✓ mil	AVE:	1.47 mm	58 ✓ mil			
ODD #: TOP EVEN #: BOTTOM				Off(Standard) ASTM D3895 minutes	205 ✓	<b>TEST RESULTS</b>

Specific Gravity ASTM D792	Density	g/cc	.943 ✓
-------------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.20 ✓
------------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
---------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	25 N/mm	145 ppi ✓	2,506 psi
	Average Strength @ Break	32 N/mm	181 ppi ✓	3,123 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	15.77 ✓
	Average Elongation @ Break	%	491.7 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31
--	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	219.1 N	✓ 49.268 lbs
---	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	411.6 N	92.544 lbs
--	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	603.4 N	✓ 135.65 lbs
--	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
--------------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
---	-------------------	---------	---------

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination: **CPU, (HI)**

Date: **1/13/2010**  
 Signature: *[Handwritten Signature]*  
 Quality Control Department

©2006 AGRU  
 REV 03  
 12/2005



# quality certificate

ROLL # **802345-10** Lot # **7291454** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.45 mm	57 ✓ mil	Length.....	125 m	410.1 feet
	MAX:	1.50 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: <b>36</b> ✓ mil	AVE:	1.48 mm	58 ✓ mil	OIT(Standard) ASTM D3895 minutes <b>205</b> / <b>TEST RESULTS</b>		
ODD # : TOP	EVEN # : BOTTOM					

Specific Gravity ASTM D792	Density	g/cc	<b>.943</b> ✓
-------------------------------	---------	------	---------------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	<b>.23</b>
---	-------------------------------	----------	------------

Carbon Black Content ASTM D4218	Range	%	<b>2.20</b> ✓
------------------------------------	-------	---	---------------

Carbon Black Dispersion ASTM D5596	Category		<b>10 IN CAT 1</b> ✓
---------------------------------------	----------	--	----------------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	<b>26 N/mm</b>	<b>146 ppi</b> ✓	<b>2,506</b> psi
	Average Strength @ Break	<b>32 N/mm</b>	<b>182 ppi</b> ✓	<b>3,123</b> psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	<b>15.77</b> ✓
	Average Elongation @ Break	%	<b>491.7</b> ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	<b>-0.31</b>
--	----------------------------	---	--------------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	<b>219.1 N</b>	✓	<b>49.268</b> lbs
---	-------------------------	----------------	---	-------------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	<b>411.6 N</b>		<b>92.544</b> lbs
--	------	----------------	--	-------------------

Puncture Resistance ASTM D4833 (Modified)	Load	<b>603.4 N</b>	✓	<b>135.65</b> lbs
--	------	----------------	---	-------------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs		<b>CERTIFIED</b>
--------------------	--------------------------	----------	--	------------------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs		<b>ONGOING</b>
---	-------------------	---------	--	----------------

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination: **CPU, (HI)**

Date: **1/13/2010**  
 Signature: *[Handwritten Signature]*  
 Quality Control Department

60HDmic.FRM  
 REV 03  
 12/23/05



# quality certificate

ROLL # **802346-10**

Lot #: **7291454**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.41 mm	56 mil	Length.....	125 m	410.1 feet
(Modified)	MAX:	1.50 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12:	32 mil	AVE:	1.47 mm	58 mil		
ODD #: TOP	EVEN #: BOTTOM			OIT(Standard) ASTM D3895	minutes	205 ✓

**TEST RESULTS**

Specific Gravity ASTM D792	Density	g/cc	.943 ✓
MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
Carbon Black Content ASTM D4218	Range	%	2.20 ✓
Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	25 N/mm	145 ppi ✓ 2,506 psi
	Average Strength @ Break	32 N/mm	181 ppi ✓ 3,123 psi
Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lb = 2.0" Break	Average Elongation @ Yield	%	15.77 ✓
	Average Elongation @ Break	%	491.7 ✓
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	219.1 N	✓ 49,268 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	411.6 N	92.544 lbs
Puncture Resistance ASTM D4833 (Modified)	Load	603.4 N	✓ 135.65 lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination: **CPU, (HI)**

Date: **1/13/2010**  
 Signature: *[Handwritten Signature]*  
 Quality Control Department

6190mic.FRM  
 REV 03  
 1/23/05



# quality certificate

ROLL # **802347-10** Lot #: **7291454** Liner Type: **MICROSPIKE™ HDPE**

Measurement ASTM D5994 (Modified)		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
	MIN:	1.46 mm	57 ✓ mil	Length.....	125 m	410.1 feet
	MAX:	1.52 mm	60 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12:	31 ✓ mil	AVE:	1.48 mm	58 ✓ mil	OIT(Standard) ASTM D3895 minutes 205 ✓	
ODD #: TOP EVEN #: BOTTOM		<b>TEST RESULTS</b>				

Specific Gravity ASTM D792	Density	g/cc	.943 ✓	
MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23	
Carbon Black Content ASTM D4218	Range	%	2.30 ✓	
Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓	
Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	25 N/mm	141 ppi ✓	2,425 psi
	Average Strength @ Break	33 N/mm	189 ppi ✓	3,247 psi
Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	17.02 ✓	
	Average Elongation @ Break	%	527.8 ✓	
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31	
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	219.1 N	✓ 49.268 lbs	
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	411.6 N	92.544 lbs	
Puncture Resistance ASTM D4833 (Modified)	Load	603.4 N	✓ 135.65 lbs	
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED	
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING	

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination **CPU, (HI)**

Date: **1/13/2010**  
 Signature: *[Handwritten Signature]*  
 Quality Control Department

50HDmic.FRM  
 REV 03  
 12/23/05



# quality certificate

ROLL # **802348-10** Lot #: **7291454** Liner Type: **MICROSPIKE™ HDPE**

Measurement	METRIC	ENGLISH	Thickness	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN: 1.40 mm	55 ✓ mil	Length	125 m	410.1 feet
	MAX: 1.48 mm	58 ✓ mil	Width	7.00 m	23.0 feet
Asperity GRI GM12 (Modified)	AVE: 1.44 mm	57 ✓ mil	O/T (Standard) ASTM D3895 minutes <b>205 ✓</b>		

**TEST RESULTS**

Specific Gravity ASTM D792	Density	g/cc	.943 ✓
----------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.30 ✓
---------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	24 N/mm	137 ppi ✓	2,425 psi
	Average Strength @ Break	32 N/mm	184 ppi ✓	3,247 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	17.02 ✓
	Average Elongation @ Break	%	527.8 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31
---	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	219.1 N	✓	49.268 lbs
--	-------------------------	---------	---	------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	411.6 N		92.544 lbs
---	------	---------	--	------------

Puncture Resistance ASTM D4833 (Modified)	Load	603.4 N	✓	135.65 lbs
---	------	---------	---	------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs		CERTIFIED
-----------------	--------------------------	----------	--	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs		ONGOING
--	-------------------	---------	--	---------

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination: **CPU, (HI)**

Date: **1/13/2010**  
 Signature: *[Handwritten Signature]*  
 Quality Control Department

REV 02  
12/2009



# quality certificate

ROLL # **802349-10** Lot # **7291454** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	80 mil
ASTM D5994 (Modified)	MIN:	1.41 mm	56 ✓ mil	Length.....	125 m	410.1 feet
	MAX:	1.52 mm	60 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 32 ✓ mil	AVE:	1.47 mm	58 ✓ mil	<b>TEST RESULTS</b>		
ODD #: TOP EVEN #: BOTTOM				OIT(Standard) ASTM D3895 minutes	205 ✓	

Specific Gravity ASTM D792	Density	g/cc	.943 ✓
----------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.30 ✓
---------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	25 N/mm	140 ppi ✓	2,425 psi
	Average Strength @ Break	33 N/mm	188 ppi ✓	3,247 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	17.02 ✓
	Average Elongation @ Break	%	527.8 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31
---	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	219.1 N	✓	49.268 lbs
--	-------------------------	---------	---	------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	411.6 N		92.544 lbs
---	------	---------	--	------------

Puncture Resistance ASTM D4833 (Modified)	Load	603.4 N	✓	135.65 lbs
---	------	---------	---	------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs		CERTIFIED
-----------------	--------------------------	----------	--	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs		ONGOING
--	-------------------	---------	--	---------

Customer: Northwest Linings  
 PO: C-4083 Kekaha LF  
 Destination CPU, (HI)

Date: 1/13/2010  
 Signature: *[Handwritten Signature]*  
 Quality Control Department

E04Dmic.FRM  
 REV 03  
 12/23/05





# quality certificate

ROLL # **802350-10** Lot # **7291454** Liner Type: **MICROSPIKE™ HDPE**

Measurement	METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN: 1.40 mm	55 ✓ mil	Length.....	125 m	410.1 feet
	MAX: 1.50 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 30 ✓ mil	AVE: 1.46 mm	57 ✓ mil	OIT(Standard) ASTM D3895 minutes 205 ✓		
ODD #: TOP	EVEN #: BOTTOM	<b>TEST RESULTS</b>			

Specific Gravity ASTM D792	Density	g/cc	.943 ✓	
MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23	
Carbon Black Content ASTM D4218	Range	%	2.30 ✓	
Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓	
Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	24 N/mm	139 ppi ✓	2,425 psi
	Average Strength @ Break	33 N/mm	187 ppi ✓	3,247 psi
Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	17.02 ✓	
	Average Elongation @ Break	%	527.8 ✓	
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31	
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	219.1 N	✓ 49.268 lbs	
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	411.6 N	92.544 lbs	
Puncture Resistance ASTM D4833 (Modified)	Load	603.4 N	✓ 135.65 lbs	
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED	
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING	

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination: **CPU, (HI)**

Date: **1/13/2010**  
 Signature: *[Handwritten Signature]*  
 Quality Control Department

80HDmc.FRM  
 REV 03  
 02/2005



# quality certificate

ROLL # **802351-10** Lot #: **7291454** Liner Type: **MICROSPIKE™ HDPE**

Measurement ASTM D5994 (Modified)		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
	MIN:	1.43 mm	56 ✓ mil	Length.....	125 m	410.1 feet
	MAX:	1.54 mm	61 mil	Width.....	7.00 in	23.0 feet
Asperity GRI GM12- ODD # TOP EVEN # BOTTOM	31 ✓	AVE:	1.49 mm	59 ✓ mil	GIT(Standard) ASTM D3895 minutes 205 ✓	

**TEST RESULTS**

Specific Gravity ASTM D792	Density	g/cc	.943 ✓
MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
Carbon Black Content ASTM D4218	Range	%	2.30 ✓
Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	25 N/mm	142 ppi ✓ 2,425 psi
	Average Strength @ Break	33 N/mm	190 ppi ✓ 3,247 psi
Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	17.02 ✓
	Average Elongation @ Break	%	527.8 ✓
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	219.1 N	✓ 49.268 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	411.6 N	92.544 lbs
Puncture Resistance ASTM D4833 (Modified)	Load	603.4 N	✓ 135.65 lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination: **CPU, (HI)**

Date: **1/13/2010**  
 Signature: *[Handwritten Signature]*  
 Quality Control Department  
 60HDmic FRM  
 REV 03  
 12/23/05



# quality certificate

ROLL # **802352-10**

Lot #: **7291454**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.42 mm	56 mil	Length.....	125 m	410.1 feet
(Modified)				Width.....	7.00 m	23.0 feet
	MAX:	1.48 mm	58 mil			
Asperity GRI GM12: 30 mil	AVE:	1.45 mm	57 mil			
ODD #: TOP EVEN #: BOTTOM				OIT(Standard) ASTM D3895 minutes	205	TEST RESULTS

Specific Gravity ASTM D792	Density	g/cc	.943	✓
MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23	
Carbon Black Content ASTM D4218	Range	%	2.28	✓
Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1	✓
Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	25 N/mm	141 ppi	✓ 2,478 psi
	Average Strength @ Break	33 N/mm	186 ppi	✓ 3,255 psi
Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.45	✓
	Average Elongation @ Break	%	499.4	✓
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31	
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	201.4 N	45.281	✓ lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	414.6 N	93.205	lbs
Puncture Resistance ASTM D4833 (Modified)	Load	559.8 N	125.84	✓ lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED	
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING	

Customer: Northwest Linings  
 PO, C-4083 Kekaha LF  
 Destination CPU, (HI)

Date: 1/13/2010  
 Signature: *[Signature]*  
 Quality Control Department  
 60HDmcFRM  
 REV 03  
 10/2005



# quality certificate

ROLL # **802353-10** Lot #: **7291454** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.47 mm	58 ✓ mil	Length.....	125 m	410.1 feet
	MAX:	1.52 mm	60 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: <b>31</b> ✓ mil	AVE:	1.49 mm	59 ✓ mil	OIT(Standard) ASTM D3895 minutes <b>205</b> ✓		
ODD # : TOP EVEN # : BOTTOM	<b>TEST RESULTS</b>					

Specific Gravity ASTM D792	Density	g/cc	.943 ✓
-------------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.28 ✓
------------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category	10 IN CAT 1 ✓	
---------------------------------------	----------	---------------	--

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	25 N/mm	145 ppi ✓	2,478 psi
	Average Strength @ Break	33 N/mm	191 ppi ✓	3,255 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.45 ✓
	Average Elongation @ Break	%	499.4 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31
--	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	201.4 N	✓ 45.281 lbs
---	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	414.6 N	93.205 lbs
--	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	559.8 N	✓ 125.84 lbs
--	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
--------------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
---	-------------------	---------	---------

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination: **CPU, (HI)**

Date:..... **1/13/2010**  
 Signature: *[Signature]*  
 Quality Control Department

6040mic-FRM  
 REV 03  
 12/25/05



# quality certificate

ROLL # **802354-10** Lot # **7291454** Liner Type: **MICROSPIKE™ HDPE**

Measurement	METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN: 1.45 mm	57 ✓ mil	Length.....	125 m	410.1 feet
	MAX: 1.51 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 31 ✓ mil	AVE: 1.48 mm	58 ✓ mil	<b>TEST RESULTS</b>		
ODD # : TOP EVEN # : BOTTOM			DIT(Standard) ASTM D3895 minutes	205 ✓	

Specific Gravity ASTM D792	Density	g/cc	.943 ✓
-------------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.28 ✓
------------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
---------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	25 N/mm	144 ppi ✓	2,478 psi
	Average Strength @ Break	33 N/mm	190 ppi ✓	3,255 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.45 ✓
	Average Elongation @ Break	%	499.4 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31
--	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	201.4 N	✓	45.281 lbs
---	-------------------------	---------	---	------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	414.6 N		93.205 lbs
--	------	---------	--	------------

Puncture Resistance ASTM D4833 (Modified)	Load	559.8 N	✓	125.84 lbs
--	------	---------	---	------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs		CERTIFIED
--------------------	--------------------------	----------	--	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs		ONGOING
---	-------------------	---------	--	---------

Customer: Northwest Linings  
PO: C-4083 Kekaha LF  
Destination CPU, (HI)

Date: 1/13/2010  
Signature: *[Handwritten Signature]*  
Quality Control Department

608Jmc.FTM  
REV 02  
12/23/05



# quality certificate

ROLL # **802355-10**

Lot #: **7291454**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.46 mm	57 ✓ mil	Length.....	125 m	410.1 feet
	MAX:	1.51 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: <b>34</b> ✓ mil	AVE:	1.49 mm	59 ✓ mil	<b>TEST RESULTS</b>		
ODD #: TOP EVEN #: BOTTOM				OIT(Standard) ASTM D3895 minutes	205 ✓	

Specific Gravity ASTM D792	Density	g/cc	.943 ✓
-------------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.28 ✓
------------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
---------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	25 N/mm	145 ppi ✓	2,478 psi
	Average Strength @ Break	33 N/mm	191 ppi ✓	3,255 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.45 ✓
	Average Elongation @ Break	%	499.4 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31
--	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	201.4 N	45.281 lbs ✓
---	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	414.6 N	93.205 lbs
--	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	559.8 N	125.84 lbs ✓
--	------	---------	--------------

ESCR ASTM D1893	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
--------------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
---	-------------------	---------	---------

Customer: Northwest Linings  
 PO: C-4083 Kekaha LF  
 Destination CPU, (HI)

Date: 1/13/2010  
 Signature: *[Handwritten Signature]*  
 Quality Control Department

EDHDmic FRM  
 REV 03  
 11/23/08



# quality certificate

ROLL # **802356-10**

Lot #: **7291454**

Liner Type: **MICROSPIKE™ HDPE**

Measurement	METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN: 1.46 mm	57 ✓ mil	Length.....	125 m	410.1 feet
	MAX: 1.50 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 31 ✓ mil	AVE: 1.48 mm	58 ✓ mil	<b>TEST RESULTS</b>		
DDD #: TOP EVEN #, BOTTOM			OIT(Standard) ASTM D3895 minutes 205 ✓		

Specific Gravity ASTM D792	Density	g/cc	.943 ✓
----------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.28 ✓
---------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	25 N/mm	144 ppi ✓	2,478 psi
	Average Strength @ Break	33 N/mm	190 ppi ✓	3,255 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.45 ✓
	Average Elongation @ Break	%	499.4 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31
---	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	201.4 N	45.281 lbs ✓
--	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	414.6 N	93.205 lbs
---	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	559.8 N	125.84 lbs ✓
---	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
-----------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
--	-------------------	---------	---------

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination: **GPU, (HI)**

Date: **1/13/2010**  
 Signature: *[Signature]*  
 Quality Control Department  
 500 Omicron  
 REV 09  
 12/2009



# quality certificate

ROLL # **802357-10** Lot # **7291454** Liner Type: **MICROSPIKE™ HDPE**

Measurement ASTM D5994 (Modified)		METRIC	ENGLISH	Thickness.....	1.5 mm	80 mil	
	MIN:	1.47 mm	58 ✓ mil	Length.....	125 m	410.1 feet	
	MAX:	1.50 mm	59 mil	Width.....	7.00 m	23.0 feet	
Asperity GRI GM12: 31 ✓ mil	AVE:	1.48 mm	58 ✓ mil				
ODD #: TOP	EVEN #: BOTTOM					DIT(Standard) ASTM D3895 minutes	205 ✓

**TEST RESULTS**

Specific Gravity ASTM D792	Density	g/cc	.943 ✓	
MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g	g/10 min	.23	
Carbon Black Content ASTM D4218	Range	%	2.24 ✓	
Carbon Black Dispersion ASTM D5596	Category	10 IN CAT 1 ✓		
Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	147 ppi ✓	2,516 psi
	Average Strength @ Break	33 N/mm	186 ppi ✓	3,201 psi
Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	15.85 ✓	
	Average Elongation @ Break	%	521.3 ✓	
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31	
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	201.4 N	✓ 45.281 lbs	
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	414.6 N	93.205 lbs	
Puncture Resistance ASTM D4833 (Modified)	Load	559.8 N	✓ 125.84 lbs	
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED	
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING	

Customer: Northwest Linings  
PO: C-4083 Kekaha LF  
Destination CPU, (HI)

Date: 1/13/2010  
Signature: *[Handwritten Signature]*  
Quality Control Department

GOMOND PFM  
REV 03  
12/2005





# quality certificate

ROLL # **802358-10**

Lot #: **7291454**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.43 mm	56 ✓ mil	Length.....	125 m	410.1 feet
(Modified)	MAX:	1.50 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12	AVE:	1.47 mm	58 ✓ mil			
33 ✓ mil						
DDO #: TOP EVEN #: BOTTOM				OIT(Standard) ASTM D3895 minutes	205 ✓	TEST RESULTS

Specific Gravity ASTM D792	Density	g/cc	.943 ✓
MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
Carbon Black Content ASTM D4218	Range	%	2.24 ✓
Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	146 ppi ✓ 2,516 psi
	Average Strength @ Break	32 N/mm	185 ppi ✓ 3,201 psi
Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	15.85 ✓
	Average Elongation @ Break	%	521.3 ✓
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	201.4 N	✓ 45.281 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	414.6 N	93.205 lbs
Puncture Resistance ASTM D4833 (Modified)	Load	559.8 N	✓ 125.84 lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING

Customer: **Northwest Linings**  
 PO: **C-4083 Kekaha LF**  
 Destination: **CPU, (HI)**

Date: **1/13/2010**  
 Signature: *[Handwritten Signature]*  
 Quality Control Department

0010micFRM  
 REV 03  
 12/23/05



# quality certificate

ROLL # **802359-10** Lot # **7291454** Liner Type: **MICROSPIKE™ HDPE**

Measurement ASTM D5994 (Modified)		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
	MIN:	1.45 mm	57 ✓ mil	Length.....	125 m	410.1 feet
	MAX:	1.50 mm	59 ✓ mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 33 ✓ (mil)	AVE:	1.47 mm	58 ✓ mil	<b>TEST RESULTS</b>		
ODD #: TOP EVEN #: BOTTOM						
				DIT(Standard) ASTM D3695 minutes	205 ✓	

Specific Gravity ASTM D792	Density	g/cc	.943 ✓
-------------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.24 ✓
------------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
---------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	146 ppi ✓	2,516 psi
	Average Strength @ Break	32 N/mm	185 ppi ✓	3,201 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	15.85 ✓
	Average Elongation @ Break	%	521.3 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31
--	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	201.4 N	45.281 lbs ✓
---	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	414.6 N	93.205 lbs
--	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	559.8 N	125.84 lbs ✓
--	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
--------------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
---	-------------------	---------	---------

Customer: Northwest Linings  
PO: C-4083 Kekaha LF  
Destination CPU, (HI)

Date: 1/13/2010  
Signature: *[Handwritten Signature]*  
Quality Control Department

60HDmic.FRM  
REV 03  
12/23/05



# quality certificate

ROLL # **802360-10**

Lot #: **7291454**

Liner Type: **MICROSPIKE™ HDPE**

Measurement  
ASTM D5994  
(Modified)

	METRIC	ENGLISH
MIN:	1.43 mm	56 ✓ mil
MAX:	1.49 mm	59 mil
AVE:	1.46 mm	57 ✓ mil

Thickness.....	1.5 mm	60 mil
Length.....	125 m	410.1 feet
Width.....	7.00 m	23.0 feet

Asperity GR1 GM12- 33 ✓ mil  
ODD # : TOP EVEN # : BOTTOM

DIT(Standard) ASTM D3895 minutes 205 ✓ **TEST RESULTS**

Specific Gravity  
ASTM D792

Density

g/cc

.943 ✓

MFI ASTM D1238

COND. E

GRADE: **K307**

Melt Flow Index 190°C /2160 g

g/10 min

.23

Carbon Black Content  
ASTM D4218

Range

%

2.24 ✓

Carbon Black Dispersion  
ASTM D5596

Category

10 IN CAT 1 ✓

Tensile Strength

ASTM D6693

ASTM D638 (Modified)

( 2 inches / minute )

Average Strength @ Yield

25 N/mm

145 ppi ✓

2,516 psi

Average Strength @ Break

32 N/mm

184 ppi ✓

3,201 psi

Elongation ASTM D6693

ASTM D638 (Modified)

( 2 inches / minute )

Lo = 1.3" Yield

Lo = 2.0" Break

Average Elongation @ Yield

%

15.85 ✓

Average Elongation @ Break

%

521.3 ✓

Dimensional Stability

ASTM D1204 (Modified)

Average Dimensional change

%

-0.31

Tear Resistance

ASTM D-1004 (Modified)

Average Tear Resistance

201.4 N

✓

45.281 lbs

Puncture Resistance

FTMS 101 Method 2065 (Modified)

Load

414.6 N

93.205 lbs

Puncture Resistance

ASTM D4833 (Modified)

Load

559.8 N

✓

125.84 lbs

ESCR

ASTM D1693

Minimum Hrs w/o Failures

1500 hrs

CERTIFIED

Notched Constant Tensile Load

ASTM D5397

pass / fail @ 30%

300 hrs

ONGOING

Customer: Northwest Linings  
PO: C-4083 Kekaha LF  
Destination CPU, (HI)

Date: 1/13/2010

Signature: *[Handwritten Signature]*  
Quality Control Department

6510mcj RM  
REV 03  
12/2005



# quality certificate

ROLL # **802461-10** Lot #: **7291454** Liner Type: **MICROSPIKE™ HDPE**

Measurement	METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN: 1.43 mm	56 ✓ mil	Length.....	125 m	410.1 feet
	MAX: 1.51 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 33 ✓ mil	AVE: 1.47 mm	58 ✓ mil	TEST RESULTS		
ODD # TOP EVEN # BOTTOM			OIT(Standard) ASTM D3895 minutes	205 ✓	

Specific Gravity ASTM D792	Density	g/cc	.943 ✓
-------------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g	g/10 min	.23
--	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.24 ✓
------------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
---------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	146 ppi ✓	2,516 psi
	Average Strength @ Break	32 N/mm	185 ppi ✓	3,201 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	15.85 ✓
	Average Elongation @ Break	%	521.3 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31
--	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	201.4 N	✓ 45.281 lbs
---	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	414.6 N	93.205 lbs
--	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	559.8 N	✓ 125.84 lbs
--	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
--------------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
---	-------------------	---------	---------

Customer: Northwest Linings  
PO: C-4083 Kekaha LF  
Destination: CPU, (HI)

Date: 1/13/2010  
Signature: *[Handwritten Signature]*  
Quality Control Department  
SHEETAL FRM  
REV 02  
12/24/09



# quality certificate

ROLL # **802462-10** Lot #: **7291454** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.45 mm	57 ✓ mil	Length.....	125 m	410.1 feet
(Modified)	MAX:	1.52 mm	60 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12:	33 ✓ mil	AVE:	1.47 mm	58 ✓ mil	OIT(Standard) ASTM D3895 minutes: 205 ✓	
QDD # - TOP, EVEN & BOTTOM					<b>TEST RESULTS</b>	

Specific Gravity ASTM D792	Density	g/cc		.945 ✓
MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min		.23
Carbon Black Content ASTM D4218	Range	%		2.22 ✓
Carbon Black Dispersion ASTM D5596	Category			10 IN CAT 1 ✓
Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	147 psi ✓	2,536 psi
	Average Strength @ Break	32 N/mm	181 psi ✓	3,128 psi
Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%		15.29 ✓
	Average Elongation @ Break	%		490.1 ✓
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%		-0.31
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	223.6 N		50.261 lbs ✓
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	405.3 N		91.120 lbs
Puncture Resistance ASTM D4833 (Modified)	Load	582.9 N		131.05 lbs ✓
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs		CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs		ONGOING

Customer: Northwest Linings  
PO: C-4083 Kekaha LF  
Destination CPU, (HI)

Date: 1/18/2010  
Signature: *[Signature]*  
Quality Control Department

0010rev.FIRM  
REV 03  
12/20/05



# quality certificate

ROLL # **802463-10** Lot #: **7291454** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.42 mm	56 mil	Length.....	125 m	410.1 feet
	MAX:	1.51 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 34 mil	AVE:	1.47 mm	58 mil			
OOD# TOP EVEN# BOTTOM				OIT(Standard) ASTM D3895 minutes	205	TEST RESULTS

Specific Gravity ASTM D792	Density	g/cc	.945 ✓
----------------------------	---------	------	--------

MFI ASTM D1238 COND E GRADE: K307	Melt Flow Index 190°C /2160 g	g/10 min	.23
-----------------------------------	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.22 ✓
---------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	26 N/mm	147 psi ✓	2,536 psi
	Average Strength @ Break	32 N/mm	181 psi ✓	3,128 psi

Elongation ASTM D5693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	15.29 ✓
	Average Elongation @ Break	%	490.1 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31
---	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	223.6 N	✓ 50.261 lbs
--	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	405.3 N	91.120 lbs
---	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	582.9 N	✓ 131.05 lbs
---	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
-----------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
--	-------------------	---------	---------

Customer: Northwest Linings  
 PO: C-4083 Kekaha LF  
 Destination CPU, (HI)

Date: 1/18/2010  
 Signature: *[Signature]*  
 Quality Control Department

99/000/11M  
 00/03  
 12/2005



# quality certificate

ROLL # **802464-10** Lot #: **7291454** Liner Type: **MICROSPIKE™ HDPE**

Measurement	METRIC	ENGLISH	Thickness	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN: 1.43 mm	56 mil	Length	125 m	410.1 feet
	MAX: 1.52 mm	60 mil	Width	7.00 m	23.0 feet
Asperity GRI GM12: <b>30</b> mil	AVE: 1.48 mm	58 mil	DIT(Standard) ASTM D3895 minutes <b>205</b> ✓		
QDD # TOP EVEN # BOTTOM	<b>TEST RESULTS</b>				

Specific Gravity ASTM D792	Density	g/cc	<b>.945</b> ✓
-------------------------------	---------	------	---------------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow index 190°C /2160 g	g/10 min	<b>.23</b>
---	-------------------------------	----------	------------

Carbon Black Content ASTM D4218	Range	%	<b>2.22</b> ✓
------------------------------------	-------	---	---------------

Carbon Black Dispersion ASTM D5596	Category		<b>10 IN CAT 1</b> ✓
---------------------------------------	----------	--	----------------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	148 psi ✓	2,536 psi
	Average Strength @ Break	32 N/mm	182 psi ✓	3,128 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) L <sub>y</sub> = 1.3" Yield L <sub>b</sub> = 2.0" Break	Average Elongation @ Yield	%	<b>15.29</b> ✓
	Average Elongation @ Break	%	<b>490.1</b> ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	<b>-0.31</b>
--	----------------------------	---	--------------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	223.6 N	✓ 50.261 lbs
---	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	405.3 N	91.120 lbs
--	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	582.9 N	✓ 131.05 lbs
--	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	<b>CERTIFIED</b>
--------------------	--------------------------	----------	------------------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	<b>ONGOING</b>
---	-------------------	---------	----------------

Customer: **Northwest Linings**  
PO: **C-4083 Kekaha LF**  
Destination: **CPU, (HI)**

Date: **1/18/2010**  
Signature: *[Signature]*  
Quality Control Department  
REV 03 12/2009



# quality certificate

ROLL # **802465-10** Lot # **7291454** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN	1.43 mm	56 ✓ mil	Length.....	125 m	410.1 feet
	MAX	1.52 mm	60 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12- ODD # TOP EVEN # BOTTOM	33 ✓ mil	AVE: 1.48 mm	58 ✓ mil	OIT(Standard) ASTM D3695 (minutes) 205 ✓		

**TEST RESULTS**

Specific Gravity ASTM D792	Density	g/cc	.945 ✓
MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
Carbon Black Content ASTM D4218	Range	%	2.28 ✓
Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	28 N/mm	148 ppi ✓ 2,536 psi
	Average Strength @ Break	32 N/mm	182 ppi ✓ 3,128 psi
Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	15.28 ✓
	Average Elongation @ Break	%	490.1 ✓
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	223.6 N	✓ 50.261 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	405.3 N	91.120 lbs
Puncture Resistance ASTM D4833 (Modified)	Load	582.9 N	✓ 131.05 lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	100 hrs	ONGOING

Customer: Northwest Linings  
PO C-4083 Kekaha LF  
Destination CPU, (HI)

Date: 1/18/2010  
Signature: *[Handwritten Signature]*  
Quality Control Department  
AGRU Quality Control Dept  
1/18/2010





# quality certificate

ROLL # **802466-10** Lot # **7291454** Liner Type: **MICROSPIKE™ HDPE**

Measurement	METRIC	ENGLISH	Thickness	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN: 1.44 mm	57 mil	Length	125 m	410.1 feet
	MAX: 1.53 mm	60 mil	Width	7.00 m	23.0 feet
Asperity GRI GM12	AVE: 1.48 mm	58 mil	OIT (Standard) ASTM D3895 minutes: 205		
ODD # TOP EVEN # BOTTOM			TEST RESULTS		

Specific Gravity ASTM D792	Density	g/cc	.945
-------------------------------	---------	------	------

MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g	g/10 min	.23
--	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.28
------------------------------------	-------	---	------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1
---------------------------------------	----------	--	-------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	148 psi	2,536 psi
	Average Strength @ Break	32 N/mm	182 psi	3,128 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	15.29
	Average Elongation @ Break	%	490.1

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31
--	----------------------------	---	-------

Tear Resistance ASTM D 1004 (Modified)	Average Tear Resistance	223.6 N	50.261 lbs
---	-------------------------	---------	------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	405.3 N	91.120 lbs
--	------	---------	------------

Puncture Resistance ASTM D4633 (Modified)	Load	582.9 N	131.05 lbs
--	------	---------	------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
--------------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
---	-------------------	---------	---------

Customer: Northwest Linings  
PO: C-4083 Kekaha LF  
Destination: CPU, (HI)

Date: 1/18/2010  
Signature: *[Handwritten Signature]*  
Quality Control Department  
REVISIONS: 03/2005



# quality certificate

ROLL # **802467-10** Lot # **7291454** Liner Type: **MICROSPIKE™ HDPE**

Measurement	MIN:	METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)		1.39 mm	55 mil ✓	Length.....	125 m	410.1 feet
	MAX:	1.54 mm	61 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12 ODD # TOP EVEN # BOTTOM	32 mil ✓	AVE	1.47 mm 58 mil ✓			

TEST RESULTS  
DIT(Standard) ASTM D3895 minutes 205 ✓

Specific Gravity ASTM D792	Density	g/cc	945 ✓
MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2180 g	g/10 min	.23
Carbon Black Content ASTM D4218	Range	%	2.26 ✓
Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	25 N/mm	143 psi ✓ 2,469 psi
	Average Strength @ Break	34 N/mm	191 psi ✓ 3,309 psi
Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.05 ✓
	Average Elongation @ Break	%	494.2 ✓
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	223.6 N	✓ 50.261 lbs.
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	405.3 N	91.120 lbs
Puncture Resistance ASTM D4833 (Modified)	Load	582.9 N	✓ 131.05 lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures	1600 hrs	CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING

Customer: Northwest Linings  
PO: C-4083 Kekaha LF  
Destination CPU, (HI)

Date: 1/18/2010

Signature: *[Handwritten Signature]*  
Quality Control Department

SPICER/PTM  
REV 02  
QMS01



# quality certificate

ROLL # **802468-10**

Lot #: **7291454**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.44 mm	57 ✓ mil	Length.....	125 m	410.1 feet
	MAX:	1.49 mm	59 mil	Width.....	7.00 m	23.0 feet
	AVE:	1.47 mm	58 ✓ mil			
Asperity GRI GM12: 32 ✓ mil						
ODD # - TOP, EVEN # - BOTTOM				OIT(Standard) ASTM D3885 minutes	205 ✓	<b>TEST RESULTS</b>

Specific Gravity ASTM D792	Density	g/cc	945 ✓
-------------------------------	---------	------	-------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index: 190°C /2160 g	g/10 min	.23
---	--------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.26 ✓
------------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
---------------------------------------	----------	--	---------------

Tensile Strength ASTM D8693 ASTM D838 (Modified) ( 2 inches / minute )	Average Strength @ Yield	25 N/mm	143 ppi ✓	2,469 psi
	Average Strength @ Break	34 N/mm	191 ppi ✓	3,309 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.05 ✓
	Average Elongation @ Break	%	494.2 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31
--	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	223.6 N	50.261 lbs ✓
---	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	405.3 N	91.120 lbs
--	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	582.9 N	131.05 lbs ✓
--	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
--------------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
---	-------------------	---------	---------

Customer: Northwest Linings  
PO: C-4083 Kekaha LF  
Destination CPU, (HI)

Date: 1/18/2010  
Signature: *[Signature]*  
Quality Control Department

QCH0002 RM  
REV 03  
11/2009



# quality certificate

ROLL # **802469-10** Lot # **7291454** Liner Type: **MICROSPIKE™ HDPE**

Measurement	MIN.	METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)		1.42 mm	56 mil	Length.....	125 m	410.1 feet
	MAX:	1.49 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12 ODD # TOP EVEN # BOTTOM	31 mil	AVE: 1.46 mm	57 mil	<b>TEST RESULTS</b>		

DIT(Standard) ASTM D3895 minutes **205** ✓

Specific Gravity ASTM D792	Density	g/cc	.945 ✓
-------------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.26 ✓
------------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
---------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	25 N/mm	142 psi ✓	2,468 psi
	Average Strength @ Break	33 N/mm	190 psi ✓	3,309 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.05 ✓
	Average Elongation @ Break	%	494.2 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31
--	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	223.6 N	✓ 50.261 lbs
---	-------------------------	---------	--------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	405.3 N	91.120 lbs
--	------	---------	------------

Puncture Resistance ASTM D4833 (Modified)	Load	582.9 N	✓ 131.05 lbs
--	------	---------	--------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
--------------------	--------------------------	----------	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
---	-------------------	---------	---------

Customer: Northwest Linings  
PO: C-4083 Kekaha LF  
Destination: CPU, (HI)

Date: 1/18/2010  
Signature: *[Handwritten Signature]*  
Quality Control Department

48-DW-TRM  
REV 03  
12/2008



# quality certificate

ROLL # **802470-10** Lot #: **7291454** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH		Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.42 mm	56 ✓ mil		Length.....	125 m	410.1 feet
	MAX:	1.52 mm	60 mil		Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 33 ✓ mil	AVE:	1.47 mm	58 ✓ mil				
ODD #: TOP # EVEN # BOTTOM					Off(Standard) ASTM D3895 minutes	205 ✓	<b>TEST RESULTS</b>

Specific Gravity ASTM D792	Density	g/cc.	<b>.945 ✓</b>
-------------------------------	---------	-------	---------------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	<b>.23</b>
---	-------------------------------	----------	------------

Carbon Black Content ASTM D4218	Range	%	<b>2.26 ✓</b>
------------------------------------	-------	---	---------------

Carbon Black Dispersion ASTM D5596	Category		<b>10 IN CAT 1 ✓</b>
---------------------------------------	----------	--	----------------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	25 N/mm	143 ppi ✓	2,469 psi
	Average Strength @ Break	34 N/mm	191 ppi ✓	3,309 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	<b>16.05 ✓</b>
	Average Elongation @ Break	%	<b>494.2 ✓</b>

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	<b>-0.31</b>
--	----------------------------	---	--------------

Tear Resistance ASTM D1004 (Modified)	Average Tear Resistance	223.8 N	<b>50.261 lbs ✓</b>
--	-------------------------	---------	---------------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	405.3 N	<b>91.120 lbs</b>
--	------	---------	-------------------

Puncture Resistance ASTM D4833 (Modified)	Load	582.9 N	<b>131.05 lbs ✓</b>
--	------	---------	---------------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	<b>CERTIFIED</b>
--------------------	--------------------------	----------	------------------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	<b>ONGOING</b>
---	-------------------	---------	----------------

Customer: Northwest Linings  
PO: C-4083 Kekaha LF  
Destination GPU, (HI)

Date: 1/18/2010  
Signature: *[Handwritten Signature]*  
Quality Control Department

001010-01-01  
REV 02  
12/28/05



# quality certificate

ROLL # **802471-10** Lot # **7291454** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil	
ASTM D5994 (Modified)	MIN:	1.41 mm	56 ✓ mil	Length.....	125 m	410.1 feet	
	MAX:	1.49 mm	59 mil	Width.....	7.00 in	23.0 feet	
Asperity GRI GM12	32 ✓ mil	AVE:	1.44 mm	57 ✓ mil			
ODD # : TOP	EVEN # : BOTTOM					OIT(Standard) ASTM D3895 minutes	205 ✓

## TEST RESULTS

Specific Gravity ASTM D792	Density	g/cc	.945 ✓
MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g	g/10 min	.23
Carbon Black Content ASTM D4218	Range	%	2.26 ✓
Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	25 N/mm	140 psi ✓
	Average Strength @ Break	33 N/mm	188 psi ✓
Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.05 ✓
	Average Elongation @ Break	%	484.2 ✓
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	223.6 N	✓ 50.261 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	405.3 N	91.120 lbs
Puncture Resistance ASTM D4833 (Modified)	Load	582.9 N	✓ 131.05 lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING

Customer: Northwest Linings  
PO: C-4083 Kekaha LE  
Destination CPU, (HI)

Date: 1/18/2010

Signature: *[Handwritten Signature]*  
Quality Control Department

REVISED 11/18/10  
10/1/10  
1/18/2010



# quality certificate

ROLL # **802472-10** Lot #: **7291454** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.41 mm	56 ✓ mil	Length.....	125 m	410.1 feet
	MAX:	1.50 mm	59 mil	Width.....	7.00 m	23.0 feet
	AVE:	1.47 mm	58 ✓ mil			
Aspenty GRI GM12: ODD #   TOP   EVEN #   BOTTOM	31 ✓ mil			OT(Standard) ASTM D3895 minutes	205 ✓	TEST RESULTS

Specific Gravity ASTM D792	Density	g/cc	.944 ✓
-------------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.30 ✓
------------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
---------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	25 N/mm	145 psi ✓	2,513 psi
	Average Strength @ Break	32 N/mm	182 psi ✓	3,153 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.36 ✓
	Average Elongation @ Break	%	501.1 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31
--	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	220.6 N	✓	49.589 lbs
---	-------------------------	---------	---	------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	414.3 N		93.147 lbs
--	------	---------	--	------------

Puncture Resistance ASTM D4833 (Modified)	Load	491.2 N	✓	110.43 lbs
--	------	---------	---	------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs		CERTIFIED
--------------------	--------------------------	----------	--	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs		ONGOING
---	-------------------	---------	--	---------

Customer: Northwest Linings  
 PO: C-4083 Kekaha LF  
 Destination: CPU, (HI)

Date: 1/18/2010  
 Signature: *[Signature]*  
 Quality Control Department

001-Draw.FRM  
 REV 00  
 11/06/08



# quality certificate

ROLL # **802473-10** Lot # **7291454** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.41 mm	56 ✓ mil	Length.....	125 m	410.1 feet
	MAX:	1.49 mm	59 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12: 34 ✓ mil	AVE:	1.45 mm	57 ✓ mil	<b>TEST RESULTS</b>		
ODD # TOP EVEN # BOTTOM				OIT(Standard) ASTM D3895 minutes	205 ✓	

Specific Gravity ASTM D792	Density	g/cc	.944 ✓
-------------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE K307	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.30 ✓
------------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
---------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	25 N/mm	143 ppi ✓	2,513 psi
	Average Strength @ Break	32 N/mm	186 ppi ✓	3,153 psi

Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.36 ✓
	Average Elongation @ Break	%	501.1 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31
--	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	220.6 N	✓	49,589 lbs
---	-------------------------	---------	---	------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	414.3 N		93,147 lbs
--	------	---------	--	------------

Puncture Resistance ASTM D4833 (Modified)	Load	491.2 N	✓	110.43 lbs
--	------	---------	---	------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs		CERTIFIED
--------------------	--------------------------	----------	--	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs		ONGOING
---	-------------------	---------	--	---------

Customer: Northwest Linings  
PO: C-4083 Kekaha LF  
Destination CPU, (HI)

Date: 1/18/2010  
Signature: *JH Palmer*  
Quality Control Department

QCC/DMC/7/04  
REV 00  
10/23/05





# quality certificate

ROLL # **802474-10** Lot #: **7291454** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.47 mm	58 ✓ mil	Length.....	125 m	410.1 feet
	MAX:	1.54 mm	61 mil	Width.....	7.00 m	23.0 feet
Asperity GRI GM12-29 ✓ mil	AVE:	1.49 mm	59 ✓ mil			
QDD # TOP EVEN # BOTTOM				OT(Standard) ASTM D3595 minutes	205 ✓	TEST RESULTS

Specific Gravity ASTM D792	Density	g/cc	.944 ✓
----------------------------	---------	------	--------

MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23
---	-------------------------------	----------	-----

Carbon Black Content ASTM D4218	Range	%	2.30 ✓
---------------------------------	-------	---	--------

Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓
------------------------------------	----------	--	---------------

Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	26 N/mm	147 psi ✓	2,513 psi
	Average Strength @ Break	32 N/mm	185 psi ✓	3,153 psi

Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.36 ✓
	Average Elongation @ Break	%	501.1 ✓

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31
---	----------------------------	---	-------

Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	220.6 N	✓	49.589 lbs
--	-------------------------	---------	---	------------

Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	414.3 N		93.147 lbs
---	------	---------	--	------------

Puncture Resistance ASTM D4833 (Modified)	Load	491.2 N	/	110.43 lbs
---	------	---------	---	------------

ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs		CERTIFIED
-----------------	--------------------------	----------	--	-----------

Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs		ONGOING
--	-------------------	---------	--	---------

Customer: Northwest Linings  
 PO: C-4083 Kekaha LF  
 Destination CPU, (HI)

Date: 1/18/2010  
 Signature: *[Handwritten Signature]*  
 Quality Control Department

Standard Form  
 REV 03  
 1/15/09



# quality certificate

ROLL # **802475-10** Lot #: **7291454** Liner Type: **MICROSPIKE™ HDPE**

Measurement	METRIC	ENGLISH	Thickness	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN: 1.46 mm	57 ✓ mil	Length	125 m	410.1 feet
	MAX: 1.50 mm	59 mil	Width	7.00 m	23.0 feet
Asperity GRI GM12: 34 ✓ mil	AVE: 1.48 mm	58 ✓ mil	DIT(Standard) ASTM D3895 minutes 205 ✓		

**TEST RESULTS**

Specific Gravity ASTM D792	Density	g/cc	.944 ✓	
MFI ASTM D1238 COND. E GRADE: <b>K307</b>	Melt Flow Index 190°C /2160 g	g/10 min	.23	
Carbon Black Content ASTM D4218	Range	%	2.30 ✓	
Carbon Black Dispersion ASTM D5596	Category		10 IN CAT 1 ✓	
Tensile Strength ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute )	Average Strength @ Yield	26 N/mm	146 ppl ✓	2,513 psi
	Average Strength @ Break	32 N/mm	184 ppl ✓	3,153 psi
Elongation ASTM D6693 ASTM D638 (Modified) ( 2 inches / minute ) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.36 ✓	
	Average Elongation @ Break	%	501.1 ✓	
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.31	
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	220.6 N	✓ 49.589 lbs	
Puncture Resistance FTMS 101 Method 2066 (Modified)	Load	414.3 N	93.147 lbs	
Puncture Resistance ASTM D4833 (Modified)	Load	491.2 N	✓ 110.43 lbs	
ESCR ASTM D1683	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED	
Notched Constant Tensile Load ASTM D5387	pass / fail @ 30%	300 hrs	ONGOING	

Customer: Northwest Linings  
PO: C-4083 Kekaha LF  
Destination CPU, (HI)

Date: 1/18/2010  
Signature: *[Handwritten Signature]*  
Quality Control Department

REVISIONS  
REV 03  
12/23/05



CoA Date: 11/29/2009

## Certificate of Analysis

Shipped To: AGRU AMERICA INC  
2000 EAST NEWLANDS  
FERNLEY NV 89408  
USA

Recipient: PALMER  
Fax:

CPC Delivery #: 87963605  
PO #: 005205  
Weight: 191300 LB  
Ship Date: 11/29/2009  
Package: BULK  
Mode: Hopper Car  
Car #: CHVX889542  
Seal No: 272682

Product:  
MARLEX POLYETHYLENE K307 BULK

Lot Number: 7291467

Property	Test Method	Value	Unit
Melt Index	ASTM D1238	0.230	g/10mi
HLMI Flow Rate	ASTM D1238	20.00	g/10mi
Density	D1505 or D4083	0.9370	g/cm <sup>3</sup>
Pellet Count	P02.08.03	34.000	pel/g
Production Date		11/26/2009	

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP. However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.

Troy Griffin  
Quality Systems Coordinator

For CoA questions contact Customer Service Representative at +1-832-813-4637



CoA Date: 11/28/2009

## Certificate of Analysis

Shipped To: AGRU AMERICA INC  
2000 EAST NEWLANDS  
FERNLEY NV 89408  
USA

Recipient: PALMER  
Fax:

CPC Delivery #: 87962914  
PO #: 005205  
Weight: 193900 LB  
Ship Date: 11/28/2009  
Package: BULK  
Mode: Hopper Car  
Car #: PSPX003162  
Seal No: 272924

Product:  
MARLEX POLYETHYLENE K307 BULK

Lot Number: 7281454

Property	Test Method	Value	Unit
Melt Index	ASTM D1238	0.230	g/10mi
HLMI Flow Rate	ASTM D1238	20.00	g/10mi
Density	D1505 or D4883	0.9370	g/cm <sup>3</sup>
Pellet Count	P02.08.03	35.000	pel/g
Production Date		11/23/2009	

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP. However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.

Troy Griffin  
Quality Systems Coordinator

For CoA questions contact Customer Service Representative at +1-832-813-4837



Rex L. Bobsein, Ph.D., Polystyrene Materials and Applications Development  
 Room 109 PTC • Bartlesville, OK 74004  
 918-661-0089 • bobsein@cpchem.com • Fax: 918-662-2550 • www.cpchem.com

January 16, 2006

Grant Palmer  
 Agru America  
 500 Garrison Road  
 Georgetown, SC 29440

Dear Grant:

This letter is to re-report the results of oven aging and UV aging testing (according to GRI-GM13 and GRI-GM17) on Agru America sheet samples that you provided to us in 2004. A graphical summary of the results was sent to you on 4/1/2005. The testing was performed by CPChem's Evaluation Laboratory in Bartlesville, OK. Oven-aging tests were completed 12/17/2004. UV-aging tests were completed on 12/13/2004.

GRI-GM13 (HDPE) and GRI-GM17 (LLDPE) durability testing was done according to the following procedures.

Test	Exposure	Method
Std. OIT	200°C, atmospheric pressure oxygen	D3895
HP-OIT	150°C, 500 psi oxygen	D5885
Oven Aging	90 days, 85°C	D5721 ✓
UV Aging	1600 UV hrs (Conditions were 20 hours UVA-340 at 75°C followed by 4 hrs dark with condensation at 60°C. Irradiance was 0.72 W/m <sup>2</sup> at 340nm.)	GRI-GM11 ✓

**Oven Aging Results**

Sample	Initial HP-OIT (min.)	HP-OIT Value after Oven Aging (min.)	% HP-OIT Retained	GRI-GM13 or GRI-GM17 % Retained Requirement
40 mil LLDPE Roll # 312588 from Marlex® 7104 Lot # CPN811170	514	396	77	60
60 mil HDPE Roll # 315103-04 from Marlex® K307 Lot # 71-3-1465	1461	1547	106 ✓	80

Sample	Initial Std. OIT (min.)	Std. OIT Value after Oven Aging (min.)	% Std. OIT Retained	GRI-GM13 or GRI-GM17 % Retained Requirement
40 mil LLDPE Roll # 312588 from Marlex® 7104 Lot # CPN811170	151	58	38	35
60 mil HDPE Roll # 315103-04 from Marlex® K307 Lot # 71-3-1465	201	127	63 ✓	55

UV Aging Results

Sample	Initial HP-OIT (min.)	HP-OIT Value after UV Aging (min.)	% HP-OIT Retained	GRI-GM13 or GRI-GM17 % Retained Requirement
40 mil LLDPE Roll # 312588 from Marlex® 7104 Lot # CPN811170	514	460	89	35
60 mil HDPE Roll # 315103-04 from Marlex® K307 Lot # 71-3-1465	1461	1513	104 ✓	50

According to these test results, the durability requirements are met.

If you have any questions, please call me at 918-661-0089.

Sincerely,



Rex L. Bobsein, Ph.D.  
Polyethylene Materials and Applications Development

*Any technical advice, recommendations, results, or analysis ("information") contained herein, including, without limitation, information as it may relate to the selection of a specific product ("Product") for your use and application, is given **without warranty or guarantee** and is accepted at your sole risk. It is imperative that you test the information (and Product, if applicable) to determine to your own satisfaction whether the information (and Product, if applicable) are suitable for your intended use and application. You expressly assume, and release Chevron Phillips Chemical Company, from all risk and liability, whether based in contract, tort or otherwise, in connection with the use of, or results obtained from, such information (and Product, if applicable).*



**GEOMEMBRANE TEST RESULTS**

TRI Client: Agru America (Kekaha LF)

Material: Agru 60 mil Microspike HDPE Geomembrane  
Sample Identification: Roll # 801613-10  
TRI Log #: E2339-10-09

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	
	1	2	3	4	5	6	7	8	9	10			
<b>Multi-axial Tensile (ASTM D 5617)</b>													
<b>Test Method A: Centerpoint Deflection Versus Pressure</b>													
Thickness (mils)	64	65	61									64	1
Maximum Stress (psi)	2515	2353	3460									2443	82
% Elongation @ Rupture (%)	17.2	21.1	20.8									19.4	2.0
Failure Description:	H-CAT N-EF	H-CAT N-EF	I3-CAT N-EF										
MDT	A tear in the machine direction.												
H	Circular or elliptical hole in the specimen.												
H-CAT	Circular or elliptical hole in an area where the material has significantly necked down or thinned. The large thinned area resembles a pupil of a cat eye.												
N-EF	No edge failure												

The testing is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI reserves and maintains client confidentiality. TRI limits reproduction of the report, except in full, without prior approval of TRI.



### GEOMEMBRANE TEST RESULTS

TRI Client: Agru America  
Project: MQC

Material: Geomembrane  
Sample Identification: 7291454 ✓  
TRI Log #: E2339-53-02  
Test Date: 25-Jan-10

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Low Temperature Brittleness (ASTM D 716, NSF 54, -50C) ✓						% passing
MD (Pass/Fail)	Pass	Pass	Pass	Pass	Pass	100
TD (Pass/Fail)	Pass	Pass	Pass	Pass	Pass	100

MD Machine Direction      TD Transverse Direction

This testing is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those listed. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.





### GEOMEMBRANE TEST RESULTS

TRI Client: **Agri America**  
Project: **MQC**

Material: Geomembrane  
Sample Identification: 7291467 ✓  
TRI Log #: E2339-S3-02  
Test Date: 25-Jan-10

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Low Temperature Brittleness (ASTM D 746, NSF 54, -60C) ✓						% passing
MD (Pass/Fail)	Pass	Pass	Pass	Pass	Pass	100
TD (Pass/Fail)	Pass	Pass	Pass	Pass	Pass	100
MD Machine Direction	TD Transverse Direction					

The testing is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



SP. NOTCHED CONSTANT TENSILE LOAD ASTM D-8397 APPENDIX A

LOT #: 7291454 ✓

MATERIAL: K307 ✓

DATE 1/12/10

ROLL # 802119-10

LINER TYPE 60 HD MICRO

REF #: F241

FORMULA FOR APPLIED LOAD:  $Load = (str@yld \times \%test \times (.80\% \text{ of nom. thickness}) \times width) - CF$

where:

MA

str@yld = Tensile strength @ yield (Transverse Direction) from ASTM D-838 in psi

thickness = Thickness of sample at notch point in inches

width = Width of sample in inches (.125" constant)

MA = Mechanical Advantage Used (1:1, 3:1, 4:1, or 5:1)

CF = Correction Factor for MA Stations is 77g (weight of arm with empty holder attached to other end)

Therefore, for each sample, load =  $(str@yld \times \text{nom. thickness} \times .0300 \times (\%TEST \times .8 \times .125)) - CF/MA$

\* This number may change due to customer specifications. Formula will be changed also.

Strength @ yield for this roll: 2,611 psi % of yield tested: 30 %

Station used: Mechanical Advantage Used: 5 CF = 77 g

Nominal Thickness (in): 0.0600

LOAD = str@yld x nominal thickness x formula

LOAD = 2,611 x 0.060 x formula

LOAD = 411 g

PASS @ 300 HRS

Specimen Thickness	Notch Depth	PASS / FAIL ?	Failure at
#1 0.0640	#1 0.0160	PASS	_____ hours
#2 0.0638	#2 0.0158	PASS	_____ hours
#3 0.0637	#3 0.0157	PASS	_____ hours
#4 0.0634	#4 0.0154	PASS	_____ hours
#5 0.0631	#5 0.0151	PASS	_____ hours

Comments: ALL SPECIMENS PASSED AND REMOVED AT 318 HOURS

Tested By: CHRIS ADAMS

Checked By: Comp

Test Conditions Temp: 70

(At Notching) Humidity: 25

**NORTHWEST LININGS & GEOTEXTILE PRODUCTS, INC.**

• 21000 77<sup>th</sup> Avenue South • Kent, WA 98032 •

Phone: (253) 872-0244 • Fax: (253) 872-0245

[www.northwestlinings.com](http://www.northwestlinings.com)

**LETTER OF TRANSMITTAL**

TO: MMinch@Geosyntec.com  
CC: jeffg@goodfellowbros.com  
JFrey@wm.com

DATE: 1/25/2010	JOB NO.:
ATTENTION: : Geosyntec	
RE: Kekaha LF Phase II Lateral Expansion Cell 1 - Geotextile Submittals	

WE ARE SENDING YOU:  Attached  Under Separate Cover via \_\_\_\_\_ the following items:

Shop Drawings  Prints  Plans  Specifications  Samples

Copy of Letter  Change Order  Submittals  Warranties  Other

Copies	Date:	Description
1	1/25/2010	<u>Crown Resources Geotextile Memo Concerning Spec. Sec. 02075</u>
1	1/25/2010	<u>TNS Advanced Technologies - Style E160 Geotextile Specifications</u>
1	1/25/2010	<u>TNS Advanced Technologies - Style E160 Test Results</u>
1	1/25/2010	<u>TNS Advanced Technologies - Style E160 Certification</u>
1	1/25/2010	<u>TNS Advanced Technologies - Style E060 Geotextile Specifications</u>
1	1/25/2010	<u>TNS Advanced Technologies - Style E060 Test Results</u>
1	1/25/2010	<u>TNS Advanced Technologies - Style E060 Certification</u>
1	1/25/2010	<u>DRAKE Extrusion Inc. - Batch #W108728 Certificate of Analysis</u>
1	1/25/2010	<u>DRAKE Extrusion Inc. - Batch #W108856 Certificate of Analysis</u>

These are transmitted as checked below:

For Approval  Approved as submitted  Resubmit  Copies for Approval

For your use  Approved as noted  Submit  Copies for distribution

For review and comment  Returned for corrections  Return  Corrected Prints

For bids due \_\_\_\_\_  Other \_\_\_\_\_

Remarks:

COPY TO: FILE SIGNED: Richard Kamienski

84 ROLLS OF 600/SY NIN GT

KeKaha Landfill  
E060 150"x360"

		Weight	AOS	PERT	PERM
		oz/sqyd	US Sieve	1/S	cm/sec
		D-5261	D-4751	D-4491	D-4491
1	300293929	6.4	70	2.30	0.53
2	300293930	6.4	70	2.30	0.53
3	300293931	6.4	70	2.30	0.53
4	300293932	6.4	70	2.30	0.53
5	300293938	6.4	70	2.30	0.53
6	300293939	6.4	70	2.30	0.53
7	300293940	6.4	70	2.30	0.53
8	300293941	6.4	70	2.30	0.53
9	300293942	6.4	70	2.30	0.53
* 10	300294086	6.4	70	1.88	0.43
11	300294087	6.4	70	1.88	0.43
12	300294088	6.4	70	1.88	0.43
13	300294089	6.4	70	1.88	0.43
14	300294090	6.4	70	1.88	0.43
15	300294607	6.4	70	1.88	0.43
16	300294613	6.4	70	1.88	0.43
17	300294614	6.4	70	1.88	0.43
* 18	300294615	6.1	70	2.00	0.46
19	300294616	6.1	70	2.00	0.46
20	300294617	6.1	70	2.00	0.46
21	300294618	6.1	70	2.00	0.46
22	300294619	6.1	70	2.00	0.46
23	300294620	6.1	70	2.00	0.46
24	300294621	6.1	70	2.00	0.46
25	300294622	6.1	70	2.00	0.46
26	300294623	6.1	70	2.00	0.46
* 27	300294624	6.3	70	2.33	0.48
28	300294625	6.3	70	2.33	0.48
29	300294626	6.3	70	2.33	0.48
30	300294627	6.3	70	2.33	0.48
31	300295419	6.3	70	2.33	0.48
32	300295420	6.3	70	2.33	0.48
33	300295421	6.3	70	2.33	0.48
34	300295422	6.3	70	2.33	0.48
35	300295423	6.3	70	2.33	0.48
36	300295424	6.3	70	2.33	0.48
37	300295425	6.3	70	2.33	0.48
38	300295426	6.3	70	2.33	0.48
39	300295427	6.3	70	2.33	0.48
40	300295428	6.3	70	2.33	0.48
41	300295429	6.3	70	2.33	0.48
42	300295430	6.3	70	2.33	0.48
43	300295431	6.3	70	2.33	0.48
44	300295432	6.3	70	2.33	0.48
45	300295433	6.3	70	2.33	0.48
46	300295434	6.3	70	2.33	0.48

		Weight	AOS	PERT	PERM
		oz/sqyd	US Sieve	1/S	cm/sec
		D-5261	D-4751	D-4491	D-4491
47	300295435	6.0	70	2.12	0.50
48	300295436	6.0	70	2.12	0.50
49	300295440	6.0	70	2.12	0.50
50	300295441	6.0	70	2.12	0.50
51	300295442	6.0	70	2.12	0.50
52	300295443	6.0	70	2.12	0.50
53	300295444	6.0	70	2.12	0.50
54	300295445	6.0	70	2.12	0.50
55	300295446	6.0	70	2.12	0.50
56	300295447	6.0	70	2.12	0.50
57	300295448	6.2	70	2.33	0.53
58	300295449	6.2	70	2.33	0.53
59	300295450	6.2	70	2.33	0.53
60	300295451	6.2	70	2.33	0.53
61	300295452	6.2	70	2.33	0.53
62	300295453	6.2	70	2.33	0.53
63	300295454	6.2	70	2.33	0.53
64	300295455	6.2	70	2.33	0.53
65	300295456	6.2	70	2.33	0.53
66	300295457	6.2	70	2.33	0.53
67	300295458	6.2	70	2.33	0.53
68	300295459	6.2	70	2.33	0.53
69	300295460	6.1	70	2.00	0.47
70	300295461	6.1	70	2.00	0.47
71	300295462	6.1	70	2.00	0.47
72	300295463	6.1	70	2.00	0.47
73	300295464	6.1	70	2.00	0.47
74	300295465	6.1	70	2.00	0.47
75	300295466	6.1	70	2.00	0.47
76	300295467	6.1	70	2.00	0.47
77	300295468	6.1	70	2.00	0.47
78	300295469	6.1	70	2.00	0.47
79	300295470	6.1	70	2.00	0.47
80	300295471	6.1	70	2.00	0.47
81	300295472	6.1	70	2.00	0.47
82	300295473	6.1	70	2.00	0.47
83	300295474	6.1	70	2.00	0.47
84	300295475	6.1	70	2.00	0.47

\* INTERFACE TESTING

TNS Advanced Technologies by Crown Resources  
681 DeYoung Rd.  
Greer, SC 29651

**Regarding:**

- Kekaha LF Phase II Lateral Expansion Cell 1
- Specification Section 02075 Geotextile Submittals & Source QC.

For the Kekaha Landfill SECTION 02075 GEOTEXTILE Section 1.02 SUBMITTALS section A, #1,#2,#3, and #4, the fiber certifications are attached. We are using fiber as our raw material in place of resin for the required information submittal package due to fiber being our raw material to manufacture the E060 and E160 geotextile. The origin and identification of the fiber is listed on the certifications. The fiber Quality Control Certificates supplied to us by the fiber manufacturer are dated. The fiber property test results are listed on the fiber certification. There is no reclaimed fiber added with the fiber supplied by the fiber supplier during the geotextile manufacturing process. The #5,#6,#7,#8, and #9 submittal requirements are reported on the fabric certifications, specifications, and test reports submitted last week. Please let me know if any additional information is needed regarding the submittal package for the Kekaha Landfill.

Thank you,

Marshall Gaddy  
Quality Control Manager  
[mgaddy@crowresources.net](mailto:mgaddy@crowresources.net)  
(864)968-0592 x130

# certificate of analysis



P.O. Box 4868, Martinsville, VA 24115-4868 Phone (276) 632-0159 Fax (276) 632-0981

CUSTOMER: CROWN RESOURCES

DATE: 01/19/10

PRODUCT CODE: 253

BATCH: W108856

COLOR NAME: OFF BLACK

COLOR NUMBER: R1234

PROPERTY	SPECIFICATION		AVERAGE	MIN	MAX	SD	
	MIN	MAX					
Denier	4.50	5.50	5.19	5.02	5.37	.24	
Spin Finish (%)	.80	1.30	1.05	1.01	1.08	.03	
Crimp Level (CPI)	8.00	10.00	9.30	9.00	9.60	.21	
Fiber Length (mm)	95.00	115.00	101.96	100.80	103.00	.89	
Tenacity (GPD)	4.50	5.50	5.11	4.87	5.43	.28	
Elongation (%)	80.00	160.00	111.56	102.81	128.76	14.89	
Color	GMC DE		1.00	1.25	.96	1.44	.21

ALL ABOVE DATA WAS COLLECTED AT THE TIME OF PRODUCTION.

# TNS Advanced Technologies

681 DeYoung Road  
Greenville, SC 29651

(864) 968-0592 Tel  
(864) 879-4639 Fax

1/25/2010

REF: TNS E060  
Kekaha Sanitary Landfill

Northwest Linings & Geotextile Products, Inc.

Dear Sir/Madam:

This is to certify that TNS E060 is a polypropylene, nonwoven, needle-punched fabric. The fabric is comprised of 98% Polypropylene, and 2% Carbon Black and other additives. TNS E060 is resistant to degradation due to ultraviolet exposure and resists commonly encountered soil chemicals, insects, mildew, and is non-biodegradable. TNS E060 has been continuously inspected for needles and found to be needle free. Polypropylene is stable within a pH range of 2 to 13. TNS E060 conforms to the physical properties listed in the following table:

<u>FABRIC PROPERTY</u>	<u>TEST METHOD</u>	<u>UNITS</u>	<u>M.A.R.V</u>
Weight	ASTM D 5261	oz/sqyd	6.0
A.O.S.	ASTM D 4751	U.S. Sieve	70
Permittivity	ASTM D 4491	1/sec	1.5
Permeability	ASTM D 4491	cm/sec	.30

*Marshall O. Gaddy*

Marshall O. Gaddy  
Quality Control Manager



681 DeYoung Rd.  
Greer, SC 29651  
(864)968-0592

Geotextile Product Description Sheet

**Style TNS E060**  
**Kekaha Sanitary Landfill**

TNS E060 is a nonwoven geotextile produced by needlepunching synthetic staple fibers in a random network to form a high strength dimensionally stable fabric. The polypropylene fibers are specially formulated to resist ultraviolet light deterioration, and are inert to commonly encountered soil chemicals. The fabric will not rot or mildew, is non-biodegradable, and is resistant to damage from insects and rodents. Polypropylene is stable within a pH range of 2 to 13. TNS E060 conforms to the physical property values listed below:

Fabric Property	Test Method	Units	Minimum Average Roll Value
Weight	ASTM D 5261	oz/sq.yd.	6.0
Permittivity*	ASTM D 4491	1/sec	1.5
AOS	ASTM D 4751	U.S. Sieve	70
Permeability*	ASTM D 4491	cm/sec	.30
Packaging			
Roll Dimensions-Foot			12.5 x360
Square Yards Per Roll			500
Estimated Roll Weight-Lbs.			220

\* At time of manufacturing, handling may change these properties.

\*\* Modified

To the best of our knowledge, the information contained herein is accurate. However, TNS Advanced Technologies cannot anticipate all conditions under which TNS product information and our products, or the products of other manufacturers in combination with our products, may be used. We accept no responsibility for results obtained by the application of this information or the safety or suitability of our products either alone or in combination with other products. Final determination of the suitability of any information or material for the use contemplated, of its manner of use, and whether the suggested use infringes any patents is the sole responsibility of the user.



**NORTHWEST LININGS & GEOTEXTILE PRODUCTS, INC.**

• 21000 77<sup>th</sup> Avenue South • Kent, WA 98032 •

Phone: (253) 872-0244 • Fax: (253) 872-0245

[www.northwestlinings.com](http://www.northwestlinings.com)

**LETTER OF TRANSMITTAL**

TO: MMinch@Geosyntec.com  
 CC: jeff@goodfellowbros.com  
 jFrey@wm.com

DATE: 1/25/2010	JOB NO.:
ATTENTION: : Geosyntec	
RE: Kekaha LF Phase II Lateral Expansion Cell 1 - Geotextile Submittals	

WE ARE SENDING YOU:  Attached  Under Separate Cover via \_\_\_\_\_ the following items:

- Shop Drawings  Prints  Plans  Specifications  Samples  
 Copy of Letter  Change Order  Submittals  Warranties  Other

Copies	Date:	Description
1	1/25/2010	<u>Crown Resources Geotextile Memo Concerning Spec. Sec. 02075</u>
1	1/25/2010	<u>TNS Advanced Technologies - Style E160 Geotextile Specifications</u>
1	1/25/2010	<u>TNS Advanced Technologies - Style E160 Test Results</u>
1	1/25/2010	<u>TNS Advanced Technologies - Style E160 Certification</u>
1	1/25/2010	<u>TNS Advanced Technologies - Style E060 Geotextile Specifications</u>
1	1/25/2010	<u>TNS Advanced Technologies - Style E060 Test Results</u>
1	1/25/2010	<u>TNS Advanced Technologies - Style E060 Certification</u>
1	1/25/2010	<u>DRAKE Extrusion Inc. - Batch #W108728 Certificate of Analysis</u>
1	1/25/2010	<u>DRAKE Extrusion Inc. - Batch #W108856 Certificate of Analysis</u>

These are transmitted as checked below:

- For Approval  Approved as submitted  Resubmit  Copies for Approval  
 For your use  Approved as noted  Submit  Copies for distribution  
 For review and comment  Returned for corrections  Return  Corrected Prints  
 For bids due \_\_\_\_\_  Other \_\_\_\_\_

Remarks:

COPY TO: FILE SIGNED: Richard Kamienski

97 ROLLS OF  
16 02/54 NW GT

Kekaha Landfill  
E160 150"x360'

		WGHT	GTMD	GTXMD	GEMD	GEXMD	TTMD	TTXMD	PUNC	UV
		OSY	LB	LB	%	%	LB	LB	LB	%
		D-5261	D-4632	D-4632	D-4632	D-4632	D-4533	D-4533	D-4833	D-4355
1	2020174353	16.5	471	588	87	90	158	224	321	70
2	2020579613	16.5	471	588	87	90	158	224	321	70
3	2020579632	16.5	471	588	87	90	158	224	321	70
4	2020579627	16.5	471	588	87	90	158	224	321	70
5	2020579615	16.5	471	588	87	90	158	224	321	70
6	2020579616	16.5	471	588	87	90	158	224	321	70
7	2020579635	16.5	471	588	87	90	158	224	321	70
8	2020579618	16.5	471	588	87	90	158	224	321	70
9	2020626841	19.4	464	820	93	78	184	273	315	70
10	2020626842	19.4	464	820	93	78	184	273	315	70
11	2020626848	19.4	464	820	93	78	184	273	315	70
12	2020626852	19.4	464	820	93	78	184	273	315	70
13	2020626898	19.2	450	694	96	92	165	261	315	70
14	2020626899	19.2	450	694	96	92	165	261	315	70
15	2020626900	19.2	450	694	96	92	165	261	315	70
16	2020626901	19.2	450	694	96	92	165	261	315	70
17	2020626902	19.2	450	694	96	92	165	261	315	70
18	2020626903	19.2	450	694	96	92	165	261	315	70
19	2020626904	19.2	450	694	96	92	165	261	315	70
20	2020626905	19.2	450	694	96	92	165	261	315	70
21	2020626906	19.2	450	694	96	92	165	261	315	70
22	2020626907	19.2	450	694	96	92	165	261	315	70
23	2020626908	19.2	450	694	96	92	165	261	315	70
24	2020626909	19.2	450	694	96	92	165	261	315	70
25	2020626910	19.2	450	694	96	92	165	261	315	70
26	2020626911	19.2	450	694	96	92	165	261	315	70
27	2020626912	19.2	450	694	96	92	165	261	315	70
28	2020626913	19.2	450	694	96	92	165	261	315	70
29	2020626914	19.2	450	694	96	92	165	261	315	70
30	2020626915	19.2	450	694	96	92	165	261	315	70
31	2020626916	19.2	450	694	96	92	165	261	315	70
32	2020626917	18.3	467	787	101	84	167	309	315	70
33	2020626918	18.3	467	787	101	84	167	309	315	70
34	2020626919	18.3	467	787	101	84	167	309	315	70
35	2020626920	18.3	467	787	101	84	167	309	315	70
36	2020626921	18.3	467	787	101	84	167	309	315	70
37	2020626922	18.3	467	787	101	84	167	309	315	70
38	2020626923	18.3	467	787	101	84	167	309	315	70
39	2020626924	18.3	467	787	101	84	167	309	315	70
40	2020626925	18.3	467	787	101	84	167	309	315	70
41	2020626926	18.3	467	787	101	84	167	309	315	70
42	2020626927	18.3	467	787	101	84	167	309	315	70
43	2020626928	18.3	467	787	101	84	167	309	315	70
44	2020626929	18.3	467	787	101	84	167	309	315	70
45	2020626930	18.3	467	787	101	84	167	309	315	70
46	2020626931	18.3	467	787	101	84	167	309	315	70
47	2020626932	18.3	467	787	101	84	167	309	315	70
48	2020626933	18.3	467	787	101	84	167	309	315	70
49	2020626934	18.3	467	787	101	84	167	309	315	70

		WGHT	GTMD	GTXMD	GEMD	GEXMD	TTMD	TTXMD	PUNC	UV
		OSY	LB	LB	%	%	LB	LB	LB	%
		D-5261	D-4632	D-4632	D-4632	D-4632	D-4533	D-4533	D-4833	D-4355
50	2020626835	18.3	467	787	101	84	167	309	315	70
51	2020626845	19.4	464	820	93	78	184	273	315	70
52	2020626846	19.4	464	820	93	78	184	273	315	70
53	2020626847	19.4	464	820	93	78	184	273	315	70
54	2020626849	19.4	464	820	93	78	184	273	315	70
55	2020626850	19.4	464	820	93	78	184	273	315	70
56	2020626851	19.4	464	820	93	78	184	273	315	70
57	2020626853	19.4	464	820	93	78	184	273	315	70
* 58	2020626855	19.4	464	820	93	78	184	273	315	70
59	2020626856	19.4	464	820	93	78	184	273	315	70
60	2020626857	18.5	478	805	102	88	160	293	315	70
61	2020626858	18.5	478	805	102	88	160	293	315	70
62	2020626859	18.5	478	805	102	88	160	293	315	70
63	2020626860	18.5	478	805	102	88	160	293	315	70
64	2020626861	18.5	478	805	102	88	160	293	315	70
65	2020626865	18.5	478	805	102	88	160	293	315	70
66	2020626866	18.5	478	805	102	88	160	293	315	70
67	2020626867	18.5	478	805	102	88	160	293	315	70
68	2020626868	18.5	478	805	102	88	160	293	315	70
69	2020626869	18.5	478	805	102	88	160	293	315	70
70	2020626870	18.5	478	805	102	88	160	293	315	70
* 71	2020626871	18.5	478	805	102	88	160	293	315	70
72	2020626872	18.5	478	805	102	88	160	293	315	70
73	2020626873	18.5	478	805	102	88	160	293	315	70
74	2020626874	18.5	478	805	102	88	160	293	315	70
75	2020626875	18.5	478	805	102	88	160	293	315	70
76	2020626876	18.5	478	805	102	88	160	293	315	70
77	2020626877	20.4	536	826	103	93	179	299	315	70
78	2020626878	20.4	536	826	103	93	179	299	315	70
79	2020626879	20.4	536	826	103	93	179	299	315	70
80	2020626880	20.4	536	826	103	93	179	299	315	70
81	2020626881	20.4	536	826	103	93	179	299	315	70
82	2020626882	20.4	536	826	103	93	179	299	315	70
83	2020626883	20.4	536	826	103	93	179	299	315	70
84	2020626884	20.4	536	826	103	93	179	299	315	70
85	2020626885	20.4	536	826	103	93	179	299	315	70
86	2020626886	20.4	536	826	103	93	179	299	315	70
87	2020626887	20.4	536	826	103	93	179	299	315	70
88	2020626888	20.4	536	826	103	93	179	299	315	70
89	2020626889	20.4	536	826	103	93	179	299	315	70
90	2020626890	20.4	536	826	103	93	179	299	315	70
91	2020626891	20.4	536	826	103	93	179	299	315	70
92	2020626892	20.4	536	826	103	93	179	299	315	70
93	2020626893	20.4	536	826	103	93	179	299	315	70
94	2020626894	20.4	536	826	103	93	179	299	315	70
95	2020626895	20.4	536	826	103	93	179	299	315	70
96	2020626896	20.4	536	826	103	93	179	299	315	70
97	2020626897	19.2	450	694	96	92	165	261	315	70

\* INTERFACE TESTING

TNS Advanced Technologies by Crown Resources  
681 DeYoung Rd.  
Greer, SC 29651

**Regarding:**

- > Kekaha LF Phase II Lateral Expansion Cell 1
- > Specification Section 02075 Geotextile Submittals & Source QC.

For the Kekaha Landfill SECTION 02075 GEOTEXTILE Section 1.02 SUBMITTALS section A, #1, #2, #3, and #4, the fiber certifications are attached. We are using fiber as our raw material in place of resin for the required information submittal package due to fiber being our raw material to manufacture the E060 and E160 geotextile. The origin and identification of the fiber is listed on the certifications. The fiber Quality Control Certificates supplied to us by the fiber manufacturer are dated. The fiber property test results are listed on the fiber certification. There is no reclaimed fiber added with the fiber supplied by the fiber supplier during the geotextile manufacturing process. The #5, #6, #7, #8, and #9 submittal requirements are reported on the fabric certifications, specifications, and test reports submitted last week. Please let me know if any additional information is needed regarding the submittal package for the Kekaha Landfill.

Thank you,

Marshall Gaddy  
Quality Control Manager  
[mgaddy@crowresources.net](mailto:mgaddy@crowresources.net)  
(864)968-0592 x130

# certificate of analysis



P.O. Box 4868, Martinsville, VA 24115-4868 Phone (276) 632-0159 Fax (276) 632-0981

CUSTOMER: CROWN RESOURCES

DATE: 01/16/10

PRODUCT CODE: 253

BATCH: W108728

COLOR NAME: OFF BLACK

COLOR NUMBER: R1234

PROPERTY	SPECIFICATION		AVERAGE	MIN	MAX	SD
	MIN	MAX				
Denier	4.50	5.50	5.24	5.24	5.25	.01
Spin Finish (%)	.80	1.30	.95	.91	.99	.03
Crimp Level (CPI)	8.00	10.00	9.48	9.20	10.00	.30
Fiber Length (mm)	95.00	115.00	108.00	103.40	112.00	4.07
Tenacity (GPD)	4.50	5.50	5.17	4.99	5.35	.24
Elongation (%)	80.00	160.00	88.17	82.03	94.31	8.67
Color	CMC DE	1.00	1.32	1.14	1.72	.21

ALL ABOVE DATA WAS COLLECTED AT THE TIME OF PRODUCTION.

# TNS Advanced Technologies

681 DeYoung Road  
Greenville, SC 29651

(864) 968-0592 Tel  
(864) 879-4639 Fax

1/25/2010

REF: TNS E160  
Kekaha Sanitary Landfill

Northwest Linings & Geotextile Products, Inc.

Dear Sir/Madam:

This is to certify that TNS E160 is a polypropylene, nonwoven, needle-punched fabric. The fabric is comprised of 98% Polypropylene, and 2% Carbon Black and other additives. TNS E160 is resistant to degradation due to ultraviolet exposure and resists commonly encountered soil chemicals, insects, mildew, and is non-biodegradable. TNS E160 has been continuously inspected for needles and found to be needle free. Polypropylene is stable within a pH range of 2 to 13. TNS E160 conforms to the physical properties listed in the following table:

<u>FABRIC PROPERTY</u>	<u>TEST METHOD</u>	<u>UNITS</u>	<u>M.A.R.V</u>
Weight	ASTM D 5261	oz/sqyd	16.0 ✓
Grab Tensile	ASTM D 4632	lbs	370 ✓
Grab Tensile Elongation	ASTM D 4632	%	50 ✓
Trap Tear	ASTM D 4533	lbs	145 ✓
Puncture	ASTM D 4833	lbs	170 ✓
UV Resistance(500 hrs)	ASTM D 4355	% retained	70 ✓

*Marshall O. Gaddy*

Marshall O. Gaddy  
Quality Control Manager



681 DeYoung Rd.  
Greer, SC 29651  
(864)968-0592

Geotextile Product Description Sheet

**Style TNS E160**  
**Kekaha Sanitary Landfill**

TNS E160 is a nonwoven geotextile produced by needlepunching 100% polypropylene staple fibers in a random network to form a high strength dimensionally stable fabric. The polypropylene fibers are specially formulated to resist ultraviolet light deterioration, and are inert to commonly encountered soil chemicals. The fabric will not rot or mildew, is non-biodegradable, and is resistant to damage from insects and rodents. Polypropylene is stable within a pH range of 2 to 13. TNS E160 conforms to the physical property values listed below:

Fabric Property	Test Method	Units	Minimum Average Roll Value
Weight	ASTM D 5261	oz/sq.yd.	16.0
Grab Tensile	ASTM D 4632	lbs.	370
Grab Elongation	ASTM D 4632	%	50
Trap Tear	ASTM D 4533	lbs.	145
Puncture	ASTM D 4833	lbs	170
UV Resistance after 500 hrs.	ASTM D 4355	% Strength Retained	70
<b>Packaging</b>			
Roll Dimensions-Feet			15 x 360
Square Yards Per Roll			600
Estimated Roll Weight-Lbs.			620

\* At time of manufacturing, handling may change these properties

\*\* Modified

To the best of our knowledge, the information contained herein is accurate. However, TNS Advanced Technologies cannot anticipate all conditions under which TNS product information and our products, or the products of other manufacturers in combination with our products, may be used. We accept no responsibility for results obtained by the application of this information or the safety or suitability of our products either alone or in combination with other products. Final determination of the suitability of any information or material for the use contemplated, of its manner of use, and whether the suggested use infringes any patents is the sole responsibility of the user.

**NORTHWEST LININGS & GEOTEXTILE PRODUCTS, INC.**

• 21000 77<sup>th</sup> Avenue South • Kent, WA 98032 •

Phone: (253) 872-0244 • Fax: (253) 872-0245

[www.northwestlinings.com](http://www.northwestlinings.com)

**LETTER OF TRANSMITTAL**

TO: GEOSYNTEC  
 CC: MMich@Geosyntec.com  
KHuynh@Geosyntec.com  
jeffg@goodfellowbras.com

DATE: 4/5/2010	JOB NO.: N09150
ATTENTION: Kim Huynh	
RE: Kekaha LF Phase II Lateral Expansion Cell 1 - TNS E160 Geotextile Certifications & Test Results (27 Rolls)	

WE ARE SENDING YOU:  Attached  Under Separate Cover via \_\_\_\_\_ the following items:

- Shop Drawings  Prints  Plans  Specifications  Samples  
 Copy of Letter  Change Order  Submittals  Warranties  Other

Copies	Date:	Description
1	4/5/2010	<u>TNS Advanced Technologies</u> - Style E160 Geotextile Test Results
1	4/5/2010	<u>TNS Advanced Technologies</u> - Style E160 Geotextile Certification

These are transmitted as checked below:

- For Approval  Approved as submitted  Resubmit  Copies for Approval  
 For your use  Approved as noted  Submit  Copies for distribution  
 For review and comment  Returned for corrections  Return  Corrected Prints  
 For bids due \_\_\_\_\_  Other \_\_\_\_\_

Remarks:

COPY TO: FILE SIGNED: Richard Kamienski



Kekaha Landfill  
E160 150"x360'

		WGHT	GTMD	GTXMD	GEMD	GEXMD	TTMD	TTXMD	PUNC	UV
		OSY	LB	LB	%	%	LB	LB	LB	%
		D-5261	D-4632	D-4632	D-4632	D-4632	D-4533	D-4533	D-4833	D-4355
✓1	2020656819	17.6	522	590	82	101	197	240	263	70
✓2	2020656821	17.6	522	590	82	101	197	240	263	70
✓3	2020656825	17.6	522	590	82	101	197	240	263	70
✓4	2020656828	16.9	532	654	87	96	188	274	263	70
✓5	2020656829	16.9	532	654	87	96	188	274	263	70
✓6	2020656831	16.9	532	654	87	96	188	274	263	70
✓7	2020656832	16.9	532	654	87	96	188	274	263	70
✓8	2020656833	16.9	532	654	87	96	188	274	263	70
✓9	2020656834	16.9	532	654	87	96	188	274	263	70
✓10	2020660913	18.4	419	684	82	96	163	279	263	70
✓11	2020660914	18.4	419	684	82	96	163	279	263	70
✓12	2020660915	18.4	419	684	82	96	163	279	263	70
✓13	2020660917	18.4	419	684	82	96	163	279	263	70
✓14	2020660918	18.4	419	684	82	96	163	279	263	70
✓15	2020660919	18.4	419	684	82	96	163	279	263	70
✓16	2020660920	18.4	419	684	82	96	163	279	263	70
✓17	2020660921	18.4	419	684	82	96	163	279	263	70
✓18	2020660922	18.4	419	684	82	96	163	279	263	70
✓19	2020660923	18.4	419	684	82	96	163	279	263	70
✓20	2020660924	18.4	419	684	82	96	163	279	263	70
✓21	2020660925	18.4	419	684	82	96	163	279	263	70
✓22	2020660929	18.4	419	684	82	96	163	279	263	70
✓23	2020660930	18.4	419	684	82	96	163	279	263	70
✓24	2020660931	18.4	419	684	82	96	163	279	263	70
✓25	2020660932	18.5	565	807	75	91	230	294	263	70
✓26	2020660958	20.1	540	658	86	98	297	400	263	70
✓27	2020660960	20.1	540	658	86	98	297	400	263	70

# TNS Advanced Technologies

681 DeYoung Road  
Greenville, SC 29651

(864) 968-0592 Tel  
(864) 879-4639 Fax

4/5/2010

REF: TNS E160  
Kekaha Sanitary Landfill

Northwest Linings & Geotextile Products, Inc.

Dear Sir/Madam:

This is to certify that TNS E160 is a polypropylene, nonwoven, needle-punched fabric. The fabric is comprised of 98% Polypropylene, and 2% Carbon Black and other additives. TNS E160 is resistant to degradation due to ultraviolet exposure and resists commonly encountered soil chemicals, insects, mildew, and is non-biodegradable. TNS E160 has been continuously inspected for needles and found to be needle free. Polypropylene is stable within a pH range of 2 to 13. TNS E160 conforms to the physical properties listed in the following table:

<u>FABRIC PROPERTY</u>	<u>TEST METHOD</u>	<u>UNITS</u>	<u>M.A.R.V</u>
Weight	ASTM D 5261	oz/sqyd	16.0 ✓
Grab Tensile	ASTM D 4632	lbs	370 ✓
Grab Tensile Elongation	ASTM D 4632	%	50 ✓
Trap Tear	ASTM D 4533	lbs.	145 ✓
Puncture	ASTM D 4833	lbs	170 ✓
UV Resistance(500 hrs)	ASTM D 4355	% retained	70 ✓

*Marshall O. Gaddy*

Marshall O. Gaddy  
Quality Control Manager



# MIRAFI 170N Certification

TROY OGASAWARA

This is to certify that Mirafi® 170N is a nonwoven geotextile composed of polypropylene fibers, which are formed into a stable network such that the fibers retain their relative position. Mirafi® 170N is inert to biological degradation and resists naturally encountered chemicals, alkalis, and acids.

Mechanical Properties	Test Method	Minimum Average Roll Value			
GRAB TENSILE STRENGTH (MD)	ASTM D 4632 ✓	180	LBS ✓	801	N
GRAB TENSILE STRENGTH (CD)	ASTM D 4632 ✓	180	LBS ✓	801	N
ELONGATION (MD)	ASTM D 4632	50	%		
ELONGATION (CD)	ASTM D 4632	50	%		
TRAP TEAR (MD)	ASTM D 4533 ✓	75	LBS ✓	333.8	N
TRAP TEAR (CD)	ASTM D 4533 ✓	75	LBS ✓	333.8	N
CBR PUNCTURE	ASTM D 6241	460	LBS	2002.5	N
APPARENT OPENING SIZE - SIEVE	ASTM D 4751 ✓	100	U.S. SIEVE ✓		
APPARENT OPENING SIZE - MM	ASTM D 4751		150 MM		
PERMITTIVITY	ASTM D 4491 ✓	1	20 SEC-1 ✓		
WATER FLOW RATE	ASTM D 4491	105	GN/FT2	4217.7	L/MIN/M2
RESISTANCE @ 500 HOURS	ASTM D 4355 ✓	70	% ✓		

Physical Properties	Test Method	Typical Value			
MASS/UNIT WEIGHT	ASTM D 5261	7.4	OZ/YD2	250.9	G/M2
THICKNESS	ASTM D 5199	67	MILS	1.7	MM

Certification reflects test results at time of manufacturing and shipment. TenCate Geosynthetics is not responsible for environment or other factors which could alter the physical properties. ASTM D 4751, AOS is a Maximum Opening Diameter Value

\* \* \* END OF REPORT \* \* \*

This May 27, 2010

Chris Whitfield, Quality Manager CERT#: 1001269

Unless specified separately in writing, material results apply only to items tested. No portion of this document may be reproduced whole or in part without the expressed written consent of TenCate. TenCate warrants our products and services to be free from defects in material and workmanship when delivered to TenCate's customers and that our products meet our published specifications. Actual test data supplied is for the full width of the tested master roll.

American Association of Laboratory Accreditation Certificate Number: 1231-01 Accreditation #: CALLAB-25-1197

365 South Bellair Dr. P.O. Box 106 693 2220 Marietta, GA 30067 Tel: 770 592 0228 Fax: 770 593 2722 www.tencate.com





### Geotextile Properties

Roll	Size	Crack Tensile Mod ASTM D4632	Compaction Mod ASTM D4637	Crack Tensile Mod ASTM D4632	Geogrid Mod ASTM D4632	Trap Test Mod ASTM D4632	Trap Test Mod ASTM D4632	ACS ASTM D4751	Flow Rate ASTM D4491	Permeation ASTM D4491
		lbs	%	lbs	%	lbs	lbs	US Std Sieve	gal/min/ sq	sec-1
✓ 921459350	170N	200	67	239	91	96	113	100	132	1.79
✓ 921459425	170N	262	69	232	94	105	114	100	117	1.59
✓ 921460365	170N	225	54	211	78	88	103	100	108	1.47
✓ 921460370	170N	225	54	211	78	88	103	100	108	1.47

**Final "put-up" rolls taken from a single master roll and having identical properties and test data.**

**Results may only be available for tested rolls.**

Unless specified otherwise, all testing, material results apply only to items tested. No portion of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or by any information storage and retrieval system, without the prior written permission of TENCATE. TENCATE warrants our products and services to be free from defect in material and workmanship when delivered to TENCATE's customers and that our products meet our published specifications.





**Appendix L**  
**HDPE Pipe and Assembly Pressure Test Results**

**ATTACHMENT 1  
FORM  
PE PIPE PRESSURE TEST REPORT**

*CELL C*

PROJECT NAME/NO: Kekaha Landfill Expansion TIME: 1:10 PM

CONTRACTOR: ITC Water Management DATE: 4/13/2010

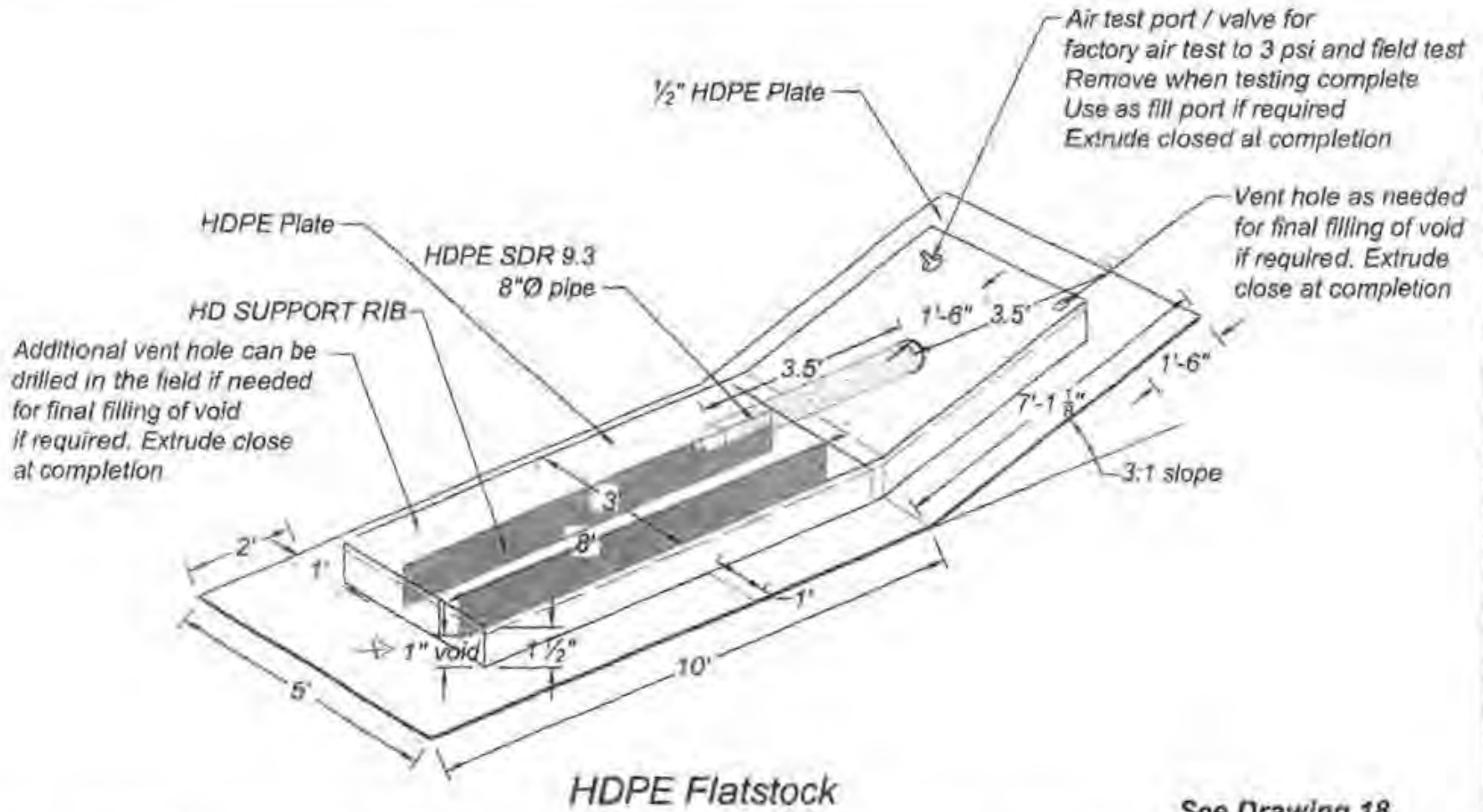
PERSON PERFORMING TESTS: Bill Hewetson *BILL HEWETSON*

DESCRIPTION / LOCAION OF TEST Segment (Pipe Diameter, Length, And SDRs):  
Pressure test pipe penetration void space for Cell C. See attached drawing

t TIME (min)	Tt TEMP READING (deg C)	Pt GAUGE READING (psig)	Pc CORRECTED PRESSURE (psig)	Pd PRESSURE DROP (%)
0	N/A	1.50	N/A	N/A
60	N/A	1.50	N/A	0.00

PASS / FAILURE: PASS  RETEST (yes / no): NO

DESCRIPTION / NATURE OF LEAKS AND REPAIRS OF RETEST SEGMENT:



Northwest Linings & Geotextile Products, Inc. (NWL) is not a licensed engineering firm and does not practice engineering or provide engineering services. NWL does not make any representation or warranties, express or implied, as to any drawings, or the suitability of any of the drawings for a particular use or purpose. Without limiting the foregoing, NWL makes no representation or warranty that the drawings are appropriate for any particular installation. Only a registered professional engineer who has specialized knowledge of a particular project and the needs and requirements of such project can determine what specific design, engineering or installation detail is best suited for each project.

SHEET NO.	DETAIL	<b>NORTHWEST LININGS &amp; GEOTEXTILE PRODUCTS, Inc.</b> www.northwestlinings.com 2100 NORTH AVE, SUITE 100 SEASIDE, WA 98138 CONTACT: 206.875.1111	JOB NAME: <i>Kekaha Sanitary Landfill - Phase II Lateral Expansion</i>	
			JOB NO. <b>N 0 9 1 5 0</b>	
			DATE: <b>3 8 10</b>	DESIGNED: <b>ML</b>
			BY: <b>SC</b>	SCALE:



**ATTACHMENT 1  
FORM  
PE PIPE PRESSURE TEST REPORT**

CELL ID

PROJECT NAME/NO: Kekaha Landfill Expansion	TIME: 8:55 AM
CONTRACTOR: ITC Water Management	DATE: 4/13/2010

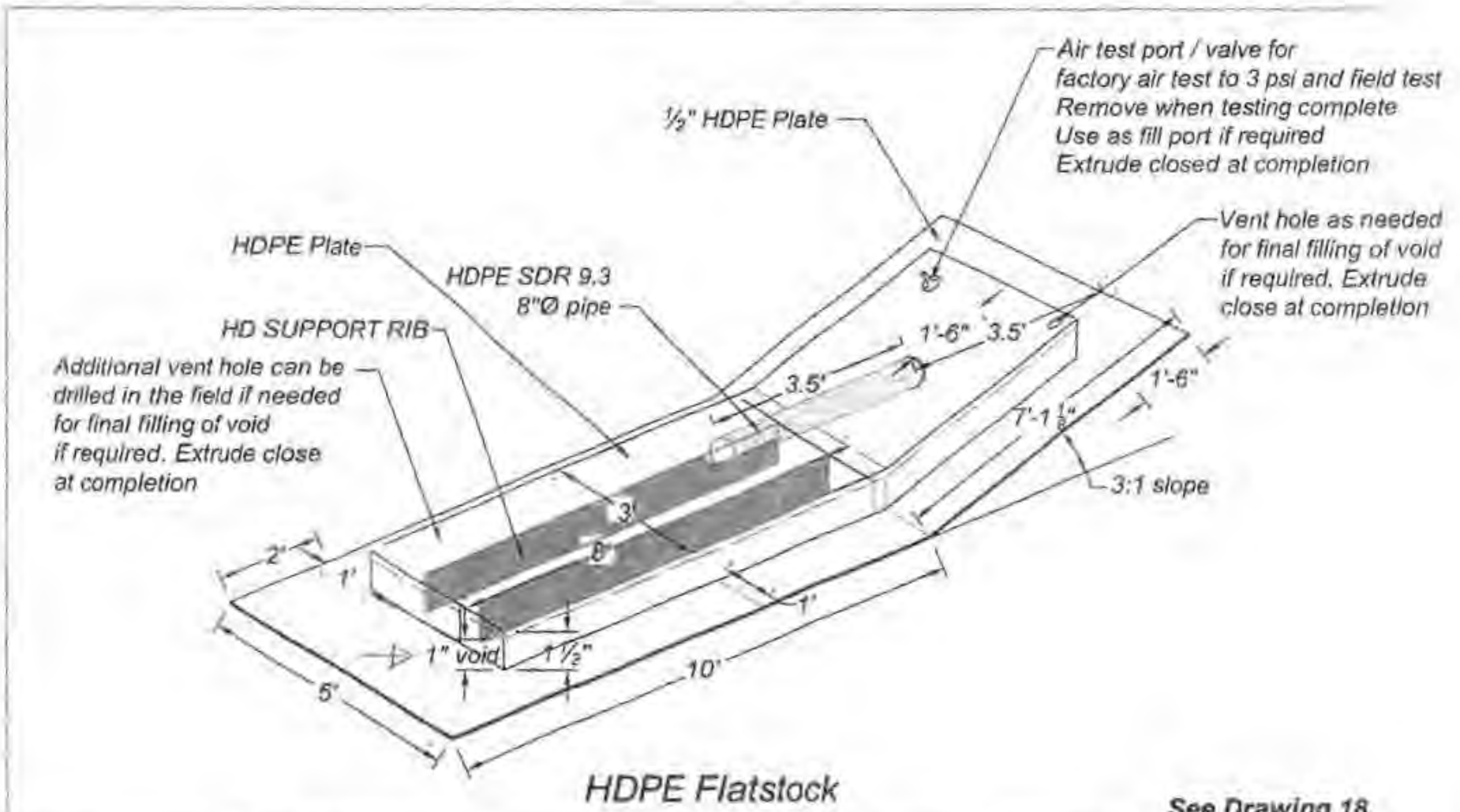
PERSON PERFORMING TESTS: Bill Hewetson *Bill Hewetson*

DESCRIPTION / LOCAION OF TEST Segment (Pipe Diamefer. Length. And SDRs):  
Pressure test pipe penetration void space for Cell D. See attached drawing

t TIME (min)	Tt TEMP READING (deg C)	Pt GAUGE READING (psig)	Pc CORRECTED PRESSURE (psig)	Pd PRESSURE DROP (%)
0	N/A	3.00	N/A	N/A
60	N/A	3.00	N/A	0.00

PASS / FAILURE: PASS ✓	RETEST (yes / no): NO
------------------------	-----------------------

DESCRIPTION / NATURE OF LEAKS AND REPAIRS OF RETEST SEGMENT:



Northwest Linings & Geotextile Products, Inc. (NWL) is not a licensed engineering firm and does not practice engineering or provide engineering services. NWL does not make any representation or warranties, express or implied as to any drawings, or the suitability of any of the drawings for a particular use or purpose. Without limiting the foregoing, NWL makes no representation or warranty that the drawings are appropriate for any particular installation. Only a registered professional engineer who has specialized knowledge of a particular project and the needs and requirements of such project can determine what specific design, engineering or installation detail is best suited for each project.

SHEET NO.	DATE	<b>NORTHWEST LININGS &amp; GEOTEXTILE PRODUCTS, Inc.</b> www.northwestlinings.com 21000 STATE AVE. SOUTH WENTZ, WA 98093 (360) 875-4200 FAX (360) 875-4201	JOB NAME: <i>Kekaha Sanitary Landfill - Phase II Lateral Expansion</i>	
			JOB NO.	N 0 9 1 5 0
			DATE: 3 8 10	CHECKED: RL
			BY: SC	SCALE: WTS

**ATTACHMENT 1  
FORM  
PE PIPE PRESSURE TEST REPORT**

*TEMPORARY  
WET WELL*

PROJECT NAME/NO: Kekaha Landfill Expansion TIME: 3:35 AM

CONTRACTOR: ITC Water Management DATE: 4/26/2010

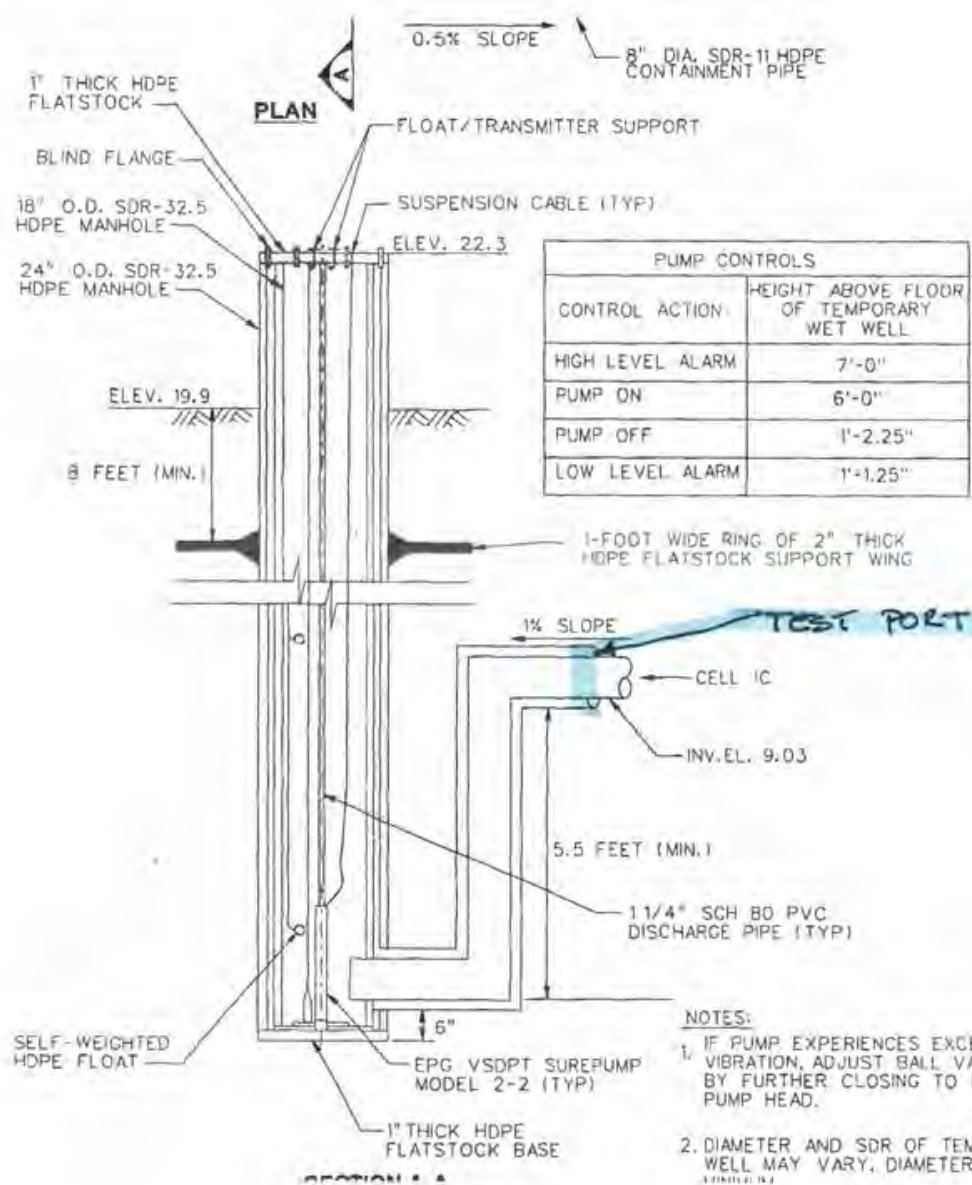
PERSON PERFORMING TESTS: Bill Hewetson *Bill Hewetson*

DESCRIPTION / LOCATION OF TEST Segment (Pipe Diameter, Length, And SDRs):  
Pressure test temporary wet well from from a test port in the annular space between the 8" and 12" of the double 90 degree elbows. See attached drawing

t TIME (min)	Tt TEMP READING (deg C)	Pt GAUGE READING (psig)	Pc CORRECTED PRESSURE (psig)	Pd PRESSURE DROP (%)
0	N/A	1.50	N/A	N/A
60	N/A	1.50	N/A	0.00

PASS / FAILURE: PASS RETEST (yes / no): NO

DESCRIPTION / NATURE OF LEAKS AND REPAIRS OF RETEST SEGMENT:



PUMP CONTROLS	
CONTROL ACTION	HEIGHT ABOVE FLOOR OF TEMPORARY WET WELL
HIGH LEVEL ALARM	7'-0"
PUMP ON	6'-0"
PUMP OFF	1'-2.25"
LOW LEVEL ALARM	1'-1.25"

P CONTROLS	
FLOOR ELL	ELEVATION FEET ABOVE MSL
	10.0
	8.0
	7.0
5"	4.19
1"	4.11

- NOTES:
- IF PUMP EXPERIENCES EXCESSIVE VIBRATION, ADJUST BALL VALVE BY FURTHER CLOSING TO INCREASE PUMP HEAD.
  - DIAMETER AND SDR OF TEMPORARY WET WELL MAY VARY, DIAMETER SHOWN IS

PREPARED BY

# AECOM

CONSTRUCTION DRAWINGS  
 PHASE II LATERAL EXPANSION  
 CELL 1 BASE LINER CONSTRUCTION  
 KEKAHA SANITARY LANDFILL  
 KAUAI, HAWAII

## CELL 1 LEACHATE MANAGEMENT SYSTEM DETAILS

DATE FEBRUARY 2010

PROJECT NO 95561

FILENAME 17details.dgn

**ATTACHMENT 1  
FORM  
PE PIPE PRESSURE TEST REPORT**

TEST 3A

PROJECT NAME/NO: Kekaha Landfill Expansion

TIME: 9:00 AM

CONTRACTOR: ITC Water Management

DATE: 4/12/2010

PERSON PERFORMING TESTS: Bill Hewetson

*BILL HEWETSON*

DESCRIPTION / LOCATION OF TEST Segment (Pipe Diameter, Length, And SDRs):

Pressure test 3A : 8 x 12 Dual Wall Gravity drain from Cell D to LCM - 14. 12" sdr 17 containment pipe 160'. See attached drawing for location.

Ti = Initial Temperature in deg C = 32.80 deg C

Pi = Initial test pressure in psig = 10.00 psig

Pc = Initial pressure in psig corrected for temperature (Tt) at time 't'

t = Time in minutes from initiation of test

Tt = Temperature in deg C at time 't'

Pt = Test pressure in psig at time 't'

$$Pc = ((Pi + 14.7) (Tt + 273) / (Ti + 273)) - 14.7$$

$$\text{Percent Pressure Drop} = ((Pc - Pt) / Pc) \times 100$$

t TIME (min)	Tt TEMP READING (deg C)	Pt GAUGE READING (psig)	Pc CORRECTED PRESSURE (psig)	Pd PRESSURE DROP (%)
0	32.8	10.00	10.00	0.00
20	33.8	10.00	10.08	0.80
30	34.3	10.10	10.12	0.21
40	34.0	10.30	10.10	-2.01
50	34.0	10.30	10.10	-2.01
60	34.2	10.40	10.11	-2.84 ✓

PASS / FAILURE: PASS

RETEST (yes / no): NO

DESCRIPTION / NATURE OF LEAKS AND REPAIRS OF RETEST SEGMENT:



**ATTACHMENT 1  
FORM  
PE PIPE PRESSURE TEST REPORT**

TEST 3B

PROJECT NAME/NO: Kekaha Landfill Expansion	TIME: 3:05 PM
CONTRACTOR: ITC Water Management	DATE: 4/13/2010
PERSON PERFORMING TESTS: Bill Hewetson <i>Bill Hewetson</i>	

DESCRIPTION / LOCAION OF TEST Segment (Pipe Diameter, Length, And SDRs):  
 Pressure test 3B : 8 x 12 Dual Wall Gravity drain from Cell D to LCM - 14. 8" sdr 11 carrier pipe 160'. Includes pipe penetration into cell D. See attached drawing for location.

- Ti = Initial Temperature in deg C = 37.20 deg C
- Pi = Initial test pressure in psig = 10.00 psig
- Pc = Initial pressure in psig corrected for temperature (Tt) at time 't'
- t = Time in minutes from initiation of test
- Tt = Temperature in deg C at time 't'
- Pt = Test pressure in psig at time 't'

$$Pc = ((Pi + 14.7) (Tt + 273) / (Ti + 273)) - 14.7$$

$$\text{Percent Pressure Drop} = ((Pc - Pt) / Pc) \times 100$$

t TIME (min)	Tt TEMP READING (deg C)	Pt GAUGE READING (psig)	Pc CORRECTED PRESSURE (psig)	Pd PRESSURE DROP (%)
0	37.2	10.00	10.00	0.00
20	38.9	10.00	10.14	1.34
30	38.1	10.00	10.07	0.71
40	36.7	10.00	9.96	-0.40
50	35.2	10.00	9.84	-1.62
60	34.4	10.00	9.78	-2.28 ✓

PASS / FAILURE: PASS	RETEST (yes / no): NO
----------------------	-----------------------

DESCRIPTION / NATURE OF LEAKS AND REPAIRS OF RETEST SEGMENT:





**ATTACHMENT 1  
FORM  
PE PIPE PRESSURE TEST REPORT**

TEST 4A

PROJECT NAME/NO: Kekaha Landfill Expansion	TIME: 11:35 AM
CONTRACTOR: ITC Water Management	DATE: 4/15/2010
PERSON PERFORMING TESTS: Bill Hewetson <i>Bill Hewetson</i>	

DESCRIPTION / LOCATION OF TEST Segment (Pipe Diameter, Length, And SDRs):  
 Pressure test 4A : 8 x 12 Dual Wall Gravity drain from Cell C to temporary wet well. 12" sdr 17 containment pipe. See attached drawing for location.

- Ti = Initial Temperature in deg C = 28.30 deg C
- Pi = Initial test pressure in psig = 10.00 psig
- Pc = Initial pressure in psig corrected for temperature (Tt) at time 't'
- t = Time in minutes from initiation of test
- Tt = Temperature in deg C at time 't'
- Pt = Test pressure in psig at time 't'

$$Pc = ((Pi + 14.7) (Tt + 273) / (Ti + 273)) - 14.7$$

$$\text{Percent Pressure Drop} = ((Pc - Pt) / Pc) \times 100$$

t TIME (min)	Tt TEMP READING (deg C)	Pt GAUGE READING (psig)	Pc CORRECTED PRESSURE (psig)	Pd PRESSURE DROP (%)
0	28.3	10.00	10.00	0.00
20	27.8	10.10	9.96	-1.42
30	27.6	10.10	9.94	-1.58
40	27.5	10.10	9.93	-1.67
50	28.9	10.10	10.05	-0.51
60	29.5	10.10	10.10	-0.02

PASS / FAILURE: PASS	RETEST (yes / no): NO
----------------------	-----------------------

DESCRIPTION / NATURE OF LEAKS AND REPAIRS OF RETEST SEGMENT:

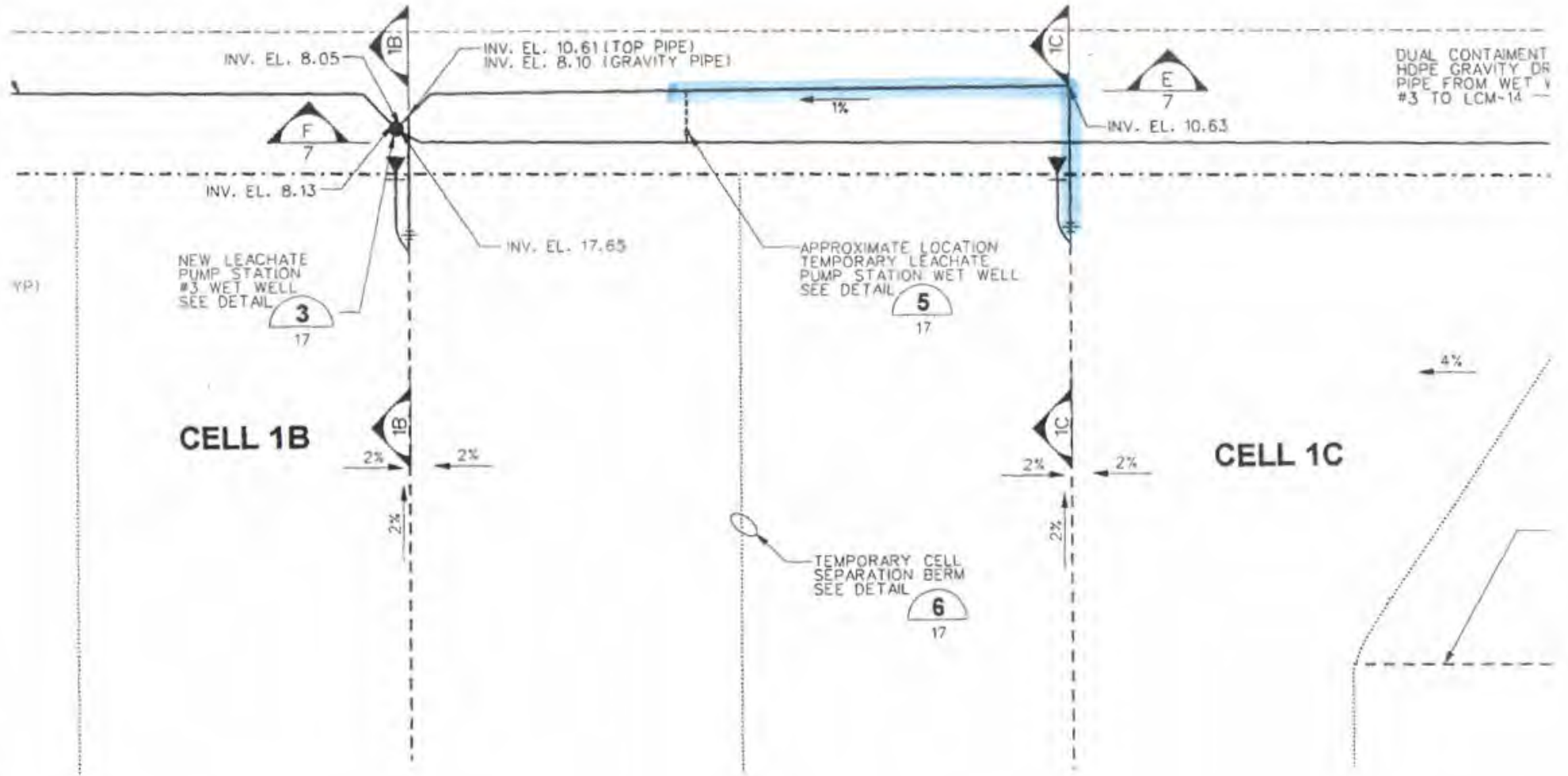
1600  
E 155.86

5700  
E 155

6800  
E 155

7900  
E 155

8000



**ATTACHMENT 1  
FORM  
PE PIPE PRESSURE TEST REPORT**

TEST 4B

PROJECT NAME/NO: Kekaha Landfill Expansion      TIME: 2:30 AM  
 CONTRACTOR: ITC Water Management      DATE: 4/15/2010  
 PERSON PERFORMING TESTS: Bill Hewetson *Bill Hewetson*

DESCRIPTION / LOCATION OF TEST Segment (Pipe Diameter, Length, And SDRs):  
 Pressure test 4B : 8 x 12 Dual Wall Gravity drain from Cell C to temporary wet well. 8" sdr 11 carrier pipe. See attached drawing for location.

- T<sub>i</sub> = Initial Temperature in deg C = 28.10 deg C
- P<sub>i</sub> = Initial test pressure in psig = 10.00 psig
- P<sub>c</sub> = Initial pressure in psig corrected for temperature (T<sub>t</sub>) at time 't'
- t = Time in minutes from initiation of test
- T<sub>t</sub> = Temperature in deg C at time 't'
- P<sub>t</sub> = Test pressure in psig at time 't'

$$P_c = ((P_i + 14.7) (T_t + 273) / (T_i + 273)) - 14.7$$

$$\text{Percent Pressure Drop} = ((P_c - P_t) / P_c) \times 100$$

t TIME (min)	T <sub>t</sub> TEMP READING (deg C)	P <sub>t</sub> GAUGE READING (psig)	P <sub>c</sub> CORRECTED PRESSURE (psig)	P <sub>d</sub> PRESSURE DROP (%)
0	28.1	10.00	10.00	0.00
20	27.6	10.00	9.96	-0.41
30	27.2	10.00	9.93	-0.74
40	27.1	10.20	9.92	-2.84
50	26.9	10.30	9.90	-4.02
60	26.7	10.40	9.89	-5.21

PASS / FAILURE: PASS      RETEST (yes / no): NO

DESCRIPTION / NATURE OF LEAKS AND REPAIRS OF RETEST SEGMENT:

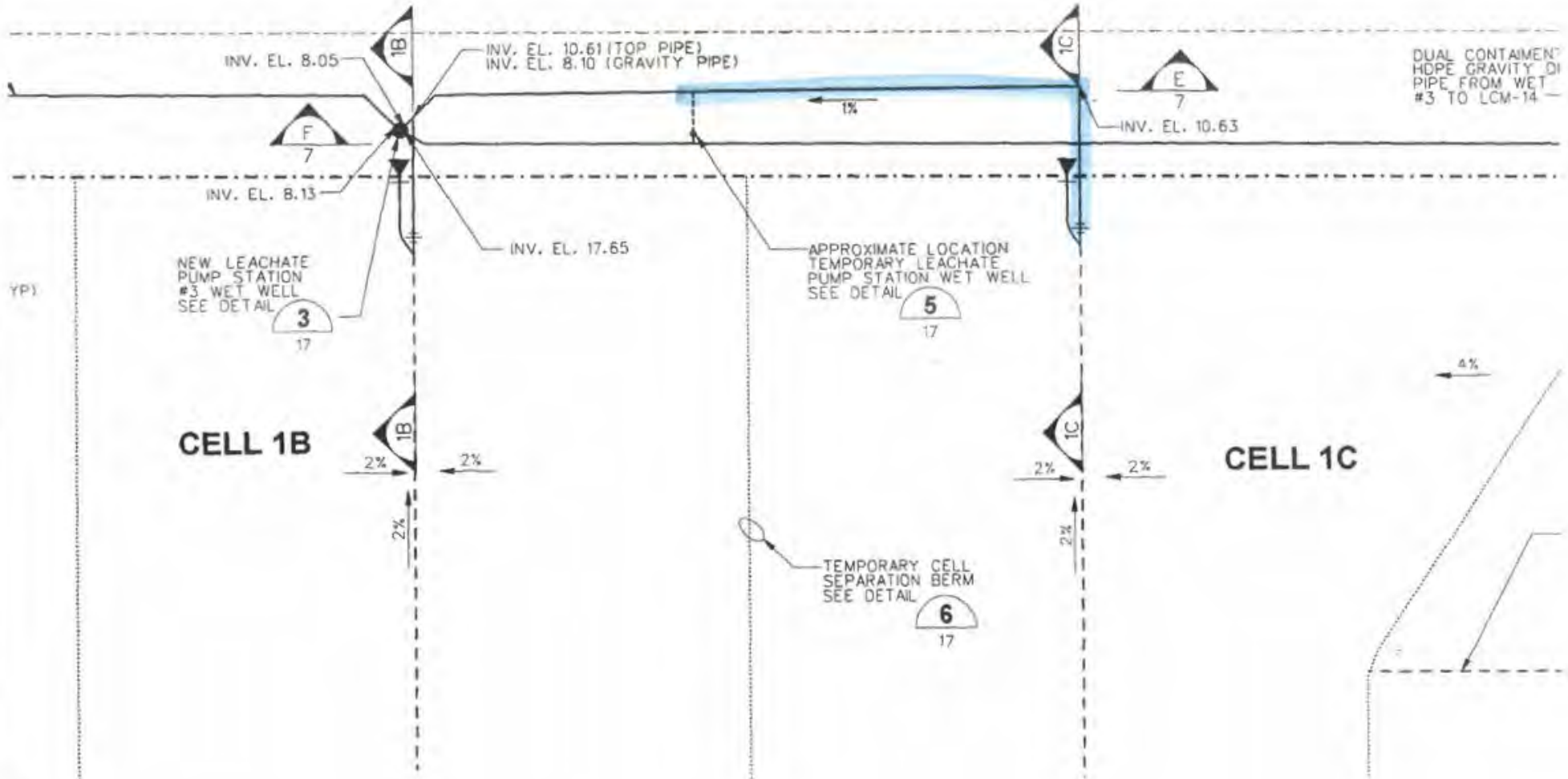
1500 E 1555BL

1570 E 155

1580 E 155

1590 E 155

1600



**ATTACHMENT 1  
FORM  
PE PIPE PRESSURE TEST REPORT**

TEST 5A

PROJECT NAME/NO: Kekaha Landfill Expansion      TIME: 3:55 AM  
 CONTRACTOR: ITC Water Management      DATE: 4/28/2010  
 PERSON PERFORMING TESTS: Bill Hewetson *Bill Hewetson*

DESCRIPTION / LOCAION OF TEST Segment (Pipe Diameter, Length, And SDRs):  
 Pressure test 5A : 4 x 8 Dual Wall forced main from temporary wet well to LCM - 14. 8" sdr 17 containment pipe. See attached drawing for location.

Ti = Initial Temperature in deg C = 34.30 deg C  
 Pi = Initial test pressure in psig = 10.00 psig  
 Pc = Initial pressure in psig corrected for temperature (Tt) at time 't'  
 t = Time in minutes from initiation of test  
 Tt = Temperature in deg C at time 't'  
 Pt = Test pressure in psig at time 't'

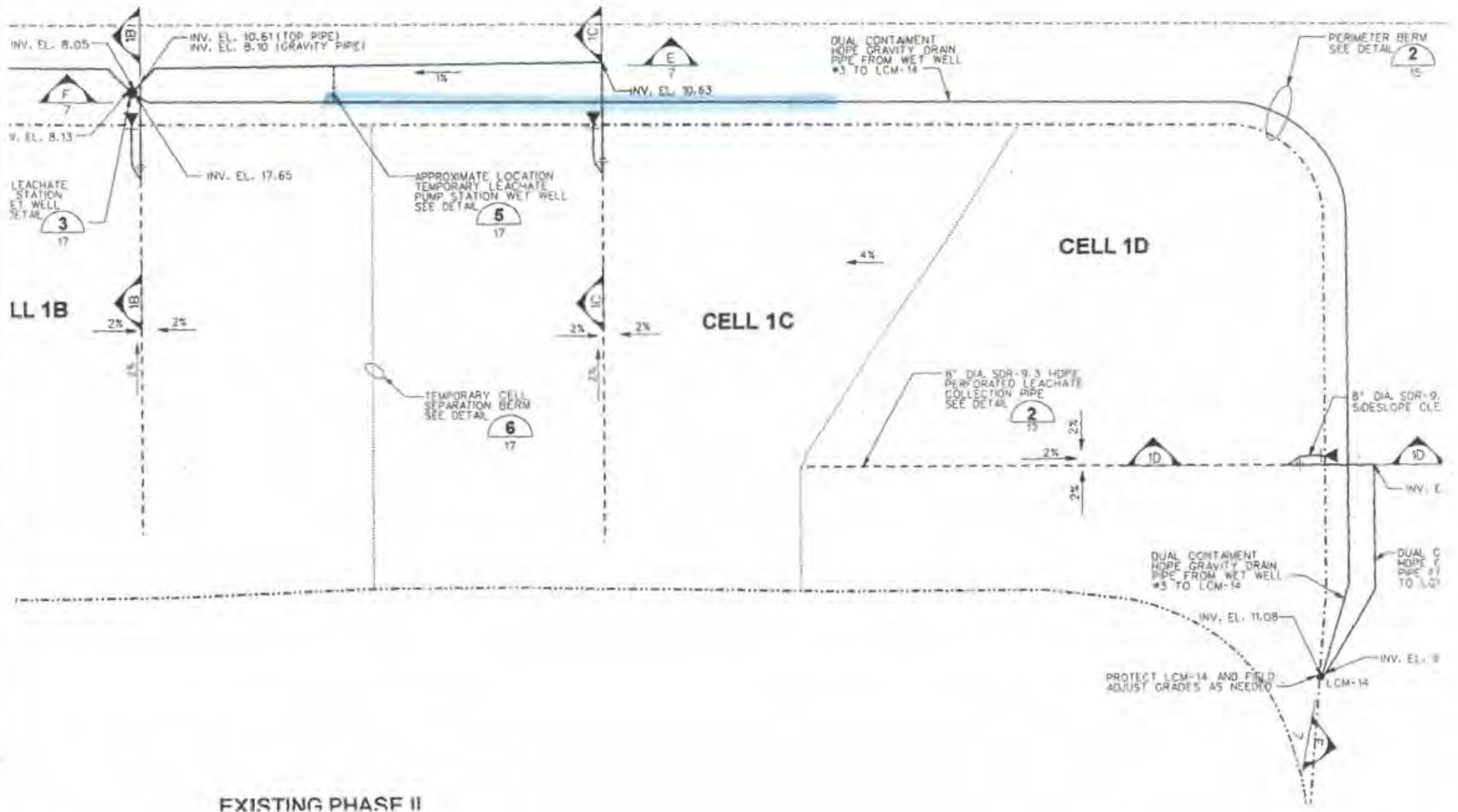
$$Pc = ((Pi + 14.7) (Tt + 273) / (Ti + 273)) - 14.7$$

$$\text{Percent Pressure Drop} = ((Pc - Pt) / Pc) \times 100$$

t TIME (min)	Tt TEMP READING (deg C)	Pt GAUGE READING (psig)	Pc CORRECTED PRESSURE (psig)	Pd PRESSURE DROP (%)
0	34.3	10.00	10.00	0.00
20	32.5	10.10	9.86	-2.48
30	32.3	10.20	9.84	-3.67
40	32.0	10.20	9.82	-3.92
50	31.5	10.20	9.77	-4.35
60	30.9	10.30	9.73	-5.89

PASS / FAILURE: PASS      RETEST (yes / no): NO

DESCRIPTION / NATURE OF LEAKS AND REPAIRS OF RETEST SEGMENT:



EXISTING PHASE II

**ATTACHMENT 1  
FORM  
PE PIPE PRESSURE TEST REPORT**

TEST 5B

PROJECT NAME/NO: Kekaha Landfill Expansion TIME: 4:25 AM

CONTRACTOR: ITC Water Management DATE: 4/29/2010

PERSON PERFORMING TESTS: Bill Hewetson *Bill Hewetson*

DESCRIPTION / LOCATION OF TEST Segment (Pipe Diameter, Length, And SDRs):  
 Pressure test 5B : 4 x 8 Dual Wall forced main from temporary wet well to LCM - 14. 4" sdr 11 carrier pipe. See attached drawing for location.

- Ti = Initial Temperature in deg C = 27.60 deg C
- Pi = Initial test pressure in psig = 10.00 psig
- Pc = Initial pressure in psig corrected for temperature (Tt) at time 't'
- t = Time in minutes from initiation of test
- Tt = Temperature in deg C at time 't'
- Pt = Test pressure in psig at time 't'

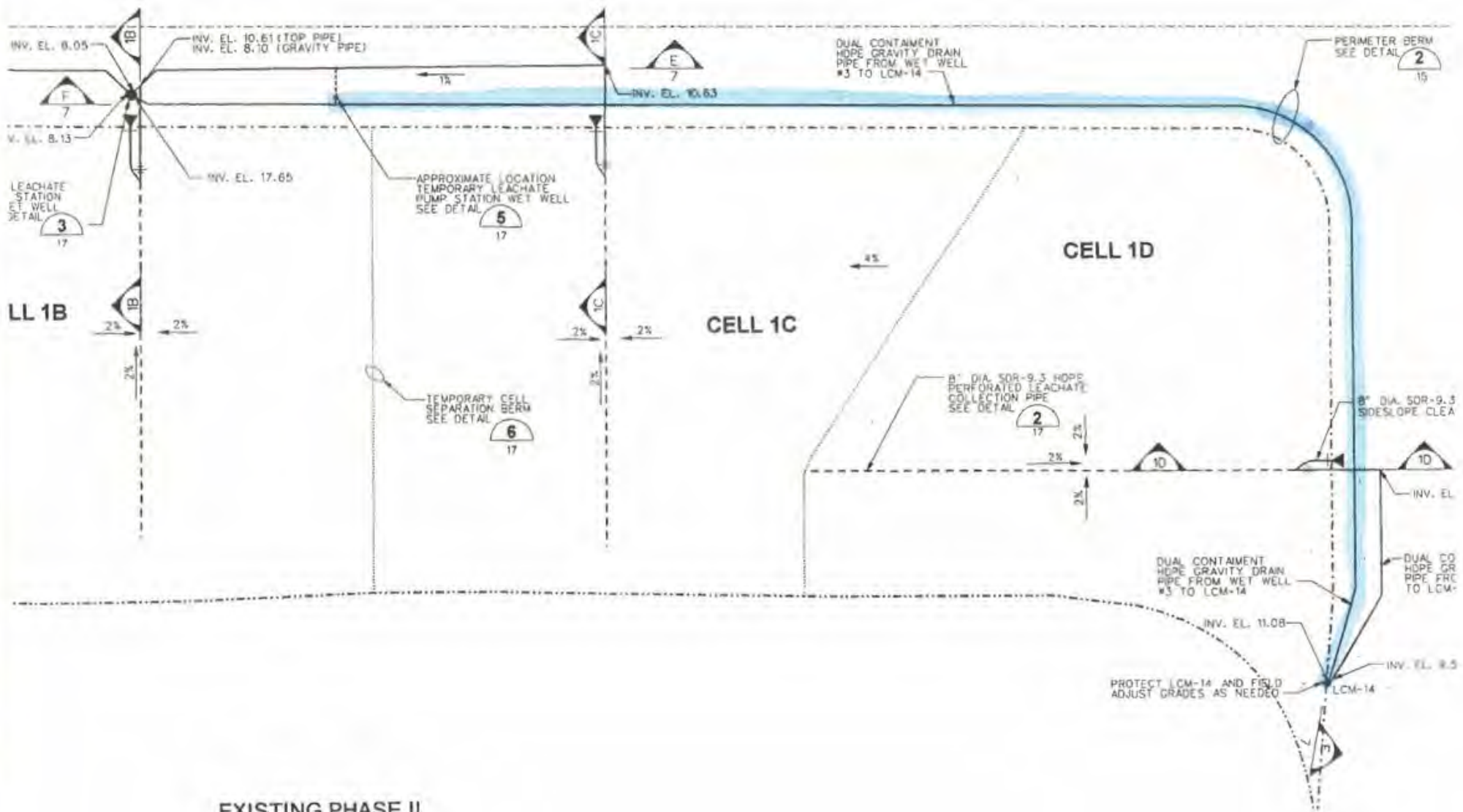
$$Pc = ((Pi + 14.7) (Tt + 273) / (Ti + 273)) - 14.7$$

$$\text{Percent Pressure Drop} = ((Pc - Pt) / Pc) \times 100$$

t TIME (min)	Tt TEMP READING (deg C)	Pt GAUGE READING (psig)	Pc CORRECTED PRESSURE (psig)	Pd PRESSURE DROP (%)
0	27.6	10.00	10.00	0.00
20	26.7	10.00	9.93	-0.75
30	26.8	10.00	9.93	-0.66
40	27.0	10.00	9.95	-0.50
50	27.2	10.00	9.97	-0.33
60	27.4	10.00	9.98	-0.16

PASS / FAILURE: **PASS** RETEST (yes / no): **NO**

DESCRIPTION / NATURE OF LEAKS AND REPAIRS OF RETEST SEGMENT:



EXISTING PHASE II



**ATTACHMENT 1  
FORM  
PE PIPE PRESSURE TEST REPORT**

PROJECT NAME/NO: Kekaha Landfill Expansion	TIME: 8:45 AM
CONTRACTOR: ITC Water Management	DATE: 5/12/2010
PERSON PERFORMING TESTS: Bill Hewetson <i>Bill Hewetson</i>	

DESCRIPTION / LOCAION OF TEST Segment (Pipe Diameter, Length, And SDRs):  
 6" SDR 11 single wall forced main under the road to the leachate pond. Approximately 120'. See attached drawing.

$T_i$  = Initial Temperature in deg C = 36.00 deg C  
 $P_i$  = Initial test pressure in psig = 10.00 psig  
 $P_c$  = Initial pressure in psig corrected for temperature ( $T_t$ ) at time 't'  
 $t$  = Time in minutes from initiation of test  
 $T_t$  = Temperature in deg C at time 't'  
 $P_t$  = Test pressure in psig at time 't'

$$P_c = ((P_i + 14.7) (T_t + 273) / (T_i + 273)) - 14.7$$

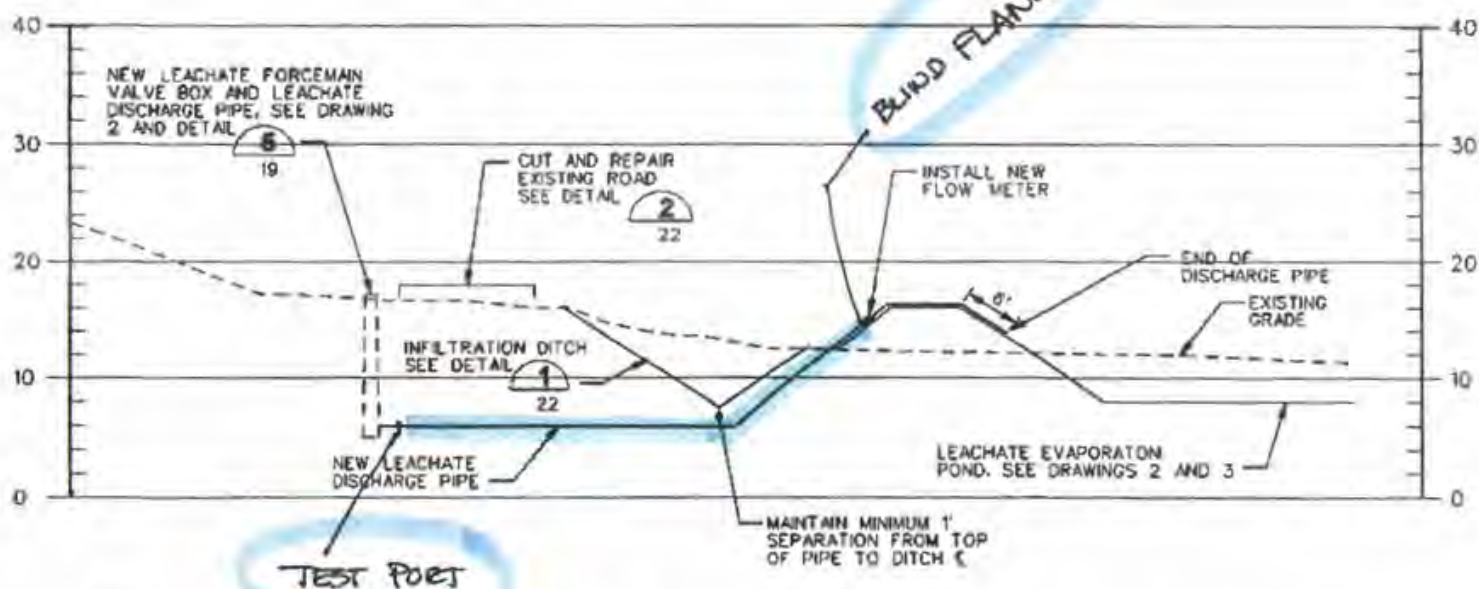
$$\text{Percent Pressure Drop} = ((P_c - P_t) / P_c) \times 100$$

t TIME (min)	T <sub>t</sub> TEMP READING (deg C)	P <sub>t</sub> GAUGE READING (psig)	P <sub>c</sub> CORRECTED PRESSURE (psig)	P <sub>d</sub> PRESSURE DROP (%)
0	36.0	10.00	10.00	0.00
20	35.9	10.00	9.99	-0.08
30	37.0	10.00	10.08	0.79
40	35.8	10.00	9.98	-0.16
50	35.9	10.10	9.99	-1.08
60	37.0	10.10	10.08	-0.20

PASS / FAILURE: Pass	RETEST (yes / no): No
----------------------	-----------------------

DESCRIPTION / NATURE OF LEAKS AND REPAIRS OF RETEST SEGMENT:

**PAVEMENT CONNECTION DETAIL 2**  
NTS



**NOTES:**

1. INSTALL NEW LEACHATE FORCEMAIN VALVE BOX AND LEACHATE DISCHARGE PIPE BASED UPON EXISTING FIELD CONNECTIONS AND MINIMUM DITCH SEPARATION SHOWN.

**NEW LEACHATE FORCEMAIN VALVE BOX AND LEACHATE DISCHARGE PIPE SECTION**

NTS

7/2/2009 11:24:17 AM  
 s:\p\1046501  
 s:\p\1046501\1046501.dwg  
 20 2/8 11:24:17 AM 1/25/2009 11:24:17 AM

**ATTACHMENT 1  
FORM  
PE PIPE PRESSURE TEST REPORT**

PROJECT NAME/NO: Kekaha Landfill Expansion

TIME: 12:15 PM

CONTRACTOR: ITC Water Management

DATE: 6/9/2010

PERSON PERFORMING TESTS: Bill Hewetson *Bill Hewetson*

DESCRIPTION / LOCATION OF TEST Segment (Pipe Diameter, Length, And SDRs):

6" sdr 11 HDPE jumper for new leachate pond. See attached drawing.

$T_i =$  Initial Temperature in deg C = 35.20 deg C  
 $P_i =$  Initial test pressure in psig = 10.00 psig  
 $P_c =$  Initial pressure in psig corrected for temperature ( $T_t$ ) at time 't'  
 $t =$  Time in minutes from initiation of test  
 $T_t =$  Temperature in deg C at time 't'  
 $P_t =$  Test pressure in psig at time 't'

$$P_c = ((P_i + 14.7) (T_t + 273) / (T_i + 273)) - 14.7$$

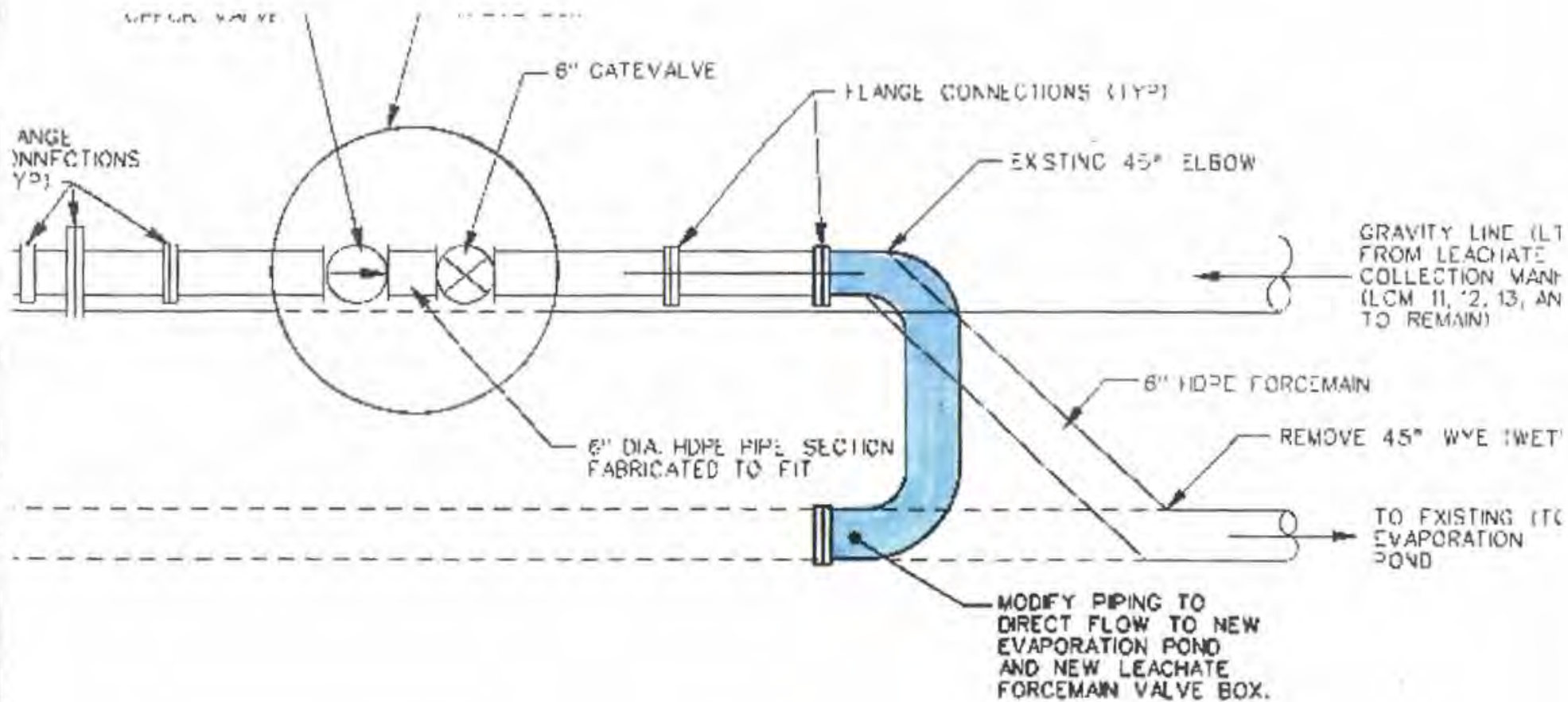
$$\text{Percent Pressure Drop} = ((P_c - P_t) / P_c) \times 100$$

I TIME (min)	T <sub>t</sub> TEMP READING (deg C)	P <sub>t</sub> GAUGE READING (psig)	P <sub>c</sub> CORRECTED PRESSURE (psig)	P <sub>d</sub> PRESSURE DROP (%)
0	35.2	10.00	10.00	0.00
20	34.1	10.00	9.91	-0.89
30	36.0	10.00	10.06	0.64
40	35.0	10.00	9.98	-0.16
50	35.9	10.00	10.06	0.56
60	35.3	10.00	10.01	0.08

PASS / FAILURE: Pass

RETEST (yes / no): No

DESCRIPTION / NATURE OF LEAKS AND REPAIRS OF RETEST SEGMENT:



**ATTACHMENT 1  
FORM  
PE PIPE PRESSURE TEST REPORT**

PROJECT NAME/NO: Kekaha Landfill Expansion	TIME: 12:15 PM
CONTRACTOR: ITC Water Management	DATE: 6/9/2010
PERSON PERFORMING TESTS: Bill Hewetson <i>Bill Hewetson</i>	
DESCRIPTION / LOCAION OF TEST Segment (Pipe Diameter, Length, And SDRs): 6" sdr 11 HDPE forced main from meter to leachate pond. See attached drawing	

$T_i$  = Initial Temperature in deg C = 35.20 deg C  
 $P_i$  = Initial test pressure in psig = 10.00 psig  
 $P_c$  = Initial pressure in psig corrected for temperature ( $T_i$ ) at time 't'  
 $t$  = Time in minutes from initiation of test  
 $T_t$  = Temperature in deg C at time 't'  
 $P_t$  = Test pressure in psig at time 't'

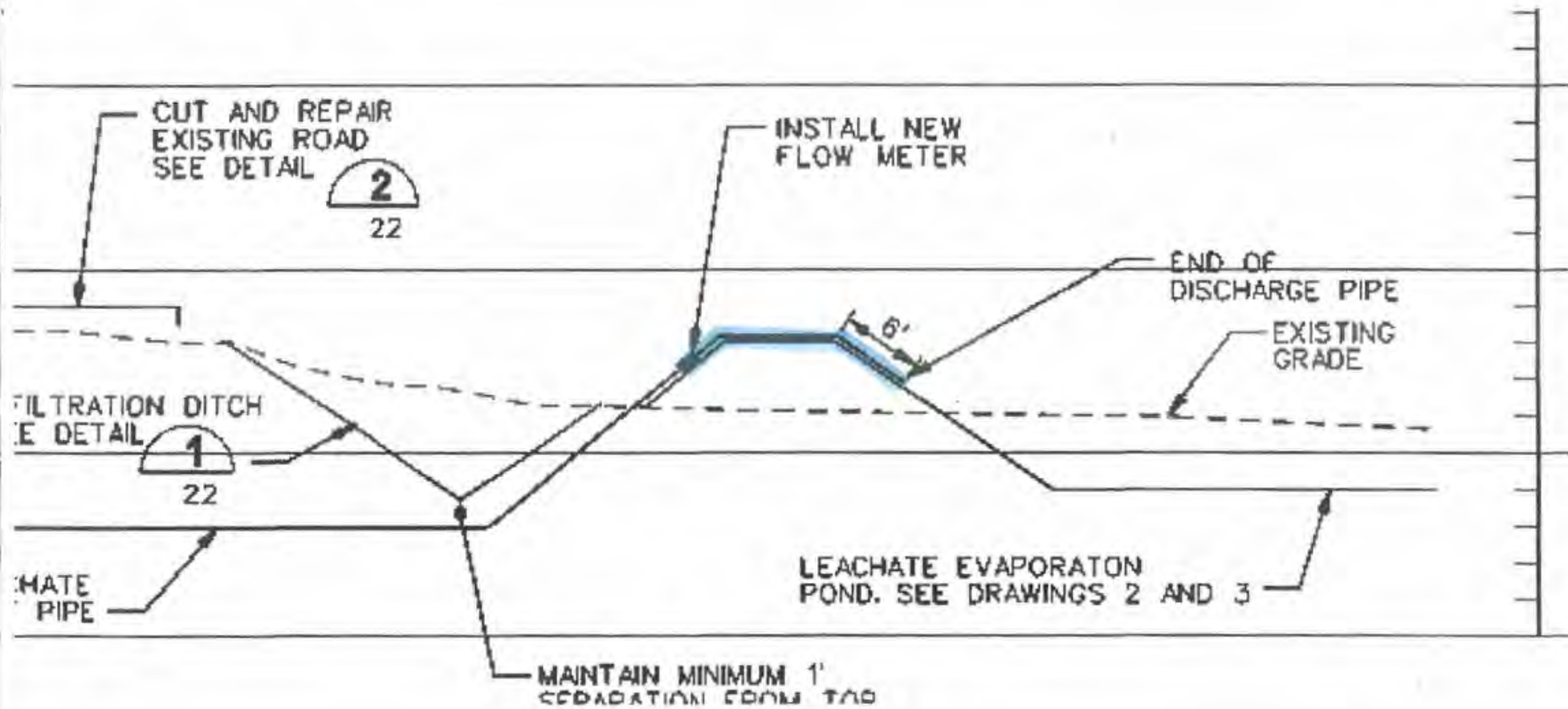
$$P_c = ((P_i + 14.7) (T_t + 273) / (T_i + 273)) - 14.7$$

$$\text{Percent Pressure Drop} = ((P_c - P_t) / P_c) \times 100$$

t TIME (min)	T <sub>t</sub> TEMP READING (deg C)	P <sub>t</sub> GAUGE READING (psig)	P <sub>c</sub> CORRECTED PRESSURE (psig)	P <sub>d</sub> PRESSURE DROP (%)
0	35.2	10.00	10.00	0.00
20	34.1	10.00	9.91	-0.89
30	36.0	10.00	10.06	0.64
40	35.0	10.00	9.98	-0.16
50	35.9	10.00	10.06	0.56
60	35.3	10.00	10.01	0.08

PASS / FAILURE: Pass	RETEST (yes / no): No
----------------------	-----------------------

DESCRIPTION / NATURE OF LEAKS AND REPAIRS OF RETEST SEGMENT:



**ATTACHMENT 1  
FORM  
PE PIPE PRESSURE TEST REPORT**

PROJECT NAME/NO: Kekaha Landfill Expansion	TIME: 2:00 PM
CONTRACTOR: ITC Water Management	DATE: 7/1/2010
PERSON PERFORMING TESTS: Bill Hewetson <i>Bill Hewetson</i>	

DESCRIPTION / LOCAION OF TEST Segment (Pipe Diameter, Length, And SDRs):  
 8" Carrier pipe from temporary wet well to permanent wet well. Note: tested carrier at 12 PSI and containment at 10 PSI. Vented the containment at the end of the test prior to venting carrier. See attached drawing.

- Ti = Initial Temperature in deg C = 32.10 deg C
- Pi = Initial test pressure in psig = 12.00 psig
- Pc = Initial pressure in psig corrected for temperature (Tt) at time 't'
- t = Time in minutes from initiation of test
- Tt = Temperature in deg C at time 't'
- Pt = Test pressure in psig at time 't'

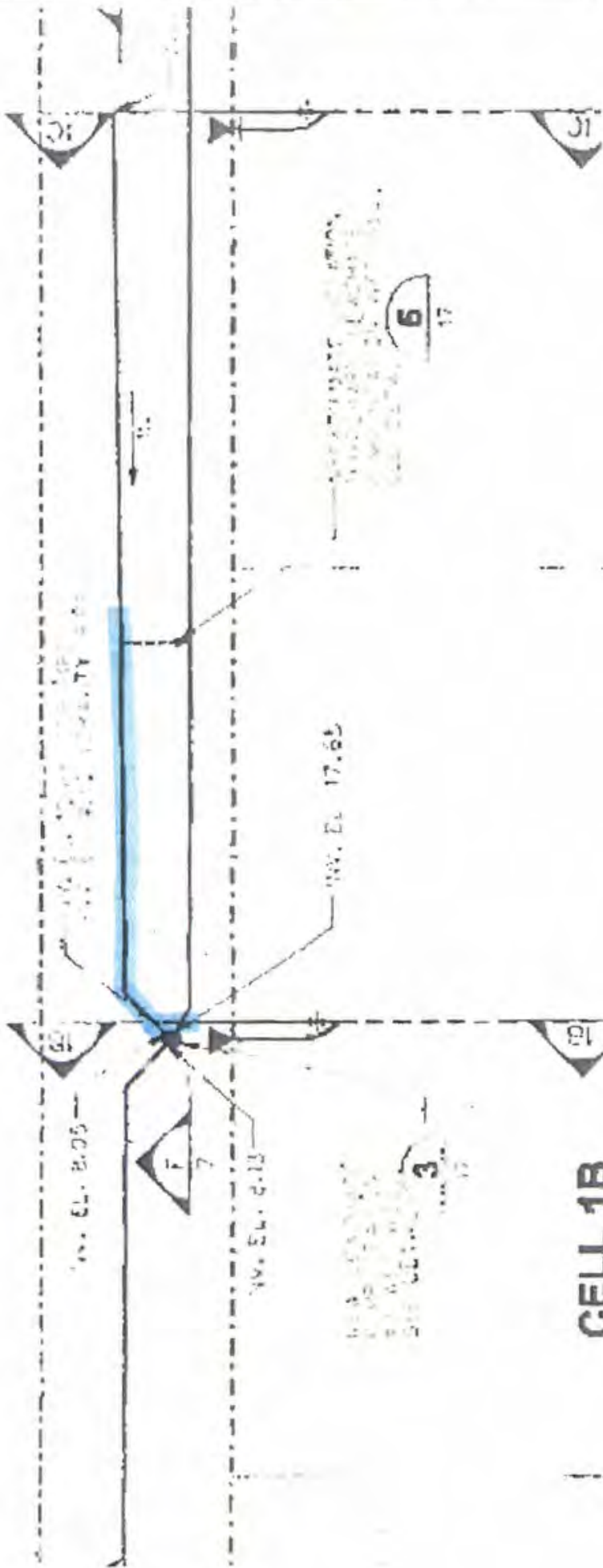
$$Pc = ((Pi + 14.7) (Tt + 273) / (Ti + 273)) - 14.7$$

$$\text{Percent Pressure Drop} = ((Pc - Pt) / Pc) \times 100$$

t TIME (min)	Tt TEMP READING (deg C)	Pt GAUGE READING (psig)	Pc CORRECTED PRESSURE (psig)	Pd PRESSURE DROP (%)
0	32.1	12.00	12.00	0.00
20	29.2	12.10	11.75	-3.01
30	27.0	12.20	11.55	-5.59
40	25.7	12.60	11.44	-10.14
50	26.3	12.80	11.49	-11.38
60	26.3	12.80	11.49	-11.38

PASS / FAILURE: Pass	RETEST (yes / no):
----------------------	--------------------

DESCRIPTION / NATURE OF LEAKS AND REPAIRS OF RETEST SEGMENT:



**CELL 1B**



**ATTACHMENT 1  
FORM  
PE PIPE PRESSURE TEST REPORT**

PROJECT NAME/NO: Kekaha Landfill Expansion	TIME: 2:00 PM
CONTRACTOR: ITC Water Management	DATE: 7/1/2010
PERSON PERFORMING TESTS: Bill Hewetson <i>Bill Hewetson</i>	

DESCRIPTION / LOCATION OF TEST Segment (Pipe Diameter, Length, And SDRs):  
 12" Containment pipe from temporary wet well to permanent wet well. Note: tested carrier at 12 PSI and containment at 10 PSI. Vented the containment at the end of the test prior to venting carrier. See attached drawing.

- Ti = Initial Temperature in deg C = 32.10 deg C
- Pi = Initial test pressure in psig = 10.00 psig
- Pc = Initial pressure in psig corrected for temperature (Tt) at time 't'
- t = Time in minutes from initiation of test
- Tt = Temperature in deg C at time 't'
- Pt = Test pressure in psig at time 't'

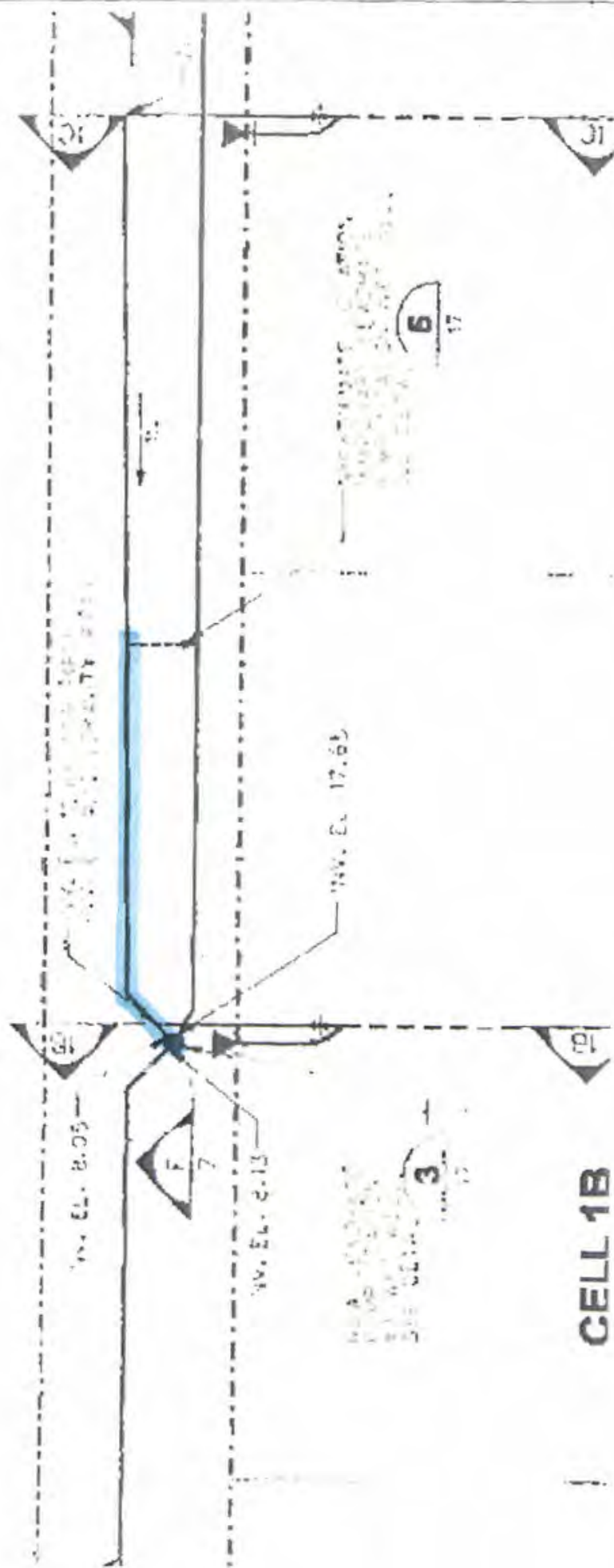
$$P_c = ((P_i + 14.7) (T_t + 273) / (T_i + 273)) - 14.7$$

$$\text{Percent Pressure Drop} = ((P_c - P_t) / P_c) \times 100$$

T TIME (min)	Tt TEMP READING (deg C)	Pt GAUGE READING (psig)	Pc CORRECTED PRESSURE (psig)	Pd PRESSURE DROP (%)
0	32.1	10.00	10.00	0.00
20	29.2	10.00	9.77	-2.40
30	27.0	10.10	9.59	-5.35
40	25.7	10.40	9.48	-9.68
50	26.3	10.50	9.53	-10.17
60	26.3	10.50	9.53	-10.17

PASS / FAILURE: Pass	RETEST (yes / no):
----------------------	--------------------

DESCRIPTION / NATURE OF LEAKS AND REPAIRS OF RETEST SEGMENT:



**CELL 1B**

**ATTACHMENT 1  
FORM  
PE PIPE PRESSURE TEST REPORT**

PROJECT NAME/NO: Kekaha Landfill Expansion

TIME: 12:15 PM

CONTRACTOR: ITC Water Management

DATE: 6/9/2010

PERSON PERFORMING TESTS: Bill Hewetson

*Bill Hewetson*

DESCRIPTION / LOCATION OF TEST Segment (Pipe Diameter, Length, And SDRs):

6" sdr 11 HDPE forced main tee. See attached drawing

$T_i =$  Initial Temperature in deg C = 35.20 deg C  
 $P_i =$  Initial test pressure in psig = 10.00 psig  
 $P_c =$  Initial pressure in psig corrected for temperature ( $T_t$ ) at time 't'  
 $t =$  Time in minutes from initiation of test  
 $T_t =$  Temperature in deg C at time 't'  
 $P_t =$  Test pressure in psig at time 't'

$$P_c = ((P_i + 14.7) (T_t + 273) / (T_i + 273)) - 14.7$$

$$\text{Percent Pressure Drop} = ((P_c - P_t) / P_c) \times 100$$

t TIME (min)	Tt TEMP READING (deg C)	Pt GAUGE READING (psig)	Pc CORRECTED PRESSURE (psig)	Pd PRESSURE DROP (%)
0	35.2	10.00	10.00	0.00
20	34.1	10.00	9.91	-0.89
30	36.0	10.00	10.06	0.64
40	35.0	10.00	9.98	-0.16
50	35.9	10.00	10.06	0.56
60	35.3	10.00	10.01	0.08

PASS / FAILURE: Pass

RETEST (yes / no): No

DESCRIPTION / NATURE OF LEAKS AND REPAIRS OF RETEST SEGMENT:

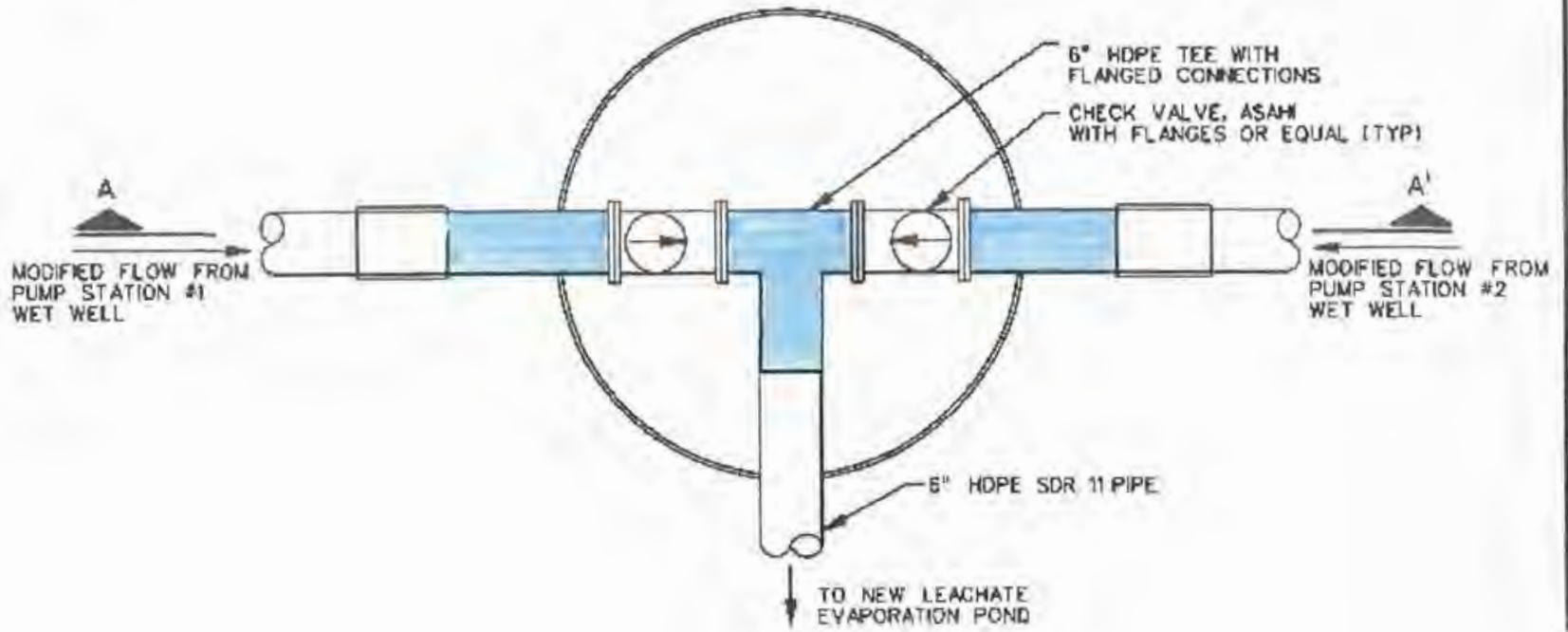
CHECK VALVE (TYP)

6" CRUSHED AGGREGATE

**SECTION A-A'**

RACER WIRE, NON-METALLIC  
IPE ONLY. SEE SPECS

4



PREPAR

CONSTRUCTION DRAWINGS  
PHASE II LATERAL EXPANSION

**ATTACHMENT 1  
FORM  
PE PIPE PRESSURE TEST REPORT**

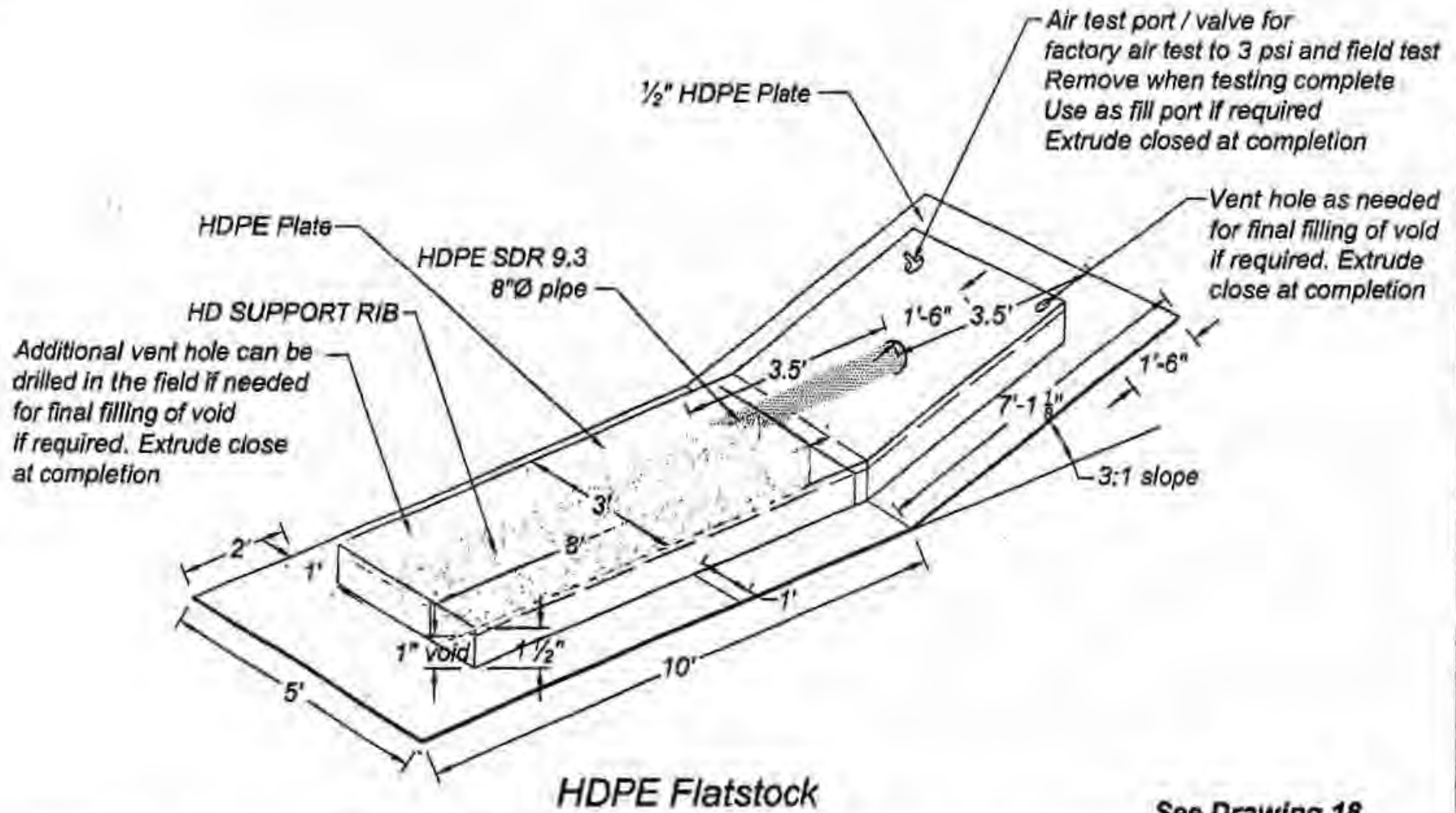
PROJECT NAME/NO: Kekaha Landfill Expansion	TIME: 7:45 AM
CONTRACTOR: ITC Water Management	DATE: 6/17/2010
PERSON PERFORMING TESTS: Bill Hewetson / Vaileen Vea <i>Bill Hewetson</i>	

DESCRIPTION / LOCATION OF TEST Segment (Pipe Diameter, Length, And SDRs):  
 Pressure test pipe penetration void space for Cell A. See attached drawing

t TIME (min)	Tt TEMP READING (deg C)	Pt GAUGE READING (psig)	Pc CORRECTED PRESSURE (psig)	Pd PRESSURE DROP (%)
0	N/A	3.00	N/A	N/A
60	N/A	3.00	N/A	0.00

PASS / FAILURE: PASS	RETEST (yes / no): NO
----------------------	-----------------------

DESCRIPTION / NATURE OF LEAKS AND REPAIRS OF RETEST SEGMENT:



Northwest Linings & Geotextile Products, Inc. (NWL) is not a licensed engineering firm and does not practice engineering or provide engineering services. NWL does not make any representation or warranties, express or implied, as to any drawings, or the suitability of any of the drawings for a particular use or purpose. Without limiting the foregoing, NWL makes no representation or warranty that the drawings are appropriate for any particular installation. Only a registered professional engineer who has specialized knowledge of a particular project and the needs and requirements of such project can determine what specific design, engineering or installation detail is best suited for each project.

Kekaha Sanitary Landfill - Phase II Lateral Expansion		N 09150	
3	8	10	KL
50			NTS

**ATTACHMENT 1  
FORM  
PE PIPE PRESSURE TEST REPORT**

PROJECT NAME/NO: Kekaha Landfill Expansion

TIME: 9:45 AM

CONTRACTOR: ITC Water Management

DATE: 6/16/2010

PERSON PERFORMING TESTS: Bill Hewetson / Vailenn Vea

*Bill Hewetson*

DESCRIPTION / LOCATION OF TEST Segment (Pipe Diameter, Length, And SDRs):

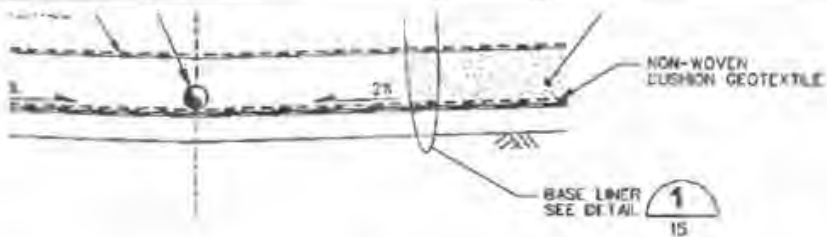
Pressure test wet well from the 4" flange on the top. Tested the annular space between the double wall of the wet well and the fittings attached at the factory. See attached drawing

t TIME (min)	Tt TEMP READING (deg C)	Pt GAUGE READING (psig)	Pc CORRECTED PRESSURE (psig)	Pd PRESSURE DROP (%)
0	N/A	3.00	N/A	N/A
60	N/A	3.00	N/A	0.00

PASS / FAILURE: PASS

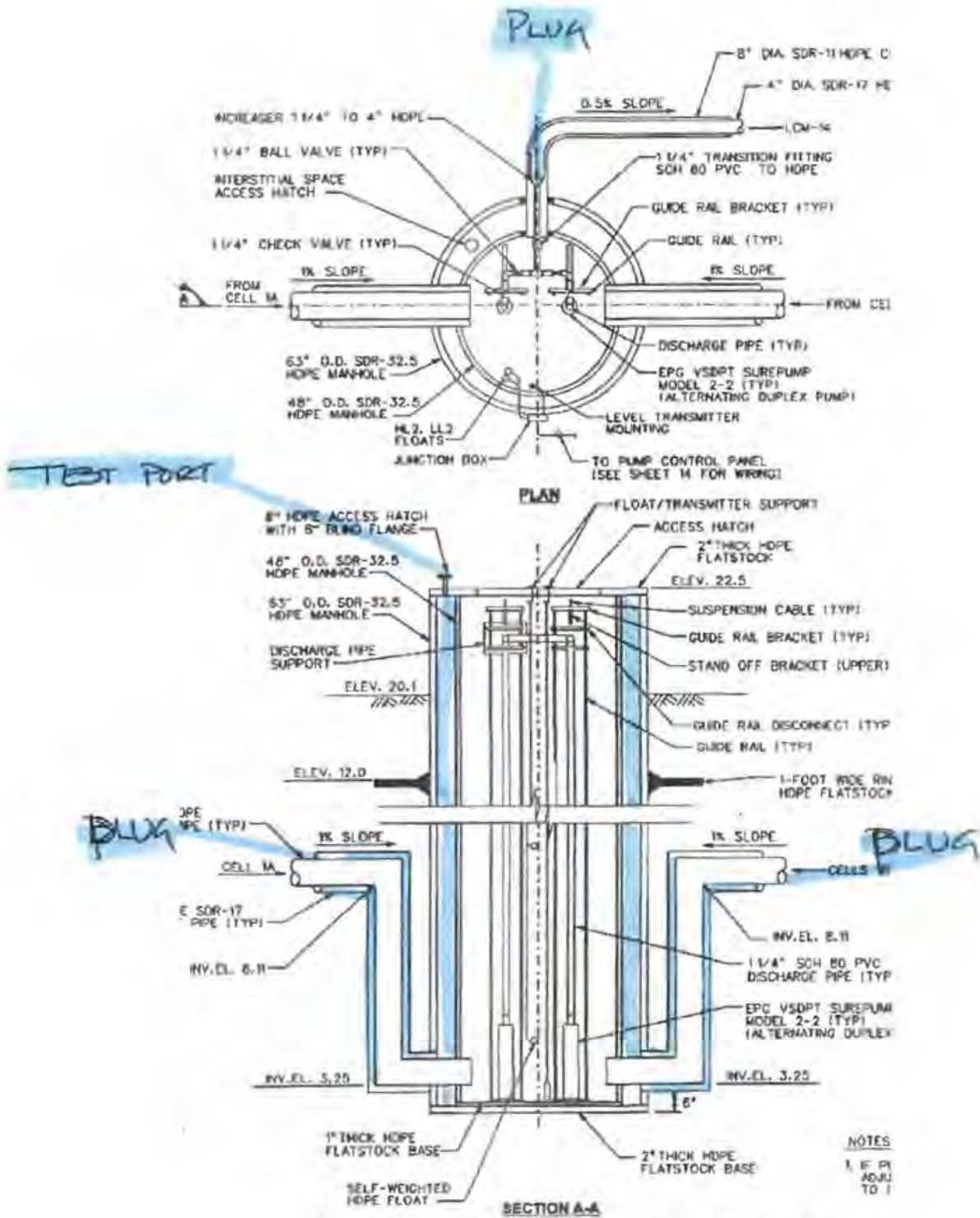
RETEST (yes / no): NO

DESCRIPTION / NATURE OF LEAKS AND REPAIRS OF RETEST SEGMENT:



**LEACHATE COLLECTION SYSTEM**

1



**LEACHATE FORCEMAIN WET WELL #3**

3

NTS



**ATTACHMENT 1  
FORM  
PE PIPE PRESSURE TEST REPORT**

PROJECT NAME/NO: Kekaha Landfill Expansion

TIME: 8:30 AM

CONTRACTOR: ITC Water Management

DATE: 7/8/2010

PERSON PERFORMING TESTS: Bill Hewetson / Vaileen Vea

*Bill Hewetson*

DESCRIPTION / LOCATION OF TEST Segment (Pipe Diameter, Length, And SDRs):  
8" Carrier pipe from Cell A to permanent wet well. See attached drawing.

Ti = Initial Temperature in deg C = 30.70 deg C

Pi = Initial test pressure in psig = 10.10 psig

Pc = Initial pressure in psig corrected for temperature (Tt) at time 't'

t = Time in minutes from initiation of test

Tt = Temperature in deg C at time 't'

Pt = Test pressure in psig at time 't'

$$Pc = ((Pi + 14.7) (Tt + 273) / (Ti + 273)) - 14.7$$

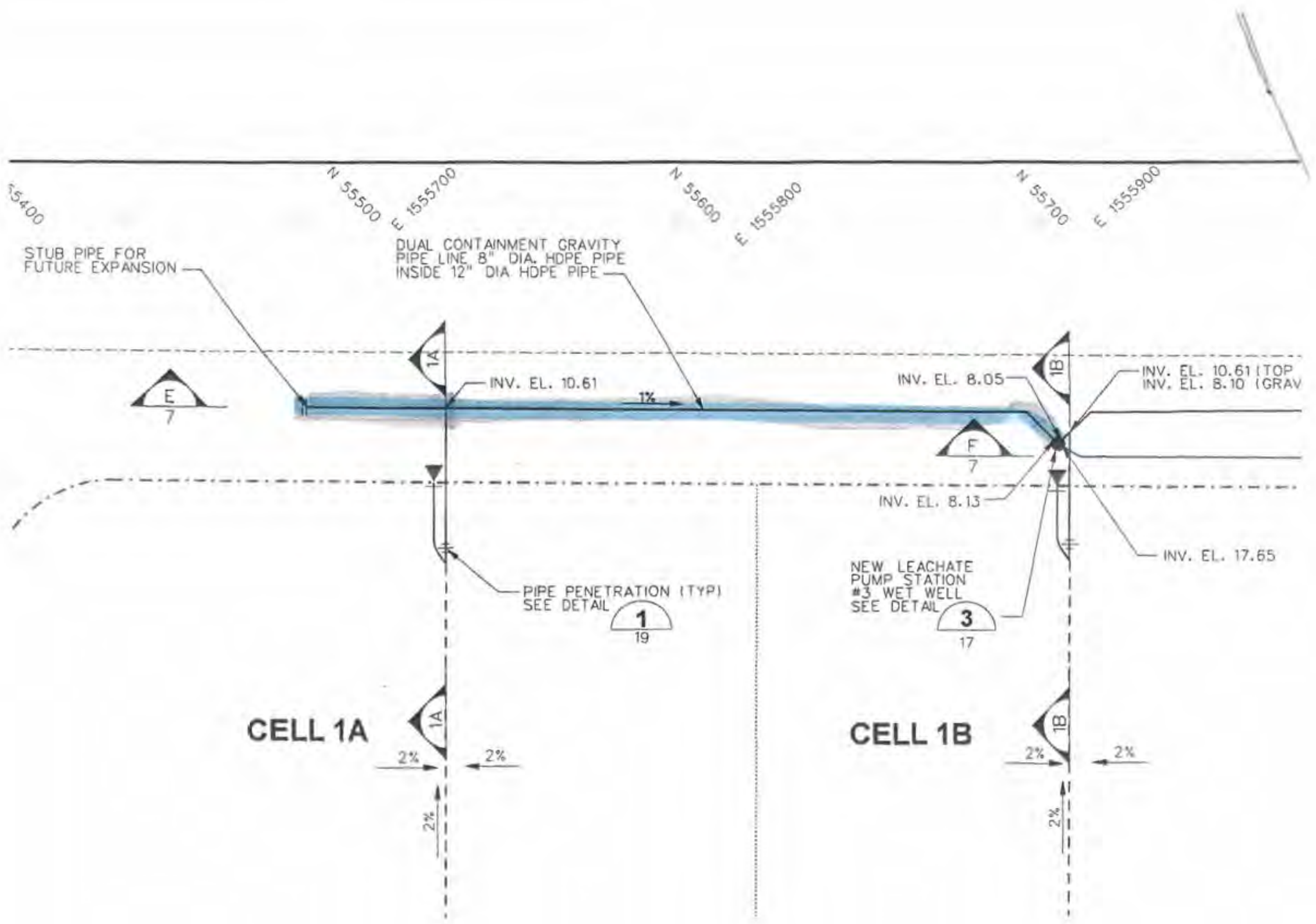
$$\text{Percent Pressure Drop} = ((Pc - Pt) / Pc) \times 100$$

t TIME (min)	Tt TEMP READING (deg C)	Pt GAUGE READING (psig)	Pc CORRECTED PRESSURE (psig)	Pd PRESSURE DROP (%)
0	30.7	10.10	10.10	0.00
20	30.7	10.10	10.10	0.00
30	30.7	10.10	10.10	0.00
40	30.7	10.10	10.10	0.00
50	30.7	10.10	10.10	0.00
60	30.8	10.20	10.11	-0.91

PASS / FAILURE: Pass

RETEST (yes / no):

DESCRIPTION / NATURE OF LEAKS AND REPAIRS OF RETEST SEGMENT:



**ATTACHMENT 1  
FORM  
PE PIPE PRESSURE TEST REPORT**

PROJECT NAME/NO: Kekaha Landfill Expansion	TIME: 10:00 AM
CONTRACTOR: ITC Water Management	DATE: 7/8/2010
PERSON PERFORMING TESTS: Bill Hewetson / Vaileen Vea <i>Bill Hewetson</i>	

DESCRIPTION / LOCATION OF TEST Segment (Pipe Diameter, Length, And SDRs):  
12" Containment pipe from Cell A to permanent wet well. See attached drawing.

$T_i =$  Initial Temperature in deg C = 29.90 deg C  
 $P_i =$  Initial test pressure in psig = 10.00 psig  
 $P_c =$  Initial pressure in psig corrected for temperature (Tt) at time 't'  
 $t =$  Time in minutes from initiation of test  
 $T_t =$  Temperature in deg C at time 't'  
 $P_t =$  Test pressure in psig at time 't'

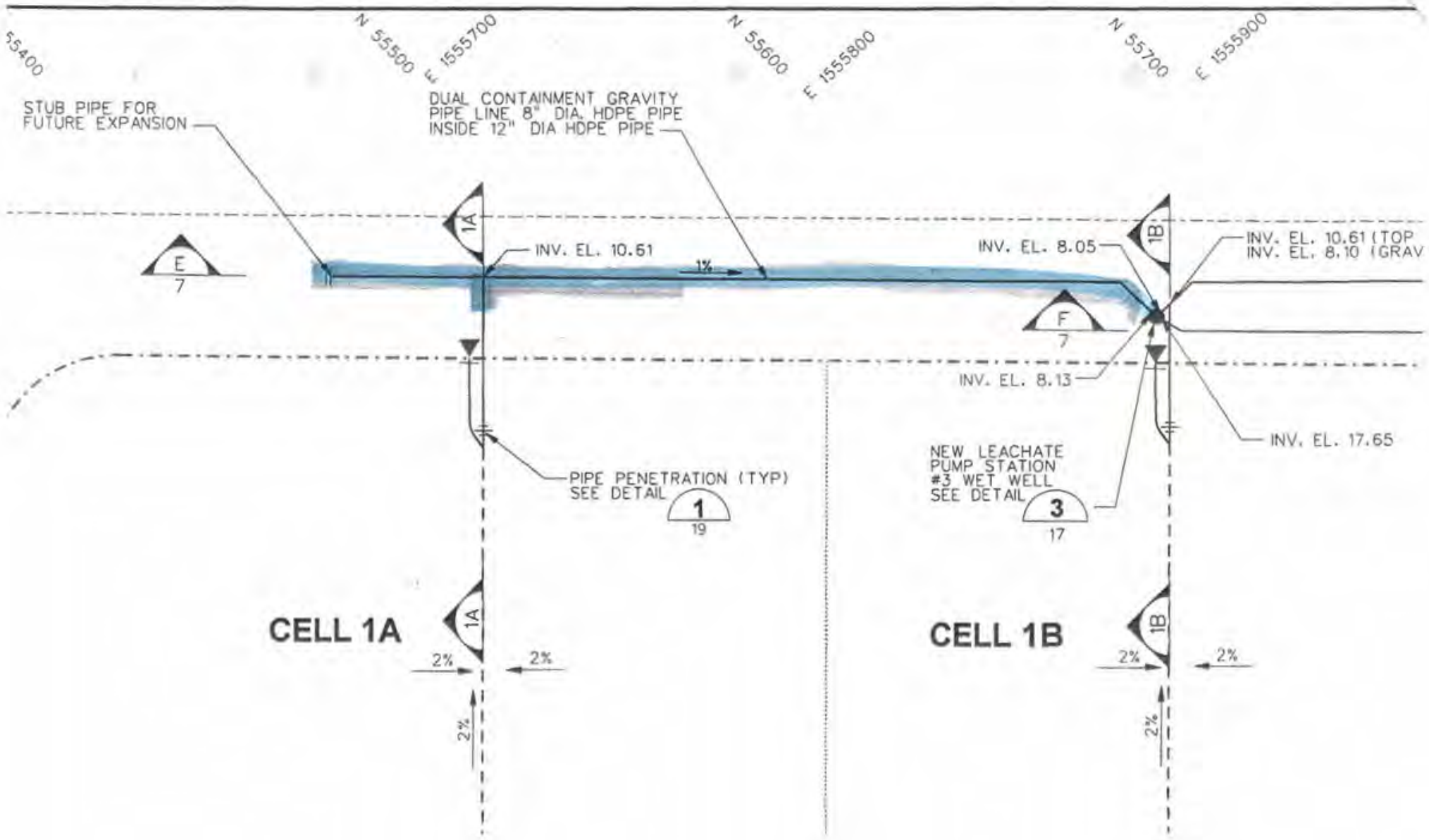
$$P_c = ((P_i + 14.7) (T_t + 273) / (T_i + 273)) - 14.7$$

$$\text{Percent Pressure Drop} = ((P_c - P_t) / P_c) \times 100$$

t TIME (min)	Tt TEMP READING (deg C)	Pt GAUGE READING (psig)	Pc CORRECTED PRESSURE (psig)	Pd PRESSURE DROP (%)
0	29.9	10.00	10.00	0.00
20	30.2	10.00	10.02	0.24
30	30.6	10.00	10.06	0.57
40	31.0	10.00	10.09	0.89
60	31.4	10.10	10.12	0.22
120	29.2	10.10	9.94	-1.58

PASS / FAILURE: Pass	RETEST (yes / no):
----------------------	--------------------

DESCRIPTION / NATURE OF LEAKS AND REPAIRS OF RETEST SEGMENT:



**ATTACHMENT 1  
FORM  
PE PIPE PRESSURE TEST REPORT**

PROJECT NAME/NO: Kekaha Landfill Expansion

TIME: 1:30 PM

CONTRACTOR: ITC Water Management

DATE: 7/9/2010

PERSON PERFORMING TESTS: Bill Hewetson

*Bill Hewetson*

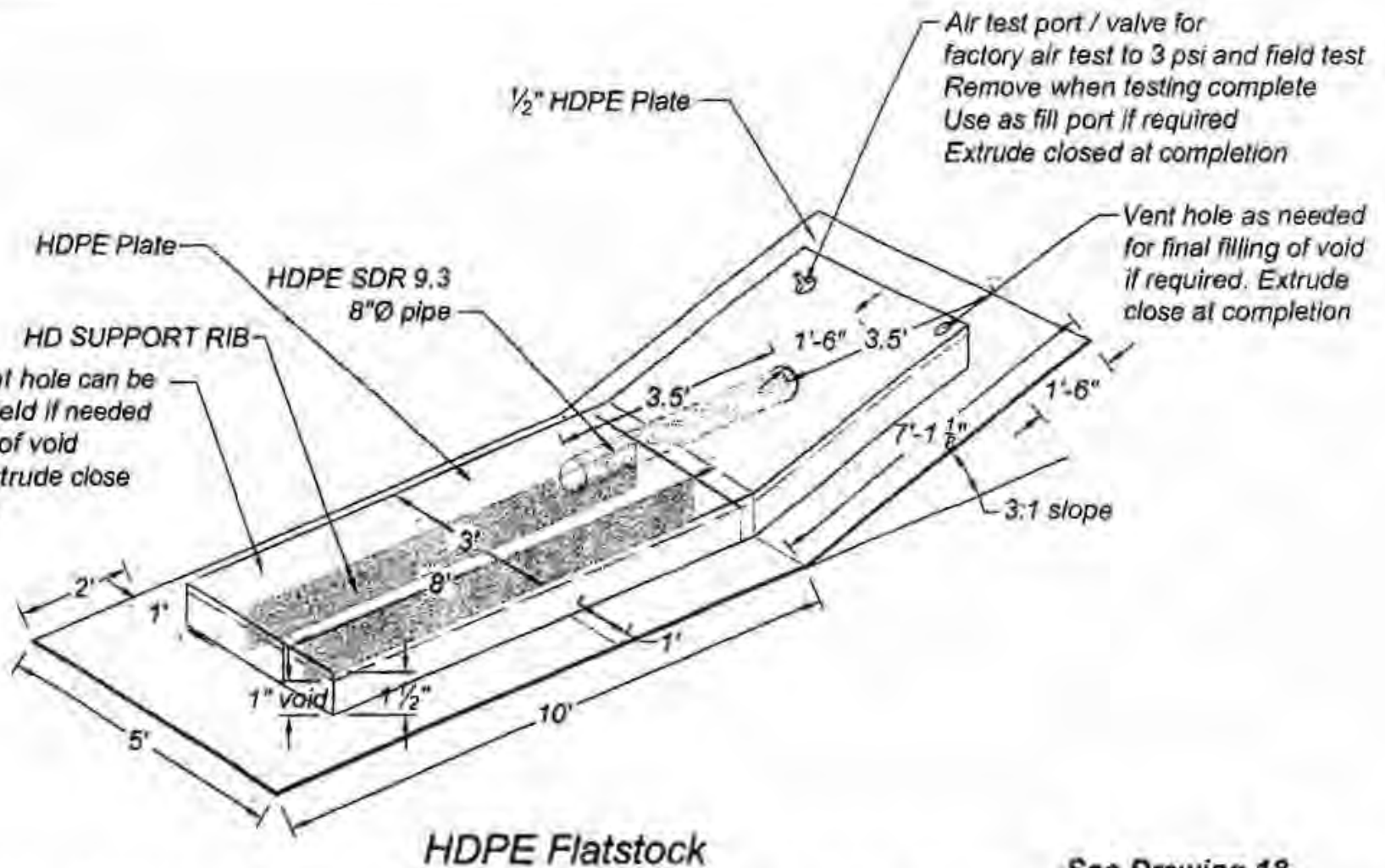
DESCRIPTION / LOCATION OF TEST Segment (Pipe Diameter, Length, And SDRs):  
Pressure test pipe penetration void space for Cell B. See attached drawing

t TIME (min)	Tt TEMP READING (deg C)	Pt GAUGE READING (psig)	Pc CORRECTED PRESSURE (psig)	Pd PRESSURE DROP (%)
0	N/A	1.50	N/A	N/A
60	N/A	1.50	N/A	0.00

PASS / FAILURE: PASS

RETEST (yes / no): NO

DESCRIPTION / NATURE OF LEAKS AND REPAIRS OF RETEST SEGMENT:



Northwest Linings & Geotextile Products, Inc. (NWL) is not a licensed engineering firm and does not practice engineering or provide engineering services. NWL does not make any representation or warranties, express or implied as to any drawings, or the suitability of any of the drawings for a particular use or purpose. Without limiting the foregoing, NWL makes no representation or warranty that the drawings are appropriate for any particular installation. Only a registered professional engineer who has specialized knowledge of a particular project and the needs and requirements of such project can determine what specific design, engineering or installation detail is best suited for each project.

SHEET NO.	DETAIL 	<b>NORTHWEST LININGS &amp; GEOTEXTILE PRODUCTS, Inc.</b>		JOB NAME: <i>Kekaha Sanitary Landfill - Phase II Lateral Expansion</i>		
		www.northwestlinings.com		JOB NO: <i>N 0 9 1 5 0</i>		
		2180 11TH AVE. (SOUTH)		DATE: <i>3 8 10</i>	CHECKED:	<i>KL</i>
		WEEK 1, WA, 98002 TEL: 360-421-1234 FAX: 360-421-1234		BY: <i>SG</i>	SCALE:	<i>NTS</i>

**ATTACHMENT 1  
FORM  
PE PIPE PRESSURE TEST REPORT**

PROJECT NAME/NO: Kekaha Landfill Expansion TIME: 10:40 AM

CONTRACTOR: ITC Water Management DATE: 7/16/2010

PERSON PERFORMING TESTS: Bill Hewetson / Vaileen Vea *Bill Hewetson*

DESCRIPTION / LOCATION OF TEST Segment (Pipe Diameter, Length, And SDRs):  
8" Carrier pipe from Cell A and CellB from ppipe penetration. See attached drawing.

Ti = Initial Temperature in deg C = 30.50 deg C  
 Pi = Initial test pressure in psig = 10.00 psig  
 Pc = Initial pressure in psig corrected for temperature (Tt) at time 't'  
 t = Time in minutes from initiation of test  
 Tt = Temperature in deg C at time 't'  
 Pt = Test pressure in psig at time 't'

$$Pc = ((Pi + 14.7) (Tt + 273) / (Ti + 273)) - 14.7$$

$$\text{Percent Pressure Drop} = ((Pc - Pt) / Pc) \times 100$$

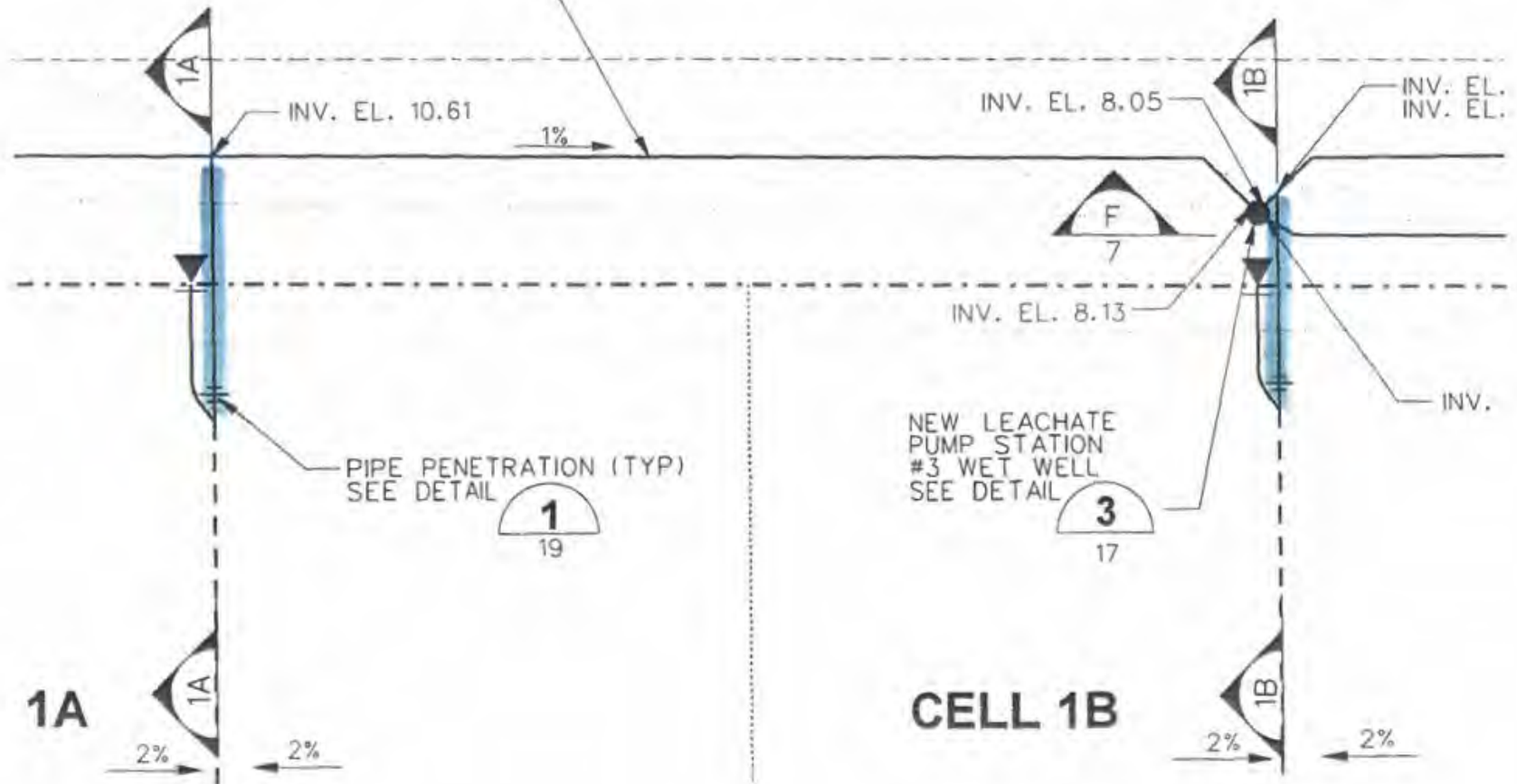
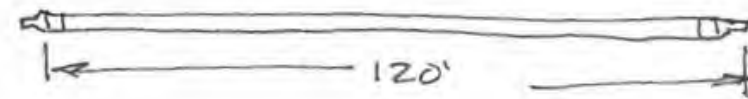
t TIME (min)	Tt TEMP READING (deg C)	Pt GAUGE READING (psig)	Pc CORRECTED PRESSURE (psig)	Pd PRESSURE DROP (%)
0	30.5	10.00	10.00	0.00
20	30.5	10.00	10.00	0.00
30	30.5	10.00	10.00	0.00
40	30.5	10.00	10.00	0.00
50	30.5	10.00	10.00	0.00
60	30.5	10.00	10.00	0.00

PASS / FAILURE: Pass RETEST (yes / no):

DESCRIPTION / NATURE OF LEAKS AND REPAIRS OF RETEST SEGMENT:

DUAL CONTAINMENT GRAVITY  
PIPE LINE, 8" DIA. HDPE PIPE  
INSIDE, 12" DIA HDPE PIPE

TWO SECTIONS WERE FUSED TOGETHER





**ATTACHMENT 1  
FORM  
PE PIPE PRESSURE TEST REPORT**

PROJECT NAME/NO: Kekaha Landfill Expansion TIME: 2:00 PM

CONTRACTOR: ITC Water Management DATE: 7/16/2010

PERSON PERFORMING TESTS: Bill Hewetson / Vaileen Vea *Bill Hewetson*

DESCRIPTION / LOCAION OF TEST Segment (Pipe Diameter, Length, And SDRs):  
12" Containment pipe from Cell A and Cell B from pipe penetration. See attached drawing.

- Ti = Initial Temperature in deg C = 30.80 deg C
- Pi = Initial test pressure in psig = 10.00 psig
- Pc = Initial pressure in psig corrected for temperature (Tt) at time 't'
- t = Time in minutes from initiation of test
- Tt = Temperature in deg C at time 't'
- Pt = Test pressure in psig at time 't'

$$Pc = ((Pi + 14.7) (Tt + 273) / (Ti + 273)) - 14.7$$

$$\text{Percent Pressure Drop} = ((Pc - Pt) / Pc) \times 100$$

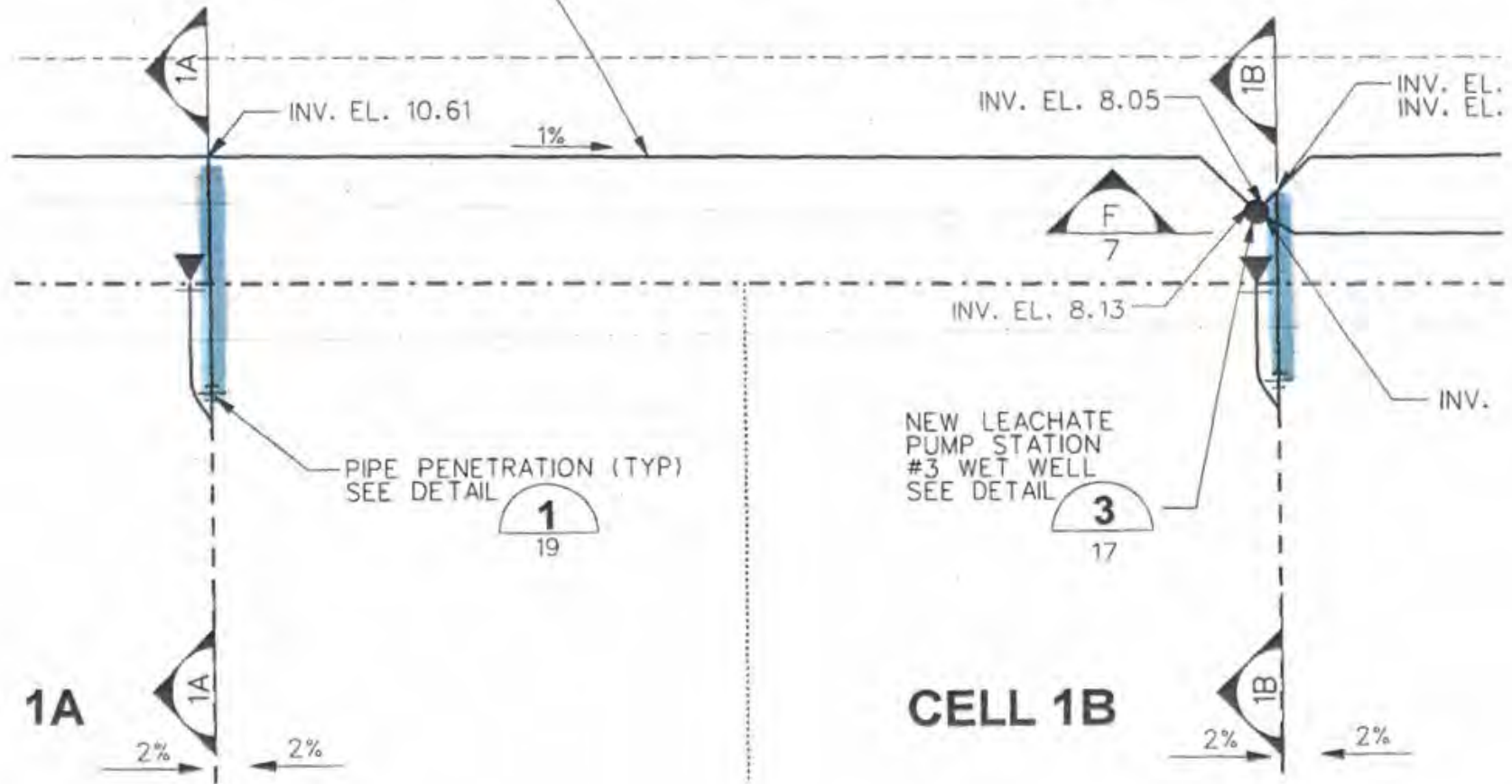
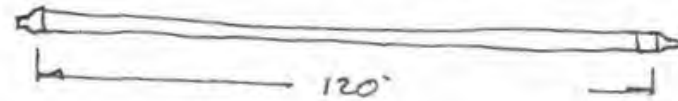
t TIME (min)	Tt TEMP READING (deg C)	Pt GAUGE READING (psig)	Pc CORRECTED PRESSURE (psig)	Pd PRESSURE DROP (%)
0	30.8	10.00	10.00	0.00
20	30.8	10.00	10.00	0.00
30	30.8	10.00	10.00	0.00
40	30.8	10.00	10.00	0.00
50	30.8	10.00	10.00	0.00
60	30.9	10.00	10.01	0.08

PASS / FAILURE: Pass RETEST (yes / no):

DESCRIPTION / NATURE OF LEAKS AND REPAIRS OF RETEST SEGMENT:

DUAL CONTAINMENT GRAVITY  
PIPE LINE, 8" DIA. HDPE PIPE  
INSIDE, 12" DIA HDPE PIPE

Two SECTIONS WERE FUSED TOGETHER



**ATTACHMENT 1  
FORM  
PE PIPE PRESSURE TEST REPORT**

PROJECT NAME/NO: Kekaha Landfill Expansion TIME: 2:00 PM

CONTRACTOR: ITC Water Management DATE: 7/26/2010

PERSON PERFORMING TESTS: Bill Hewetson / Vaileen Vea *Bill Hewetson*

DESCRIPTION / LOCAION OF TEST Segment (Pipe Diameter, Length, And SDRs):  
4" Carrier pipe from Temporary wet well to Permanent Wet well. See attached drawing.

- Ti = Initial Temperature in deg C = 37.30 deg C
- Pi = Initial test pressure in psig = 10.00 psig
- Pc = Initial pressure in psig corrected for temperature (Tt) at time 't'
- t = Time in minutes from initiation of test
- Tt = Temperature in deg C at time 't'
- Pt = Test pressure in psig at time 't'

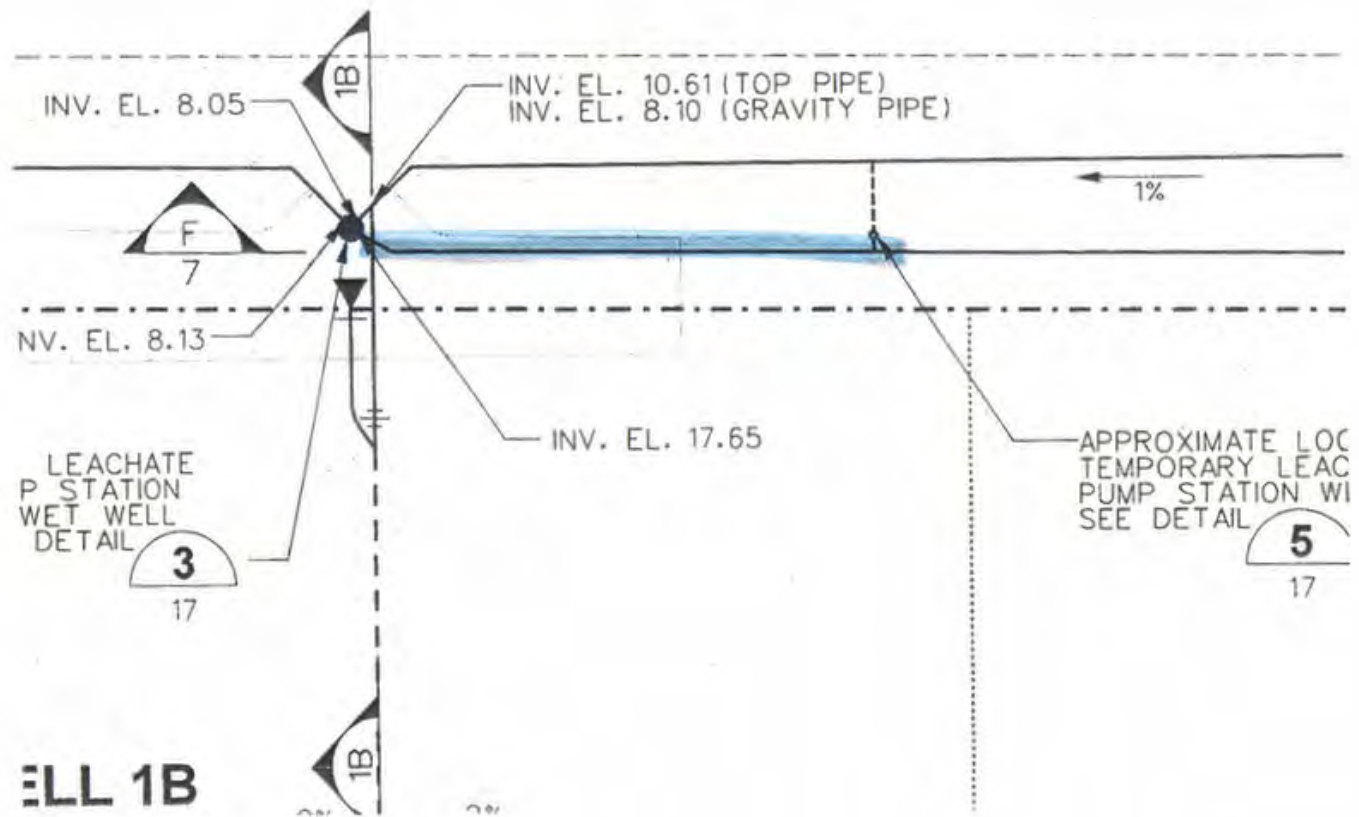
$$Pc = ((Pi + 14.7) (Tt + 273) / (Ti + 273)) - 14.7$$

$$\text{Percent Pressure Drop} = ((Pc - Pt) / Pc) \times 100$$

t TIME (min)	Tt TEMP READING (deg C)	Pt GAUGE READING (psig)	Pc CORRECTED PRESSURE (psig)	Pd PRESSURE DROP (%)
0	37.3	10.00	10.00	0.00
20	36.3	10.00	9.92	-0.80
30	35.6	10.00	9.86	-1.37
40	35.0	10.00	9.82	-1.86
50	35.1	10.00	9.82	-1.78
60	35.2	10.00	9.83	-1.70

PASS / FAILURE: Pass RETEST (yes / no):

DESCRIPTION / NATURE OF LEAKS AND REPAIRS OF RETEST SEGMENT:



**ATTACHMENT 1  
FORM  
PE PIPE PRESSURE TEST REPORT**

PROJECT NAME/NO: Kekaha Landfill Expansion TIME: 12:08 PM

CONTRACTOR: ITC Water Management DATE: 7/26/2010

PERSON PERFORMING TESTS: Bill Hewetson / Vaileen Vea *Bill Hewetson*

DESCRIPTION / LOCAION OF TEST Segment (Pipe Diameter, Length, And SDRs):  
8" Containment pipe from Temporary wet well to Permanent Wet well. See attached drawing.

- Ti = Initial Temperature in deg C = 36.30 deg C
- Pi = Initial test pressure in psig = 10.00 psig
- Pc = Initial pressure in psig corrected for temperature (Tt) at time 't'
- t = Time in minutes from initiation of test
- Tt = Temperature in deg C at time 't'
- Pt = Test pressure in psig at time 't'

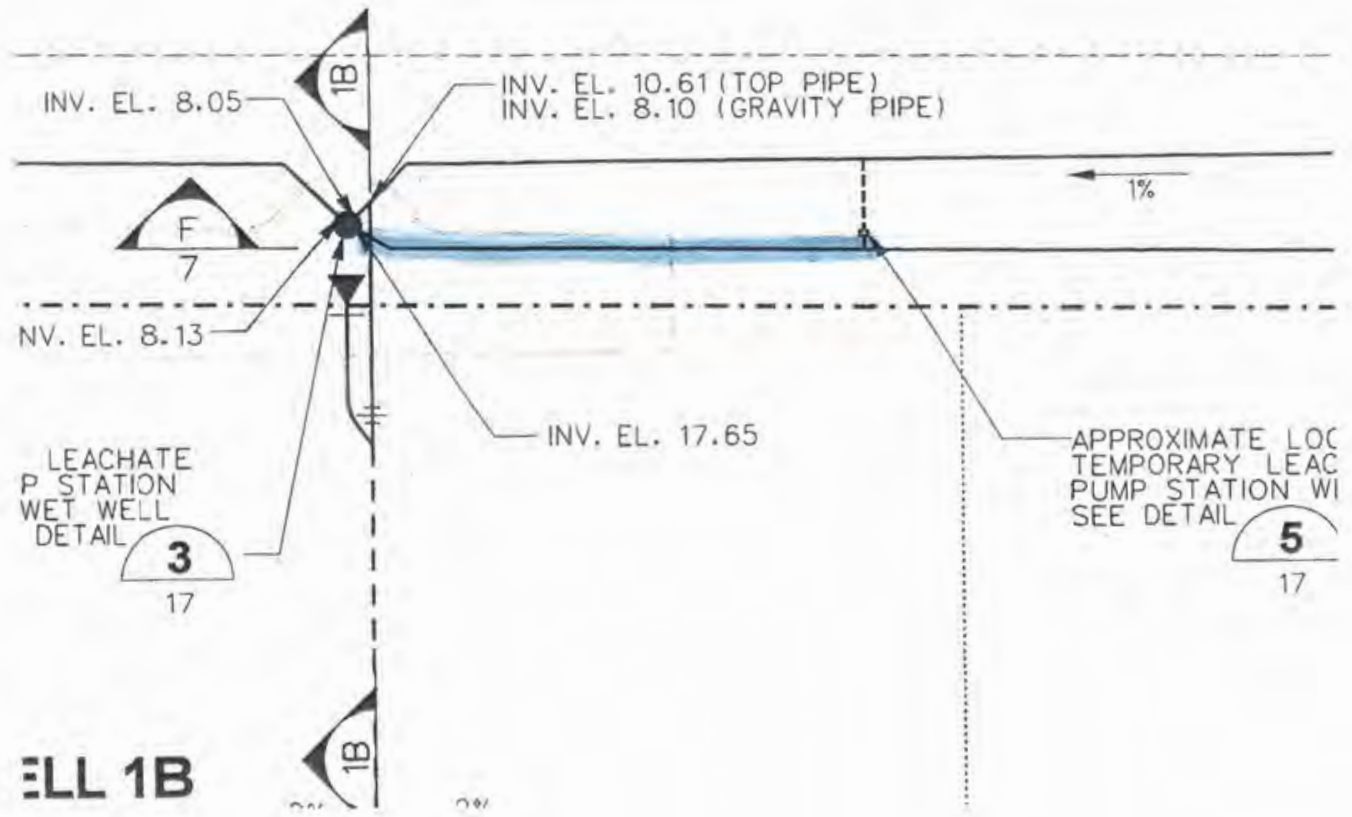
$$Pc = ((Pi + 14.7) (Tt + 273) / (Ti + 273)) - 14.7$$

$$\text{Percent Pressure Drop} = ((Pc - Pt) / Pc) \times 100$$

t TIME (min)	Tt TEMP READING (deg C)	Pt GAUGE READING (psig)	Pc CORRECTED PRESSURE (psig)	Pd PRESSURE DROP (%)
0	36.3	10.00	10.00	0.00
20	34.1	10.00	9.82	-1.79
30	34.6	10.00	9.86	-1.38
40	34.6	10.00	9.86	-1.38
50	34.2	10.00	9.83	-1.71
60	34.8	10.00	9.88	-1.21

PASS / FAILURE: Pass RETEST (yes / no):

DESCRIPTION / NATURE OF LEAKS AND REPAIRS OF RETEST SEGMENT:



**ILL 1B**



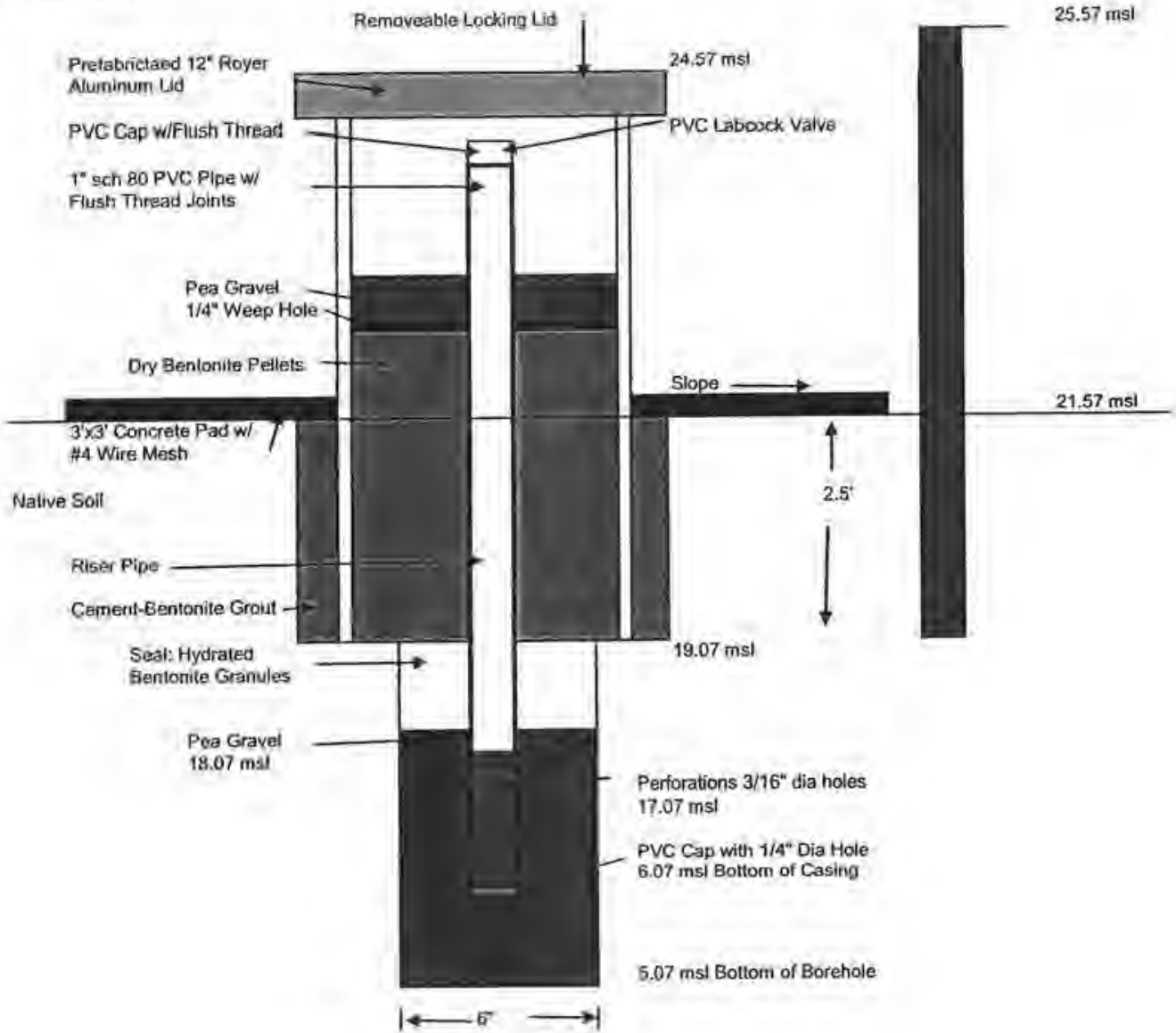
**Appendix M**  
**Gas Monitoring Probe Installation**





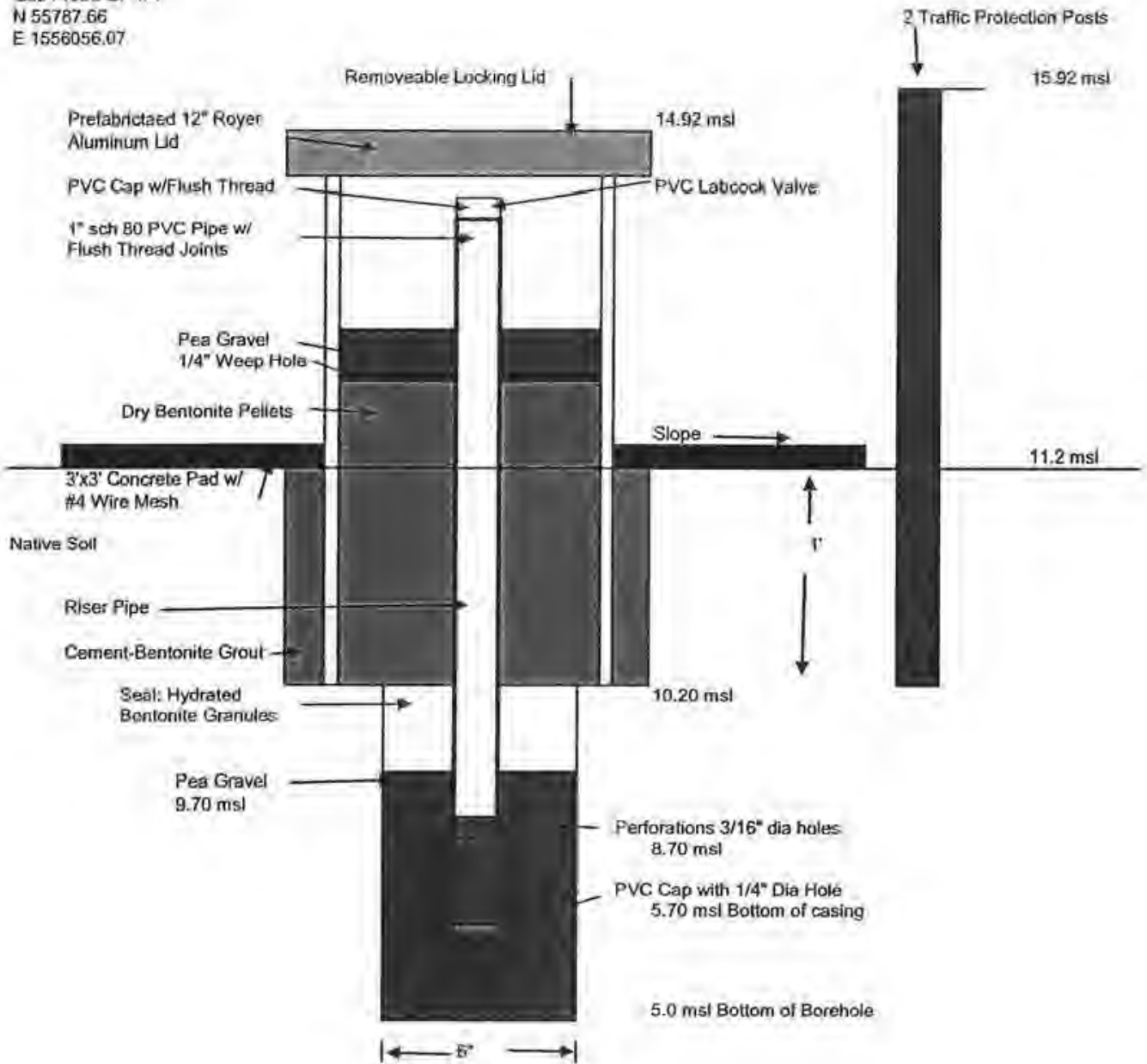
Kekaha Landfill  
Gas Probe GP-II-6  
N 55041.79  
E 1555906.76

2 Traffic Protection Posts





Kekaha Landfill  
 Gas Probe GP-II-7  
 N 55787.66  
 E 1556056.07





**Appendix N**  
**Systems Demonstrations**



**Temporary Leachate Collection and Recovery System (LCRS)**  
**Operational Test Report**

Date: 8 June 2010

Project: Phase II Lateral Expansion Cell I Base Liner Construction

Project Number: WG1298

---

**The Temporary LCRS system was constructed by Goodfellow Bros Construction and Ron's Electric.**

Goodfellow Bros installed the following: 24-inch dual wall HDPE Temporary wet well, 12-inch Diameter dual wall gravity flow pipe, 8-inch diameter dual wall containment force main discharge pipe, EPG VSDPT 2-2 submersible SUREPUMP, motor lead, submersible pump stainless steel support cable, 1 1/4-inch PVC discharge pipe.

Ron's Electric installed the following: 1000 feet of 1" PVC electrical conduit; 1000 feet of 1 1/4" PVC electrical conduit; 3 electrical pull boxes, installed new LCRS system control panel, parts and fitting to provide electrical power to the system.  
The primary power for the system was obtained from the NLEP control panel.

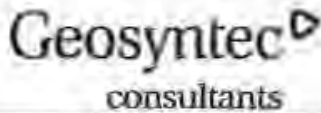
During construction today the Temporary LCRS system was tested upon completion of the test the below undersign verify the system is operating in accordance with the project plans and specifications.

**Signatures verifying system test:**

Goodfellow Bros Construction: [Signature] Date: 6/8/10

Ron's Electric: [Signature] Date: 6/8/2010

Geosyntec Consultants: [Signature] Date: 6/8/2010



Wet Well #3 System  
Operational Test Report

Date: 22 September 2010

Project: Phase II Lateral Expansion Cell I Base Liner Construction

Project Number: WG1298

---

The New Wet Well #3 System was constructed by Goodfellow Bros Construction and Ron's Electric.

Goodfellow Bros installed the following: 63-inch dual wall HDPE wet well, 12-inch Diameter dual wall gravity flow pipe, 8-inch diameter dual wall containment force main discharge pipe, EPG VSDPT 2-2 submersible SUREPUMP, motor lead, submersible pump stainless steel support cable, 1 1/4-inch PVC discharge pipe.

Ron's Electric installed the following: 1000 feet of 1" PVC electrical conduit; 1000 feet of 1 1/2" PVC electrical conduit; 3 electrical pull boxes, installed new LCRS system control panel, parts and fitting to provide electrical power to the system.  
The primary power for the system was obtained from the NLEP control panel.

The New Wet Well #3 System tested and the below undersign verify the system is operating in accordance with the project plans and specifications.

Signatures verifying system test:

Goodfellow Bros Construction: *Keith Suga* KEITH SUGA Date: 9-22-10

Ron's Electric: *Gary Yokum* GARY YOKUM Date: 9/23/10

Waste Management, Inc.: *Jeffrey K. Kashi* Date: 9/22/10



# EPG Companies Inc.

## SurePump™ Installation Record

Form Completed by: GAVIN YOTSUDA Installation Date: 9-3-10  
 Company: RON'S ELECTRIC EPG Serial #: 10-9671

### PUMPS, CONTROLS AND POWER SUPPLY

Installer: <u>RON'S ELECTRIC</u>	Address: <u>1840A LELEIONAST. LIHUE, HI 96766</u>	Installation Location: <u>LEKAHA LANDFILL</u>
Motor Model <u>1/2</u> HP	Volts: <u>460VAC</u> Max Amps Rating: <u>1.3</u>	Pump Model: <u>VSDPT 2-2</u>
Power Supply Transformers: <u>-</u> Number Used: <u>-</u> KVA Each: <u>-</u>	Hertz: <u>60</u>	Comments:
Pump Control Panel: Mfg. & Model #: <u>EPG L950 PT</u>	Motor Starter Size: <u>1.3A</u>	Overload Heater Part or setting range: <u>IEC Starters:</u>
Lightning Arrestors: Mfg. & Model: <u>INTERMATIC AG6503</u>	Surge Capacitors: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Disconnect Fuse or Circuit Breaker Amp Rating: <u>15A</u>
Primary Flow Control Devices: (Low Level Control, Flow Control, Valve, System Back Pressure, etc.) <u>LEVEL TRANSMITTER,</u>		

### PUMP 1 OPERATING DATA (Measurements at Control Panel)

PUMP CONDITIONS:	GPM	VOLTS	AMPS
Pump Not Running	0	R-Y <u>483</u> R-B <u>486</u> B-Y <u>483</u>	
Open Discharge		R-Y <u>-</u> R-B <u>-</u> B-Y <u>-</u>	R <u>-</u> Y <u>-</u> B <u>-</u>
Normal Operation		R-Y <u>483</u> R-B <u>486</u> B-Y <u>483</u>	R <u>1.2</u> Y <u>1.2</u> B <u>1.2</u>
Run Time	<u>-</u>		
Off Time	<u>-</u>		

### INSTALLATION DATA

# EPG Companies Inc.

Discharge Line Size: <u>1/4"</u>	Discharge Pressure:	Pump Submergence:	Fluid Temp: ____ °F ____ °C
External Check Valve Used? <u>Yes</u>	Location: <u>Inside Wet Well</u>	Cable Length & Size:	Ground Resistance
Insulation Megohm Readings:	Before Installation: <u>&lt; 1 KMΩ</u>	After Installation: <u>&lt; 1 KMΩ</u>	After 30 min. Run: <u>&lt; 1 KMΩ</u>

## SENSORS

Type of Level Sensor: <u>- LEVEL MASTER - LEVEL SENSOR</u> <u>CH1000-DDHX</u> <u>- SS FLOAT SWITCH (N.O.)</u>	Transmitter Serial Number:
Pressure Transmitter <input checked="" type="checkbox"/> Load Monitor _____ Floats <input checked="" type="checkbox"/> Other _____	
Length of Sensor Lead:	Ohm Readings Across I.S. Barrier:
mA Readings on Transmitter Lead:	Voltage Reading Entering Level Meter: ____ VAC Voltage Leaving Level Meter: ____ VAC
Are Flow Sensors Used: Yes _____ No <input checked="" type="checkbox"/>	Flow Spool Made of: PVC _____ Stainless Steel _____

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Place one copy of this record in the control panel, return one copy to EPG, and retain original for your records.

In case of problems or questions, contact EPG Companies Inc., 19900 County Road 81, Maple Grove, MN 55311. Phone: 800-762-8418 FAX: 763-493-4812

EPG SurePump™ Installation Record

EPG Job No. 10-9671

Installer's Name Ron's Electric, Inc.

Address PO Box 311

City Lihue State HI Zip 96766

Phone (808) 245-4411 Fax (808) 246-9515

Contact name Randy Nishimura

Owner's Name County of Kauai

Address 4444 Rice Street Suite 255

City Lihue State HI Zip 96766

Phone (808) 241-4838 Fax (808) 241-6887

Contact name Tom Taniguchi

Sump Name/ ID Wet Well #3 Date Installed 9-3-10

Leachate or Condensate Temp \_\_\_\_\_ °F or °C

Pump: 1

Model No. VSDPT 2-2

Rating: \_\_\_\_\_ GPM@ \_\_\_\_\_ Ft. TDH

HP 1/2 Voltage 460 Phase 3

Actual Pump Delivery \_\_\_\_\_ GPM@ \_\_\_\_\_ PSI

Opening Cycle: \_\_\_\_\_ ON (Min/Hr) \_\_\_\_\_ OFF (Min/Hr)

(Circle Min. or Hr. as appropriate)

Side Slope Riser Information:

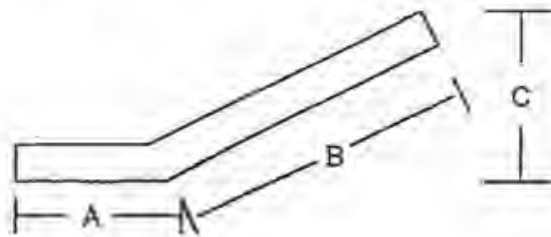
Slope \_\_\_\_\_ ft

Length of riser Pipe (A+B) \_\_\_\_\_ ft

Vertical Distance = Sump to Top of Riser Pipe (C) \_\_\_\_\_ ft

Riser ID \_\_\_\_\_ SDR \_\_\_\_\_

Distance From Top of Riser Pipe to Controller \_\_\_\_\_ ft



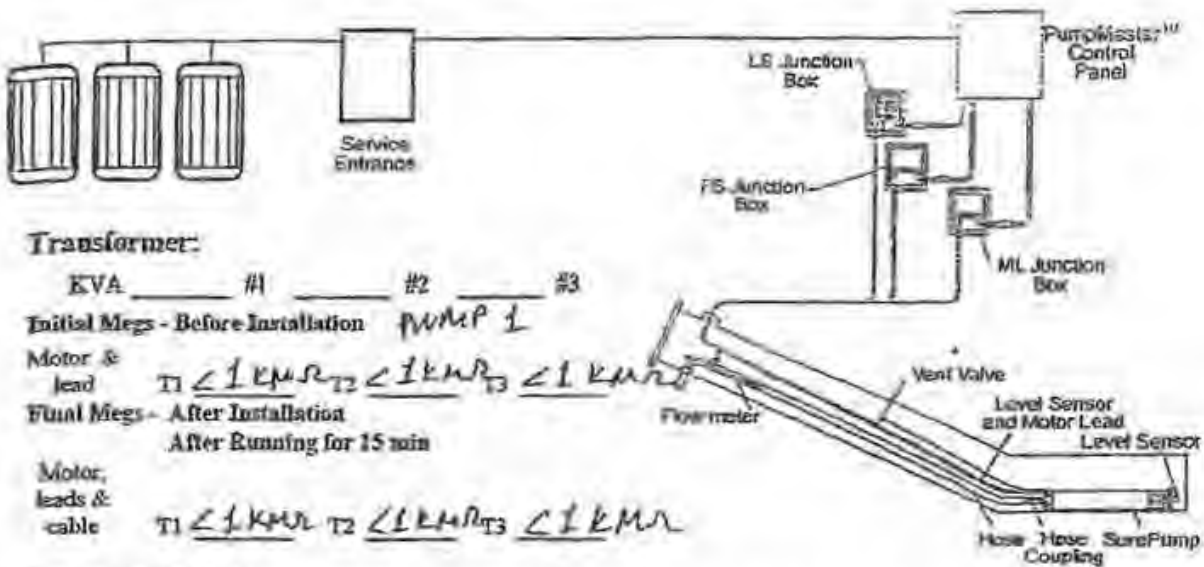
Power Supply:

Cable: Service Entrance to Control Distance 1260 ft Wire Size 8 AWG/MCM

Copper  Jacketed \_\_\_\_\_ Aluminum \_\_\_\_\_ individual conductors \_\_\_\_\_

Cable: Control to Motor 50' ft 12 AWG/MCM

Copper  Jacketed \_\_\_\_\_



**Transformer:**

KVA \_\_\_\_\_ #1 \_\_\_\_\_ #2 \_\_\_\_\_ #3

Initial Mags - Before Installation PUMP 1

Motor & lead T1 < 1kVA T2 < 1kVA T3 < 1kVA

Final Mags - After Installation  
After Running for 15 min

Motor, leads & cable T1 < 1kVA T2 < 1kVA T3 < 1kVA

**Incoming Voltage:**

No Load	L1-L2	<u>484</u>	L2-L3	<u>486</u>	L1-L3	<u>483</u>
Full Load	L1-L2	<u>484</u>	L2-L3	<u>485</u>	L1-L3	<u>483</u>

**Running Amps:**

Hookup:1	Full Load	L1	<u>1.2</u>	L2	<u>1.2</u>	L3	<u>1.2</u>	% unbalanced	<u>0</u>
Hookup:2	Full Load	L1	<u>-</u>	L2	<u>-</u>	L3	<u>-</u>	% unbalanced	<u>-</u>
Hookup:3	Full Load	L1	<u>-</u>	L2	<u>-</u>	L3	<u>-</u>	% unbalanced	<u>-</u>

Ground wire size 12 AWG/MCM

DC Ground Current \_\_\_\_\_ mA Ground Test \_\_\_\_\_ Ohms

Motor Surge Protection \_\_\_\_\_ Yes X No

**Control Panel:**

Model # EPG L950PT

**Short Circuit Device**

Circuit Breaker \_\_\_\_\_ Rating \_\_\_\_\_ Setting \_\_\_\_\_  
Fuses LJ-25R Type 2A Rating \_\_\_\_\_  
\_\_\_\_\_ Standard X Time Delay \_\_\_\_\_

**Controls are Grounded to:**

X Motor  
\_\_\_\_\_ Rod  
X Power Supply

Name: GAVIN YOTSUDA

**Start Overloads:**

Set at 1.3 amps

Company RON'S ELECTRIC

Date 9/23/10

# EPG Companies Inc.

## SurePump™ Installation Record

Form Completed by: GAVIN YOTSUDI Installation Date: 9-3-10  
 Company: RON'S EPG Serial #: 10-9671

### PUMPS, CONTROLS AND POWER SUPPLY

Installer: <u>RON'S ELECTRIC</u>	Address: <u>18404 LELEIONA ST. LIHUE, HI 96766</u>	Installation Location: <u>KOKAHA LANDFILL</u>
Motor Model <u>EP 1/2</u>	Volts: <u>460VAC</u> Max Amps Rating: <u>1.3</u>	Pump Model: <u>VSDPT 2-2</u>
Power Supply Transformers: Number Used: <u>-</u> KVA Each: <u>-</u>	Hertz: <u>60</u>	Comments:
Pump Control Panel: Mfg. & Model #: <u>EPG L950 PT</u>	Motor Starter Size: <u>1.3</u>	Overload Heater Part or setting range: <u>IEC Starters:</u>
Lightning Arrestors: Mfg. & Model: <u>INTERMATIC A66503</u>	Surge Capacitors: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Disconnect Fuse or Circuit Breaker Amp Rating: <u>15A</u>
Primary Flow Control Devices: (Low Level Control, Flow Control, Valve, System Back Pressure, etc.) <u>Level Transmitter</u>		

### PUMP 2 OPERATING DATA (Measurements at Control Panel)

PUMP CONDITIONS:	GPM	VOLTS	AMPS
Pump Not Running	<u>0</u>	<u>R-Y 484 R-B 486 B-Y 483</u>	
Open Discharge		<u>R-Y ___ R-B ___ B-Y ___</u>	<u>R 1 Y ___ B ___</u>
Normal Operation		<u>R-Y 484 R-B 486 B-Y 483</u>	<u>R 1.2 Y 1.1 B 1.2</u>
Run Time _____			
Off Time _____			

### INSTALLATION DATA

# EPG Companies Inc.

Discharge Line Size: <u>1 1/4"</u>	Discharge Pressure:	Pump Submergence:	Fluid Temp: ____ °F ____ °C
External Check Valve Used? <u>Yes</u>	Location: <u>Inside Wet Well</u>	Cable Length & Size:	Ground Resistance:
Insulation Megohm Readings:	Before Installation: <u>&lt; 1 KMΩ</u>	After Installation: <u>&lt; 1 KMΩ</u>	After 30 min. Run: <u>&lt; 1 KMΩ</u>

## SENSORS

Type of Level Sensor: <u>LEVEL MASTER - LEVEL SENSOR</u> <u>CH 1000-DDHX</u> <u>SI FLOAT SWITCH N.O.</u>	Transmitter Serial Number:
Pressure Transmitter <input checked="" type="checkbox"/> Load Monitor _____ Floats <input checked="" type="checkbox"/> Other _____	
Length of Sensor Lead:	Ohm Readings Across LS. Barrier:
mA Readings on Transmitter Lead:	Voltage Reading Entering Level Meter: ____ VAC Voltage Leaving Level Meter: ____ VAC
Are Flow Sensors Used: Yes _____ No <input checked="" type="checkbox"/>	Flow Spool Made of: PVC _____ Stainless Steel _____

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Place one copy of this record in the control panel, return one copy to EPG, and retain original for your records.

In case of problems or questions, contact EPG Companies Inc., 19900 County Road 81, Maple Grove, MN 55311, Phone: 800-762-8418 FAX: 763-493-4812

EPG SurePump™ Installation Record

EPG Job No. 10-9671

Installer's Name Ron's Electric, Inc.

Address PO Box 211

City Lihue State HI

Zip 96766

Phone (808) 245-4611

Fax (808) 245-4545

Contact name Randy Nishimura

Owner's Name County of Kauai

Address 4444 Rice Street Suite 255

City Lihue State HI

Zip 96766

Phone (808) 241-4938

Fax (808) 241-6987

Contact name Greg Tomigawa

Sump Name/ID Wet Well #3

Date Installed 9-3-10

Leachate or Condensate Temp \_\_\_\_\_ °F or °C

Pump: 2

Model No. VSDPT 2-2

Rating: \_\_\_\_\_ GPM@ \_\_\_\_\_ Ft TDH

HP 1/2 Voltage 460 Phase 3

Actual Pump Delivery \_\_\_\_\_ GPM@ \_\_\_\_\_ PSI

Operating Cycle: \_\_\_\_\_ ON (Min/Hr) \_\_\_\_\_ OFF (Min/Hr)

(Circle Min. or Hr. as appropriate)

Side Slope Riser Information:

Slope \_\_\_\_\_ :1

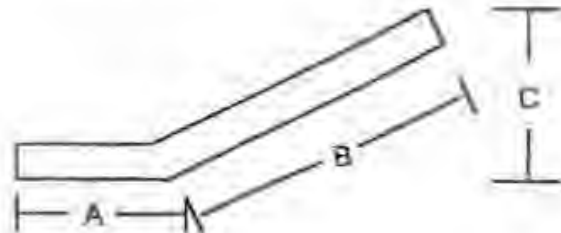
Length of riser Pipe (A+B) \_\_\_\_\_ ft.

Vertical Distance = Sump to

Top of Riser Pipe (C) \_\_\_\_\_ ft.

Riser ID \_\_\_\_\_ SDR \_\_\_\_\_

Distance From Top of Riser Pipe to Controller \_\_\_\_\_ ft.



Power Supply:

Cable: Service Entrance to Control Distance 1260 ft Wire Size 8 AWG/MCM

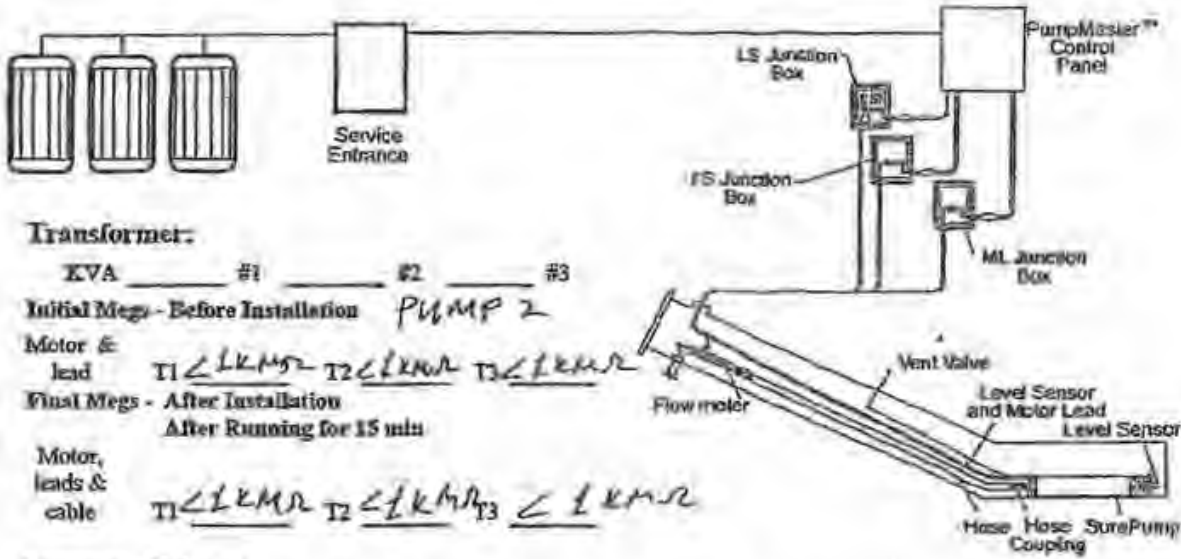
Copper X Jacketed Aluminum Individual conductors

Cable: Control to Motor 50' ft 12 AWG/MCM

Copper X Jacketed

# EPG Companies Inc.

July 2002



**Transformer:**

KVA \_\_\_\_\_ #1 \_\_\_\_\_ #2 \_\_\_\_\_ #3

Initial Megs - Before Installation PUMP 2

Motor & lead T1 < LKMR T2 < LKMR T3 < LKMR

Final Megs - After Installation  
After Running for 15 min

Motor, leads & cable T1 < LKMR T2 < LKMR T3 < LKMR

**Incoming Voltage:**

No Load	L1-L2	<u>484</u>	L2-L3	<u>486</u>	L1-L3	<u>483</u>
Full Load	L1-L2	<u>484</u>	L2-L3	<u>485</u>	L1-L3	<u>483</u>

**Running Amps:**

<b>Hookup:1</b>						
Full Load	L1	<u>1.2</u>	L2	<u>1.1</u>	L3	<u>1.2</u>
						% unbalanced _____
<b>Hookup:2</b>						
Full Load	L1	<u>-</u>	L2	<u>-</u>	L3	<u>-</u>
						% unbalanced _____
<b>Hookup:3</b>						
Full Load	L1	<u>-</u>	L2	<u>-</u>	L3	<u>-</u>
						% unbalanced _____

Ground wire size 12 AWG/MCM

DC Ground Current \_\_\_\_\_ mA Ground Test \_\_\_\_\_ Ohms

Motor Surge Protection \_\_\_\_\_ Yes X No

**Control Panel:**

Model # EPG L950PT

**Short Circuit Device**

Circuit Breaker \_\_\_\_\_ Rating \_\_\_\_\_ Setting \_\_\_\_\_  
Fuses LJ-250 Type 2A Rating \_\_\_\_\_  
\_\_\_\_\_ Standard X Time Delay \_\_\_\_\_

**Controls are Grounded to:**

X Motor  
\_\_\_\_ Rod  
X Power Supply

**Start Overloads:**

Set at 1.3 amps  
Date 9/23/10

Name: GAVIN YOTSUDA

Company: RON'S ELECTRIC





**Appendix O**  
**Report of Findings, Former Leachate Evaporation**  
**Pond Sub-Surface Soils**

*Prepared for:*

County of Kaua'i Solid Waste Division  
4444 Rice Street  
Mo'ikeha Building, Suite 295  
Lihue, HI 96766

**DRAFT  
REPORT OF FINDINGS**

**FORMER LEACHATE EVAPORATION  
POND SUB-SURFACE SOILS**

**Phase II Lateral Expansion, Cell 1 Base Liner Construction  
Kekaha Sanitary Landfill  
Kekaha, Hawai'i**

*Prepared by:*

**Geosyntec**<sup>®</sup>  
consultants

475 14<sup>th</sup> Street, Suite 400  
Oakland, California 94612  
(510) 836-3034

Project Number: WG1298  
15 September 2010

## TABLE OF CONTENTS

	Page
<b>1. INTRODUCTION</b> .....	1-1
1.1 Terms of Reference.....	1-1
1.2 Organization of Report .....	1-1
<b>2. PROJECT DESCRIPTION</b> .....	2-1
2.1 Background.....	2-1
2.1.1 Groundwater.....	2-2
2.1.2 Former Leachate Evaporation Pond.....	2-2
<b>3. DEMOLITION OF FORMER POND</b> .....	3-1
3.1 General.....	3-1
3.2 Liner Materials and Underlying Soils.....	3-2
<b>4. SUBGRADE SOIL SAMPLING</b> .....	4-1
4.1 Subgrade Sampling Program .....	4-1
4.2 Increment Sampling Locations.....	4-2
4.3 Field Sampling.....	4-2
4.4 Analytical Testing.....	4-3
4.4.1 General .....	4-3
4.4.2 Quality Assurance Evaluation of Analytical Data .....	4-3
4.5 Data Evaluation .....	4-3
<b>5. SUMMARY AND CONCLUSIONS</b> .....	5-1
<b>6. REFERENCES</b> .....	6-1
<b>7. LIMITATIONS</b> .....	7-1

## TABLE OF CONTENTS

### LIST OF TABLES

Table 1	Corner Points of Pond
Table 2	Proposed Soil Sampling Locations
Table 3	Comparison of Analytical Test Results to Tier I EAL for Semi-Volatile Organic Compounds (Method 8270C)

### LIST OF FIGURES

Figure 1	Site Vicinity Map
Figure 2	Site Plan
Figure 3	Kauai UIC Line
Figure 4	Former Leachate Evaporation Pond Liner System
Figure 5	Subgrade Sample Locations

### LIST OF APPENDICES

Appendix A	Correspondence
Appendix B	Photographic Log
Appendix C	Existing Leachate Evaporation Pond Sub-Surface Sampling Strategy
Appendix D	Hawai'i Department of Health Tier I Environmental Action Levels
Appendix E	Laboratory Analytical Report

## **I. INTRODUCTION**

### **1.1 Terms of Reference**

This report of findings describes the actions that were taken to verify the soil conditions below the former leachate evaporation pond at the Kekaha Sanitary Landfill (Kekaha Landfill) in Kaua'i, Hawai'i. This report has been prepared by Geosyntec Consultants, Inc. (Geosyntec) for the County of Kaua'i Solid Waste Division (County) to satisfy the requirements of the Hawai'i Department of Health (HDOH).

The report was prepared by Kim Huynh and Michael J. Minch, and was reviewed by Lisa Van Tassell, P.E., and Hari D. Sharma, Ph.D., P.E., all of Geosyntec, in accordance with the internal review policy of the firm.

### **1.2 Organization of Report**

The remainder of this report is organized as follows:

- a description of the project and a brief site history is presented in Section 2;
- a description of the implemented closure method, including the handling and disposal of all materials, is presented in Section 3;
- a description of the soil sampling program conducted after the removal of former leachate evaporation pond containment system is presented in Section 4;
- a summary of the work performed and conclusions are presented in Section 5;
- references are included in Section 6; and
- limitations on the application of information presented in this report are described in Section 7.

For ease of reference during construction, a local site orientation was adopted that was based on the surrounding topography. For documentation purposes within this report, the mauka (mountain) side of the project is referred to as "north" and the makai (ocean) side of the project is referred to as "south."<sup>1</sup> These terms were used in various landfill construction CQA documents as well as in this report to describe portions of the construction.

---

<sup>1</sup> These do not represent actual north and south directions.

## 2 PROJECT DESCRIPTION

### 2.1 Background

Kekaha Landfill is a Class II disposal facility owned by the County of Kaua'i (County), and operated by Waste Management of Hawai'i (WMH). Kekaha Landfill is located on the southwest side of the island of Kaua'i, approximately 1.3 miles northwest of the town of Kekaha. A location map is provided as Figure 1.

The disposal facility comprises two distinct disposal units (Phase I [roughly 33 acres] and Phase II [roughly 32 acres]), a former 1.9-acre leachate evaporation pond, and administration and maintenance facilities. The Phase II landfill is currently undergoing an approximate 6.3-acre lateral expansion along its western boundary. The Phase II Lateral Expansion, Cell 1 Base Liner Construction consists of (i) construction of Cell 1, an approximate 2-acre New Leachate Evaporation Pond (NLEP), a new infiltration basin (NIB), and associated ancillary facilities, and (ii) the demolition of the former leachate evaporation pond. Figure 2 shows the site plan and the main components of the expansion<sup>2</sup>.

The NLEP and roughly half of Cell 1 (Cells 1C and 1D) have been completed as of the writing of this report. With the approval of the NLEP<sup>3</sup> and Cells 1C/1D<sup>4</sup>, the Phase II landfill leachate collection and removal system (LCRS) was connected to the NLEP, and the former leachate pond was demolished. This report summarizes the demolition

<sup>2</sup> Source: Drawing 2 of the "Construction Drawings, Phase II Lateral Expansion, Cell 1 Base Liner Construction, Kekaha Sanitary Landfill, Kauai, Hawai'i," prepared by AECOM, April 2009.

<sup>3</sup> The NLEP containment system CQA report was submitted to HDOH on 27 May 2010, and was approved by HDOH on 4 June 2010. The approval letter is included in Appendix A of this report.

<sup>4</sup> The Cells 1C and 1D containment system CQA report was submitted to HDOH on 8 June 2010, and was conditionally approved on 24 June 2010. Although HDOH approved waste placement in Cells 1C/1D, the agency reserved further comments on Cells 1C/1D until the final CQA report for the completed Cell 1 (Cells 1A through 1D) has been submitted. The approval letter is included in Appendix A of this report.



of the former leachate pond, and the subsequent sampling and laboratory analyses of the sub-surface soils below the leachate pond containment system.

### 2.1.1 Groundwater

According to the Draft Environmental Assessment (EA) report (Earth Tech, Inc. [Earth Tech], 2007), the Kekaha Mana coastal plain is underlain by two distinct aquifers. The lower aquifer is basaltic, composed of lava flows of the Nāpali Formation, and typically yields large quantities of water from wells and shafts with relatively little drawdown. The United States Geological Survey (USGS) had estimated its hydraulic conductivity to be 400 feet/day. A coastal plain sedimentary (caprock) aquifer overlies the basaltic aquifer near the coast and is much less permeable, thereby retarding the seaward discharge of groundwater from the basaltic aquifer. USGS estimated the average permeability of the caprock aquifer to be 0.12 feet/day.

The aquifers underlying the Kekaha Landfill have been designated by HDOH as non-drinking water sources based on criteria set forth by the HDOH Administrative Rules, Title 11, Chapter 23, Section 4. Under Chapter 23, which establishes the State Underground Injection Control (UIC) program, HDOH publishes a “UIC Line” defining the boundary between underground sources of drinking water and non-drinking water aquifers for each of the six Hawaiian islands, including Kaua’i. As shown on Figure 3, the Kekaha Landfill is located in an area where the underlying aquifer is not considered a drinking water source.

### 2.1.2 Former Leachate Evaporation Pond

The former leachate evaporation pond was located west of the Phase II landfill and within the new Cells 1A and 1B (Cells 1A/1B) footprint. The composite-lined pond was equipped with two aerator systems to enhance evaporation. Figure 4<sup>5</sup> presents the pond containment system design, and includes the following components (from top to bottom):

---

<sup>5</sup> Source: Drawing 10 of the “Construction Drawings, Phase II Lateral Expansion, Cell 1 Base Liner Construction, Kekaha Sanitary Landfill, Kauai, Hawaii,” prepared by AECOM, April 2009.

DRAFT

Geosyntec<sup>®</sup>  
consultants

- geotextile;
- geomembrane;
- geosynthetic clay liner (GCL);
- foundation layer
- subgrade

Reinforced concrete and shotcrete slabs were reportedly overlying the composite liner system.

### 3. DEMOLITION OF FORMER POND

#### 3.1 General

Goodfellow Brothers, Inc. (GBI) completed the demolition of the former leachate evaporation pond between 10 June and 16 June 2010. No liquid was present in the pond at the time of demolition.

During the demolition, the following layers were found to make up the pond containment system:

##### Sideslope (from top to bottom)

- two to three inches of a grouted geotextile mat;
- cushion nonwoven geotextile;
- double-sided textured (DST) high density polyethylene (HDPE) geomembrane; and
- Gundseal-type GCL with geomembrane backing.

##### Floor (from top to bottom)

- two to three inches of a grouted geotextile mat;
- cushion nonwoven geotextile;
- smooth HDPE geomembrane;
- DST HDPE geomembrane; and
- Gundseal-type GCL with geomembrane backing.

No reinforced concrete and shotcrete slabs were observed. Photographs of the demolition work are provided in Appendix B.

### **3.2 Liner Materials and Underlying Soils**

GBI removed the top layer of grouted geotextile mat and the underlying liner materials using a Hitachi 450 LC excavator and transported the material to the Phase II landfill for disposal.

During demolition, as the grouted geotextile mat was broken into discrete slabs that could be picked up by the excavator and placed into the dump trucks, smaller hand-size, 1-inch to 12-inch, pieces naturally broke off and mixed with the underlying foundation/subgrade soils. To ensure that all the liner materials in the pond were removed in its entirety, GBI also removed roughly six inches of foundation/subgrade soils from directly below the liners and laborers walked a final pass to hand-pick and remove stray pieces. After visually confirming that all pond liner materials had been removed, Geosyntec commenced sampling of the subgrade soils. The subgrade sampling is discussed in detail in Section 4.

#### 4. SUBGRADE SOIL SAMPLING

This section outlines the subgrade soil sampling program and analytical methods performed by Geosyntec for the materials sampled from the former leachate evaporation pond. The sampling program discussed in the following sections was performed following liner removal activities.

##### 4.1 Subgrade Sampling Program

The subgrade sampling program was developed during the design of the Phase II lateral expansion, and was proposed to HDOH by Earth Tech [2008]. The proposed subgrade sampling strategy is provided in Appendix C of this report.

The goal of the sampling program was to verify chemical concentrations within the surface soils directly below the existing pond containment system. The program follows the multi-increment sampling (MIS) strategy described in the HDOH Technical Guidance Manual [HDOH Office of Hazard Evaluation and Emergency Response (HEER), 2009], which evaluates an area of concern or a "decision unit" and estimates an average contaminant concentration representative for that decision unit. The MIS strategy involves collecting small increments of soil within the decision unit and combining these increments into a single sample for analysis. For this program, the former leachate evaporation pond is the decision unit and the average concentration of semi-volatile organic compounds (SVOCs) was evaluated.

The main components of the sampling program were as follows:

- using a systematic random selection approach, determine increment sampling locations for three multi-increment samples: primary, duplicate, and triplicate;
- using calibrated sampling tools (as described in Section 5.4 of the Technical Guidance Manual [HDOH, 2009]) to collect surface samples from the top 2 inches of soil at each increment sampling location;

- combine the increment samples to form the primary, duplicate, and triplicate samples, and send the samples to the laboratory for SVOC analysis by EPA method 8270C; and
- compare the analytical test results to the Tier 1 Environmental Action Levels (EALs) published by HDOH [2008] (Appendix D) of this report.

#### **4.2 Increment Sampling Locations**

In accordance with Attachment 6 (Appendix C), the former leachate pond (decision unit) was divided into 50 equally sized subunits, and one primary increment sampling location was selected within each subunit using the Visual Sample Plan (VSP) software [Battelle Memorial Institute, 2009]. Within each subunit, duplicate and triplicate sample locations were also selected by moving a pre-determined distance and direction from the primary increment locations. A map of the primary, duplicate, and triplicate locations are shown on Figure 5.

#### **4.3 Field Sampling**

Prior to sampling, the pond corners and the increment sample locations were field staked using GBI's GPS unit and wire flags. The locations are listed on Tables 1 and 2.

At each primary, duplicate, and triplicate location, the increment sample was collected using a metal tube, approximately 1 inch in diameter. The tube was hammered approximately 2 inches deep into the subgrade soil, collecting approximately 50 grams of soil. The primary, duplicate, and triplicate increment samples were combined to form their respective primary, duplicate, and triplicate samples. Each sample weighed approximately 2,500 grams. Photographs of the field sampling are provided in Appendix A.

Each sample was placed in a clean Ziploc bag, packaged in an insulated box with Blue Ice®, and shipped overnight express to the TestAmerica laboratory in Aiea, Honolulu, Hawai'i, under standard chain-of-custody procedures.

#### 4.4 Analytical Testing

##### 4.4.1 General

All samples were analyzed for SVOCs by EPA Method 8270C. Analytical results are provided in Appendix E.

##### 4.4.2 Quality Assurance Evaluation of Analytical Data

A data quality assurance check of the analytical data associated with this sampling program was performed following receipt of the analytical results. Laboratory QA/QC narratives were reviewed following receipt of the data packages, with the following evaluation results noted:

- all tests requested in the chains-of-custody were performed, and the correct sampling date was accurately reflected in all laboratory reports;
- all samples received by the laboratory were analyzed within acceptable holding times; and
- method blanks, laboratory control samples, and/or surrogate recoveries met quality assurance objectives of the laboratory.

#### 4.5 Data Evaluation

The analytical test results were compared to the Hawai'i Tier 1 EALs [HDOH, 2008] and are summarized in Table 3. All analytes were found to be non-detect. In comparing the reporting limits to the EALs, one compound, bis(2-chloroethyl)ether, had a laboratory method detection limit (MDL) higher than the associated Tier 1 EAL: 0.0061 mg/kg versus the 0.0026 mg/kg criteria. Since the lab method is unable to detect concentrations of this compound below 0.0061 mg/kg, there was a possibility that the bis(2-chloroethyl)ether was present in the soil above the Tier 1 criteria. However, with no other SVOC detections in any of the samples, however, it was unlikely that the subgrade soils would be contaminated with only one analyte. HDOH concurred with this conclusion and accepted the subgrade soils be left in place (see correspondence in Appendix A).

## 5. SUMMARY AND CONCLUSIONS

The demolition of former leachate evaporation pond at the Kekaha Sanitary Landfill in Kaua'i, Hawai'i, was conducted between 10 through 16 June 2010.

As part of the removal work, the liner materials and the grouted geotextile mat, as well as roughly 6 inches of subgrade soils from underneath the pond liner system, were removed and deposited in the landfill.

Confirmation soil samples were collected from the subgrade once demolition was completed. The results of the confirmation sampling indicate that the subgrade soils left in place satisfy the regulatory threshold and site-specific clean-up levels.



## 6. REFERENCES

Earth Tech [2008], "*Kekaha LF Phase II Lateral Expansion – Response to Comments – Application for Solid Waste Permit*," Transmittal letter and attachments to the County of Kauai, Department of Solid Waste, 7 July 2008.

AECOM [2009], "*Construction Drawings, Phase II Lateral Expansion, Cell 1 Base Liner Construction, Kekaha Sanitary Landfill, Kauai, Hawaii*," April 2009.

Battelle Memorial Institute [2009], *Visual Sample Plan, Version 5.9*.

Earth Tech, Inc. [2007], "*Draft Environmental Assessment, Kekaha Landfill, Phase II Lateral Expansion, Kekaha, Kaua'i, Hawai'i*," July.

State of Hawai'i Department of Health Environmental Management Division [2008], "*Evaluation of Environmental Hazards at Sites with Contaminated Soil and Groundwater*," Volumes 1 and 2, Summer 2008, updated March 2009.

State of Hawai'i Department of Health, Office of Hazard Evaluation and Emergency Response [2009], "*Technical Guidance Manual for the Implementation of the Hawai'i State Contingency Plan*," Interim Final updated 12 November 2009.

## 7. LIMITATIONS

This report was prepared in general accordance with the accepted standard of practice, which existed in Hawai'i at the time this report was submitted to the County of Kaua'i. Geosyntec Consultants, Inc. has prepared this report for the exclusive use by the County of Kaua'i. No other representations, expressed or implied, and no warranty or guarantee is included or intended. No other party is authorized to use this report.

## TABLES

**PROPOSED SUBGRADE SAMPLE LOCATIONS  
EXISTING LEACHATE EVAPORATION POND  
KEKAHA SANITARY LANDFILL  
Kekaha, Kauai, Hawaii  
February 2010**

Table 1. Corner Points of Pond

Point ID	Northing	Easting
1	55152.71	1555756.01
2	55145.59	1555781.63
3	55151.03	1555804.48
4	55218.68	1555851.08
5	55477.66	1556084.08
6	55497.02	1556094.60
7	55514.51	1556091.46
8	55605.41	1555997.67
9	55621.58	1555973.62
10	55624.19	1555950.94
11	55611.54	1555927.77
12	55297.70	1555634.51
13	55284.76	1555631.17
14	55272.69	1555631.26
15	55258.99	1555637.96

Table 2. Proposed Soil Sampling Locations

Primary			Duplicate*			TriPLICATE*		
Sample ID	Northing	Easting	Sample ID	Northing	Easting	Sample ID	Northing	Easting
101	55166.44	1555767.07	201	55154.44	1555767.07	301	55166.44	1555782.07
102	55203.68	1555800.41	202	55191.68	1555800.41	302	55203.68	1555815.41
103	55240.91	1555833.75	203	55228.91	1555833.75	303	55240.91	1555848.75
104	55278.15	1555867.09	204	55266.15	1555867.09	304	55278.15	1555882.09
105	55315.38	1555900.43	205	55303.38	1555900.43	305	55315.38	1555915.43
106	55352.62	1555933.77	206	55340.62	1555933.77	306	55352.62	1555948.77
107	55389.86	1555967.11	207	55377.86	1555967.11	307	55389.86	1555982.11
108	55427.09	1556000.46	208	55415.09	1556000.46	308	55427.09	1556015.46
109	55464.33	1556033.80	209	55452.33	1556033.80	309	55464.33	1556048.80
110	55501.56	1556067.14	210	55489.56	1556067.14	310	55501.56	1556082.14
111	55194.23	1555736.04	211	55182.23	1555736.04	311	55194.23	1555751.04
112	55231.46	1555769.38	212	55219.46	1555769.38	312	55231.46	1555784.38
113	55268.70	1555802.72	213	55256.70	1555802.72	313	55268.70	1555817.72
114	55305.93	1555836.06	214	55293.93	1555836.06	314	55305.93	1555851.06
115	55343.17	1555869.40	215	55331.17	1555869.40	315	55343.17	1555884.40
116	55380.40	1555902.74	216	55368.40	1555902.74	316	55380.40	1555917.74
117	55417.64	1555936.08	217	55405.64	1555936.08	317	55417.64	1555951.08
118	55454.87	1555969.43	218	55442.87	1555969.43	318	55454.87	1555984.43
119	55492.11	1556002.77	219	55480.11	1556002.77	319	55492.11	1556017.77
120	55529.35	1556036.11	220	55517.35	1556036.11	320	55529.35	1556051.11
121	55222.01	1555705.01	221	55210.01	1555705.01	321	55222.01	1555720.01
122	55259.25	1555738.35	222	55247.25	1555738.35	322	55259.25	1555753.35
123	55296.48	1555771.69	223	55284.48	1555771.69	323	55296.48	1555786.69
124	55333.72	1555805.03	224	55321.72	1555805.03	324	55333.72	1555820.03
125	55370.95	1555838.37	225	55358.95	1555838.37	325	55370.95	1555853.37
126	55408.19	1555871.71	226	55396.19	1555871.71	326	55408.19	1555886.71
127	55445.42	1555905.06	227	55433.42	1555905.06	327	55445.42	1555920.06
128	55482.66	1555938.40	228	55470.66	1555938.40	328	55482.66	1555953.40
129	55519.89	1555971.74	229	55507.89	1555971.74	329	55519.89	1555986.74
130	55557.13	1556005.08	230	55545.13	1556005.08	330	55557.13	1556020.08

**PROPOSED SUBGRADE SAMPLE LOCATIONS  
EXISTING LEACHATE EVAPORATION POND  
KEKAHA SANITARY LANDFILL  
Kekaha, Kauai, Hawaii  
February 2010**

Table 2. Proposed Soil Sampling Locations

Primary			Duplicate *			Tributate *		
Sample ID	Northing	Eastng	Sample ID	Northing	Eastng	Sample ID	Northing	Eastng
131	55249.80	1555673.98	231	55237.80	1555673.98	331	55249.80	1555688.98
132	55287.03	1555707.32	232	55275.03	1555707.32	332	55287.03	1555722.32
133	55324.27	1555740.66	233	55312.27	1555740.66	333	55324.27	1555755.66
134	55361.50	1555774.00	234	55349.50	1555774.00	334	55361.50	1555789.00
135	55398.74	1555807.34	235	55386.74	1555807.34	335	55398.74	1555822.34
136	55435.97	1555840.69	236	55423.97	1555840.69	336	55435.97	1555855.69
137	55473.21	1555874.03	237	55461.21	1555874.03	337	55473.21	1555889.03
138	55510.44	1555907.37	238	55498.44	1555907.37	338	55510.44	1555922.37
139	55547.68	1555940.71	239	55535.68	1555940.71	339	55547.68	1555955.71
140	55584.91	1555974.05	240	55572.91	1555974.05	340	55584.91	1555989.05
141	55277.58	1555642.95	241	55265.58	1555642.95	341	55277.58	1555657.95
142	55314.82	1555676.29	242	55302.82	1555676.29	342	55314.82	1555691.29
143	55352.05	1555709.63	243	55340.05	1555709.63	343	55352.05	1555724.63
144	55389.29	1555742.97	244	55377.29	1555742.97	344	55389.29	1555757.97
145	55426.52	1555776.31	245	55414.52	1555776.31	345	55426.52	1555791.31
146	55463.76	1555809.66	246	55451.76	1555809.66	346	55463.76	1555824.66
147	55500.99	1555843.00	247	55488.99	1555843.00	347	55500.99	1555858.00
148	55538.23	1555876.34	248	55526.23	1555876.34	348	55538.23	1555891.34
149	55575.46	1555909.68	249	55563.46	1555909.68	349	55575.46	1555924.68
150	55612.70	1555943.02	250	55600.70	1555943.02	350	55612.70	1555958.02

\* Duplicate locations are offset 12 ft south of Primary locations; Triplicate locations are offset 15 ft east of Primary locations

Table 3. Comparison of Analytical Test Results  
to Tier 1 EAL for Semi-Volatile Organic Compounds  
(Method 8270C)

Contaminant	Tier 1 EAL (mg/kg) Groundwater IS NOT potential or current source of drinking water	Laboratory Reporting Limit (mg/kg)	Laboratory Result (mg/kg)	Laboratory Method Detection Limit (mg/kg)
ACENAPHTHENE	1.4E+02	1.2E-02		9.6E-04
ACENAPHTHYLENE	1.3E+02	1.2E-02		9.8E-04
ALDRIN	2.9E-02			
AMETRYN	1.1E+01			
AMINO,2- DINITROTOLUENE,4,6-	2.5E+00			
AMINO,4- DINITROTOLUENE,2,6-	2.5E+00			
ANTHRACENE	2.5E+00	1.2E-02		8.6E-04
ATRAZINE	2.1E+00			
BENZO(a)ANTHRACENE	1.5E+00	1.8E-02	1.8E-03 (J)	1.0E-03
BENZO(a)PYRENE	1.5E-01	1.8E-02		1.3E-03
BENZO(b)FLUORANTHENE	1.5E+00	1.2E-02	3.1E-03 (J)	2.5E-03
BENZO(g,h,i)PERYLENE	2.7E+01	1.5E-02		9.2E-04
BENZO(k)FLUORANTHENE	1.5E+01	1.5E-02	1.5E-03 (J)	8.0E-04
BIPHENYL, 1,1-	5.2E+00			
BIS(2-CHLOROETHYL)ETHER	2.8E-03	6.1E-03		6.1E-03
BIS(2-CHLOROISOPROPYL)ETHER	3.3E+00			
BIS(2-ETHYLHEXYL)PHTHALATE	3.5E+01	9.2E-01		2.6E-02
CHLORDANE (TECHNICAL)	1.8E+01			
CHLOROANILINE, p-	6.0E-02	8.1E-02		5.7E-03
CHLOROPHENOL, 2-	1.3E-01	6.1E-02		4.5E-03
CHRYSENE	1.4E+01	1.5E-02		8.6E-04
CYCLO-1,3,5-TRIMETHYLENE-2,4,6-TRINITRAMINE (RDX)	5.5E+00			
DALAPON	1.4E+00			
DIBENZO(a,h)ANTHRACENE	1.5E-01	2.4E-02		1.3E-03
DICHLORO BENZENE, 1,2-	7.1E+00	3.1E-02		3.9E-03
DICHLORO BENZENE, 1,3-	3.0E+01	3.1E-02		4.4E-03
DICHLORO BENZENE, 1,4-	3.7E-02	3.1E-02		2.0E-03
DICHLORO BENZIDINE, 3,3'	1.1E+00	1.2E-01		4.8E-03
DICHLOROPHENOL, 2,4-	3.8E-01	6.1E-02		1.8E-03
DICHLOROPHENOXYACETIC ACID (2,4-D)	9.8E-01			
DIELDRIN	3.0E-02			
DIETHYL PHTHALATE	2.0E-01	6.1E-02		9.2E-03
DIMETHYLPHENOL, 2,4-	3.2E+01	6.1E-02		1.3E-03
DIMETHYL PHTHALATE	2.2E+01	6.1E-02		2.8E-03
DINITRO BENZENE, 1,3-	1.2E+00			
DINITROPHENOL, 2,4-	1.4E+01	6.1E-01		8.8E-03
DINITROTOLUENE, 2,4- (2,4-DNT)	6.6E+00	6.1E-02		1.5E-03
DINITROTOLUENE, 2,6- (2,6-DNT)	6.8E+00	6.1E-02		2.5E-03
DIURON	4.5E+00			
ENDOSULFAN	1.2E-01			
ENDRIN	6.0E-02			
FLUORANTHENE	4.0E+01	1.2E-02		7.3E-04
FLUORENE	1.3E+02	1.2E-02		7.3E-04
GLYPHOSATE	1.8E+00			
HEPTACHLOR	1.1E-01			
HEPTACHLOR EPOXIDE	4.6E-02			
HEXACHLORO BENZENE	3.0E-01	3.1E-02		2.3E-03
HEXACHLOROCYCLODIENE	2.5E+00	3.1E-02		5.6E-03

**Table 3. Comparison of Analytical Test Results  
to Tier 1 EAL for Semi-Volatile Organic Compounds  
(Method 8270C)**

Contaminant	Tier 1 EAL (mg/kg) Groundwater IS NOT potential or current source of drinking water	Laboratory Reporting Limit (mg/kg)	Laboratory Result (mg/kg)	Laboratory Method Detection Limit (mg/kg)
HEXACHLOROCYCLOHEXANE (gamma) LINDANE	9.0E-02			
HEXACHLOROETHANE	6.2E+00	6.1E-02		6.7E-03
HEXAZINONE	4.0E+02			
INDENO(1,2,3-cd)PYRENE	1.5E+00	2.4E-02		2.6E-03
ISOPHORONE	4.2E+01	6.1E-02		2.5E-03
METHOXYCHLOR	2.5E+01			
METHYLNAPHTHALENE, 1-	2.6E+00	1.8E-02		1.1E-03
METHYLNAPHTHALENE, 2-	2.5E+01	1.2E-02		1.4E-03
NAPHTHALENE	4.8E-01	1.2E-02		1.3E-03
NITROBENZENE	6.2E+00	6.1E-02		1.8E-02
NITROGLYCERIN	1.2E+00			
NITROTOLUENE, 2-	1.9E+00			
NITROTOLUENE, 3-	2.1E+02			
NITROTOLUENE, 4-	3.0E+01			
PENTACHLOROPHENOL	3.0E+00	6.1E-02		7.3E-03
PENTAERYTHRITOLTETRAMITRATE (PETN)	4.4E+00			
PHENANTHRENE	1.8E+01	1.2E-02		1.3E-03
PHENOL	4.0E+01	8.1E-02		4.5E-03
PROPIQUAZOLE	1.6E+02			
PYRENE	5.6E+01	1.2E-02		6.8E-04
SIMAZINE	2.5E-01			
TERBACIL	1.6E+02			
TETRACHLOROPHENOL, 2,3,4,6-	3.3E+00			
TETRANITRO-1,3,5,7-TETRAAZOCYCLOOCTANE (HMX)	5.0E+02			
TOXAPHENE	4.4E-01			
TRICHLOROBENZENE, 1,2,4-	1.5E-01	3.1E-02		1.3E-03
TRICHLOROPHENOL, 2,4,5-	1.0E+01	6.1E-02		3.6E-03
TRICHLOROPHENOL, 2,4,6-	1.0E+01	9.2E-02		2.4E-03
TRICHLOROPHENOXYACETIC ACID, 2,4,5- (2,4,5-T)	5.5E+00			
TRICHLOROPHENOXYPROPIONIC ACID, 2,4,5- (2,4,5-TP)	4.0E-01			
TRIFLURALIN	3.2E+01			
TRINITROBENZENE, 1,3,5-	2.5E+01			
TRINITROPHENYLMETHYLNITRAMINE, 2,4,6- (TETRYL)	4.9E+01			
TRINITROTOLUENE, 2,4,6- (TNT)	7.2E+00			

## Notes:

Tier 1 Environmental Action Levels (EALs) from Hawai'i Department of Health, Environmental Management Division, "Evaluation of Environmental Hazards at Sites with Contaminated Soil and Groundwater," 2008.

J = result is less than the reporting limit but greater than the method detection limit and the concentration reported is an approximate value.

## FIGURES





MAP/IMAGE SOURCES: ©MICROSOFT CORPORATION ©2010 NAVTEQ ©GEDEYE ©DIGITALGLOBE

**Geosyntec**  
consultants

SITE VICINITY MAP  
FORMER LEACHATE EVAPORATION POND SUBSURFACE  
KEKAHA SANITARY LANDFILL  
KAUAI, HAWAII

FIGURE NO.	1
PROJECT NO.	WG1298
DATE:	SEPTEMBER 2010





# Island of Kauai Underground Injection Control Areas



- BELOW (maka) UIC LINE**
  - Underlying aquifer not considered drinking water source
  - Wider variety of wells allowed
  - Injection wells need UIC Permit or Permit Exemption
  - Permit limitations are imposed
  
- ABOVE (mauka) UIC LINE**
  - Underlying aquifer considered a drinking water source
  - Limited types of injection wells allowed
  - Injection wells need UIC Permit or Permit Exemption
  - Permit limitations are imposed and requirements are more stringent
  
- Major Roads

Department of Health EGIS 9/99

MAP SOURCE: STATE OF HAWAII DEPARTMENT OF HEALTH, SAFE DRINKING WATER BRANCH, UNDERGROUND INJECTION CONTROL (UIC) PROGRAM (<http://health.gov/hst/hf/environmental/water/sdwbr/uc/ucprogram.html>)

**Geosyntec<sup>®</sup>**  
consultants

KAUAI UIC LINE  
FORMER LEACHATE EVAPORATION POND SUBSURFACE  
KEKAHA SANITARY LANDFILL  
KAUAI, HAWAII

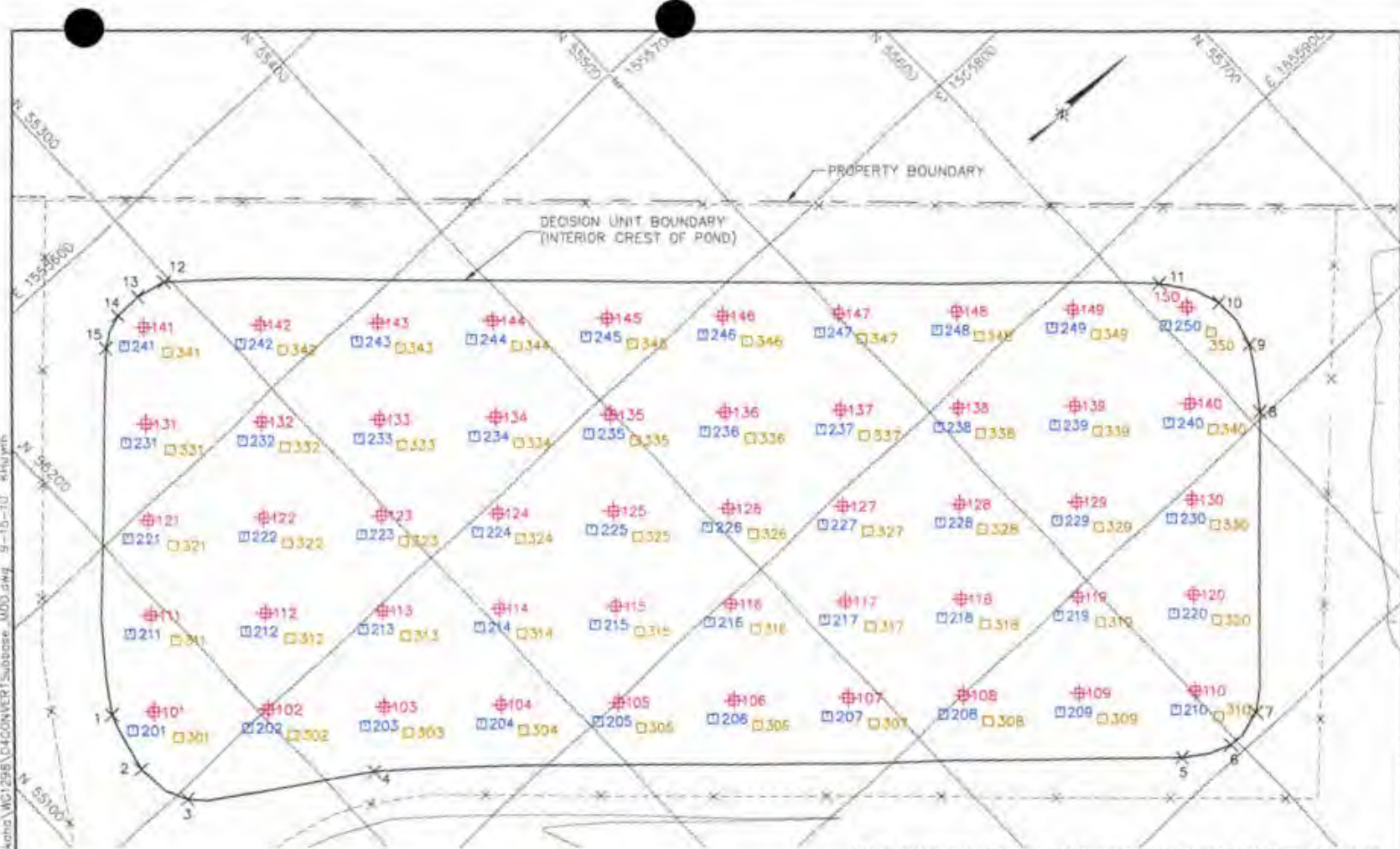
FIGURE NO.	3
PROJECT NO.	WG1298
DATE:	SEPTEMBER 2010

P:\CADD\Land Projects\_3\W1\Kakaha\WG1298\Report\_Figures.mxd 9-15-10 KHU





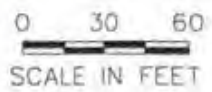




P:\04000\Land Projects\J\WA\Kekaha\WG1298\CONVERT\Subbase\_MDD.dwg 9-15-10 kluym

**LEGEND**

	EXISTING GROUND (10-FT CONTOUR)
	EXISTING GROUND (2-FT CONTOUR)
	PROPERTY LINE
	CORNER POINTS
	PRIMARY LOCATION
	DUPLICATE LOCATION
	TRIPPLICATE LOCATION



SOURCE: TOPOGRAPHIC INFORMATION AND PROPERTY BOUNDARY FROM AECOM, "CELL 1 SUBBASE GRADES, CONSTRUCTION DRAWINGS, PHASE 1 LATERAL EXPANSION, CELL 1 BASE LAYER CONSTRUCTION, KEKAHA SANITARY LANDFILL, KAUAI, HAWAII," REVISION 1, 22 JANUARY 2010

**Geosyntec<sup>D</sup>**  
consultants

SUBGRADE SAMPLE LOCATIONS  
FORMER LEACHATE EVAPORATION POND  
KEKAHA SANITARY LANDFILL  
KEKAHA, KAUAI, HAWAII

FIGURE NO.	5
PROJECT NO.	WG1298
DATE:	SEPTEMBER 2010







STATE OF HAWAII  
DEPARTMENT OF HEALTH  
ENVIRONMENTAL MANAGEMENT DIVISION  
SOLID AND HAZARDOUS WASTE BRANCH  
919 ALA MOANA BLVD, #212  
HONOLULU, HAWAII 96814

June 4, 2010

S0617TM

**CERTIFIED MAIL NO. 7009 2250 0004 4923 0584**  
**RETURN RECEIPT REQUIRED**

Mr. Jeff Kaohi, District Manager  
Waste Management of Hawaii, Inc.  
Kekaha MSW Landfill  
6900-D Kaunualii Highway  
Kekaha, HI 96752

**CERTIFIED MAIL NO. 7009 2250 0004 4923 0577**  
**RETURN RECEIPT REQUIRED**

Mr. Donald Fujimoto  
County Engineer  
County of Kauai  
4444 Rice Street, Suite 275  
Lihue, HI 96766

Dear Messrs. Kaohi and Fujimoto:

**SUBJECT:** CQA Report for New Evaporation Pond  
Phase II Landfill Expansion  
Kekaha MSW Landfill

On June 1, 2010, the Department of Health, Solid and Hazardous Waste Branch received the *Report of Construction Quality Assurance (CQA) New Leachate Evaporation Pond*, dated May 25, 2010 and prepared by Geosyntec Consultants, Inc., as part of the Kekaha Municipal Solid Waste (MSW) Landfill Phase II lateral expansion under solid waste management (SWM) permit number LF-0053-09.

The CQA includes certification by Geosyntec Consultants, Inc. that all construction of the leachate pond containment system has been completed in accordance with the approved *Construction Drawings Phase II Lateral Expansion Cell 1 Base Liner Construction*, dated April 2009 and prepared by AECOM. Deviations from construction drawing requirements cited by the contractor or CQA consultant that are included in the

Mr. Jeff Kaohi  
Mr. Donald Fujimoto  
June 4, 2010  
Page 2

CQA report have been approved by the design engineer. The DOH has reviewed the CQA report and has no adverse comment on the adequacy of the work performed. The DOH understands that certain ancillary components shown on the construction drawings, including aerators and electrical power and control systems for the aerators, have not yet been completed, and, other than the aerators, the evaporation pond is fully operational.

Part II, Special Conditions, Section B, Item 14 of SWM permit LF-0053-09 states that the Evaporation Pond shall not be placed in operation until the CQA officer or manager certifies completion of construction in accordance with the approved construction drawings, and the DOH approves the CQA report. With the submission of Geosyntec's certification and CQA report, the DOH approves the construction of the Evaporation Pond containment system, and grants approval to temporarily operate the Evaporation Pond without the aerators if the aerators cannot be installed in time to support scheduled start of Evaporation Pond operation. Satisfactory installation of aerators shall be documented in a CQA report.

Should there be any questions regarding this letter, please contact Thomas Miyashiro of our Solid Waste Section at (808) 586-4226.

Sincerely,

  
STEVEN Y.K. CHANG, P.E., CHIEF  
Solid and Hazardous Waste Branch

c. Mr. Jesse Frey, Waste Management of Hawaii, Inc.



STATE OF HAWAII  
DEPARTMENT OF HEALTH  
ENVIRONMENTAL MANAGEMENT DIVISION  
SOLID AND HAZARDOUS WASTE BRANCH  
#19 ALA MOANA BLVD., #217  
HONOLULU, HAWAII 96814

If reply, please refer to  
EM009160

June 24, 2010

S0661TM

Mr. Donald Fujimoto, County Engineer  
Department of Public Works  
County of Kauai  
4444 Rice Street, Suite 275  
Lihue, Hawaii 96766

Mr. Jeffrey K. Kaohi, District Manager  
Waste Management of Hawaii  
6900-D Kaunuaui Highway  
Kekaha, Hawaii 96752

Dear Messrs. Fujimoto and Kaohi:

**SUBJECT:** Kekaha MSW Landfill Phase II Lateral Expansion  
Report of Construction Quality Assurance, Cells 1C and 1D

On June 9, 2010, the Department of Health, Solid and Hazardous Waste Branch (DOH) received the subject CQA report for the construction of Cells 1C and 1D. This report, dated June 8, 2010 and prepared by Geosyntec Consultants, Inc., covers the construction of the containment systems for Cells 1C and 1D, and interim facilities to enable operation of Cells 1C and 1D while Cells 1A and 1B are being constructed. This phased construction to enable earlier waste placement was proposed by the County of Kauai and concurred by DOH due to the limited space available in the existing Phase II landfill. The scope of work accomplished is indicated by annotations in red on the construction drawings for the Phase II lateral expansion. Exactly what portions of the construction work has not been completed is not clear.

It should be noted that the "red-lined" drawings included in the CQA report do not constitute the complete set of construction drawings. Some sheets are missing, presumably because they do not contain relevant information on the construction work performed. These drawings have been signed and sealed, and dated April 30, 2010, by the Design Engineer. These drawings include at least one design change not previously discussed with the DOH, namely the addition of a temporary wet well. One of the annotations in red on Drawing No. 2 indicates that the new leachate transfer piping connection to the new evaporation pond has not been installed. In a discussion with Mr. Jesse Frey, WMH project engineer, on June 22, 2010, Mr. Frey said the new evaporation pond could not be put into operation until the CQA for the pond construction was approved by DOH. The DOH approval was issued about the same time that the subject CQA report was prepared. The connection to the new

Mr. Donald Fujimoto  
Mr. Jeffrey K. Kaohi  
June 24, 2010  
Page 2

pond has since been installed, and the system is delivering leachate from the existing Phase II cells to the new pond. It is our understanding that portions of the new leachate collection and transfer piping for Cells 1C and 1D, including the temporary wet well, are complete and operational. Section 2.1 of the subject CQA, page 2-2, also noted that leachate from the temporary wet well and LCM-14 will be routed to the new evaporation pond, that construction of this portion of the leachate conveyance system was in progress at the time of the writing of this report, and that documentation of the final connection to the new evaporation pond will be submitted in a follow-up letter upon completion of the work.

At this time, the DOH has no adverse comments on the subject CQA report. The DOH acknowledges the certification of the construction work completed for Cells 1C and 1D containment systems by the CQA Officer. The DOH also acknowledges the fact that the DOH was not apprised of design changes made subsequent to permit issuance, and has not received the updated final drawings. The DOH will reserve further comment until a complete set of final drawings and the final CQA report for the remainder of the Phase II expansion work are received.

Part II, Special Conditions, Section B, Item 14 of the solid waste management permit for the landfill expansion, permit number LF-0053-09, states that no solid waste shall be disposed into the new cell until the CQA Officer certifies completion of construction in accordance with the approved construction drawings, and the DOH approves the CQA report. With the submission of Geosyntec's certification and partial CQA report, the DOH accepts the submitted CQA report, and the permittee may commence with select waste placement in Cells 1C and 1D in accordance with your solid waste management permit, Part II, Special Conditions, Section B, Item 8. However, as mentioned in the previous paragraph, the DOH reserves further comment on the construction of the expansion cells, including Cells 1C and 1D, until a complete set of final drawings and the final CQA report for the remainder of the Phase II expansion work are received.

If you have any questions regarding this letter, please contact Mr. Thomas Miyashiro of the Office of Solid Waste Management at (808) 586-4226.

Sincerely,

  
STEVEN Y. K. CHANG, P.E., CHIEF  
Solid and Hazardous Waste Branch

c: Mr. Jesse Frey, Waste Management of Hawaii  
Mr. Jeff Impens, AECOM  
Mr. Troy Tanigawa, County of Kauai

Kim Huynh

---

**From:** Frey, Jesse [JFrey@wm.com]  
**Sent:** Thursday, July 01, 2010 12:42 PM  
keiths@goodfellowbros.com  
jeffg@goodfellowbros.com; Mike Minch; Chris Scott; Lottig, Justin; Kaohi, Jeffrey; itanigawa@kauai.gov;  
ken.bergschultz@aecom.com  
**Subject:** Fw: Kekaha Soil Sampling Results from Beneath the Former Leachate Pond

Keith,

You are good to go. See email below from HDOH.

JF

---

**From:** Lottig, Justin  
**To:** Frey, Jesse; Kaohi, Jeffrey  
**Sent:** Thu Jul 01 14:38:11 2010  
**Subject:** Fw: Kekaha Soil Sampling Results from Beneath the Former Leachate Pond

---

**From:** Fujimoto, Janice K <janice.fujimoto@doh.hawaii.gov>  
**To:** Lottig, Justin  
**Cc:** Ichinotsubo, Lene K <lene.ichinotsubo@doh.hawaii.gov>; Miyashiro, Thomas <thomas.miyashiro@doh.hawaii.gov>  
**Sent:** Thu Jul 01 14:37:02 2010  
**Subject:** RE: Kekaha Soil Sampling Results from Beneath the Former Leachate Pond

lin -

Thank you for the following info and the follow-up reference regarding the July 2008 sampling plan. Based on the results provided, the soil is acceptable to be left in place.

Thanks  
~Janice

—Original Message—

**From:** Lottig, Justin [mailto:JLottig@wm.com]  
**Sent:** Tuesday, June 29, 2010 11:26 AM  
**To:** Fujimoto, Janice K  
**Cc:** Ichinotsubo, Lene K; Miyashiro, Thomas  
**Subject:** Kekaha Soil Sampling Results from Beneath the Former Leachate Pond

Janice, as we discussed in a phone call earlier today, we received the results of the soil samples from beneath the former leachate pond. The results are presented in the attached table. Three samples were collected using a multi-incremental sampling approach that were each comprised of 50 individual samples. All samples were non-detect, however, one compound, Bis(2-Chloroethyl)ether, had a method detection limit higher than the associated EAL. The landfill is situated makai of the underground injection control line, so the area should be considered to be not a potential or current source of drinking water. Since there were no detections in any of the samples, there is likely no contamination as it would be unlikely to have contamination of with only one analyte. I would like to have your concurrence on this matter before we proceed. If you agree and say that this analysis satisfies your needs, the soil will be left in place and the landfill will be constructed over top of this area. Please let me know ASAP because we'd like to continue construction right away. Thank you for your time. <<EAL comparison.xls>>

Justin H. Lottig

Environmental Protection Manager

Waste Management of Hawaii

92-460 Farrington Highway

Kapolei, HI 96707

808.668.2985

**Waste Management is North America's largest recycler of household-generated recyclables, recycling enough newspaper, office paper and cardboard last year to save more than 41 million trees.**

---

**Waste Management recycles enough paper every year to save 41 million trees. Please recycle any printed emails.**



Photo 1. Existing leachate evaporation pond area prior to removal of leachate (looking northwest)



Photo 2. Hitachi 450 LC excavator removing existing leachate pond materials (looking west)





Photo 3. Hitachi 450 LC excavator removing existing leachate pond materials (looking south)

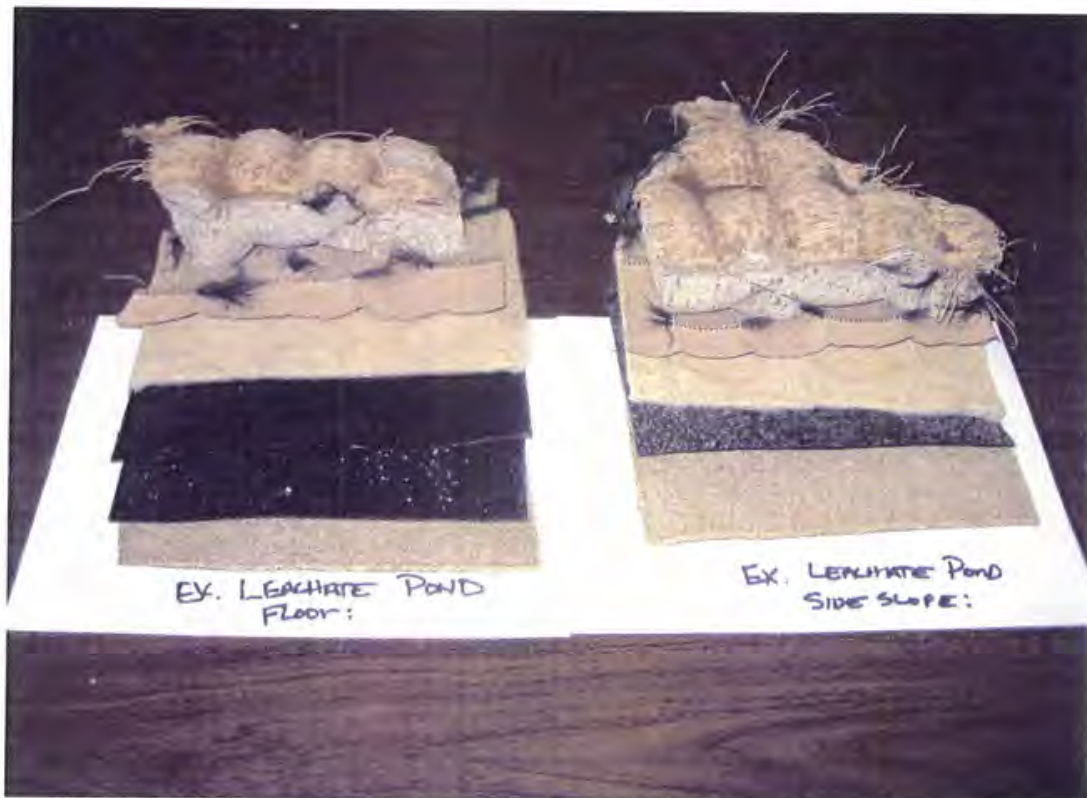


Photo 4. Layers comprising the existing leachate pond containment and protection system



Photo 5. Motorgrader removes the approximate top 6 inches of subgrade soils (looking south)



Photo 6. A Caterpillar 740 haul truck transports the removed pond materials to the Phase II landfill for disposal (looking south)



Photo 7. Existing leachate pond subgrade (looking southwest)



Photo 8. Collecting soil samples from the primary, duplicate, and triplicate sample locations



Photo 9. Samples were collected using a hollow metal rod, approximately 1-inch in diameter

## **APPENDIX C**

### **Existing Leachate Evaporation Pond Sub-Surface Sampling Strategy**

841 Bishop Street, Suite 500, Honolulu, HI 96813  
 Tel No: 808.523.8874 Fax No. 808.523.8950

**LETTER OF TRANSMITTAL**

<b>TO:</b> County of Kauai
Department of Solid Waste
4444 Rice Street
Molokaha Building, Suite 275
Lihue, Hawaii 96766

Date: July 7, 2008	Job No.: 95561.08
Attention: Troy Tanigawa 241-6880	
RE: Kekaha LF Phase II Lateral Expansion - Response to Comments - Application for Solid Waste Permit	

- WE ARE SENDING YOU    
  Attached    
  Under separate cover via \_\_\_\_\_ the following items:  
 Shop drawings    
  Prints    
  Plans    
  Samples    
  Specifications  
 Copy of letter    
  Change order    
  Other \_\_\_\_\_

COPIES	DATE	NO.	DESCRIPTION
1			Kekaha LF Phase II Response to Comments (DOH), Response to Comments (Earth Tech), and replacement & new pages for the permit application document.

THESE ARE TRANSMITTED as checked below:

- For approval    
  Approved as submitted    
  Resubmit \_\_\_\_\_ copies for approval  
 For your use    
  Approved as noted    
  Submit \_\_\_\_\_ copies for approval  
 As requested    
  Returned for corrections    
  Return \_\_\_\_\_ corrected print(s)  
 For review and comment    
  Other \_\_\_\_\_  
 FOR BIDS DUE \_\_\_\_\_    
  Prints returned after loan to us

REMARKS Hi Troy, Attached is Earth Tech's response to comments that were communicated to us from DOH in the teleconference conducted on May 23, 2008. Also included are the Earth Tech revisions to the "package" submitted to DOH in late December 2007. This response to comment document is submitted to you for County and Sanifill's review. Once all reviews are complete the response document can be finalized and submitted to

4

Please call if you have any questions.

Thanks Jeff

---

---

COPY TO \_\_\_\_\_

SIGNED: \_\_\_\_\_

Application for Solid Waste Disposal Facilities (December 2007),  
 Kekaha Landfill Phase II Lateral Expansion, Kauai, Hawaii  
 Reviewer: Tom Miyashiro, State of Hawaii Department of Health  
 June 2008

Comment No.	Document	Comment	Response
1	Engineering Report, Section 3.1, page 7	Fourth bullet should state that the 60-mil HDPE geomembrane (upper component) is textured on both sides (per Section 4.5).	The fourth bullet has been updated to: <ul style="list-style-type: none"> <li>60-mil HDPE geomembrane (upper component), textured on both sides of geomembrane</li> </ul> Replacement of page 7 included in Attachment 1.
2	Engineering Report, Section 3.2, page 7	The first paragraph refers to Drawings No. 1 and No. 5. This needs to be corrected to refer only to Drawing No. 2.	Revised to refer to only Drawing No. 2.  Replacement of page 7 included in Attachment 1.
3	Engineering Report, Section 3.3	Demonstrate that this alternate liner system is acceptable. Provide demonstration that the proposed liner system is equivalent to a 2 ft clay layer liner.	This was demonstrated and added to a new appendices, Appendix B-7 "Base Liner Evaluation – Point of Compliance".  Lead in text was added to Section 3.1 resulting in replacement pages of 7-9.  Replacement of Table of Contents (pages v, vi, vii), pages 7, 8, and 9 and Appendix B-7 are included in Attachment 1.
4	Engineering Report, Section 5, page 15	The second sentence of the first paragraph, change "northeast" to "northwest".	Revised to northwest.  Replacement of page 15 included in Attachment 1.
5	Engineering Report, Section 7	Identify and explain the control systems and how the leachate levels will be maintained below the maximum allowable depths in the new cell and how they will be checked.	New Section 7.3 added to report, "Leachate Transfer System".  Revised existing Section 7.3 "Leachate Evaporation Pond Sizing" to Section 7.4.  Replacement of pages 20 and 21 included in Attachment 1.
6	Engineering Report, Appendix A, Section 2	Revise the first sentence of the second paragraph since ground leachate storage tank systems were not used.	Revised first sentence.  Replacement of page 1 of Appendix A included in Attachment 1.
7	Engineering Report, Appendix A, Section 2	Revise the first sentence of the first paragraph to state that the Mana coastal plain is located in "southeastern" Kauai instead of "northeastern" Kauai.	Revised to southeastern.  Replacement of page 4 of Appendix A included in Attachment 1.
8	Engineering Report, Appendix B-3 Base Slope Stability Equipment, Figure 2	Provide clarification on the factor of safety.	A factor of safety of 1.1 was employed as the stability of the drainage layer during placement. Placement of the drainage layer is a temporary condition and only is realized when a piece of equipment is on the sideslope over the drainage layer material. Placement of the drainage layer will be from the toe of slope up the sideslope which allows the use of the buttress effect from the



Application for Solid Waste Disposal Facilities (December 2007),  
 Kealahou Landfill Phase II, Lateral Expansion, Kauai, Hawaii  
 Reviewer: Tam Miyashiro, State of Hawaii Department of Health  
 June 2008

Comment No.	Document	Comment	Response
			drainage layer present at the toe of slope. Since this activity is a brief and a temporary condition (i.e. the dozer moves up and down the sideslope), a factor of safety of 1.1 was deemed acceptable. Once the piece of equipment used to place the drainage layer leaves the sideslope (backs onto the base area off of the sideslope), the factor of safety of the in place drainage layer increases.
9	Engineering Report, Appendix D-2 Leachate Collection Pipe Flow Capacity Analysis, Section "Calculation"	Provide calculations of flow through the holes in the pipe.	Calculations requested are provided in Appendix D-2.  Replacement of both pages in Appendix D-2 included in Attachment 1. Titled "Calculation Sheet – Leachate Collection Pipe Perforation Sizing" (2 pages).
10	Engineering Report, Appendix E, Geosynthetic Liner	Interface friction angle testing requirements of the geosynthetic materials are to be included in Appendix E.	New Appendix E-7 "Interface Friction Angle Testing" added to report.  Additional Appendix E-7 page included in Attachment 1.
11	Addendum to Operating Plan, Section 6.8.4	Review applicability of second bullet.	Second bullet was deleted.  Replacement of page 14 included in Attachment 2.
12	Addendum to Operating Plan	Provide leachate level control system description of the 2 pump stations, wet wells.	Detailed description added to Section 6.10.  Replacement of Table of Contents (page ii) and pages 14 and 15 included in Attachment 2.
13	Closure/Post-Closure Plan, Appendix A, Section 1.1	The second paragraph, last sentence conflicts with Drawing No. 1.	Drawing No. 1 revised to reflect proposed gas collection system.  Replacement of Drawing No. 1 included in Attachment 3.
14	Closure/Post-Closure Plan, Appendix A, Drawing No. 1	Review Drawing No. 1 for applicability.	Drawing No. 1 revised to reflect proposed gas collection system.  Replacement of Drawing No. 1 included in Attachment 3.
15	Landfill Gas Monitoring Effort	Identify how this will be performed for the new cell.	2 new gas probes will be added to the western boundary of the new cell (Figure "Proposed Gas Monitoring Probe Locations"). This incorporates spacing of less than 1000 feet between gas probes. Figures "Existing Gas Monitoring Probe Locations" and "Gas Monitoring Probe Details" are also included

Application for Solid Waste Disposal Facilities (December 2007),  
 Kekaha Landfill Phase II Lateral Expansion, Kauai, Hawaii  
 Reviewer: Tom Miyashiro, State of Hawaii Department of Health  
 June 2008

Comment No.	Document	Comment	Response
			for reference. Existing gas probe BP-11-5 will be removed.  These figures are included in Attachment 4.
16	Buffer Zone	Provide justification on buffer zone and surrounding areas around landfill.	The distance between the landfill limits of waste to the property line varies between 71 feet and 74 feet. See attached figure.  There is an access road that effectively extends the buffer zone. The road is between the landfill's property line and the adjacent agricultural use lands. The access road adjacent to property line is federally owned, and is part of TMK 412002010, upon which the Lae O Kokole Lighthouse is located. This parcel is indicated as parcel "G" on Figure 3-1.  Furthermore, the possibility of future residential development on the adjacent lands are highly unlikely because all of the surrounding parcels are under federal or state ownership, and have a state land use designation of Agricultural District or Conservation District. This parcel is indicated as parcel "E" on Figure 3-1 (Land Ownership & Use).  The figure showing the distance between the landfill limits of waste and the property line, and Figures 3-1 and 3-2 are included in Attachment 5.
17	Sampling Strategy for existing leachate evaporation pond.	Provide sampling strategy for subsurface below the existing leachate evaporation pond.	Sub-Surface Sampling Strategy is included in Attachment 6.
18	Permit Application, Attachment P-1, Figure 3	Title block on Figure 3 needs to be revised from "Second Vertical Expansion" to "Lateral Expansion"	Title block revised to "Lateral Expansion",  Replacement of Figure 3 included in Attachment 7.
19	Material Drop-off Facility Plan	Material Drop-off Facility Plan submittal is required.	The Material Drop-off Facility Plan is included in Attachment 8. (PENDING)
20	Design Drawings and Specifications	Provide a set of design drawings and specifications.	Provided to DOH on May 30, 2008
21	Aerator Design/ Construction Details	Provide aerator moorings, support pad, etc. details	Earth Tech submitted details to DOH on May 30, 2008 as part of the design drawings package.

Application for Solid Waste Disposal Facilities (December 2007),  
Kekaha Landfill Phase II, Lateral Expansion, Kauai, Hawaii  
Reviewer: Tom Miyashiro, State of Hawaii Department of Health  
June 2008

Comment No.	Document	Comment	Response
22	Existing As-Built Drawings	Provide a copy of as-built drawings from 1993/1994 construction.	Provided to DOH with a copy of the 1993 Design Drawings on May 30, 2008. As-built drawings are not available.

Attachment 6  
Sub-Surface Sampling Strategy

## **Existing Leachate Evaporation Pond Sub-Surface Sampling Strategy**

Prior to constructing the new landfill cell, soil conditions below the existing leachate evaporation pond will be verified using a multi-increment (MI) sampling strategy.

The existing leachate evaporation pond will be removed and reconstructed elsewhere on-site to allow for the new landfill cell. The current location of the existing leachate evaporation pond is shown on Drawing No. 1 of the Design Drawings.

Field sampling activities commence with laying out the decision unit, identifying increment sampling locations, and preparing the sampling equipment. Once these tasks have been completed, sample collection will proceed as described below.

One decision unit will be used for the site to determine what the average concentration of constituents of concern are beneath the liner. This decision unit is defined to be coincident with the area of the removed leachate evaporation pond.

This decision unit will be used to assess whether a breach of the liner has occurred which has impacted the soil at concentrations above the Hawaii Department of Health (DOH) Environmental Action Levels (EALs).

Based on the likely distribution of contaminants and soil heterogeneity, it was determined that 50 increments should be sufficient to adequately characterize the decision unit. The locations of the 50 increments will be based on a systematic sampling grid.

The decision unit, including the corners, will be staked using GPS stationing. The decision unit will then be divided into 50 equally sized subunits. A standard location within each subunit will be identified on a map and marked in the field using flags or other easily visible markers. These flags will be used to designate the increment sampling location. Under the systematic random MI sampling approach, each increment sampling location is randomly selected using Visual Sample Plan (VSP) software. The VSP software is a program that is used to determine the increment sampling locations using a systematic random design, see Figure 1.

Equipment used in the collection of sample increments includes sampling tools (disposable or non-disposable) such as a square bottomed scoop or coring tool and laboratory supplied sample containers. Sampling tools will be "calibrated" so that each increment is the correct mass (i.e., the sum of all the increment masses equals the final sample mass) and is the same from location to location.

Samples will be taken from the top 2" of soil. Loose soil and debris will be removed from the sampling equipment between increment locations to keep the mass from each increment location the same.

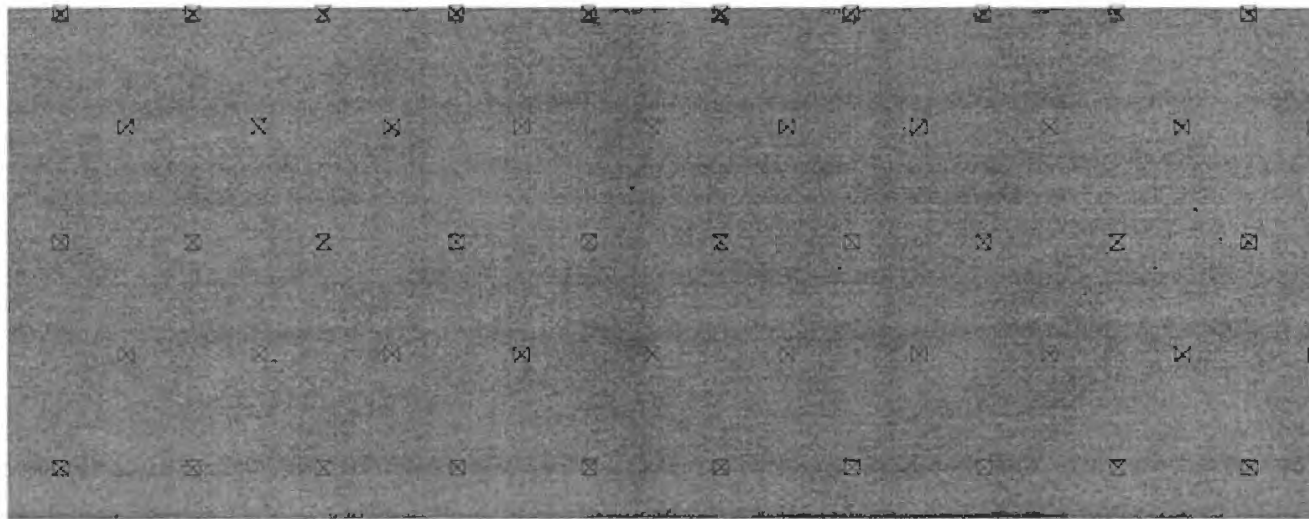
In addition to the primary or normal sample, a duplicate, and a triplicate will be collected for QC purposes. Field replicates will be collected for the purpose of evaluating total project error, which is the sum of errors due to field sampling and analytical laboratory sub-sampling and analysis. Data generated from the field replicates will be used to estimate the average concentration for the decision unit and to determine the 95% upper confidence limit (UCL) for the decision unit.

The method for collecting replicate increments will be to move a pre-determined distance and direction from the primary increment location (e.g., 8 feet north, south, east, or west of the primary increment location). The distance between primary and replicate sample increments will be adequate to evaluate heterogeneity within the decision unit.

All three multi-increment samples will be submitted to the laboratory for analytical testing.

The MI samples (one primary and 2 QC samples) will be analyzed for semi-volatile organic compounds (SVOCs) using EPA method 8270D. VOC analysis testing is not proposed at Kekaha Landfill since the samples will only be collected from surface soil or near surface soil.

If any of these soil samples have compounds that exceed the EALs, then further action will be evaluated by the County of Kauai.



Sampling Location

Figure 1 - Increment Sampling Locations  
Kekaha Landfill Phase II, Lateral Expansion

**APPENDIX D**

**Hawai'i Department of Health  
Tier 1 Environmental Action Levels**



**TABLE B: GROUNDWATER IS NOT A CURRENT OR  
POTENTIAL SOURCE OF DRINKING  
WATER**

**TABLE B. ENVIRONMENTAL ACTION LEVELS (EALs)**  
**Groundwater IS NOT Current or Potential Source of Drinking Water**

CONTAMINANT	>150m to Surface Water Body		≤150m to Surface Water Body	
	Soil (mg/kg)	Groundwater (µg/L)	Soil (mg/kg)	Groundwater (µg/L)
ACENAPHTHENE	1.4E+02	2.0E+02	2.3E+01	2.3E+01
ACENAPHTHYLENE	1.3E+02	3.0E+02	1.3E+01	3.0E+01
ACETONE	8.6E-01	1.8E+03	8.6E-01	1.5E+03
ALDRIN	2.0E-02	1.3E+00	2.9E-02	1.3E-01
AMETRYN	1.1E+01	1.5E+02	1.1E+00	1.5E+01
AMINO,2-DINITROTOLUENE,4,6-	2.5E+00	1.5E+02	2.5E-01	1.5E+01
AMINO,4-DINITROTOLUENE,2,6-	2.5E+00	1.5E+02	2.5E-01	1.5E+01
ANTHRACENE	2.5E+00	7.3E-01	2.5E+00	7.3E-01
ANTIMONY	6.3E+00	1.5E+03	6.3E+00	3.0E+01
ARSENIC	2.0E-01	6.9E+01	2.0E+01	3.6E+01
ATRAZINE	2.1E+00	3.6E+02	4.6E-01	1.2E+01
BARIUM	7.5E+02	2.0E+03	7.5E+02	2.0E+03
BENZENE	5.3E-01	1.5E+03	5.3E-01	4.6E+01
BENZO(a)ANTHRACENE	1.5E+00	2.7E-02	1.5E+00	2.7E-02
BENZO(a)PYRENE	1.5E-01	1.4E-02	1.5E-01	1.4E-02
BENZO(b)FLUORANTHENE	1.5E+00	9.2E-02	1.5E+00	9.2E-02
BENZO(g,h,i)PERYLENE	2.7E+01	1.0E-01	2.7E+01	1.0E-01
BENZO(k)FLUORANTHENE	1.5E+01	4.0E-01	1.5E+01	4.0E-01
BERYLLIUM	4.0E+00	4.3E+01	4.0E+00	2.7E+00
BIPHENYL, 1,1-	5.2E+00	5.0E+00	5.2E+00	5.0E+00
BIS(2-CHLOROETHYL)ETHER	2.6E-03	1.1E+02	2.6E-03	6.1E+01
BIS(2-CHLOROISOPROPYL)ETHER	3.3E+00	3.2E+03	6.6E-01	6.1E+01
BIS(2-ETHYLHEXYL)PHTHALATE	3.5E+01	3.2E+01	3.5E+01	3.2E+01
BORON	1.0E+02	7.3E+03	1.0E+02	7.3E+03
BROMODICHLOROMETHANE	2.3E-02	1.6E+02	2.3E-02	1.6E+02
BROMOFORM	4.7E+01	5.1E+03	2.9E+01	3.2E+03
BROMOMETHANE	1.8E-01	3.6E+02	1.8E-01	1.6E+02
CADMIUM	1.2E+01	3.0E+00	1.2E+01	3.0E+00
CARBON TETRACHLORIDE	2.7E-02	3.1E+01	2.7E-02	3.6E+00
CHLORDANE (TECHNICAL)	1.8E+01	9.0E-02	1.8E+01	4.0E-03
CHLOROAMINE, p-	6.0E-02	5.0E+00	6.0E-02	5.0E+00
CHLOROBENZENE	1.8E+00	1.6E+02	1.8E+00	2.5E+01
CHLOROETHANE	2.8E-01	3.9E+00	1.2E+01	1.6E+02
CHLOROFORM	1.8E-02	7.4E+01	1.8E-02	7.4E+01
CHLOROMETHANE	2.3E-01	2.9E+02	2.3E-01	2.9E+02
CHLOROPHENOL, 2-	1.3E-01	1.8E+00	1.3E-01	1.8E+00
CHROMIUM (Total)	5.0E+02	5.7E+02	5.0E+02	7.4E+01
CHROMIUM III	7.5E+02	5.7E+02	7.5E+02	7.4E+01
CHROMIUM VI	8.0E+00	1.6E+01	8.0E+00	1.1E+01
CHRYSENE	1.4E+01	3.5E-01	1.4E+01	3.5E-01
COBALT	4.0E+01	3.0E+00	4.0E+01	3.0E+00
COPPER	2.3E+02	2.9E+00	2.3E+02	2.9E+00
CYANIDE (Free)	1.0E+02	1.0E+00	1.0E+02	1.0E+00
CYCLO-1,3,5-TRIMETHYLENE-2,4,6-TRINITRAMINE (RDX)	5.5E+00	1.4E+03	5.5E+00	1.5E+02
DALAPON	3.4E+00	3.0E+03	1.4E-01	3.0E+02
DIBENZO(a,b)ANTHRACENE	1.5E-01	5.2E-01	1.5E-01	5.2E-01
DIBROMO,1,2-CHLOROPROPANE,3-	8.0E-04	4.0E-02	9.0E-04	4.0E-02
DIBROMOCHLOROMETHANE	1.7E-02	2.7E+02	1.7E-02	2.7E+02
DIBROMOETHANE, 1,2-	6.9E-04	1.2E+01	6.9E-04	1.2E+01
DICHLOROBENZENE, 1,2-	7.1E+00	1.0E+02	1.2E+00	1.4E+01
DICHLOROBENZENE, 1,3-	3.0E+01	3.7E+02	7.4E+00	8.5E+01
DICHLOROBENZENE, 1,4-	3.7E-02	1.1E+02	3.7E-02	1.5E+01
DICHLOROBENZITINE, 3,3-	1.1E+00	2.5E+02	1.1E+00	2.5E+02
DICHLORODIPHENYLDICHLOROETHANE (DDO)	2.0E+00	6.0E-01	2.0E+00	1.0E-03
DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	1.4E+00	1.1E+00	1.4E+00	1.0E-03
DICHLORODIPHENYLTRICHLOROETHANE (DDT)	1.7E+00	1.3E-02	1.7E+00	1.0E-03
DICHLOROETHANE, 1,1-	2.6E-01	4.7E+01	2.6E-01	4.7E+01
DICHLOROETHANE, 1,2-	1.8E-02	1.2E+02	1.5E-02	1.2E+02
DICHLOROETHYLENE, 1,1-	7.1E+00	3.9E+03	4.3E+00	2.5E+01

**TABLE B. ENVIRONMENTAL ACTION LEVELS (EALs)**  
**Groundwater IS NOT Current or Potential Source of Drinking Water**

CONTAMINANT	>150m to Surface Water Body		≤150m to Surface Water Body	
	*Soil (mg/kg)	*Groundwater (ug/L)	*Soil (mg/kg)	*Groundwater (ug/L)
DICHLOROETHYLENE, Cis 1,2-	1.2E+00	4.3E+03	1.2E+00	5.9E+02
DICHLOROETHYLENE, Trans 1,2-	2.1E+00	2.6E+03	2.1E+00	5.9E+02
DICHLOROPHENOL, 2,4-	3.6E-01	3.0E+00	3.6E-01	3.0E+00
DICHLOROPHENOXYACETIC ACID (2,4-D)	9.8E-01	2.0E+02	2.0E-01	4.0E+01
DICHLOROPROPANE, 1,2-	4.1E-02	1.0E+02	4.1E-02	1.0E+02
DICHLOROPROPENE, 1,3-	1.0E-01	2.6E+02	1.0E-01	1.2E+02
DIELDRIN	3.0E-02	7.1E-01	3.3E-03	1.9E-03
DIETHYLPHTHALATE	2.0E+01	9.4E+02	3.1E-02	1.5E+00
DIMETHYLPHENOL, 2,4-	3.2E+01	2.7E+02	1.3E+01	1.1E+02
DIMETHYLPHTHALATE	2.2E+01	8.4E+02	3.5E-02	1.5E+00
DINITROBENZENE, 1,3-	1.2E+00	1.1E+02	1.1E+00	3.0E+01
DINITROPHENOL, 2,4-	1.4E+01	2.3E+02	4.5E+00	7.5E+01
DINITROTOLUENE, 2,4- (2,4-DNT)	6.6E+00	1.1E+02	2.7E+00	4.4E+01
DINITROTOLUENE, 2,6- (2,6-DNT)	5.8E+00	1.1E+02	2.7E+00	4.4E+01
DIOXANE, 1,4-	9.8E+00	3.0E+04	9.8E+00	5.0E+04
DIOXINS (TEQ)	4.5E-06	3.0E-03	4.5E-06	5.8E-06
DIURON	4.5E+00	2.0E+02	1.4E+00	6.0E+01
ENDOSULFAN	1.2E-01	3.4E-02	3.2E-02	8.7E-03
ENDRIN	6.0E-02	3.7E-02	4.0E-03	2.3E-03
ETHANOL	4.5E+00	5.0E+04	4.5E+00	5.0E+04
ETHYLBENZENE	1.6E+00	3.0E+02	1.6E+00	2.9E+02
FLUORANTHENE	4.0E+01	4.0E+01	4.0E+01	5.0E+00
FLUORENE	1.3E+02	3.0E+02	7.3E+00	3.9E+00
GLYPHOSATE	1.9E+00	6.0E+02	2.0E-01	6.5E+01
HEPTACHLOR	1.1E-01	5.3E-02	1.1E-01	3.6E-03
HEPTACHLOR EPOXIDE	4.6E-02	5.3E-02	3.1E-03	3.6E-03
HEXACHLORO BENZENE	3.0E-01	3.1E+00	3.0E-01	3.1E+00
HEXACHLOROBUTADIENE	2.5E+00	1.1E+01	1.1E+00	4.7E+00
HEXACHLORO CYCLOHEXANE (gamma) LINDANE	9.0E-02	1.6E-01	4.5E-02	8.0E-02
HEXACHLOROETHANE	5.2E+00	1.0E+02	7.4E-01	1.2E+01
HEXAZINONE	4.0E+02	5.0E+04	4.0E+02	5.0E+03
INDEN(1,2,3-cd)PYRENE	1.5E+00	9.2E-02	1.5E+00	9.2E-02
ISOPHORONE	4.2E+01	4.3E+03	1.3E+00	1.3E+02
LEAD	2.0E+02	2.9E+01	2.0E+02	5.6E+00
MERCURY	4.7E+00	2.1E+00	4.7E+00	2.5E-02
METHOXYCHLOR	2.6E+01	3.0E-02	2.6E+01	3.0E-02
METHYL ETHYL KETONE	1.4E+01	1.4E+04	1.4E+01	1.4E+04
METHYL ISOBUTYL KETONE	4.5E-01	1.7E+02	4.5E-01	1.7E+02
METHYL MERCURY	1.6E+00	3.0E-03	1.6E+00	3.0E-03
METHYL TERT BUTYL ETHER	1.6E+00	1.6E+03	1.6E+00	1.6E+03
METHYLENE CHLORIDE	8.8E-01	3.1E+03	8.8E-01	2.2E+03
METHYLNAPHTHALENE, 1-	2.6E+00	1.0E+02	1.1E+00	2.1E+00
METHYLNAPHTHALENE, 2-	2.5E+01	1.0E+02	1.0E+00	2.1E+00
MOLYBDENUM	4.0E+01	2.4E+02	4.0E+01	2.4E+02
NAPHTHALENE	4.6E-01	2.1E+02	4.6E-01	2.4E+01
NICKEL	1.5E+02	5.0E+00	1.5E+02	5.0E+00
NITROBENZENE	6.2E+00	2.0E+03	1.9E+00	6.0E+01
NITROGLYCERIN	1.2E+00	1.4E+02	1.2E+00	1.4E+02
NITROTOLUENE, 2-	1.9E+00	7.5E+03	1.9E+00	1.0E+03
NITROTOLUENE, 3-	2.1E+02	3.8E+03	2.1E+01	3.8E+02
NITROTOLUENE, 4-	3.0E+01	3.3E+03	3.0E+01	1.9E+03
PENTACHLOROPHENOL	3.0E+00	1.3E+01	3.0E+00	7.9E+00
PENTAERYTHRITOLTETRAMITRATE (PETM)	4.4E+00	2.2E+04	4.4E+00	2.2E+04
PERCHLORATE	1.2E+00	6.0E+02	1.2E+00	6.0E+02
PHENANTHRENE	1.8E+01	7.7E+00	1.1E+01	4.8E+00

**TABLE B. ENVIRONMENTAL ACTION LEVELS (EALs)**  
**Groundwater IS NOT Current or Potential Source of Drinking Water**

CONTAMINANT	>150m to Surface Water Body		<150m to Surface Water Body	
	<sup>1</sup> Soil (mg/kg)	<sup>2</sup> Groundwater (ug/L)	<sup>1</sup> Soil (mg/kg)	<sup>2</sup> Groundwater (ug/L)
PHENOL	4.0E+01	3.4E+03	4.0E+01	1.3E+03
POLYCHLORINATED BIPHENYLS (PCBs)	1.1E+00	2.0E+00	1.1E+00	1.4E+02
PROPICONAZOLE	1.6E+02	2.6E+02	2.4E+01	2.6E+01
PYRENE	5.6E+01	2.0E+00	5.6E+01	2.0E+00
SELENIUM	1.0E+01	2.0E+01	1.0E+01	5.0E+00
SILVER	2.0E+01	1.0E+00	2.0E+01	1.0E+00
SIMAZINE	2.5E-01	1.0E+01	4.9E-02	2.0E+00
STYRENE	1.0E+01	1.0E+02	1.0E+01	1.0E+02
TERBACIL	1.6E+02	2.3E+04	3.0E+01	2.3E+03
tert-BUTYL ALCOHOL	8.1E+01	5.0E+04	8.1E+01	1.8E+04
TETRACHLOROETHANE, 1,1,1,2-	2.6E+00	3.1E+03	2.0E+00	3.1E+02
TETRACHLOROETHANE, 1,1,2,2-	7.1E-03	1.6E+02	7.1E-03	1.6E+02
TETRACHLOROETHYLENE	7.0E-02	1.4E+02	7.0E-02	1.2E+02
TETRACHLOROPHENOL, 2,3,4,6-	3.3E+00	1.0E+01	4.0E-01	1.2E+00
TETRAMITRO-1,3,5,7-TETRAAZOCYCLOOCTANE (HMX)	5.0E+02	1.9E+03	1.0E+02	3.3E+02
THALLIUM	1.0E+00	4.7E+02	1.0E+00	2.0E+01
TOLUENE	3.4E+01	4.0E+02	1.1E+01	1.3E+02
TOXAPHENE	4.4E-01	2.1E-01	4.4E-01	2.0E-04
TPH (gasolines)	1.0E+02	5.0E+03	1.0E+02	5.0E+02
TPH (middle distillates)	5.0E+02	2.5E+03	5.0E+02	6.4E+02
TPH (residual fuels)	5.0E+02	2.5E+03	5.0E+02	6.4E+02
TRICHLOROBENZENE, 1,2,4-	1.5E-01	1.8E+02	1.5E-01	2.5E+01
TRICHLOROETHANE, 1,1,1-	1.8E+02	6.0E+03	7.1E+00	6.2E+01
TRICHLOROETHANE, 1,1,2-	2.6E-02	3.0E+02	2.6E-02	3.0E+02
TRICHLOROETHYLENE	2.1E-01	4.8E+02	2.1E-01	3.6E+02
TRICHLOROPHENOL, 2,4,5-	1.0E+01	1.0E+02	2.2E+00	1.1E+01
TRICHLOROPHENOL, 2,4,6-	1.0E+01	4.9E+02	1.0E+01	4.9E+02
TRICHLOROPHENOXYACETIC ACID, 2,4,5- (2,4,5-T)	5.5E+00	6.9E+02	5.5E+00	6.9E+02
TRICHLOROPHENOXYPROPIONIC ACID, 2,4,5- (2,4,5-TP)	4.0E-01	3.0E+01	4.0E-01	3.0E+01
TRICHLOROPROPANE, 1,2,3-	1.8E-02	1.4E+02	1.8E-02	1.4E+01
TRICHLOROPROPENE, 1,2,3-	4.0E-01	2.2E+00	1.0E+01	1.5E+02
TRIFLURALIN	3.2E+01	2.0E+01	3.2E+01	2.0E+01
TRINITROBENZENE, 1,3,5-	2.5E+01	1.4E+02	5.4E+00	3.0E+01
TRINITROPHENYLMETHYLNITRAMINE, 2,4,6- (TETRYL)	4.8E+01	1.5E+02	4.9E+01	1.5E+02
TRINITROTOLUENE, 2,4,6- (TNT)	7.2E+00	5.7E+02	7.2E+00	1.3E+02
VANADIUM	1.1E+02	1.9E+01	1.1E+02	1.9E+01

**TABLE B. ENVIRONMENTAL ACTION LEVELS (EALs)  
Groundwater IS NOT Current or Potential Source of Drinking Water**

CONTAMINANT	>150m to Surface Water Body		≤150m to Surface Water Body	
	<sup>1</sup> Soil (mg/kg)	<sup>2</sup> Groundwater (ug/L)	<sup>1</sup> Soil (mg/kg)	<sup>2</sup> Groundwater (ug/L)
VINYL CHLORIDE	4.0E-02	2.1E-01	4.0E-02	2.1E+01
XYLENES	1.2E+02	1.0E+03	1.2E+01	1.0E+02
ZINC	6.0E+02	2.2E+01	6.0E+02	2.2E+01
Electrical Conductivity (mS/cm, USEPA Method 120.1 MOD)	2.0	0.0E+00	4.0	0.0E+00
Sodium Adsorption Ratio	3.0	0.0E+00	12	0.0E+00

**Notes:**

1. Based on unrestricted current or future land use. Considered adequate for residential housing, schools, medical facilities, day-care centers, parks and other sensitive uses.

2. Assumes potential discharge of groundwater into a freshwater, marine or estuary surface water system.

Source of Soil Action Levels: Refer to Appendix 1, Tables B-1 and B-2.

Source of Groundwater Action Levels: Appendix 1, Table D-1c (≤150m to Surface Water Body) and Table D-1d (>150m to Surface Water Body).

Soil data should be reported on dry-weight basis (see Appendix 1, Section 6.2)

Soil Action Levels intended to address direct-exposure, vapor intrusion, groundwater protection (leaching), ecologic (urban areas) and nuisance hazards. Soil gas data should be collected for additional evaluation of potential vapor intrusion hazards at sites with significant areas of VOC-impacted soil. See also Section 4.4 and Table C.

Groundwater Action Levels intended to address surface water impacts, vapor intrusion and nuisance concerns. Use in conjunction with soil gas action levels to evaluate potential impacts to vapor intrusion hazards if groundwater action levels for this concern approached or exceeded (refer to Table C-1a in Appendix 1). See also Section 4.4 and Table C.

Groundwater action levels should be compared to dissolved phase chemical concentrations unless otherwise instructed by HDOH.

Groundwater ALs >150m to Surface Water Body: Groundwater screened with respect to acute surface water goals (See Table D-1d).

Groundwater ALs ≤150m to Surface Water Body: Groundwater screened with respect to chronic surface water goals (see Table D-1c).

TPH - Total Petroleum Hydrocarbons: TPH Action Levels must be used in conjunction with Action Levels for related chemicals (e.g., BTEX, PAHs, oxidizers, etc.). See Section 2.6 in text.

TPH soil action levels for gross contamination hazards in isolated soils may be used as final cleanup levels if soil situated >3m deep at residential site and >1m (or otherwise capped) at commercial sites AND site data indicate that remaining contamination will not pose leaching or vapor intrusion hazards (refer to Table F-3 in Appendix 1; TPHg = 4,500 mg/kg, TPHind & TPHtr = 5,000 mg/kg). TPH soil action levels noted in above table should be applied at sites with elevated threats to drinking water resources or aquatic habitats. Refer to Section 2.6 in text.

**APPENDIX E**

**Laboratory Analytical Report**

# TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

## ANALYTICAL REPORT

TestAmerica Laboratories Inc.  
TestAmerica Seattle  
5755 8th Street East  
Tacoma, WA 98424  
Tel: (253)922-2310

TestAmerica Job ID: 580-20037-1  
Client Project/Site: HTF0091

For:  
TestAmerica Laboratories, Inc  
99-193 Aiea Heights Drive  
Suite 121  
Aiea, Hawaii 96701

Attn: Mike D. Solick

*Pamela R. Johnson*

Authorized for release by:  
6/28/2010 4:53 PM

Pam Johnson  
Project Manager I  
pamr.johnson@testamericainc.com

### LINKS

Review your project  
results through  
**Total Access**

Have a Question?

**Ask  
The  
Expert**

Visit us at:  
[www.testamericainc.com](http://www.testamericainc.com)

*This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.*

# Table of Contents

Cover Page . . . . .	1
Table of Contents . . . . .	2
Case Narrative . . . . .	3
Definitions . . . . .	4
Client Sample Results . . . . .	5
QC Sample Results . . . . .	10
Chronicle . . . . .	17
Certification Summary . . . . .	18
Sample Summary . . . . .	19
Chain of Custody . . . . .	20
Sample Receipt Checklist . . . . .	21



Job Narrative  
580-20037.1

Comments  
Additional comments.

**Receipt**

All samples were received in good condition within temperature requirements.

**GC/MS Semi VOA - Method 8270C**

The laboratory control sample (LCS) for preparation batch 56107 recovered low for 2,4-dinitrophenol. Because this recovery was within the marginal exceedance limits, re-extraction and/or re-analysis was not performed. Data have been "" flagged and reported.

No other analytical or quality issues were noted.

**General Chemistry**

No analytical or quality issues were noted.

**Organic Prep**

No analytical or quality issues were noted.

## Qualifier Definition/Glossary

Client: TestAmerica Laboratories, Inc  
Project/Site: HTF0091

TestAmerica Job ID: 580-20037-1

### Qualifiers

#### GC/MS Semi VOA

Qualifier	Qualifier Description
A	LCS or LCSD exceeds the control limits
B	Compound was found in the blank and sample
F	MS or MSD exceeds the control limits
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

### Glossary

Glossary	Glossary Description
D	Listed under the "D" column to designate that the result is reported on a dry weight basis.

# Analytical Data

Client: TestAmerica Laboratories, Inc  
Project/Site: HTF0091

TestAmerica Job ID: 580-20037-1

Sample ID: HTF0091-01

Lab Sample ID: 580-20037-1

Collected: 06/16/10 13:00

Matrix: Solid

Date Received: 06/22/10 08:15

Method: 8270C - Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Phenol	ND		51	4.5	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
Bis(2-chloroethyl)ether	ND		51	5.1	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
2-Chlorophenol	ND		51	4.5	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
1,3-Dichlorobenzene	ND		31	4.4	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
1,4-Dichlorobenzene	ND		31	2.0	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
benzyl alcohol	ND		51	5.9	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
1,2-Dichlorobenzene	ND		31	3.9	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
2-Methylphenol	ND		51	4.3	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
3 & 4 Methylphenol	ND		120	3.4	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
N-Nitrosodi-n-propylamine	ND		51	5.9	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
Hexachloroethane	ND		51	6.7	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
Nitrobenzene	ND		51	1.6	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
Isophorone	ND		51	2.5	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
2-Nitrophenol	ND		51	2.6	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
2,4-Dimethylphenol	ND		51	1.3	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
Benzoic acid	ND		1500	400	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
Bis(2-chloroethoxy)methane	ND		51	1.8	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
2,4-Dichlorophenol	ND		51	1.5	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
1,2,4-Trichlorobenzene	ND		51	7.3	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
Naphthalene	ND		12	1.3	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
1-chloroaniline	ND		51	5.7	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
1-chlorobutadiene	ND		31	5.6	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
4-Chloro-3-methylphenol	ND		51	4.3	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
2-Methylnaphthalene	ND		12	1.4	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
Hexachlorocyclopentadiene	ND		51	1.6	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
2,4,6-Trichlorophenol	ND		52	2.4	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
2,4,5-Trichlorophenol	ND		51	2.6	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
2-Chloronaphthalene	ND		12	1.1	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
2-Nitroaniline	ND		51	2.8	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
Dimethyl phthalate	ND		51	2.6	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
Acenaphthylene	ND		12	0.98	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
2,6-Dinitrotoluene	ND		51	2.5	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
3-Nitroaniline	ND		51	3.5	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
Acenaphthene	ND		12	0.98	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
2,4-Dinitrophenol	ND		510	5.6	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
4-Nitrophenol	ND		510	106	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
Dibenzofuran	ND		51	0.92	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
2,4-Dinitrotoluene	ND		51	1.5	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
Diethyl phthalate	ND		51	5.2	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
4-Chlorophenyl phenyl ether	ND		51	3.5	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
Fluorene	ND		12	0.73	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
4-Nitroaniline	ND		51	8.6	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
4,6-Dinitro-2-methylphenol	ND		510	11	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
N-Nitrosodiphenylamine	ND		31	1.3	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
4-Bromophenyl phenyl ether	ND		51	2.0	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
Hexachlorobenzene	ND		31	2.3	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
1-chlorophenol	ND		51	7.3	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
1-threne	ND		12	1.3	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
Amrfacene	ND		12	0.86	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
Di-n-butyl phthalate	ND		120	15	ug/Kg		06/22/10 14:37	06/22/10 20:03	1

### Analytical Data

Client: TestAmerica Laboratories, Inc  
Project/Site: HTF0091

TestAmerica Job ID: 580-20037-1

Client Sample ID: HTF0091-01  
Date Collected: 06/16/10 13:00  
Date Received: 06/22/10 08:15

Lab Sample ID: 580-20037-1  
Matrix: Solid

**Method: 8270C - Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS) (Continued)**

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluoranthene	ND		12	0.73	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
Pyrene	ND		12	0.60	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
Butyl benzyl phthalate	ND		81	18	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
3,3'-Dichlorobenzidine	ND		120	4.8	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
Benzo[a]anthracene	1.8	J	15	1.0	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
Chrysene	ND		15	0.86	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
Bis(2-ethylhexyl) phthalate	ND		920	26	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
Di-n-octyl phthalate	ND		120	0.60	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
Benzo[b]pyrene	ND		18	1.2	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
Indeno[1,2,3-cd]pyrene	ND		24	2.6	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
Dibenz[a,h]anthracene	ND		24	1.3	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
Benzo[g,h,i]perylene	ND		15	0.92	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
Carbazole	ND		92	2.6	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
1-Methylpiperthalene	ND		18	1.1	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
Benzo[b]fluoranthene	3.1	J	12	0.5	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
Benzo[k]fluoranthene	1.8	J B	15	0.80	ug/Kg		06/22/10 14:37	06/22/10 20:03	1
2,2'-oxybis[1-chloropropane]	ND		93	4.1	ug/Kg		06/22/10 14:37	06/22/10 20:03	1

Surrogate	% Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
2-Fluorophenol	85		36 - 145	06/22/10 14:37	06/22/10 20:03	1
Phenol-d5	85		38 - 149	06/22/10 14:37	06/22/10 20:03	1
Nitrobenzene-d5	89		38 - 141	06/22/10 14:37	06/22/10 20:03	1
2-Fluorobiphenyl	94		42 - 140	06/22/10 14:37	06/22/10 20:03	1
2,4,6-Tribromophenol	91		28 - 143	06/22/10 14:37	06/22/10 20:03	1
Terphenyl-d14	88		42 - 151	06/22/10 14:37	06/22/10 20:03	1

Client Sample ID: HTF0091-02  
Date Collected: 06/16/10 14:00  
Date Received: 06/22/10 08:15

Lab Sample ID: 580-20037-2  
Matrix: Solid

**Method: 8270C - Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)**

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Phenol	ND		63	4.7	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
Bis(2-chloroethyl)ether	ND		63	6.3	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
2-Chlorophenol	ND		63	4.7	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
1,3-Dichlorobenzene	ND		32	4.6	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
1,4-Dichlorobenzene	ND		32	2.8	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
Benzyl alcohol	ND		63	6.1	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
1,2-Dichlorobenzene	ND		32	4.0	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
2-Methylphenol	ND		63	6.5	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
3 & 4 Methylphenol	ND		130	3.5	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
N-Nitrosodi-n-propylamine	ND		63	6.1	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
Hexachlorocyclohexane	ND		63	7.0	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
Nitrobenzene	ND		63	18	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
Isophorone	ND		63	2.6	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
2-Nitrophenol	ND		63	2.7	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
2,4-Dimethylphenol	ND		63	1.3	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
Benzoic acid	ND		1600	410	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
Bis(2-chloroethoxy)methane	ND		63	1.8	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
2,4-Dichlorophenol	ND		63	1.9	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
1,2,4-Trichlorobenzene	ND		32	7.6	ug/Kg		06/22/10 14:37	06/22/10 21:03	1

# Analytical Data

Client: TestAmerica Laboratories, Inc  
Project/Site: HTF0091

TestAmerica Job ID: 580-20037-1

nt Sample ID: HTF0091-02

Lab Sample ID: 580-20037-2

Collected: 06/16/10 14:00

Matrix: Solid

Date Received: 06/22/10 08:15

Method: 8270C - Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	ND		13	1.4	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
4-Chloroaniline	ND		63	7.0	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
Hexachlorobutadiene	ND		32	5.8	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
4-Chloro-3-methylphenol	ND		63	4.5	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
2-Methylnaphthalene	ND		13	1.5	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
Hexachlorocyclopentadiene	ND		63	1.8	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
2,4,6-Trichlorophenol	ND		95	2.5	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
2,4,5-Trichlorophenol	ND		63	2.7	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
2-Chloronaphthalene	ND		13	1.1	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
2-Nitroaniline	ND		63	2.7	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
Dimethyl phthalate	ND		63	3.7	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
Acenaphthylene	ND		13	1.0	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
2,6-Dinitrotoluene	ND		63	2.8	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
3-Nitroaniline	ND		63	3.7	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
Acenaphthene	ND		13	1.0	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
2,4-Dinitrophenol	ND		630	8.8	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
4-Nitrophenol	ND		630	110	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
Dibenzofuran	ND		63	0.95	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
2,4-Dinitrotoluene	ND		63	1.0	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
Diethyl phthalate	ND		63	9.5	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
4-Chlorophenyl phenyl ether	ND		63	3.6	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
me	ND		13	0.76	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
o-aniline	ND		63	8.8	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
4,6-Dinitro-2-methylphenol	ND		630	11	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
N-Nitrosodiphenylamine	ND		32	1.4	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
4-Bromophenyl phenyl ether	ND		63	2.1	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
Hexachlorobenzene	ND		32	2.4	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
Pentachlorophenol	ND		63	7.6	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
Phenanthrene	ND		13	1.3	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
Anthracene	ND		13	0.88	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
Di-n-butyl phthalate	ND		130	18	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
Fluoranthene	ND		18	0.76	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
Pyrene	ND		13	0.88	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
Butyl benzyl phthalate	ND		63	20	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
2,3'-Dichlorobenzidine	ND		130	5.0	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
Benzo[ <i>a</i> ]anthracene	ND		16	1.1	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
Chrysene	1.6	u	16	0.98	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
Bis(2-ethylhexyl) phthalate	ND		950	27	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
Di-n-octyl phthalate	ND		130	0.82	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
Benzo[ <i>a</i> ]pyrene	ND		19	1.3	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
Indeno[1,2,3- <i>cd</i> ]pyrene	ND		25	2.7	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
Dibenz[ <i>a,h</i> ]anthracene	ND		25	1.4	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
Benzo[ <i>g,h,i</i> ]perylene	ND		18	0.95	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
Carbazole	ND		65	2.7	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
1-Methylnaphthalene	ND		19	1.1	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
Benzo[ <i>b</i> ]fluoranthene	ND		13	2.6	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
Benzo[ <i>k</i> ]fluoranthene	ND		18	0.82	ug/Kg		06/22/10 14:37	06/22/10 21:03	1
bis[1-chloropropane]	ND		95	4.2	ug/Kg		06/22/10 14:37	06/22/10 21:03	1

Surrogate	% Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
2-Fluorophenol	100		35 - 145	06/22/10 14:37	06/22/10 21:03	1

TestAmerica Seattle

## Analytical Data

Client: TestAmerica Laboratories, Inc.  
Project/Site: HTF0091

TestAmerica Job ID: 580-20037-1

Client Sample ID: HTF0091-02

Lab Sample ID: 580-20037-2

Date Collected: 06/16/10 14:00

Matrix: Solid

Date Received: 06/22/10 08:15

**Method: 8270C - Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS) (Continued)**

Surrogate	% Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Phenol-d5	89		38 - 149	06/22/10 14:37	06/22/10 21:03	1
Nitrobenzene-d5	90		38 - 141	06/22/10 14:37	06/22/10 21:03	1
2-Fluorobiphenyl	98		42 - 140	06/22/10 14:37	06/22/10 21:03	1
2,4,5-Tribromophenol	96		28 - 143	06/22/10 14:37	06/22/10 21:03	1
Terphenyl-d14	93		42 - 181	06/22/10 14:37	06/22/10 21:03	1

Client Sample ID: HTF0091-03

Lab Sample ID: 580-20037-3

Date Collected: 06/16/10 15:00

Matrix: Solid

Date Received: 06/22/10 08:15

**Method: 8270C - Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)**

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Phenol	ND		62	4.6	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
Bis(2-chloroethyl)ether	ND		62	6.1	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
3-Chlorophenol	ND		62	4.8	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
1,3-Dichlorobenzene	ND		31	4.5	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
1,4-Dichlorobenzene	ND		31	2.0	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
Benzyl alcohol	ND		62	6.0	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
1,2-Dichlorobenzene	ND		61	4.0	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
2-Methylphenol	ND		62	4.4	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
3 & 4 Methylphenol	ND		120	3.5	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
N-Nitrosodi-n-propylamine	ND		62	6.0	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
Hexachloroethane	ND		62	6.8	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
Nitrobenzene	ND		62	18	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
Isophorone	ND		62	2.5	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
2-Nitrophenol	ND		62	2.7	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
2,4-Dimethylphenol	ND		62	1.3	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
Benzoic acid	ND		1600	400	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
Bis(2-chloroethoxy)methane	ND		62	1.9	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
2,4-Dichlorophenol	ND		62	1.9	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
1,2,4-Trichlorobenzene	ND		31	7.5	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
Naphthalene	ND		12	1.4	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
4-Chloroaniline	ND		62	6.8	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
Hexachlorobutadiene	ND		31	3.7	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
4-Chloro-3-methylphenol	ND		62	4.4	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
2-Methylnaphthalene	ND		19	1.4	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
Hexachlorocyclopentadiene	ND		62	1.6	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
2,4,6-Trichlorophenol	ND		63	2.5	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
2,4,5-Trichlorophenol	ND		62	2.7	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
2-Chloronaphthalene	ND		15	1.1	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
2-Nitroaniline	ND		62	2.6	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
Dimethyl phthalate	ND		62	2.6	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
Acenaphthylene	ND		12	0.99	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
2,6-Dinitrotoluene	ND		62	2.5	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
3-Nitroaniline	ND		62	3.6	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
Acenaphthene	ND		12	0.99	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
2,4-Dinitrophenol	NI		620	6.7	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
4-Nitrophenol	NI		620	110	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
Dibenzofuran	NI		62	0.93	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
2,4-Dinitrotoluene	NI		62	1.6	ug/Kg		06/22/10 14:37	06/22/10 21:23	1

# Analytical Data

Client: TestAmerica Laboratories, Inc  
Project/Site: HTF0091

TestAmerica Job ID: 580-20037-1

Int Sample ID: HTF0091-03

Lab Sample ID: 580-20037-3

Collected: 06/16/10 15:00

Matrix: Solid

Data Received: 06/22/10 08:16

## Method: 8270C - Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Diethyl phthalate	ND		62	9.3	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
4-Chlorophenyl phenyl ether	ND		62	3.5	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
Fluorene	ND		12	0.75	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
4-Nitroaniline	ND		62	6.7	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
4,6-Dinitro-2-methylphenol	ND		620	11	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
N-Nitrosodiphenylamine	ND		31	1.4	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
4-Bromophenyl phenyl ether	ND		62	2.0	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
Hexachlorobenzene	ND		31	2.4	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
Pentachlorophenol	ND		62	7.5	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
Phenanthrene	ND		12	1.3	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
Anthracene	ND		12	0.87	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
Di-n-butyl phthalate	ND		120	15	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
Fluoranthene	ND		12	0.75	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
Pyrene	ND		12	0.87	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
Butyl benzyl phthalate	ND		62	19	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
3,3'-Dichlorobenzidine	ND		120	4.9	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
Benzo[a]anthracene	ND		15	1.1	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
Chrysene	ND		15	0.87	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
Bis(2-ethylhexyl) phthalate	ND		930	26	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
Di-n-octyl phthalate	ND		120	0.81	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
Benzo[a]pyrene	ND		19	1.3	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
[1,2,3-cd]pyrene	ND		25	2.6	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
Benzo[a,h]anthracene	ND		25	1.4	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
Benzo[g,h,i]perylene	ND		18	0.83	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
Carbazole	ND		93	2.7	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
1-Methylnaphthalene	ND		15	1.1	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
Benzo[b]fluoranthene	ND		12	2.5	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
Benzo[k]fluoranthene	ND		16	0.81	ug/Kg		06/22/10 14:37	06/22/10 21:23	1
2,2'-oxybis[1-chloropropane]	ND		93	4.2	ug/Kg		06/22/10 14:37	06/22/10 21:23	1

Surrogate	% Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
2-Fluorophenol	85		35 - 145	06/22/10 14:37	06/22/10 21:23	1
Phenol-d5	82		38 - 149	06/22/10 14:37	06/22/10 21:23	1
Nitrobenzene-d5	87		38 - 141	06/22/10 14:37	06/22/10 21:23	1
2-Fluorobiphenyl	91		42 - 140	06/22/10 14:37	06/22/10 21:23	1
2,4,6-Tribromophenol	79		28 - 143	06/22/10 14:37	06/22/10 21:23	1
Terphenyl-d14	65		42 - 151	06/22/10 14:37	06/22/10 21:23	1

## Quality Control Data

Client: TestAmerica Laboratories, Inc.  
Project/Site: HTF0091

TestAmerica Job ID: 580-20037-1

### Method: 8270C - Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)

Lab Sample ID: MB 580-66107/1-A

Matrix: Solid

Analysis Batch: 66103

Client Sample ID: MB 580-66107/1-A

Prep Type: Total/NA

Prep Batch: 66107

Analyte	MB MB		RL	MDL	Unit	O	Prepared	Analyzed	Dil Fac
	Result	Qualifier							
Phenol	ND		67	4.9	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
Bis(2-chloroethyl)ether	ND		67	6.6	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
2-Chlorophenol	ND		67	4.9	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
1,3-Dichlorobenzene	ND		33	4.8	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
1,4-Dichlorobenzene	ND		33	2.1	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
Benzyl alcohol	ND		67	6.4	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
1,2-Dichlorobenzene	ND		33	4.3	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
2-Methylphenol	ND		67	4.7	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
3 & 4 Methylphenol	ND		138	3.7	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
N-Nitrosod-n-propylamine	ND		67	6.5	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
Hexachloroethane	ND		67	7.3	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
Nitrobenzene	ND		67	19	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
Isophorone	ND		67	2.7	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
2-Nitrophenol	ND		67	2.9	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
2,4-Dimethylphenol	ND		67	1.4	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
Benzoic acid	ND		1700	430	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
Bis(2-chloroethoxy)methane	ND		67	2.0	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
2,4-Dichlorophenol	ND		67	2.0	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
1,2,4-Trichlorobenzene	ND		33	8.0	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
Naphthalene	ND		13	1.5	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
4-Chloroaniline	ND		67	7.3	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
Hexachlorobutadiene	ND		33	6.1	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
4-Chloro-3-methylphenol	ND		67	4.7	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
2-Methylnaphthalene	ND		13	1.5	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
Hexachlorocyclopentadiene	ND		67	1.7	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
2,4,6-Trichlorophenol	ND		100	2.7	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
2,4,5-Trichlorophenol	ND		67	2.9	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
2-Chloronaphthalene	ND		13	1.2	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
2-Nitroaniline	ND		67	2.8	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
Dimethyl phthalate	ND		67	2.8	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
Acenaphthylene	ND		13	1.1	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
2,6-Dinitrotoluene	ND		67	2.7	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
3-Nitroaniline	ND		67	3.9	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
Acenaphthene	ND		13	1.1	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
2,4-Dinitrophenol	ND		670	9.3	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
4-Nitrophenol	ND		670	119	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
Dibenzofuran	ND		67	1.0	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
2,4-Dinitrotoluene	ND		67	1.7	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
Diethyl phthalate	ND		67	10	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
4-Chlorophenyl phenyl ether	ND		67	3.8	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
Fluorene	ND		13	0.80	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
4-Nitroaniline	ND		67	9.3	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
4,6-Dinitro-2-methylphenol	ND		670	12	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
N-Nitrosodiphenylamine	ND		33	1.5	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
4-Bromophenyl phenyl ether	ND		67	3.2	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
Hexachlorobenzene	ND		33	2.5	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
Pentachlorophenol	ND		67	8.0	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
Phenanthrene	ND		13	1.4	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
Anthracene	ND		13	0.93	ug/Kg		06/22/10 14:37	06/22/10 18:01	1



### Quality Control Data

Client: TestAmerica Laboratories, Inc  
Project/Site: HTF0091

TestAmerica Job ID: 580-20037-1

#### Method: 8270C - Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS) (continued)

Lab Sample ID: MB 580-66107/1-A  
Matrix: Solid  
Analysis Batch: 66103

Client Sample ID: MB 580-66107/1-A  
Prep Type: Total/NA  
Prep Batch: 66107

Analyte	MB MB		RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
	Result	Qualifier							
Di-n-butyl phthalate	ND		130	17	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
Fluoranthene	ND		13	0.60	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
Pyrene	ND		13	0.53	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
Butyl benzyl phthalate	ND		67	21	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
3,3'-Dichlorobenzidine	ND		130	5.3	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
Benzo(a)anthracene	ND		17	1.1	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
Chrysene	ND		17	0.93	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
Bis(2-ethylhexyl) phthalate	ND		1000	28	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
Di-n-octyl phthalate	ND		130	0.87	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
Benzo(a)pyrene	ND		20	1.4	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
Indeno(1,2,3-cd)pyrene	ND		27	2.6	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
Dibenz(a,h)anthracene	ND		27	1.5	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
Benzo(g,h,i)perylene	ND		17	1.0	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
Carbazole	ND		100	2.9	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
1-Methylnaphthalene	ND		20	1.2	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
Benzo(b)fluoranthene	ND		13	2.7	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
Benzo(k)fluoranthene	2.18	J	17	0.87	ug/Kg		06/22/10 14:37	06/22/10 18:01	1
2,2'-oxybis[1-chloropropane]	ND		100	4.5	ug/Kg		06/22/10 14:37	06/22/10 18:01	1

Spike	MB MB		Limits	Prepared	Analyzed	Dil Fac
	% Recovery	Qualifier				
2-Fluorophenol	89		36 - 145	06/22/10 14:37	06/22/10 18:01	1
Phenol-d5	90		38 - 149	06/22/10 14:37	06/22/10 18:01	1
Nitrobenzene-d5	89		38 - 141	06/22/10 14:37	06/22/10 18:01	1
2-Fluorobiphenyl	95		42 - 140	06/22/10 14:37	06/22/10 18:01	1
2,4,6-Trinitrophenol	92		28 - 143	06/22/10 14:37	06/22/10 18:01	1
Tetraphenyl-d14	91		42 - 157	06/22/10 14:37	06/22/10 18:01	1

Lab Sample ID: LCS 580-66107/2-A  
Matrix: Solid  
Analysis Batch: 66103

Client Sample ID: LCS 580-66107/2-A  
Prep Type: Total/NA  
Prep Batch: 66107

Analyte	Spike Added	LCS LCS		Unit	% Rec.	Limits
		Result	Qualifier			
Phenol	330	316		ug/Kg	96	66 - 126
Bis(2-chloroethyl)ether	333	262		ug/Kg	79	57 - 122
2-Chlorophenol	327	365		ug/Kg	108	65 - 125
1,3-Dichlorobenzene	336	360		ug/Kg	107	64 - 124
1,4-Dichlorobenzene	333	374		ug/Kg	112	62 - 132
Benzyl alcohol	333	343		ug/Kg	103	42 - 147
1,2-Dichlorobenzene	334	352		ug/Kg	106	68 - 118
3-Methylphenol	334	332		ug/Kg	99	56 - 121
3,4,4-Methylphenol	336	337		ug/Kg	100	61 - 126
N-Nitrosod-n-propylamine	332	295		ug/Kg	89	52 - 127
Hexachloroethane	333	302		ug/Kg	90	58 - 131
Nitrobenzene	335	345		ug/Kg	103	58 - 134
1,2,4-Trichlorobenzene	334	306		ug/Kg	92	53 - 118
Phenol	329	398		ug/Kg	121	58 - 128
2,4,6-Trimethylphenol	329	328		ug/Kg	100	58 - 133
Benzoic acid	1670	452	J	ug/Kg	27	10 - 120

### Quality Control Data

Client: TestAmerica Laboratories, Inc  
 Project/Site: HTF0091

TestAmerica Job ID: 580-20037-1

**Method: 8270C - Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)**  
 (Continued)

Lab Sample ID: LCS 580-66107/2-A

Client Sample ID: LCS 580-66107/2-A

Matrix: Solid

Prep Type: Total/NA

Analysis Batch: 66103

Prep Batch: 66107

Analyte	Spike	LCS	LCS	Unit	% Rec.	% Rec. Limits
	Added	Result	Qualifier			
Bis(2-chloroethoxy)methane	333	312		ug/Kg	93	63 - 128
2,4-Dichlorophenol	330	300		ug/Kg	91	69 - 124
1,2,4-Trichlorobenzene	333	340		ug/Kg	102	63 - 129
Naphthalene	333	342		ug/Kg	102	64 - 129
4-Chloroaniline	333	242		ug/Kg	73	20 - 181
Hexachlorobutadiene	335	375		ug/Kg	112	59 - 134
4-Chloro-3-methylphenol	328	278		ug/Kg	85	58 - 128
2-Methylnaphthalene	335	364		ug/Kg	109	65 - 125
Hexachlorocyclopentadiene	335	165		ug/Kg	49	30 - 132
2,4,6-Trichlorophenol	327	304		ug/Kg	93	66 - 131
2,4,5-Trichlorophenol	331	334		ug/Kg	101	64 - 124
2-Chloronaphthalene	334	343		ug/Kg	103	69 - 129
2-Nitroaniline	333	357		ug/Kg	107	68 - 133
Dimethyl phthalate	334	374		ug/Kg	112	66 - 125
Acenaphthylene	334	357		ug/Kg	107	69 - 129
2,6-Dinitrotoluene	332	408		ug/Kg	122	65 - 125
3-Nitroaniline	333	383		ug/Kg	115	80 - 165
Acenaphthene	333	334		ug/Kg	100	66 - 130
2,4-Dinitrophenol	1660	825	*	ug/Kg	50	53 - 166
4-Nitrophenol	1680	1860		ug/Kg	111	47 - 172
Dibenzofuran	329	348		ug/Kg	106	70 - 125
2,4-Dinitrotoluene	333	396		ug/Kg	119	57 - 122
Diethyl phthalate	332	358		ug/Kg	108	64 - 129
4-Chlorophenyl phenyl ether	333	368		ug/Kg	110	65 - 130
Fluorene	336	352		ug/Kg	105	68 - 128
4-Nitroaniline	334	406		ug/Kg	122	70 - 150
4,6-Dinitro-2-methylphenol	1670	1500		ug/Kg	90	38 - 143
N-Nitrosodiphenylamine	333	349		ug/Kg	105	66 - 153
4-Bromophenyl phenyl ether	334	323		ug/Kg	97	64 - 134
Hexachlorobenzene	333	338		ug/Kg	101	61 - 136
Pentachlorophenol	327	191		ug/Kg	58	29 - 124
Phenanthrene	333	311		ug/Kg	93	65 - 125
Anthracene	334	359		ug/Kg	108	73 - 123
Di-n-butyl phthalate	333	320		ug/Kg	96	60 - 124
Fluoranthene	334	357		ug/Kg	107	61 - 121
Pyrene	334	346		ug/Kg	103	54 - 134
Butyl benzyl phthalate	335	324		ug/Kg	97	65 - 140
3,3'-Dichlorobenzidine	673	642		ug/Kg	95	73 - 163
Benzo[a]anthracene	333	323		ug/Kg	97	64 - 124
Chrysene	325	339		ug/Kg	101	71 - 126
Bis(2-ethylhexyl) phthalate	336	299	J	ug/Kg	89	64 - 144
Di-n-octyl phthalate	334	375		ug/Kg	112	58 - 168
Benzo[a]pyrene	333	353		ug/Kg	106	68 - 128
Indeno[1,2,3-cd]pyrene	334	293		ug/Kg	88	39 - 139
Dibenz[a,h]anthracene	334	323		ug/Kg	97	57 - 142
Benzo[g,h,i]perylene	334	267		ug/Kg	80	57 - 142
Carbazole	333	379		ug/Kg	114	68 - 158
1-Methylnaphthalene	335	332		ug/Kg	99	48 - 148
Benzo[b]fluoranthene	333	338		ug/Kg	101	65 - 138

### Quality Control Data

Client: TestAmerica Laboratories, Inc  
Project/Site: HTF0091

TestAmerica Job ID: 580-20037-1

**Method: 8270C - Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)**  
(Continued)

Lab Sample ID: LCS 580-66107/2-A  
Matrix: Solid  
Analysis Batch: 66103

Client Sample ID: LCS 580-66107/2-A  
Prep Type: Total/NA  
Prep Batch: 66107

Analyte	Spike Added	LCS LCS		Unit	% Rec.	% Rec. Limits
		Result	Qualifier			
Benzo(h)fluoranthene	333	393		ug/Kg	118	63 - 143
2,2'-oxybis(1-chloropropane)	333	284		ug/Kg	85	44 - 140
Surrogate	LCS LCS		Limits			
% Recovery	Qualifier					
2-Fluorophenol	99		36 - 145			
Phenol-d5	93		38 - 149			
Nitrobenzene-d5	89		38 - 141			
2-Fluorobiphenyl	93		42 - 149			
2,4,6-Tribromophenol	101		28 - 143			
Terphenyl-d14	91		42 - 151			

Lab Sample ID: 580-20037-1 MS  
Matrix: Solid  
Analysis Batch: 66103

Client Sample ID: HTF0091-01  
Prep Type: Total/NA  
Prep Batch: 66107

Analyte	Sample Result	Sample Qualifier	Spike Added	MS MS		Unit	% Rec.	% Rec. Limits
				Result	Qualifier			
Phenol	ND		328	293		ug/Kg	89	66 - 126
Bis(2-chloroethyl)ether	ND		331	208		ug/Kg	62	57 - 122
2-Chlorophenol	ND		325	318		ug/Kg	98	65 - 125
Nitrobenzene	ND		334	340		ug/Kg	102	64 - 124
Nitrobenzene	ND		331	334		ug/Kg	101	62 - 132
Benzyl alcohol	ND		331	309		ug/Kg	93	42 - 147
1,2-Dichlorobenzene	ND		332	337		ug/Kg	102	68 - 116
2-Methylphenol	ND		332	323		ug/Kg	87	56 - 121
3 & 4 Methylphenol	ND		334	315		ug/Kg	95	61 - 126
N-Nitrosodi-n-propylamine	ND		330	301		ug/Kg	91	52 - 127
Hexachloroethane	ND		331	296		ug/Kg	89	56 - 131
Nitrobenzene	ND		333	313		ug/Kg	94	59 - 134
Isophrone	ND		332	302		ug/Kg	91	63 - 118
2-Nitrophenol	ND		327	385		ug/Kg	112	58 - 128
2,4-Dimethylphenol	ND		327	311		ug/Kg	85	58 - 133
Benzoic acid	ND		1660	ND	F	ug/Kg	0	10 - 130
Bis(2-chloroethoxy)methane	ND		331	295		ug/Kg	89	63 - 128
2,4-Dichlorophenol	ND		328	279		ug/Kg	85	59 - 124
1,2,4-Trichlorobenzene	ND		331	321		ug/Kg	97	63 - 128
Naphthalene	ND		331	329		ug/Kg	99	64 - 129
4-Chloroaniline	ND		331	338		ug/Kg	72	20 - 181
Hexachlorobutadiene	ND		333	360		ug/Kg	108	59 - 134
4-Chloro-3-methylphenol	ND		326	296		ug/Kg	72	58 - 128
2-Methylnaphthalene	ND		333	360		ug/Kg	108	65 - 126
Hexachlorocyclopentadiene	ND		333	127		ug/Kg	38	30 - 132
2,4,6-Trichlorophenol	ND		325	280		ug/Kg	86	66 - 131
2,4,5-Trichlorophenol	ND		329	287		ug/Kg	87	64 - 124
2-Chloronaphthalene	ND		332	346		ug/Kg	104	69 - 129
2-Nitroaniline	ND		330	353		ug/Kg	107	58 - 133
o-phthalate	ND		332	367		ug/Kg	111	65 - 125
m-tylene	ND		332	360		ug/Kg	108	69 - 129
2,6-Dinitrotoluene	ND		331	364		ug/Kg	110	65 - 125
2-Nitroaniline	ND		331	364		ug/Kg	107	60 - 165

### Quality Control Data

Client: TestAmerica Laboratories, Inc.  
Project/Site: HTF0091

TestAmerica Job ID: 580-20037-1

Method: 8270C - Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)

(Continued)

Lab Sample ID: 580-20037-1 MS

Matrix: Solid

Analysis Batch: 66103

Client Sample ID: HTF0091-01

Prep Type: Total/NA

Prep Batch: 66107

Analyte	Sample	Sample	Spike	MS	MS	Unit	% Rec.	% Rec.
	Result	Qualifier		Added	Result			
Acenaphthene	ND		331	332		ug/Kg	100	65 - 130
2,4-Dinitrophenol	ND		1650	296	J F	ug/Kg	18	53 - 168
4-Nitrophenol	ND		1670	1340		ug/Kg	80	47 - 172
Dibenzofuran	ND		327	352		ug/Kg	108	70 - 125
2,4-Dinitrotoluene	ND		331	404		ug/Kg	122	57 - 123
Diethyl phthalate	ND		331	358		ug/Kg	108	84 - 129
4-Chlorophenyl phenyl ether	ND		331	367		ug/Kg	111	65 - 130
Fluorene	ND		334	350		ug/Kg	105	88 - 128
4-Nitroaniline	ND		332	336		ug/Kg	101	70 - 150
4,6-Dinitro-2-methylphenol	ND		1660	893		ug/Kg	54	38 - 143
N-Nitrosodiphenylamine	ND		331	334		ug/Kg	101	88 - 153
4-Bromophenyl phenyl ether	ND		332	329		ug/Kg	90	84 - 134
Hexachlorobenzene	ND		331	326		ug/Kg	99	61 - 136
Pentachlorophenol	ND		325	111		ug/Kg	34	29 - 124
Phenanthrene	ND		331	304		ug/Kg	92	65 - 125
Anthracene	ND		332	349		ug/Kg	105	73 - 123
Di-n-butyl phthalate	ND		331	311		ug/Kg	94	69 - 124
Fluoranthene	ND		332	338		ug/Kg	102	81 - 121
Pyrene	ND		332	329		ug/Kg	99	64 - 134
Butyl benzyl phthalate	ND		333	338		ug/Kg	101	65 - 140
3,3'-Dichlorobenzidine	ND		668	692		ug/Kg	104	73 - 163
Benzo[a]anthracene	1.8 J		331	321		ug/Kg	89	64 - 124
Chrysene	ND		330	320		ug/Kg	96	71 - 126
Bis(2-ethylhexyl) phthalate	ND		334	343 J		ug/Kg	103	64 - 144
Di-n-octyl phthalate	ND		332	402		ug/Kg	121	68 - 148
Benzo[a]pyrene	ND		331	342		ug/Kg	103	68 - 128
Indeno[1,2,3-cd]pyrene	ND		332	302		ug/Kg	91	56 - 139
Dibenz(a,h)anthracene	ND		332	309		ug/Kg	93	57 - 142
Benzo[g,h,i]perylene	ND		330	264		ug/Kg	79	57 - 142
Carbazole	ND		331	353		ug/Kg	107	88 - 156
1-Methylnaphthalene	ND		333	322		ug/Kg	97	48 - 148
Benzo[b]fluoranthene	3.1 J		331	332		ug/Kg	99	66 - 136
Benzo[k]fluoranthene	1.5 J B		331	375		ug/Kg	113	63 - 143
2,2'-oxybis[1-chloropropane]	ND		331	373		ug/Kg	83	44 - 140
MS MS								
Surrogate	% Recovery	Qualifier	Limits					
2-Fluorophenol	93		36 - 145					
Phenol-d5	88		38 - 149					
Nitrobenzene-d5	90		38 - 141					
2-Fluorobiphenyl	100		42 - 140					
2,4,6-Tribromophenol	97		28 - 143					
Terphenyl-d14	85		42 - 157					

Lab Sample ID: 580-20037-1 MSD

Matrix: Solid

Analysis Batch: 66103

Client Sample ID: HTF0091-01

Prep Type: Total/NA

Prep Batch: 66107

Analyte	Sample	Sample	Spike	MSD	MSD	Unit	% Rec.	% Rec.	RPD
	Result	Qualifier		Added	Result				
Phenol	ND		293	245		ug/Kg	84	66 - 126	18 26

TestAmerica Seattle

# Quality Control Data

Client: TestAmerica Laboratories, Inc  
 Project/Site: HTF0091

TestAmerica Job ID: 580-20037-1

## Method: 8270C - Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS) (Continued)

Lab Sample ID: 580-20037-1 MSD  
 Matrix: Solid  
 Analysis Batch: 66103

Client Sample ID: HTF0091-01  
 Prep Type: Total/NA  
 Prep Batch: 66107

Analyte	Sample	Sample	Spike	MSD	MSD	Unit	% Rec.	% Rec.		RPD	Lbdl
	Result	Qualifier	Added	Result	Qualifier			Limits	RPD		
Bis(2-chloroethyl)ether	ND		296	221		ug/Kg	75	57 - 122	7	60	
2-Chlorophenol	ND		291	276		ug/Kg	95	65 - 125	14	27	
1,3-Dichlorobenzene	ND		298	316		ug/Kg	106	64 - 124	8	60	
1,4-Dichlorobenzene	ND		296	317		ug/Kg	107	62 - 132	5	32	
Benzyl alcohol	ND		296	268		ug/Kg	90	42 - 147	14	60	
1,2-Dichlorobenzene	ND		297	284		ug/Kg	96	68 - 116	17	60	
2-Methylphenol	ND		297	288		ug/Kg	97	66 - 121	12	25	
3 & 4 Methylphenol	ND		299	269		ug/Kg	90	61 - 126	16	27	
N-Nitrosodi-n-propylamine	ND		295	257		ug/Kg	87	52 - 127	16	28	
Hexachlorosthane	ND		296	240		ug/Kg	81	56 - 131	21	60	
Nitrobenzene	ND		298	310		ug/Kg	104	59 - 134	1	60	
Isophorone	ND		297	276		ug/Kg	93	53 - 118	9	60	
2-Nitrophenol	ND		292	344		ug/Kg	117	58 - 126	6	60	
2,4-Dimethylphenol	ND		292	285		ug/Kg	98	66 - 133	9	60	
Benzoic acid	ND		1480	ND	F	ug/Kg	0	10 - 130	NC	60	
Bis(2-chloroethoxy)methane	ND		298	270		ug/Kg	91	63 - 128	9	60	
2,4-Dichlorophenol	ND		293	254		ug/Kg	87	59 - 124	9	60	
1,2,4-Trichlorobenzene	ND		296	301		ug/Kg	102	63 - 128	6	28	
1,2,3-Trichlorobenzene	ND		296	304		ug/Kg	103	64 - 129	8	26	
trans-1,2-Dichloroethane	ND		296	268		ug/Kg	91	20 - 181	12	60	
1,2-Dichlorobutadiene	ND		298	323		ug/Kg	108	59 - 134	11	60	
4-Chloro-3-methylphenol	ND		292	225		ug/Kg	77	58 - 128	5	27	
2-Methylnaphthalene	ND		298	322		ug/Kg	108	65 - 125	11	27	
Hexachlorocyclopentadiene	ND		298	122		ug/Kg	41	30 - 132	4	60	
2,4,6-Trichlorophenol	ND		291	241		ug/Kg	83	66 - 131	16	60	
2,4,5-Trichlorophenol	ND		294	276		ug/Kg	94	64 - 124	4	60	
2-Chloronaphthalene	ND		297	298		ug/Kg	101	69 - 129	15	25	
2-Nitroaniline	ND		296	317		ug/Kg	107	58 - 133	11	60	
Dimethyl phthalate	ND		297	332		ug/Kg	112	65 - 125	10	60	
Acenaphthylene	ND		297	320		ug/Kg	108	59 - 129	12	28	
2,6-Dinitrotoluene	ND		296	339		ug/Kg	113	65 - 125	8	60	
3-Nitroaniline	ND		296	364		ug/Kg	123	90 - 165	3	60	
Acenaphthene	ND		296	292		ug/Kg	89	65 - 130	13	27	
2,4-Dinitrophenol	ND		1480	297	J F	ug/Kg	20	53 - 168	1	60	
4-Nitrophenol	ND		1490	1270		ug/Kg	85	47 - 172	6	33	
Dibenzofuran	ND		292	309		ug/Kg	106	70 - 125	13	60	
2,4-Dinitrotoluene	ND		296	355		ug/Kg	120	57 - 122	13	31	
Diethyl phthalate	ND		296	318		ug/Kg	107	64 - 129	12	26	
4-Chlorophenyl phenyl ether	ND		296	332		ug/Kg	112	65 - 130	10	60	
Fluorene	ND		299	311		ug/Kg	104	68 - 128	12	31	
4-Nitroaniline	ND		297	377		ug/Kg	127	70 - 150	12	60	
4,6-Dinitro-2-methylphenol	ND		1480	895		ug/Kg	60	38 - 143	0	60	
N-Nitrosodiphenylamine	ND		296	209		ug/Kg	101	66 - 153	11	60	
4-Bromophenyl phenyl ether	ND		297	297		ug/Kg	100	64 - 134	10	60	
1,2,3-Trichlorobenzene	ND		296	307		ug/Kg	104	61 - 138	7	60	
1,2,4-Trichlorobenzene	ND		291	124		ug/Kg	43	29 - 124	11	68	
1,2,3-Trichlorobenzene	ND		296	272		ug/Kg	92	65 - 125	11	28	
Anthracene	ND		297	312		ug/Kg	105	73 - 123	11	27	
Bis(2-ethylhexyl)phthalate	ND		296	281		ug/Kg	85	69 - 124	10	60	

### Quality Control Data

Client: TestAmerica Laboratories, Inc  
 Project/Site: HTF0091

TestAmerica Job ID: 580-20037-1

**Method: 8270C - Semivolatile Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)**  
 (Continued)

Lab Sample ID: 580-20037-1 MSD

Client Sample ID: HTF0091-01

Matrix: Solid

Prep Type: Total/NA

Analysis Batch: 66103

Prep Batch: 66107

Analyte	Sample	Sample	Spike	MSD	MSD	Unit	% Rec.	% Rec.	RPD	RPI
	Result	Qualifier		Added	Result					
Fluoranthene	ND		297	314		ug/Kg	106	61 - 121	7	36
Pyrene	ND		297	309		ug/Kg	104	54 - 134	6	31
Butyl benzyl phthalate	ND		298	296		ug/Kg	100	65 - 140	13	60
3,3'-Dichlorobenzidine	ND		598	657		ug/Kg	110	73 - 163	5	60
Benzo[a]anthracene	1.8	J	296	291		ug/Kg	98	64 - 124	10	27
Chrysene	ND		297	293		ug/Kg	98	71 - 126	9	26
Bis(2-ethylhexyl) phthalate	ND		298	284	J	ug/Kg	95	64 - 144	19	60
Di-n-octyl phthalate	ND		297	335		ug/Kg	113	58 - 148	18	31
Benzo[a]pyrene	ND		298	310		ug/Kg	105	68 - 128	10	30
Indeno[1,2,3-cd]pyrene	ND		297	266		ug/Kg	89	59 - 139	13	29
Dibenz[a,h]anthracene	ND		297	283		ug/Kg	95	57 - 142	9	30
Benzo[g,h,i]perylene	ND		297	235		ug/Kg	79	57 - 142	11	28
Carbazole	ND		298	331		ug/Kg	112	68 - 158	7	60
1-Methylnaphthalene	ND		298	287		ug/Kg	97	48 - 146	11	30
Benzo[b]fluoranthene	3.1	J	298	302		ug/Kg	101	66 - 138	10	31
Benzo[k]fluoranthene	1.5	J B	298	344		ug/Kg	116	63 - 143	9	31
2,2'-oxybis[1-chloropropane]	ND		298	251		ug/Kg	85	44 - 140	8	60

Surrogate	MSD		Limits
	% Recovery	Qualifier	
2-Fluorophenol	87		36 - 145
Phenol-d5	85		38 - 149
Nitrobenzene-d5	90		36 - 141
2-Fluorobiphenyl	87		42 - 140
2,4,6-Tribromophenol	102		28 - 143
Terphenyl-d14	85		42 - 151

# Lab Chronicle

Client: TestAmerica Laboratories, Inc.  
Project/Site: HTF0091

TestAmerica Job ID: 580-20037-1

Client Sample ID: HTF0091-01

Lab Sample ID: 580-20037-1

Collected: 06/16/10 13:00

Matrix: Solid

Date Received: 06/22/10 08:15

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared Or Analyzed	Analyst	Lab
Total/NA	Prep	3550B			86107	06/22/10 14:37	KKJ	TestAmerica Seattle
Total/NA	Analysis	8270C		1	86103	06/22/10 20:02	AP	TestAmerica Seattle

Client Sample ID: HTF0091-02

Lab Sample ID: 580-20037-2

Date Collected: 06/16/10 14:00

Matrix: Solid

Date Received: 06/22/10 08:15

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared Or Analyzed	Analyst	Lab
Total/NA	Prep	3550B			86107	06/22/10 14:37	KKJ	TestAmerica Seattle
Total/NA	Analysis	8270C		1	86103	06/22/10 21:03	AP	TestAmerica Seattle

Client Sample ID: HTF0091-03

Lab Sample ID: 580-20037-3

Date Collected: 06/16/10 15:00

Matrix: Solid

Date Received: 06/22/10 08:15

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared Or Analyzed	Analyst	Lab
Total/NA	Prep	3550B			86107	06/22/10 14:37	KKJ	TestAmerica Seattle
Total/NA	Analysis	8270C		1	86103	06/22/10 21:23	AP	TestAmerica Seattle

## Certification Summary

Client: TestAmerica Laboratories, Inc  
 Project/Site: HTF0091

TestAmerica Job ID: 580-20037-1

Laboratory	Program	Authority	EPA Region	Certification ID	Expiration Dat
TestAmerica Seattle	DoD ELAP	L-A-B	0	L2236	01/18/12
TestAmerica Seattle	ISO/IEC 17025	L-A-B	0	L2236	01/19/12
TestAmerica Seattle	NELAC Primary AB	Oregon	10	WA100007	11/06/10
TestAmerica Seattle	NELAC Secondary AB	California	9	1115CA	01/31/11
TestAmerica Seattle	State Program	Alaska	10	UST-022	03/04/11
TestAmerica Seattle	State Program	Montana	8		04/30/28
TestAmerica Seattle	State Program	Washington	10	C1226	02/17/11
TestAmerica Seattle	USDA			P330-08-00098	05/22/11

Accreditation may not be offered or required for all methods and analytes reported in this package. Please contact your project manager for the laboratory's current list of certified methods and analytes.



# Sample Summary

Client: TestAmerica Laboratories, Inc  
Project/Site: HTF0091

TestAmerica Job ID: 580-20037-1

Sample ID	Client Sample ID	Matrix	Sampled	Received
580-20037-1	HTF0091-01	Solid	06/16/10 13:00	06/22/10 08:15
580-20037-2	HTF0091-02	Solid	06/16/10 14:00	06/22/10 08:15
580-20037-3	HTF0091-03	Solid	06/16/10 15:00	06/22/10 08:15

**SUBCONTRACT ORDER**  
**TestAmerica Honolulu**

**HTF0091**

20037

**SENDING LABORATORY:**

TestAmerica Honolulu  
 99-193 Aiea Heights Drive, Suite 121  
 Aiea, HI 96701  
 Phone: 808-486-5227  
 Fax: 808-486-2456  
 Project Manager: Mike D. Solick  
 Client: Gensyntec Consultants

**RECEIVING LABORATORY:**

TestAmerica Seattle  
 5755 8th Street East  
 Tacoma, WA 98424  
 Phone: (253) 922-2310  
 Fax: 253  
 Project Location: HI - HAWAII  
 Receipt Temperature: 3.7 °C

*Fed Std Env*  
*Med Red/wh*  
*W/CS*  
 (Blue Bubble)  
 Ice: Y N

Analysis	Units	Due	Expires	Interlab Price	Surch	Comments
----------	-------	-----	---------	----------------	-------	----------

Sample ID: HTF0091-01 (ELEP-P - Solid/Soil)

Sampled: 06/16/10 13:00

8270D Semi Vol Organics	mg/kg	06/24/10	06/30/10 13:00	\$260.00	50%	1
-------------------------	-------	----------	----------------	----------	-----	---

Containers Supplied:

Incremental Sub-sample (analyze entire content) (B)	2 oz. Glass Jar (C)	2 oz. Glass Jar (D)	2 oz. Glass Jar (E)	2 oz. Glass Jar (F)
---	---------------------	---------------------	---------------------	---------------------

Sample ID: HTF0091-02 (ELEP-D - Solid/Soil)

Sampled: 06/16/10 14:00

8270D Semi Vol Organics	mg/kg	06/24/10	06/30/10 14:00	\$260.00	50%	2
-------------------------	-------	----------	----------------	----------	-----	---

Containers Supplied:

Incremental Sub-sample (analyze entire content) (B)	2 oz. Glass Jar (C)	2 oz. Glass Jar (D)
---	---------------------	---------------------

Sample ID: HTF0091-03 (ELEP-T - Solid/Soil)

Sampled: 06/16/10 15:00

8270D Semi Vol Organics	mg/kg	06/24/10	06/30/10 15:00	\$260.00	50%	3
-------------------------	-------	----------	----------------	----------	-----	---

Containers Supplied:

Incremental Sub-sample (analyze entire content) (B)	2 oz. Glass Jar (C)	2 oz. Glass Jar (D)
---	---------------------	---------------------

*[Signature]*  
 Released By

*6/24/10*  
 Date/Time

*[Signature]*  
 Received By

*6/24/10*  
 Date/Time

Released By

Date/Time

Received By

Date/Time

## Login Sample Receipt Check List

TestAmerica Laboratories, Inc

Job Number: 580-20037-1

Login Number: 20037

List Source: TestAmerica Seattle

Creator: Presley, Kim

List Number: 1

Question	T / F / N/A	Comment
Radioactivity either was not measured or, if measured, is at or below background	True	
The cooler's custody seal, if present, is intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
There are no discrepancies between the sample IDs on the containers and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Air sample containers are used.	True	
Solid bottles are completely filled.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
VOA sample vials do not have headspace or bubble is <6mm (1/4") in diameter.	N/A	
If necessary, staff have been informed of any short hold time or quick TAT needs	True	
Multiphase samples are not present.	True	
Samples do not require splitting or compositing.	True	
Is the Field Sampler's name present on COC?	N/A	
Sample Preservation Verified	N/A	

ATTN: MIKE

Honolulu

99-193 Aiea Heights Drive Suite 121 • Aiea, HI 96701-3900

808-486-LABS (5227) • Fax 808-486-2456

LABORATORY USE ONLY

LAB JOB NO. \_\_\_\_\_

LOCATION \_\_\_\_\_

CONTAINERS \_\_\_\_\_

## Chain of Custody / Analysis Request Form

Report to: <b>MIKE MINCH</b>		Project identification					Indicate analyses requested									
Company name: <b>GEOSYNTEC CONSULTANTS, INC.</b>		Job name: <b>KEKAHA LF, POND SUBSURFACE</b>					SVOCs (8270D)									
Address: <b>475 14th St SUITE 400</b>		Job number: <b>WG1298, TASK 04 SAMPLING</b>														
City: <b>OAKLAND</b> State: <b>CA</b> ZIP: <b>94612</b>		Contact email address: <b>mminch@geosyntec.com</b> <b>khuyh@geosyntec.com</b>														
Phone: <b>(510) 285-2700</b> Fax: <b>(510) 836-3036</b>		# samples in shipment: <b>3</b>														
Sample: <b>Kim Huynh</b>																
Item no.	Client sample ID	COMP	GRAB	Matrix							Sampling		No. of containers	Laboratory ID no.		
				Water	Soil	Wastewater	Drinking water	Sludge	Liquid	Solid	Oil	Other			Preservation method	Date
1	ELEP-P	X	X								NA	6/16/10	1300	1	X	
2	ELEP-D	X	X								NA	6/16/10	1400	1	X	
3	ELEP-T	X	X								NA	6/16/10	1500	1	X	
4	<del>_____</del>															
5	<del>_____</del>															
6	<del>_____</del>															
7	<del>_____</del>															
8	<del>_____</del>															
9	<del>_____</del>															
10	<del>_____</del>															

Released by (print / sign)	Date / time released	Delivery method	Received by (print / sign)	Company / Agency affiliation	Date / time received	Condition noted
<i>[Signature]</i>	6/16/10 6PM	AIR	ALOHA AIR CARGO	TestAmerica	/	
	/				/	
	/				/	

Comments: \_\_\_\_\_

Please check one:  
 Dispose by lab  
 Return to client  
 Archive


687 - 0515 2140

FREIGHT

687 - LIH 0515 2140

Shipper: LOAN HUYNH 0  
 1839 15TH ST #262  
 SAN FRANCISCO, CA 94103  
 415, 515-3806

Consignee: TEST AMERICA 0  
 99-193 AIEA HGTS STE 121  
 AIEA, HI 96701  
 808, 486-5227

	ALOHA AIR CARGO P.O. BOX 30910 HONOLULU, HI 96820
	It is agreed that the good described herein are accepted in apparent good order and condition (except as noted) for carriage SUBJECT TO THE CONDITIONS OF CONTRACT ON THE REVERSE HEREOF. THE SHIPPER'S ATTENTION IS DRAWN TO THE NOTICE CONCERNING CARRIER'S LIMITATION OF LIABILITY. Shipper may increase such limitation of liability by declaring a higher value for carriage and paying a supplemental charge if required.
Accounting Information GENERAL FREIGHT	

Origin	LIH	Currency	USD
Destination	HNL	Charge Code	PP
Handling Information ATTN: MIKE SOLICK/CHILL		Declared Value for Carriage	0.00

Pieces	Gross Weight	Nature of Goods	Chargeable Weight	Rate/Charge	Total	Length	Width	Height	Dim Weight
1		SAND SAMPLES				18	14	12	15

1		24		24		15	
Fee	Prepaid	Collect	Other Charges Due Carrier				
Weight Charge	30.00		FSC Fee	4.08	SSC Fee	0.00	
Volume Charge	0.00		Cod Fee	0.00	DG Fee	0.00	
Tax	2.13		Oth Fees	0.00	P/U Fee	0.00	
Total Other Charges Due Agent	0.00		DEL Fees	0.00			
Total Other Charges Due Carrier	4.08		The shipper certifies that the particulars on the face hereof are correct, and that the shipment does not contain dangerous goods, and that all ITEMS ARE ACCEPTED AT SHIPPER'S RISK.				
Total	36.21						
COD		0.00					
Signature of Issuing Carrier or its Agent	WB Date	WB Time	The consignee certifies that the shipment is received in good order except where noted below:				
KEN L736	16-JUN-10	1811					



**Appendix P**  
**Red-lined Construction Drawings**

# CONSTRUCTION DRAWINGS PHASE II LATERAL EXPANSION CELL 1 BASE LINER CONSTRUCTION KEKAHA SANITARY LANDFILL

KAUAI, HAWAII

April 2009

RED-LINED DRAWINGS  
(AS OF 22 SEPTEMBER 2016)



VICINITY MAP

DRAWING NO.	TITLE
-	TITLE SHEET/INDEX
1	EXISTING SITE CONDITIONS AND PHASE I STAGING AREAS
2	PROJECT OVERVIEW
3	LEACHATE EVAPORATION POND GRADES AND CROSS SECTIONS
4	CELL 1 SUBBASE GRADES
5	CELL 1 CROSS SECTIONS
6	CELL 1 LEACHATE MANAGEMENT SYSTEM
7	CELL 1 LEACHATE MANAGEMENT SYSTEM PIPING PROFILES
8	FINAL COVER GRADES (NOT IN CONTRACT)
9	INFILTRATION BASIN GRADES AND CROSS SECTION
10	EXISTING LEACHATE EVAPORATION POND DETAILS
11	LEACHATE EVAPORATION POND DETAILS
12	LEACHATE EVAPORATION POND DETAILS
13	LEACHATE EVAPORATION POND DETAILS
14	EXISTING AND NEW LEACHATE EVAPORATION POND ELECTRICAL DETAILS
15 + (DR)	CELL 1 BASE LINER DETAILS
16	FINAL COVER LINER DETAILS (NOT IN CONTRACT)
17	CELL 1 LEACHATE MANAGEMENT SYSTEM DETAILS
18	CELL 1 LEACHATE MANAGEMENT SYSTEM DETAILS
19	EXISTING LEACHATE MANAGEMENT SYSTEM AND MODIFICATION DETAILS
20	EXISTING LEACHATE MANAGEMENT SYSTEM AND MODIFICATION DETAILS
21	SURFACE WATER MANAGEMENT SYSTEM DETAILS (NOT IN CONTRACT)
22	MISCELLANEOUS DETAILS
23	PERIMETER ROAD ENHANCEMENTS AND DETAILS
24	PERIMETER ROAD ENHANCEMENT DETAILS
25	MOOF PAVEMENT MODIFICATION DETAILS
26	SECURITY FENCE DETAILS



LOCATION MAP

ISSUANCE BY:

DEPT. OF PUBLIC UTILITIES  
444 KEELE ST.  
HONOLULU, HI 96813

DEPT. OF PUBLIC UTILITIES  
444 KEELE ST.  
HONOLULU, HI 96813

APPROVED:

*[Signature]*  
RONALD A. CARROLL, JR.  
COUNTY ENGINEER OF HAWAII

DESIGNED BY:

AECOM

344 BRIDGE STREET  
SUITE 500  
HONOLULU, HAWAII 96813  
808-923-8874



*[Signature]*  
DATE: 04/01/09





		<b>EXISTING SITE CONDITIONS AND PHASE I STAGING AREAS</b>	
PROJECT: [REDACTED] SHEET: [REDACTED]		CONTRACTOR: [REDACTED] DATE: [REDACTED]	



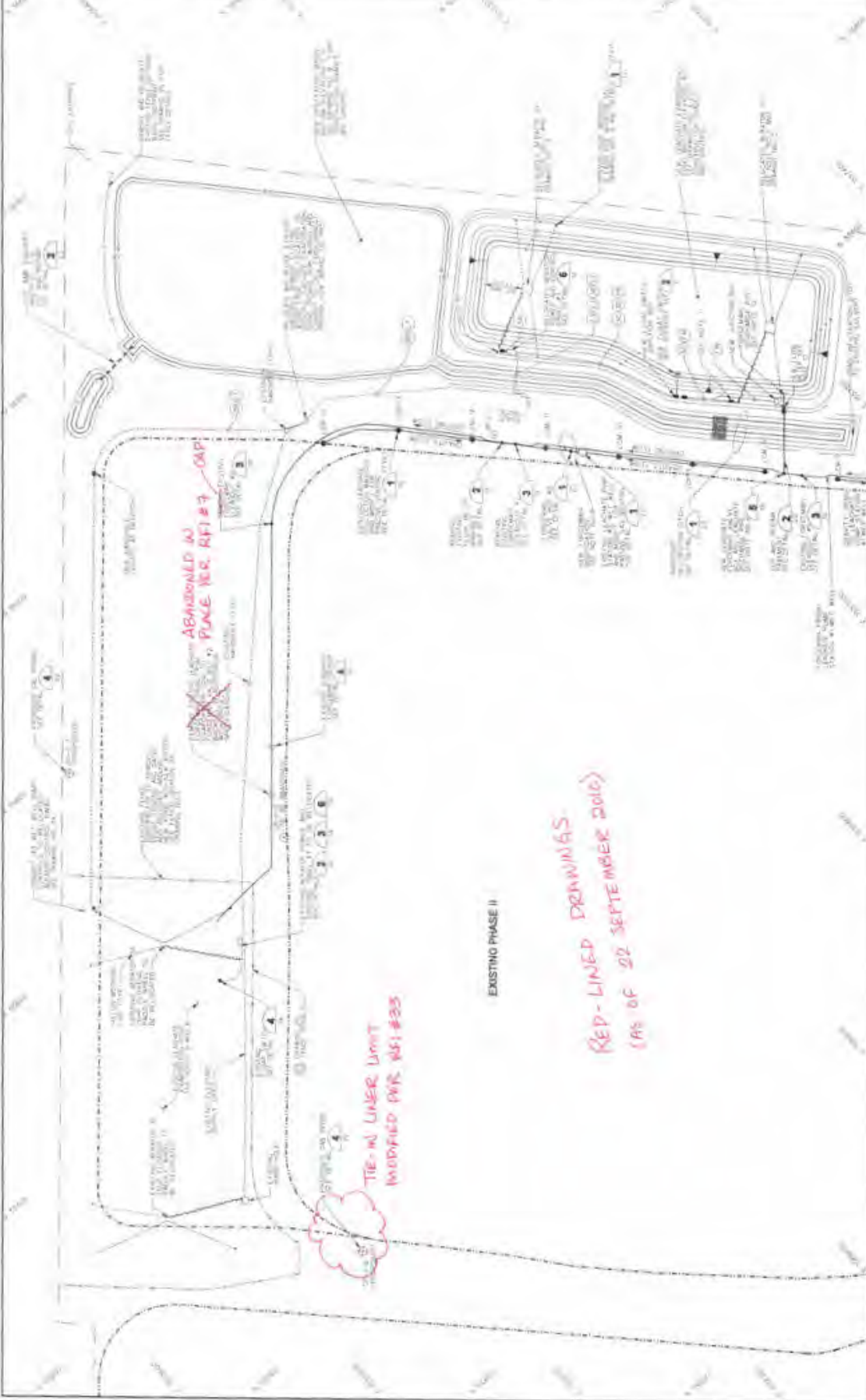
**LEGEND**

- EXISTING PHASE I STAGING AREA
- EXISTING PHASE II STAGING AREA
- EXISTING PHASE I
- EXISTING PHASE II

**NOTES**

1. ALL EXISTING UTILITIES SHOWN ON THIS PLAN ARE BASED ON THE MOST RECENT RECORD DRAWINGS AVAILABLE TO THE ENGINEER.
2. THE ENGINEER HAS CONDUCTED VISUAL INSPECTIONS OF THE SITE AND HAS OBSERVED THE EXISTING UTILITIES AS SHOWN ON THIS PLAN.
3. THE ENGINEER HAS CONDUCTED VISUAL INSPECTIONS OF THE SITE AND HAS OBSERVED THE EXISTING UTILITIES AS SHOWN ON THIS PLAN.
4. THE ENGINEER HAS CONDUCTED VISUAL INSPECTIONS OF THE SITE AND HAS OBSERVED THE EXISTING UTILITIES AS SHOWN ON THIS PLAN.
5. THE ENGINEER HAS CONDUCTED VISUAL INSPECTIONS OF THE SITE AND HAS OBSERVED THE EXISTING UTILITIES AS SHOWN ON THIS PLAN.





**LEGEND**

- EXISTING PHASE II
- PROPOSED PHASE II
- PROPOSED PHASE III
- PROPOSED PHASE IV
- PROPOSED PHASE V
- PROPOSED PHASE VI
- PROPOSED PHASE VII
- PROPOSED PHASE VIII
- PROPOSED PHASE IX
- PROPOSED PHASE X
- PROPOSED PHASE XI
- PROPOSED PHASE XII
- PROPOSED PHASE XIII
- PROPOSED PHASE XIV
- PROPOSED PHASE XV
- PROPOSED PHASE XVI
- PROPOSED PHASE XVII
- PROPOSED PHASE XVIII
- PROPOSED PHASE XIX
- PROPOSED PHASE XX

**NOTES**

1. ALL WORK SHALL BE IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS.
3. THE CONTRACTOR SHALL MAINTAIN ACCESS TO ALL ADJACENT PROPERTIES AND UTILITIES.
4. THE CONTRACTOR SHALL PROTECT ALL EXISTING UTILITIES AND STRUCTURES.
5. THE CONTRACTOR SHALL MAINTAIN ADEQUATE DRAINAGE AND EROSION CONTROL MEASURES.
6. THE CONTRACTOR SHALL MAINTAIN ADEQUATE SAFETY AND SECURITY MEASURES.
7. THE CONTRACTOR SHALL MAINTAIN ADEQUATE RECORDING AND DOCUMENTATION.
8. THE CONTRACTOR SHALL MAINTAIN ADEQUATE COMMUNICATIONS AND REPORTING.
9. THE CONTRACTOR SHALL MAINTAIN ADEQUATE ENVIRONMENTAL PROTECTION MEASURES.
10. THE CONTRACTOR SHALL MAINTAIN ADEQUATE QUALITY CONTROL MEASURES.
11. THE CONTRACTOR SHALL MAINTAIN ADEQUATE HEALTH AND SAFETY MEASURES.
12. THE CONTRACTOR SHALL MAINTAIN ADEQUATE SOCIAL RESPONSIBILITY MEASURES.
13. THE CONTRACTOR SHALL MAINTAIN ADEQUATE COMMUNITY RELATIONS MEASURES.
14. THE CONTRACTOR SHALL MAINTAIN ADEQUATE RISK MANAGEMENT MEASURES.
15. THE CONTRACTOR SHALL MAINTAIN ADEQUATE COMPLIANCE MEASURES.
16. THE CONTRACTOR SHALL MAINTAIN ADEQUATE ETHICS MEASURES.
17. THE CONTRACTOR SHALL MAINTAIN ADEQUATE INTEGRITY MEASURES.
18. THE CONTRACTOR SHALL MAINTAIN ADEQUATE TRANSPARENCY MEASURES.
19. THE CONTRACTOR SHALL MAINTAIN ADEQUATE ACCOUNTABILITY MEASURES.
20. THE CONTRACTOR SHALL MAINTAIN ADEQUATE RESPONSIBILITY MEASURES.













NO.	REV.	DATE	DESCRIPTION
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

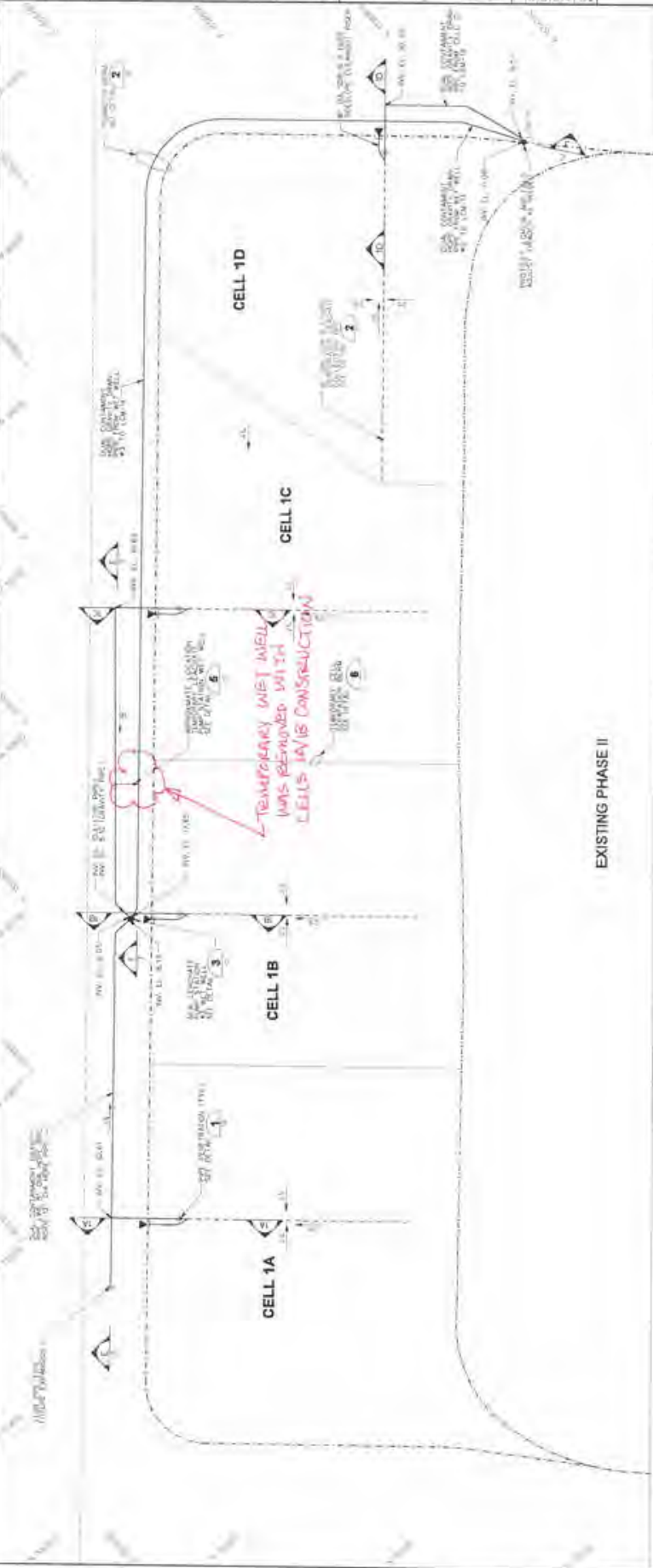


**AECOM**

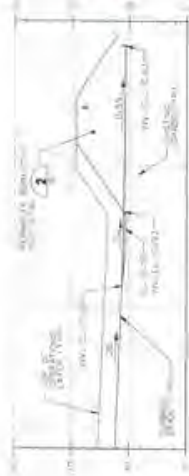
**PROPOSED CELL 1 LEACHATE MANAGEMENT SYSTEM**

CONSTRUCTION DRAWINGS  
FINAL LAYOUT EXHIBITION  
KIMBERLY-CLARK LEACHATE  
MANAGEMENT SYSTEM  
WALTON, FLORIDA

DATE: 09/22/2010
PROJECT NO: 10000
TITLE: 10000
SCALE: 1"=100'
SHEET NO: 6



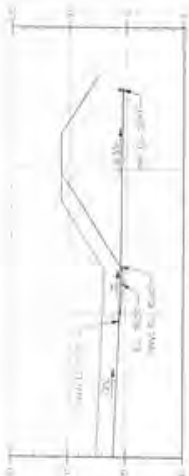
**EXISTING PHASE II**



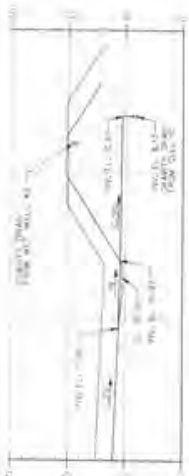
**PROFILE 1C**



**PROFILE 1D**



**PROFILE 1A**



**PROFILE 1B**

**RED-LINED DRAWINGS  
(AS OF 22 SEPTEMBER 2010)**

NOTES:  
1. CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE  
KIMBERLY-CLARK LEACHATE MANAGEMENT SYSTEM  
CONSTRUCTION MANUAL, LATEST EDITION.  
2. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH  
THE KIMBERLY-CLARK LEACHATE MANAGEMENT SYSTEM  
CONSTRUCTION MANUAL, LATEST EDITION.

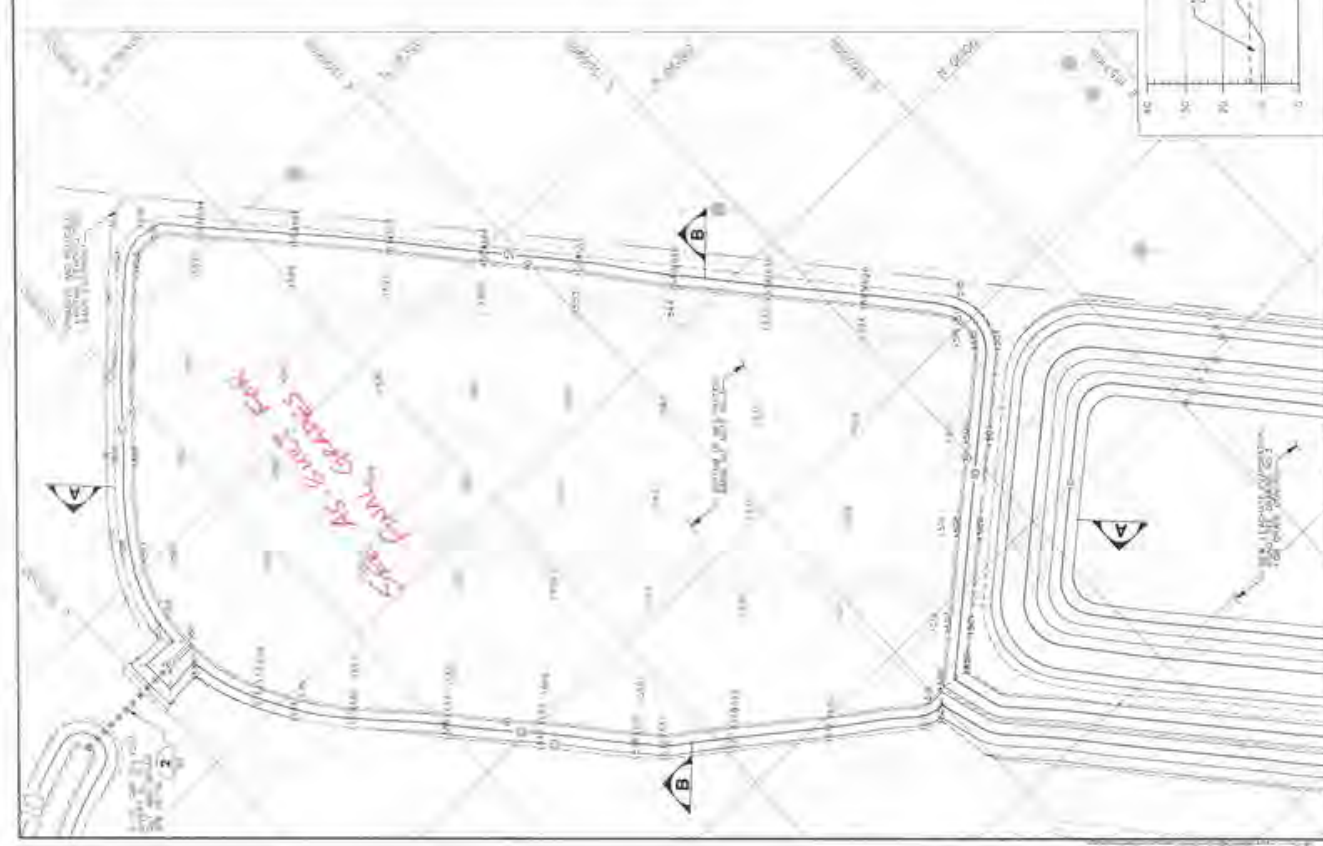
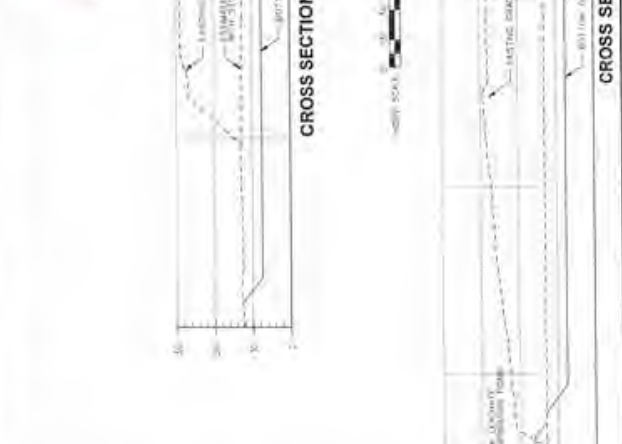






**Infiltration Basin Control Points**

STATION	ELEVATION	STATION	ELEVATION	STATION	ELEVATION	STATION	ELEVATION
100	50.00	100	50.00	100	50.00	100	50.00
101	50.05	101	50.05	101	50.05	101	50.05
102	50.10	102	50.10	102	50.10	102	50.10
103	50.15	103	50.15	103	50.15	103	50.15
104	50.20	104	50.20	104	50.20	104	50.20
105	50.25	105	50.25	105	50.25	105	50.25
106	50.30	106	50.30	106	50.30	106	50.30
107	50.35	107	50.35	107	50.35	107	50.35
108	50.40	108	50.40	108	50.40	108	50.40
109	50.45	109	50.45	109	50.45	109	50.45
110	50.50	110	50.50	110	50.50	110	50.50
111	50.55	111	50.55	111	50.55	111	50.55
112	50.60	112	50.60	112	50.60	112	50.60
113	50.65	113	50.65	113	50.65	113	50.65
114	50.70	114	50.70	114	50.70	114	50.70
115	50.75	115	50.75	115	50.75	115	50.75
116	50.80	116	50.80	116	50.80	116	50.80
117	50.85	117	50.85	117	50.85	117	50.85
118	50.90	118	50.90	118	50.90	118	50.90
119	50.95	119	50.95	119	50.95	119	50.95
120	51.00	120	51.00	120	51.00	120	51.00
121	51.05	121	51.05	121	51.05	121	51.05
122	51.10	122	51.10	122	51.10	122	51.10
123	51.15	123	51.15	123	51.15	123	51.15
124	51.20	124	51.20	124	51.20	124	51.20
125	51.25	125	51.25	125	51.25	125	51.25
126	51.30	126	51.30	126	51.30	126	51.30
127	51.35	127	51.35	127	51.35	127	51.35
128	51.40	128	51.40	128	51.40	128	51.40
129	51.45	129	51.45	129	51.45	129	51.45
130	51.50	130	51.50	130	51.50	130	51.50
131	51.55	131	51.55	131	51.55	131	51.55
132	51.60	132	51.60	132	51.60	132	51.60
133	51.65	133	51.65	133	51.65	133	51.65
134	51.70	134	51.70	134	51.70	134	51.70
135	51.75	135	51.75	135	51.75	135	51.75
136	51.80	136	51.80	136	51.80	136	51.80
137	51.85	137	51.85	137	51.85	137	51.85
138	51.90	138	51.90	138	51.90	138	51.90
139	51.95	139	51.95	139	51.95	139	51.95
140	52.00	140	52.00	140	52.00	140	52.00
141	52.05	141	52.05	141	52.05	141	52.05
142	52.10	142	52.10	142	52.10	142	52.10
143	52.15	143	52.15	143	52.15	143	52.15
144	52.20	144	52.20	144	52.20	144	52.20
145	52.25	145	52.25	145	52.25	145	52.25
146	52.30	146	52.30	146	52.30	146	52.30
147	52.35	147	52.35	147	52.35	147	52.35
148	52.40	148	52.40	148	52.40	148	52.40
149	52.45	149	52.45	149	52.45	149	52.45
150	52.50	150	52.50	150	52.50	150	52.50



DATE	NO.	BY	CHKD.



CONTRACT NO. 10-100-0000  
 PROJECT NO. 10-100-0000  
 SHEET NO. 15  
 DATE: 10/10/00

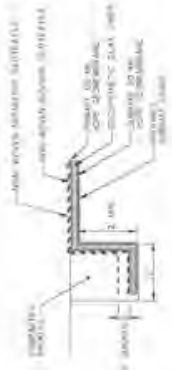
**ACCOM**  
 CONSULTING ENGINEERS

**CELL 1 BASE LINER DETAILS**  
 CONSTRUCTION DRAWINGS  
 CELL 1 BASE LINER CONSTRUCTION  
 PHASE I AT CELL 1  
 FROM: HMM



- NOTE:**
1. SEE DRAWING 10-100-0000 FOR TRENCH DETAIL.
  2. SEE DRAWING 10-100-0000 FOR TRENCH DETAIL.
  3. SEE DRAWING 10-100-0000 FOR TRENCH DETAIL.

**TYPICAL BASE LINER DETAIL - CELL 1** \_\_\_\_\_ 1  
**FOR CELLS 1A AND 1B**

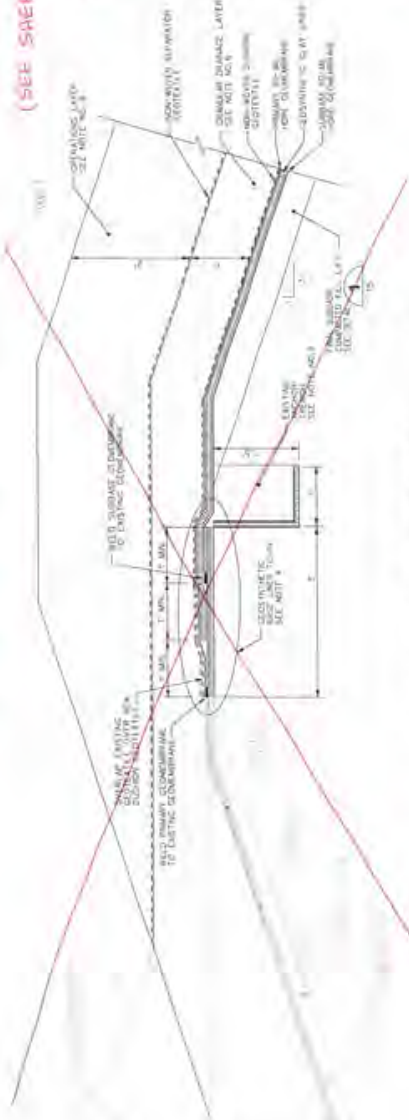


- NOTE:**
1. SEE DRAWING 10-100-0000 FOR TRENCH DETAIL.
  2. SEE DRAWING 10-100-0000 FOR TRENCH DETAIL.

**PERIMETER BERM ANCHOR TRENCH FOR TYPICAL BASE LINER** \_\_\_\_\_ 3  
**FOR CELLS 1A AND 1B**

**Red-Lined Drawings**  
**(AS OF 12 SEPTEMBER 2000)**

**(SEE SHEET 15R)**



**PHASE II / CELL 1 BASE LINER TIE-IN DETAIL** \_\_\_\_\_ 4

- NOTE:**
1. SEE DRAWING 10-100-0000 FOR TRENCH DETAIL.
  2. SEE DRAWING 10-100-0000 FOR TRENCH DETAIL.
  3. SEE DRAWING 10-100-0000 FOR TRENCH DETAIL.
  4. SEE DRAWING 10-100-0000 FOR TRENCH DETAIL.
  5. SEE DRAWING 10-100-0000 FOR TRENCH DETAIL.
  6. SEE DRAWING 10-100-0000 FOR TRENCH DETAIL.
  7. SEE DRAWING 10-100-0000 FOR TRENCH DETAIL.
  8. SEE DRAWING 10-100-0000 FOR TRENCH DETAIL.
  9. SEE DRAWING 10-100-0000 FOR TRENCH DETAIL.
  10. SEE DRAWING 10-100-0000 FOR TRENCH DETAIL.

DATE	BY	CHKD	APP'D
11/11/11	...	...	...
11/11/11	...	...	...
11/11/11	...	...	...



PROJECT NO. 11111  
 CONTRACT NO. 11111  
 SHEET NO. 11111

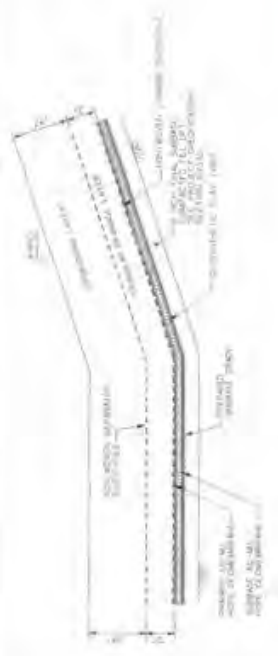
**ACCOM**

**CELL - BASE LINER DETAILS**  
 CELL BASE LINER CONSTRUCTION  
 SEE CELL 10 FOR CONSTRUCTION  
 DETAILS

DATE	BY	CHKD	APP'D
11/11/11	...	...	...
11/11/11	...	...	...
11/11/11	...	...	...

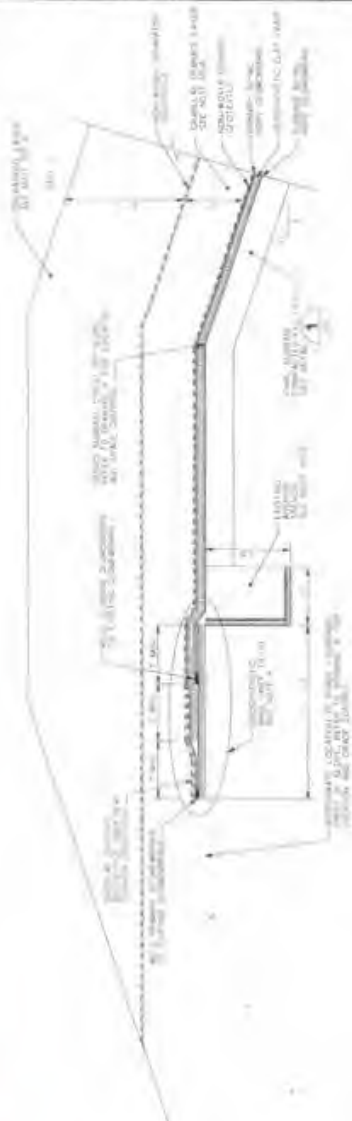


**PERIMETER BERM ACCESS ROAD (NO FINAL COVER INSTALLED)**  
**FOR CELLS 10 AND 11**

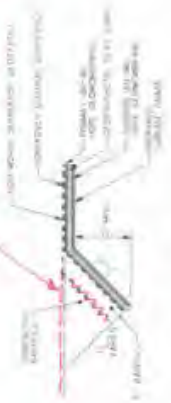


**TYPICAL BASE LINER DETAIL - CELL 1**

**RED-LINED DRAWINGS**  
**(AS OF 22 SEPTEMBER 2010)**



**CUT-OUT SEPARATING GEOTEKILE (RFI #22)**



**PERIMETER BERM ANCHOR TRENCH FOR TYPICAL BASE LINER**  
**FOR CELLS 10 AND 11**

- NOTES:**
1. THE PERIMETER BERM SHALL BE CONSTRUCTED WITH A MINIMUM OF 12" COMPACTED GRANULAR FILL OVER A 4" MINIMUM THICKNESS OF 100% SAND OR EQUIVALENT.
  2. THE PERIMETER BERM SHALL BE CONSTRUCTED WITH A MINIMUM OF 12" COMPACTED GRANULAR FILL OVER A 4" MINIMUM THICKNESS OF 100% SAND OR EQUIVALENT.
  3. THE PERIMETER BERM SHALL BE CONSTRUCTED WITH A MINIMUM OF 12" COMPACTED GRANULAR FILL OVER A 4" MINIMUM THICKNESS OF 100% SAND OR EQUIVALENT.
  4. THE PERIMETER BERM SHALL BE CONSTRUCTED WITH A MINIMUM OF 12" COMPACTED GRANULAR FILL OVER A 4" MINIMUM THICKNESS OF 100% SAND OR EQUIVALENT.
  5. THE PERIMETER BERM SHALL BE CONSTRUCTED WITH A MINIMUM OF 12" COMPACTED GRANULAR FILL OVER A 4" MINIMUM THICKNESS OF 100% SAND OR EQUIVALENT.
  6. THE PERIMETER BERM SHALL BE CONSTRUCTED WITH A MINIMUM OF 12" COMPACTED GRANULAR FILL OVER A 4" MINIMUM THICKNESS OF 100% SAND OR EQUIVALENT.
  7. THE PERIMETER BERM SHALL BE CONSTRUCTED WITH A MINIMUM OF 12" COMPACTED GRANULAR FILL OVER A 4" MINIMUM THICKNESS OF 100% SAND OR EQUIVALENT.
  8. THE PERIMETER BERM SHALL BE CONSTRUCTED WITH A MINIMUM OF 12" COMPACTED GRANULAR FILL OVER A 4" MINIMUM THICKNESS OF 100% SAND OR EQUIVALENT.
  9. THE PERIMETER BERM SHALL BE CONSTRUCTED WITH A MINIMUM OF 12" COMPACTED GRANULAR FILL OVER A 4" MINIMUM THICKNESS OF 100% SAND OR EQUIVALENT.
  10. THE PERIMETER BERM SHALL BE CONSTRUCTED WITH A MINIMUM OF 12" COMPACTED GRANULAR FILL OVER A 4" MINIMUM THICKNESS OF 100% SAND OR EQUIVALENT.

**PHASE II CELL 1 BASE LINER TIE-IN DETAIL**







DATE	NO.	BY	CHKD.	APP.

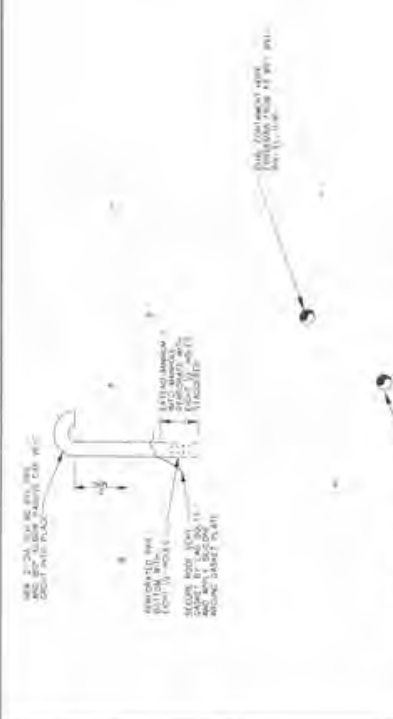


PROJECT: *Leachate Treatment Plant*  
 DRAWING NO.: *10-100*  
 DATE: *10/22/2010*  
 SCALE: *AS SHOWN*  
 SHEET NO.: *19*

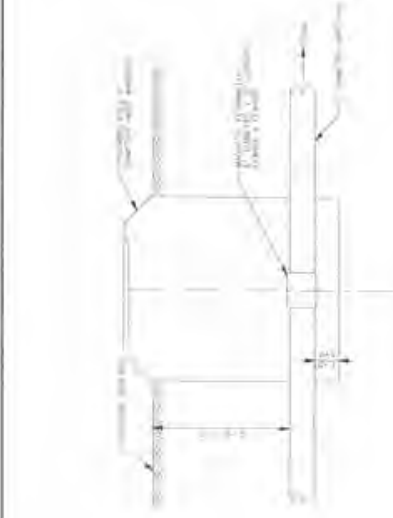
**AECOM**

CONTRACTOR: *...*  
 PROJECT: *...*  
 SHEET NO.: *...*  
 DATE: *...*

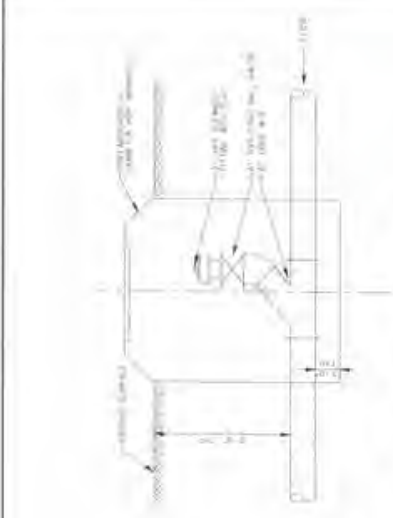
DATE: *...*  
 NO.: *...*  
 BY: *...*  
 CHECKED: *...*  
 TITLE: *...*



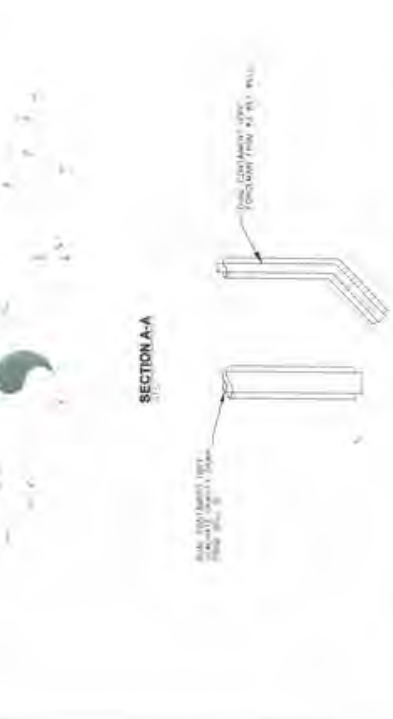
EXISTING LEACHATE COLLECTION MANHOLE



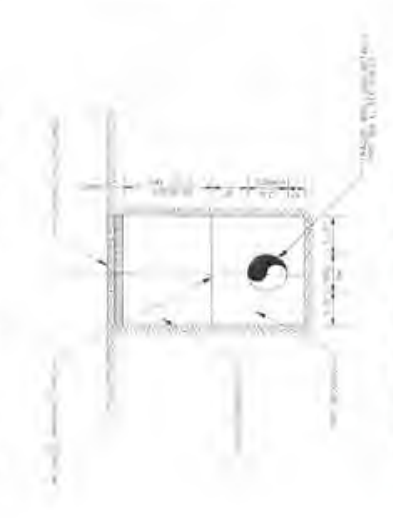
EXISTING LEACHATE FORCEMAIN FLOWMETER



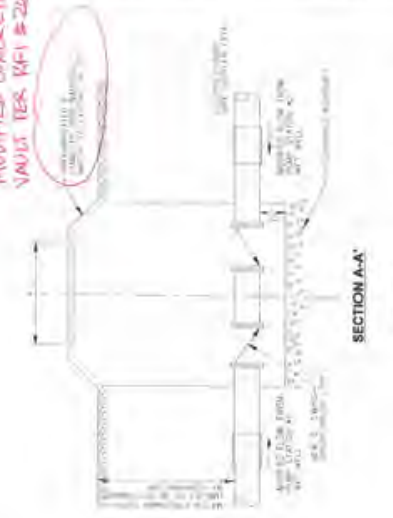
EXISTING LEACHATE FORCEMAIN CLEANOUT



SECTION A-A



EXISTING FORCEMAIN TRENCH SECTION



SECTION A-A

MODIFIED CONCRETE  
 VAULT PER RFI # 226



PLAN

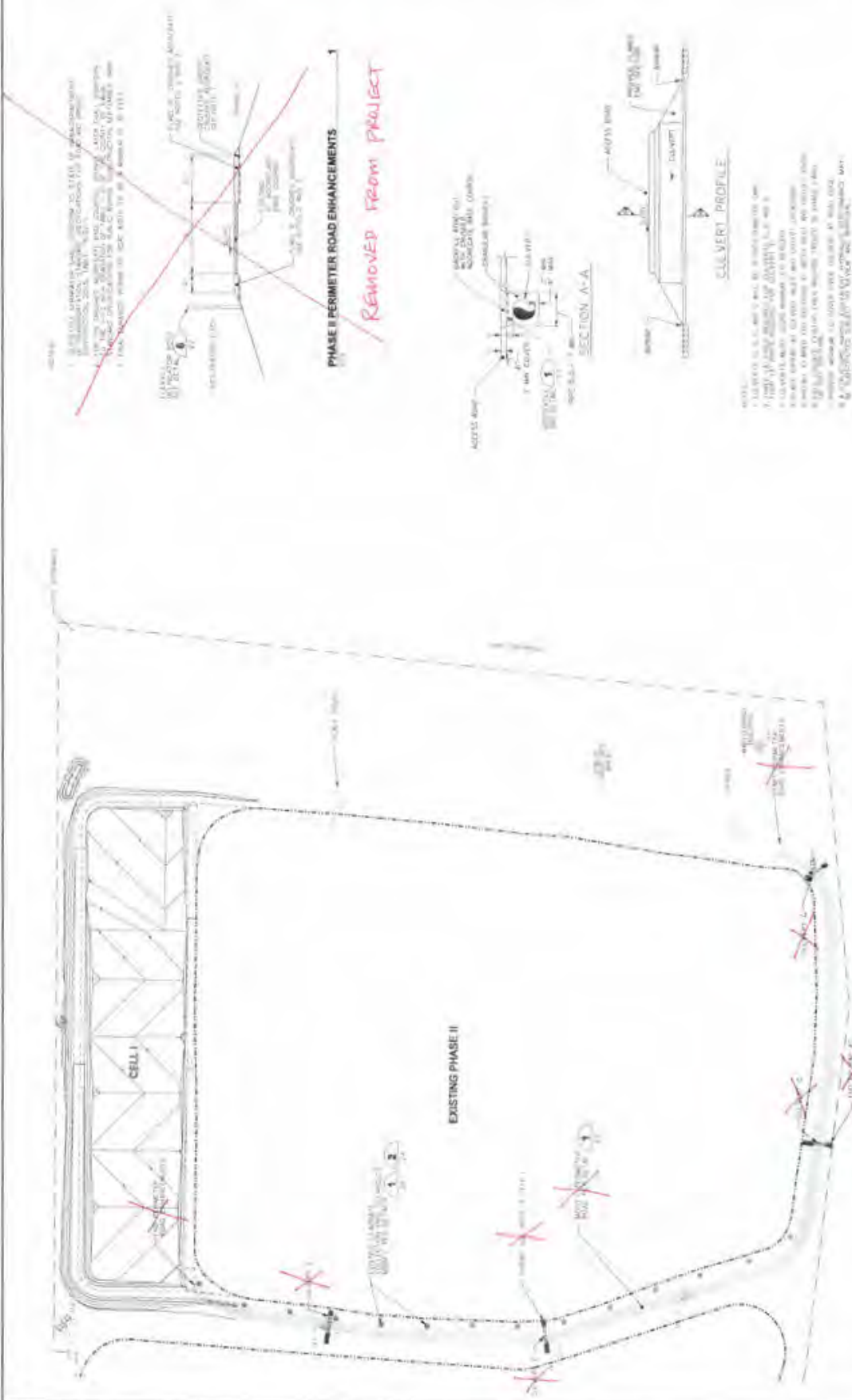
NEW LEACHATE FORCEMAIN VALVE BOX

RED-LINED DRAWINGS  
 (AS OF 22 SEPTEMBER 2010)

- 1. ALL DIMENSIONS ARE IN FEET AND INCHES.
- 2. ALL DIMENSIONS ARE TO FACE UNLESS OTHERWISE NOTED.
- 3. ALL DIMENSIONS ARE TO CENTERLINE UNLESS OTHERWISE NOTED.
- 4. ALL DIMENSIONS ARE TO CENTERLINE UNLESS OTHERWISE NOTED.
- 5. ALL DIMENSIONS ARE TO CENTERLINE UNLESS OTHERWISE NOTED.







1. ALL ROAD ENHANCEMENTS SHALL BE DESIGNED TO MEET THE DESIGN CRITERIA OF THE LOCAL AGENCY.  
 2. ALL ROAD ENHANCEMENTS SHALL BE DESIGNED TO MEET THE DESIGN CRITERIA OF THE LOCAL AGENCY.  
 3. ALL ROAD ENHANCEMENTS SHALL BE DESIGNED TO MEET THE DESIGN CRITERIA OF THE LOCAL AGENCY.  
 4. ALL ROAD ENHANCEMENTS SHALL BE DESIGNED TO MEET THE DESIGN CRITERIA OF THE LOCAL AGENCY.  
 5. ALL ROAD ENHANCEMENTS SHALL BE DESIGNED TO MEET THE DESIGN CRITERIA OF THE LOCAL AGENCY.

**PHASE II PERIMETER ROAD ENHANCEMENTS**  
 REMOVED FROM PROJECT



**CULVERT INSTALLATION DETAIL**

1. ALL ROAD ENHANCEMENTS SHALL BE DESIGNED TO MEET THE DESIGN CRITERIA OF THE LOCAL AGENCY.  
 2. ALL ROAD ENHANCEMENTS SHALL BE DESIGNED TO MEET THE DESIGN CRITERIA OF THE LOCAL AGENCY.  
 3. ALL ROAD ENHANCEMENTS SHALL BE DESIGNED TO MEET THE DESIGN CRITERIA OF THE LOCAL AGENCY.  
 4. ALL ROAD ENHANCEMENTS SHALL BE DESIGNED TO MEET THE DESIGN CRITERIA OF THE LOCAL AGENCY.  
 5. ALL ROAD ENHANCEMENTS SHALL BE DESIGNED TO MEET THE DESIGN CRITERIA OF THE LOCAL AGENCY.

1. ALL ROAD ENHANCEMENTS SHALL BE DESIGNED TO MEET THE DESIGN CRITERIA OF THE LOCAL AGENCY.  
 2. ALL ROAD ENHANCEMENTS SHALL BE DESIGNED TO MEET THE DESIGN CRITERIA OF THE LOCAL AGENCY.  
 3. ALL ROAD ENHANCEMENTS SHALL BE DESIGNED TO MEET THE DESIGN CRITERIA OF THE LOCAL AGENCY.  
 4. ALL ROAD ENHANCEMENTS SHALL BE DESIGNED TO MEET THE DESIGN CRITERIA OF THE LOCAL AGENCY.  
 5. ALL ROAD ENHANCEMENTS SHALL BE DESIGNED TO MEET THE DESIGN CRITERIA OF THE LOCAL AGENCY.





NO.	DATE	REVISION

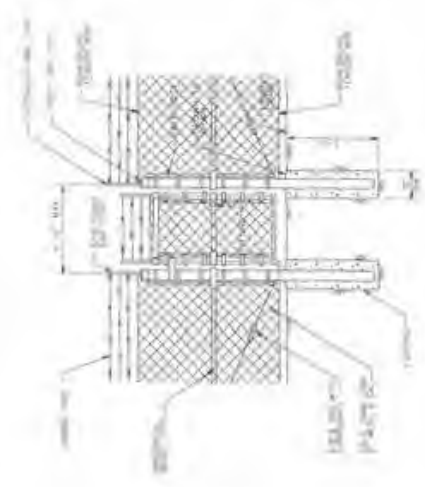


*Handwritten signatures and initials*

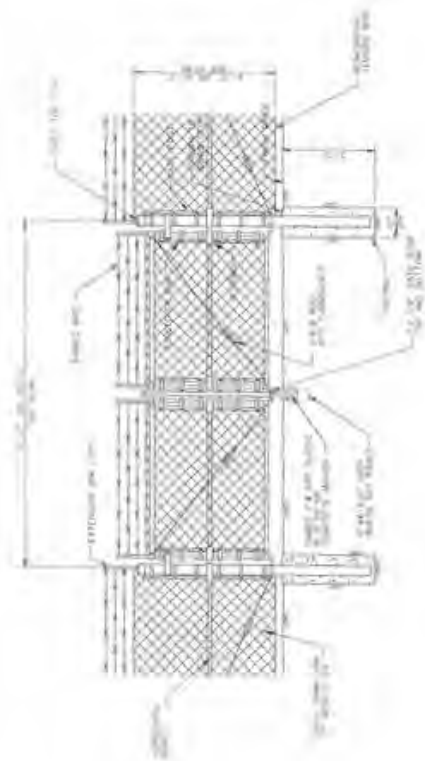
**AECOM**

**SECURITY FENCE DETAILS**

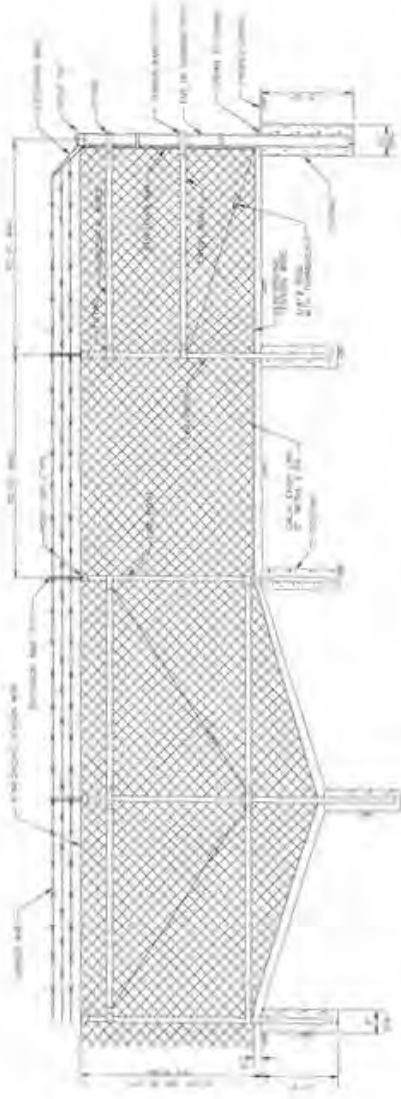
DATE	
SCALE	
PROJECT	
SHEET NO.	
TOTAL SHEETS	



TYPICAL PERSONNEL GATE



TYPICAL DOUBLE SWING GATE



CHAIN LINK FENCE DETAIL

*Small block of handwritten notes or specifications.*

*Red handwritten note: "Red-lined drawings (As of 22 September 2010)"*





## **Appendix Q**

### **Record Drawings**

**Subbase As-built Survey**

**Top of Granular Drainage Layer As-Built Survey**

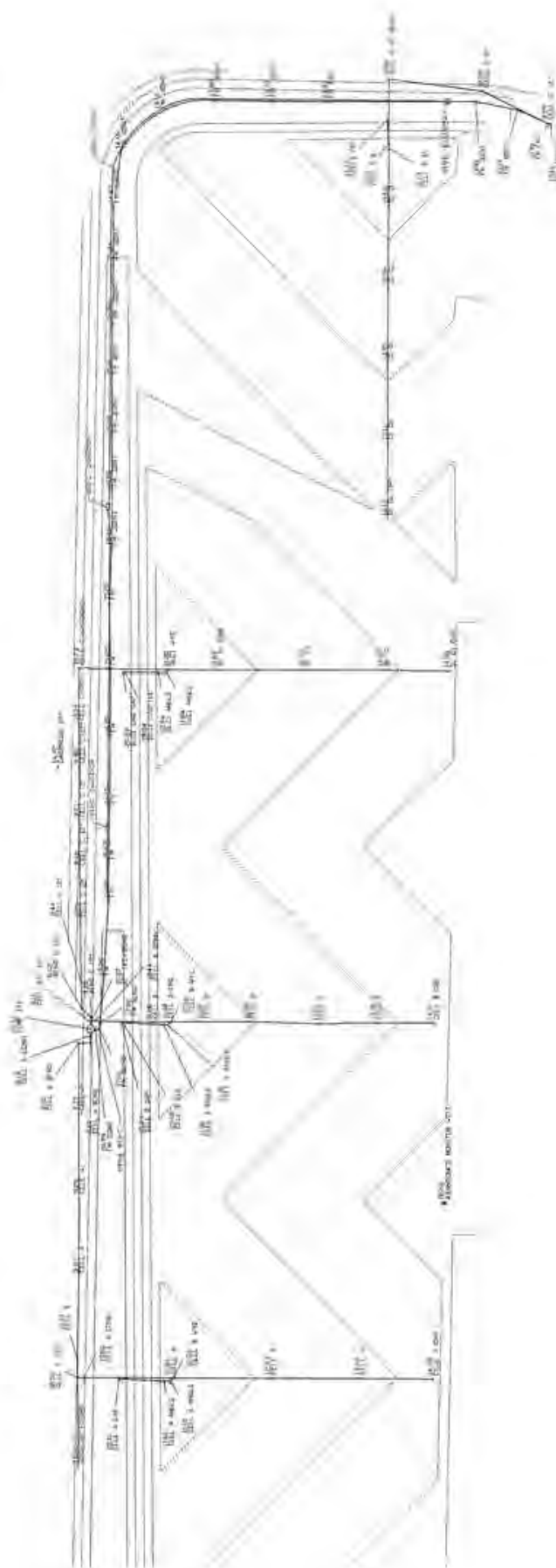
**Top of Operations Layer As-Built Survey**

**Cell 1 Utilities As-Built Survey**

**Gas Probe Locations**

**Subbase 60 mil HDPE Geomembrane As-Built Panel Layouts**

**Primary 60 mil HDPE Geomembrane As-Built Panel Layouts**



1. ALL DIMENSIONS SHOWN ON THIS DRAWING ARE TO BE CONSIDERED AS APPROXIMATE UNLESS OTHERWISE SPECIFIED.  
 2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND RIGHTS OF WAY.  
 3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY UTILITIES INFORMATION.  
 4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY EROSION CONTROL MEASURES.  
 5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY TRAFFIC CONTROL MEASURES.  
 6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY SAFETY MEASURES.  
 7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY ENVIRONMENTAL PROTECTION MEASURES.  
 8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY HISTORIC PRESERVATION MEASURES.  
 9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY CULTURAL RESOURCE PROTECTION MEASURES.  
 10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY ARCHAEOLOGICAL PROTECTION MEASURES.  
 11. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PALEONTOLOGICAL PROTECTION MEASURES.  
 12. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PLANT AND ANIMAL PROTECTION MEASURES.  
 13. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY VISUAL QUALITY IMPROVEMENT MEASURES.  
 14. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY SOUND AND VIBRATION PROTECTION MEASURES.  
 15. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY AIR QUALITY IMPROVEMENT MEASURES.  
 16. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY WATER QUALITY IMPROVEMENT MEASURES.  
 17. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY SOIL CONSERVATION MEASURES.  
 18. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY WETLAND PROTECTION MEASURES.  
 19. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY RIVER AND STREAM PROTECTION MEASURES.  
 20. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY COASTAL ZONE PROTECTION MEASURES.  
 21. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY HISTORIC LANDMARK PROTECTION MEASURES.  
 22. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY NATIONAL HISTORIC LANDMARK PROTECTION MEASURES.  
 23. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY NATIONAL MONUMENT PROTECTION MEASURES.  
 24. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY NATIONAL ANTIQUITIES ACT PROTECTION MEASURES.  
 25. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY NATIONAL MONUMENT AND ANTIQUITIES ACT PROTECTION MEASURES.  
 26. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY NATIONAL HISTORIC LANDMARK AND MONUMENT PROTECTION MEASURES.  
 27. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY NATIONAL HISTORIC LANDMARK AND MONUMENT AND ANTIQUITIES ACT PROTECTION MEASURES.  
 28. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY NATIONAL HISTORIC LANDMARK AND MONUMENT AND ANTIQUITIES ACT AND MONUMENT PROTECTION MEASURES.  
 29. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY NATIONAL HISTORIC LANDMARK AND MONUMENT AND ANTIQUITIES ACT AND MONUMENT AND ANTIQUITIES ACT PROTECTION MEASURES.  
 30. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY NATIONAL HISTORIC LANDMARK AND MONUMENT AND ANTIQUITIES ACT AND MONUMENT AND ANTIQUITIES ACT AND MONUMENT PROTECTION MEASURES.



[Signature]  
 [Title]  
 [Date]

Mr. [Name]  
 [Address]  
 [City, State, Zip]

[Title]  
 [Address]  
 [City, State, Zip]

[Title]  
 [Address]  
 [City, State, Zip]

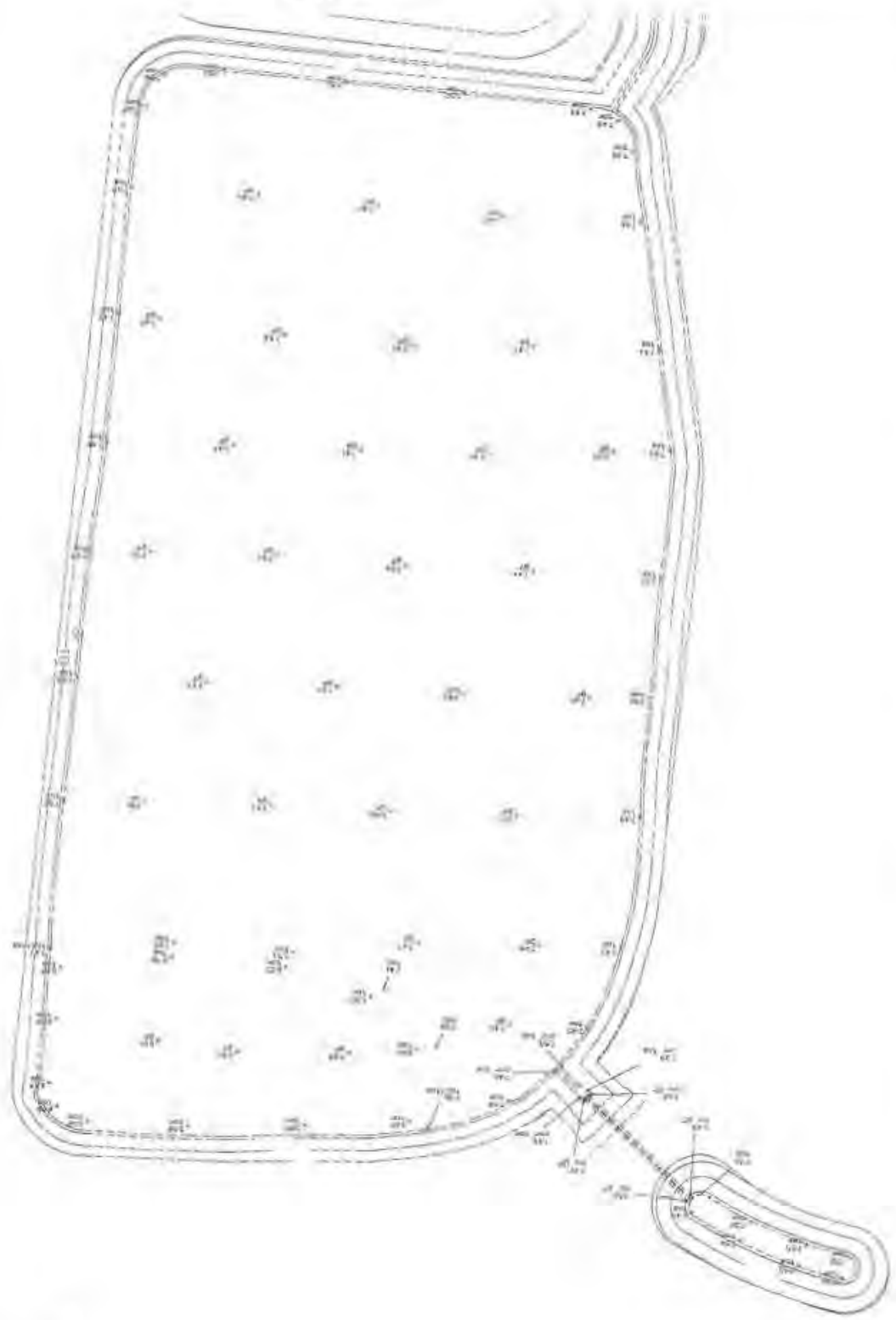
MAP NUMBER  
ASPHALT STATION MARK  
DATE OF SURVEY - SEPTEMBER 20, 1957  
RECALC. SCALE, 1:500  
DRAWN BY: GARDNER BIRD

DATE OF SURVEY  
BY: GARDNER BIRD  
SCALE: 1:500

1:500  
SCALE OF THIS DRAWING



THIS DRAWING (MARKED) MEANS (LATER) THEREIN THAT THE WORK SHOWN THEREON HAS BEEN CHECKED BY THE SURVEYOR AND FOUND TO BE CORRECT IN ACCORDANCE WITH THE REQUIREMENTS OF THE PROFESSIONAL SURVEYING ACT, CHAPTER 100, SECTION 10000, AND THE RULES AND REGULATIONS OF THE BOARD OF SURVEYORS AND MAPPING ENGINEERS, STATE OF CALIFORNIA.



MAP SHOWING  
 DILUTATION PITCH AND LOW UTILITY AS-BUILT  
 DATES OF SURVEY - SEPTEMBER 8 AND 22, 2000  
 ESCROW, KANSAS, UNITED STATES OF AMERICA  
 Prepared for: Goodwater, Inc.

DATE OF SURVEY: SEP 8, 2000  
 DATE OF SURVEY: SEP 22, 2000



11-541 (2000)  
 100  
 200  
 400  
 800  
 1600  
 3200  
 6400  
 12800  
 25600  
 51200  
 102400  
 204800  
 409600  
 819200  
 1638400  
 3276800  
 6553600  
 13107200  
 26214400  
 52428800  
 104857600  
 209715200  
 419430400  
 838860800  
 1677721600  
 3355443200  
 6710886400  
 13421772800  
 26843545600  
 53687091200  
 107374182400  
 214748364800  
 429496729600  
 858993459200  
 1717986918400  
 3435973836800  
 6871947673600  
 13743895347200  
 27487790694400  
 54975581388800  
 109951162777600  
 219902325555200  
 439804651110400  
 879609302220800  
 1759218604441600  
 3518437208883200  
 7036874417766400  
 14073748835532800  
 28147497671065600  
 56294995342131200  
 112589990684262400  
 225179981368524800  
 450359962737049600  
 900719925474099200  
 1801439850948198400  
 3602879701896396800  
 7205759403792793600  
 14411518807585587200  
 28823037615171174400  
 57646075230342348800  
 115292150460684697600  
 230584300921369395200  
 461168601842738790400  
 922337203685477580800  
 1844674407370955161600  
 3689348814741910323200  
 7378697629483820646400  
 14757395258967641292800  
 29514790517935282585600  
 59029581035870565171200  
 118059162071741130342400  
 236118324143482260684800  
 472236648286964521369600  
 944473296573929042739200  
 1888946593147858085478400  
 3777893186295716170956800  
 7555786372591432341913600  
 15111572745182864683827200  
 30223145490365729367654400  
 60446290980731458735308800  
 120892581961462917470617600  
 241785163922925834941235200  
 483570327845851669882470400  
 967140655691703339764940800  
 1934281311383406679529881600  
 3868562622766813359059763200  
 7737125245533626718119526400  
 15474250491067253436239052800  
 30948500982134506872478105600  
 61897001964269013744956211200  
 123794003928538027489924422400  
 247588007857076054979848844800  
 495176015714152109959697689600  
 990352031428304219919395379200  
 1980704062856608439838790758400  
 3961408125713216879677581516800  
 7922816251426433759355163033600  
 15845632502852867518710326067200  
 31691265005705735037420652134400  
 63382530011411470074841304268800  
 126765060022822940149682608537600  
 253530120045645880299365217075200  
 507060240091291760598730434150400  
 1014120480182583521197460868300800  
 2028240960365167042394921736601600  
 4056481920730334084789843473203200  
 8112963841460668169579686946406400  
 16225927682921336339159373892812800  
 32451855365842672678318747785625600  
 64903710731685345356637495571251200  
 12980742146337069071327499114502400  
 25961484292674138142654998229004800  
 51922968585348276285309996458009600  
 10384593717069655257061999291619200  
 20769187434139310514123998583238400  
 41538374868278621028247997166476800  
 83076749736557242056495994332953600  
 166153499473114484112991988665907200  
 332306998946228968225983973331814400  
 664613997892457936451967946663628800  
 1329227995784915872903935893327257600  
 2658455991569831745807871786654515200  
 5316911983139663491615743573309030400  
 10633823966279326983231487146618060800  
 21267647932558653966462974293236121600  
 42535295865117307932925948586472243200  
 85070591730234615865851897172944486400  
 17014118346046923173170379434588892800  
 34028236692093846346340758869177785600  
 68056473384187692692681517738355571200  
 136112946768375385385363035476711142400  
 272225893536750770770726070953422284800  
 544451787073501541541452141906844579200  
 108890357414700308308290428381369158400  
 217780714829400616616580856762738316800  
 435561429658801233233161713525476633600  
 871122859317602466466323427050953267200  
 174224571863520493293264854410190654400  
 34844914372704098658652970882038128800  
 69689828745408197317305941764076257600  
 139379657490816394634611883528155155200  
 278759314981632789269223767056310310400  
 557518629963265578538447534112620620800  
 111503725992653115707689506822524121600  
 223007451985306231415379013645048243200  
 446014903970612462830758027290096486400  
 892029807941224925661516054580192972800  
 1784059615882449851323032089160385945600  
 3568119231764899702646064178320771910400  
 7136238463529799405292128356641543820800  
 14272476927059598810584256713283087641600  
 2854495385411919762116851426656617523200  
 5708990770823839524233702853313234846400  
 11417981541647679048467405706626469692800  
 22835963083295358096934811413252939385600  
 45671926166590716193869622826505878771200  
 9134385233318143238773924565301175754400  
 182687704666362864775478491306035151188800  
 365375409332725729550956982612070302377600  
 730750818665451459101913965224140604755200  
 1461501637330902918203827930448281311510400  
 2923003274661805836407655860896562623020800  
 5846006549323611672815311721793125246041600  
 11692013098647223345630623443586250492083200  
 23384026197294446691261246887172500984166400  
 46768052394588893382522493774345001968332800  
 9353610478917778676504498754869003936665600  
 18707220957835557353008997509738007873331200  
 37414441915671114706017995019476001546662400  
 74828883831342229412035990038952003093324800  
 149657767662684458824071980077904006186649600  
 299315535325368917648143960155808012373299200  
 598631070650737835296287920311616024746598400  
 1197262141301475670592575840623220494931987200  
 2394524282602951341185151721246440989863974400  
 4789048565205902682370303442492881979727948800  
 9578097130411805364740606884985763959455897600  
 19156194260823610729481213769971527918911795200  
 38312388521647221458962427539943055837823590400  
 76624777043294442917924855079886111675647180800  
 153249554086588885835849710159772233513294361600  
 30649910817317777167169942031954446702658723200  
 61299821634635554334339884063908893405317464400  
 12259964326927110866867976812717798881071888800  
 24519928653854221733735953625435597762143777600  
 49039857307708443467471907250871195448287555200  
 98079714615416886934943814501742390889171110400  
 19615942922883377386988763000348477837822220800  
 39231885845766754773977526000696955675644441600  
 784637716915335095479550520013939113511288883200  
 1569275433830670190959101040027878227022577766400  
 3138550867661340381918202080055756454045155532800  
 627710173532268076383640416001115129080901111065600  
 1255420346064536152767280832002230258161802222131200  
 251084069212907230553456166400446051633640444262400  
 5021681384258144611069123328008921032672888884800  
 100433627685162892221384665600178420653457777769600  
 20086725537032578444276933120035684130691555555200  
 4017345107406515688855386624007136826138311110400  
 80346902148130313777107732480014273652276622220800  
 160693804296260675544215464960028547304553244441600  
 32138760859252135108843092992005709460910688883200  
 642775217185042702176861859840011418921821377766400  
 12855503543700854043537237196800228378436427555200  
 2571100708740170808707447439360045675687285510400  
 5142201417480341617414894878720091351375711020800  
 102844028349606832348297897574400182702751422041600  
 20568805669921366469659779514880036540550284403200  
 41137611339842732939319559029760073081100568886400  
 8227522267968546587863911805952001461622011377772800  
 16455044535937093175727823611904002923244022755555200  
 3291008907187418635145564722380800584648804551110400  
 658201781437483727029112944476160011692976111022220800  
 13164035628749674540582258889523200233859522244441600  
 26328071257499349081165177779046400467719044488883200  
 52656142514998698162332355558092800935438089777766400  
 105312285029997396324664711116185600187087617955555200  
 21062457005999479264932942223237120037417523911110400  
 42124914011998958529865884446474240074835047822220800  
 842498280239979170597317688929484800149670095644441600  
 168499656047995834119463537785897600299340191288883200  
 336999312095991668238927075571795200598680382577766400  
 673998624191983336477854151143590400119736076515555200  
 13479972483839666729557083022878080023947215303110400  
 269599449676793334591141660457561600478944306062220800  
 539198899353586669182283320915123200957888612144441600  
 107839779870717333836456664182246400191577722488883200  
 215679559741434667672913328364492800383155444977766400  
 4313591194828693353458266567289856007663108995555200  
 86271823896573867069165331345797120015326217991110400  
 17254364779314773413833066269155440030652435982220800  
 34508729558629546827666135378310880061304879764441600  
 690174591172590936553322707566217600122609759528883200  
 138034918234518187310664541513243200245219519057766400  
 276069836469036374621329083026486400490439038115555200  
 5521396729380727492426581660529728009808780762220800  
 110427934587614549848531633105945600196175615244441600  
 22085586917522909969706326621189120039235122488883200  
 4417117383504581993941265324237840078470244977766400  
 8834234767009163987882530648475680015694049955555200  
 176684695340183279757650612969513600313880991110400  
 3533693906803665595153012593990272006277619822220800  
 70673878136073311903060251879805440012555239644441600  
 141347756272146623806120503759610880025110479288883200  
 28269551254429324761224100751922176005022095857766400  
 56539102508858649522448201503844320010044191715555200  
 11307820501771729904489640300768864002008838343110400  
 22615641003543459808979280601537728004017676682220800  
 45231282007086919617958561203075520080353533644441600  
 9046256401417383923591712240615110400160707067288883200  
 1809251280283476784718342448122220800321414134577766400  
 361850256056695356943668489624444160064282826915555200  
 72370051211339071388733697924888960012856565383110400  
 144740102422678142777467395697779200257131307662220800  
 28948020484535628555493479139554400514262615244441600  
 578960409690712571109869582791088001028525230488883200  
 115792081938142514221977965558217600205705046097766400  
 23158416387628502844395593111643200411410092195555200  
 4631683277525700568879118622328640082282018439110400  
 926336655505140113775837724465728001645640368782220800  
 1852673311010280227551675488931456003291280737564441600  
 3705346622020560455103350977862912006582561475110400  
 74106932440411209102067019557258240013165122902220800  
 148213864800824182044134039114516800263302458044441600  
 29642772960164836408826807822903360052660496088883200  
 592855459203296728176536156458067200105320992177766400  
 11857109184065934563530723129113440021064198435555200  
 2371421836813186912706144625822688004212839687110400  
 4742843673626373825412289251645376008425679342220800  
 948568734725274765082457850329075200168513586844441600  
 1897137469450549530164915700658150400337027173688883200  
 379427493890109906032983140131630080067405434737766400  
 7588549877802198120659762802632601600134810869475555200  
 151770997556043962413195256052652032002696217389110400  
 3035419951120879248263905121053040640053924347782220800  
 60708399022417584965278102421060812800107848695564441600  
 121416798044835169930556204842121625600215697391110400  
 2428335960896703398611124096842432512004313947822220800  
 4856671921793406797222248193684645248008627895644441600  
 97133438435868135944444963873692904960017255791288883200  
 19426687687173627188888992774738580992003451158257766400  
 38853375374347254377777985549477161984006902316515555200  
 777067507486945087555559710989543233776001380463303110400  
 155413501497389075511111942197906467552002760926602220800  
 310827002994778151022223884395813351040055218532044441600  
 6216540059895563020444477687916267020800110437064088883200  
 124330801197911260408889557598325340480022087412817766400  
 248661602395822520817779115197660680960044174825635555200  
 497323204791645041635558230395321371840088349651110400  
 9946464095832900832711164607

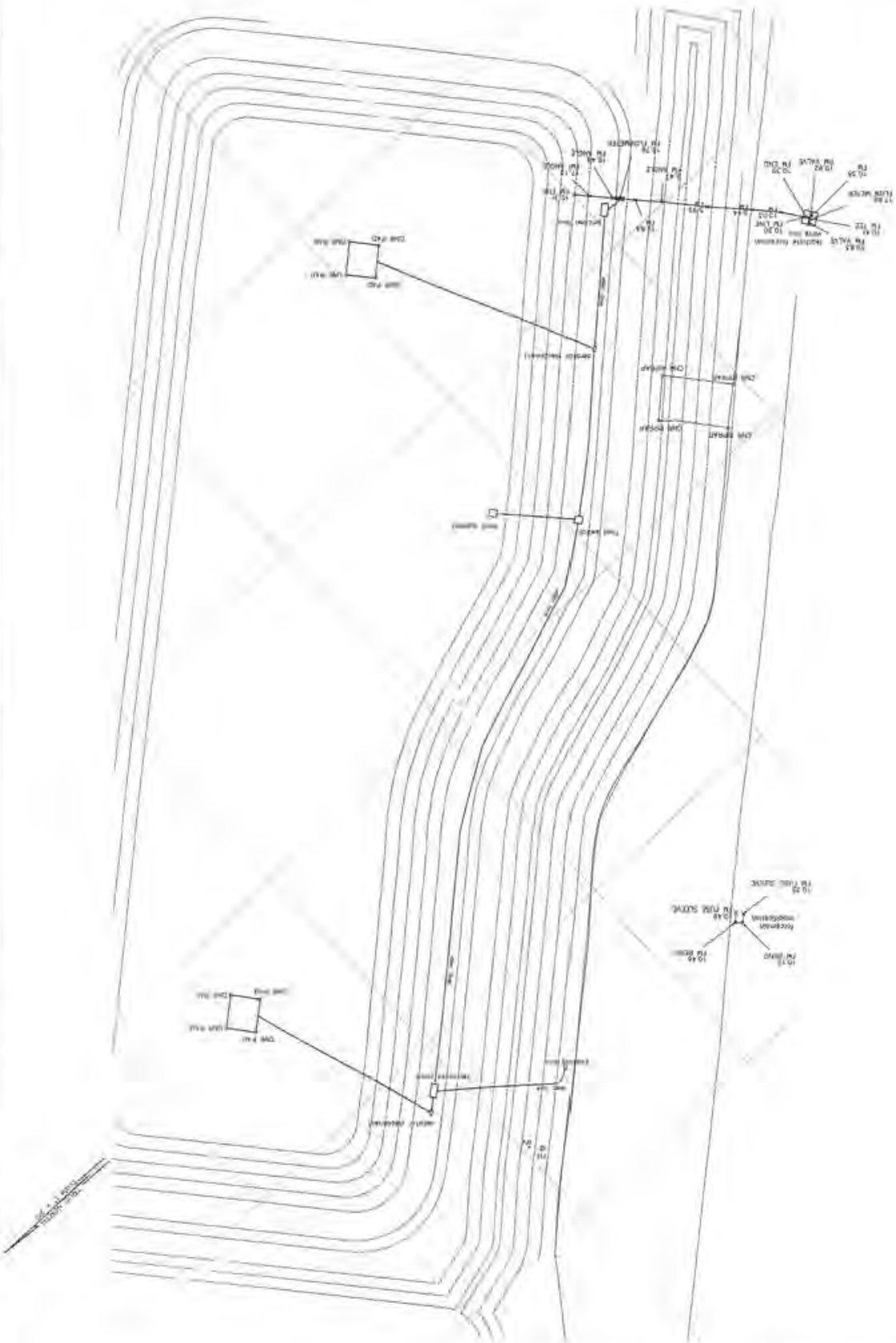
MAP SHOWING  
TERRAIN AND ELEVATION  
CONTOUR LINES  
AND OTHER DATA  
AS SHOWN

UNITED STATES  
NAVY  
NAVY ENGINEERING  
CORPS  
OFFICE OF THE  
CHIEF OF ENGINEERS  
WASHINGTON, D. C.



GRAPHIC SCALE

THIS DATA WAS OBTAINED BY THE USE OF THE  
TRIPLE BEAM LEVEL AND THE DATA IS  
BASED ON A MEAN SEA LEVEL DATUM  
OF 1929. THE DATA IS NOT TO BE  
USED FOR ANY OTHER PURPOSES  
WITHOUT THE WRITTEN PERMISSION  
OF THE CHIEF OF ENGINEERS.



1:500

New Gas Probe  
GP-11-7  
55,787.66 N  
1,556,056.07 E

Abandoned Gas Probe  
GP-11-6  
55,375.31 N  
1,556,044.27 E

New Gas Probe  
GP-11-8  
55,041.79 N  
1,555,906.76 E

GRAPHIC SCALE

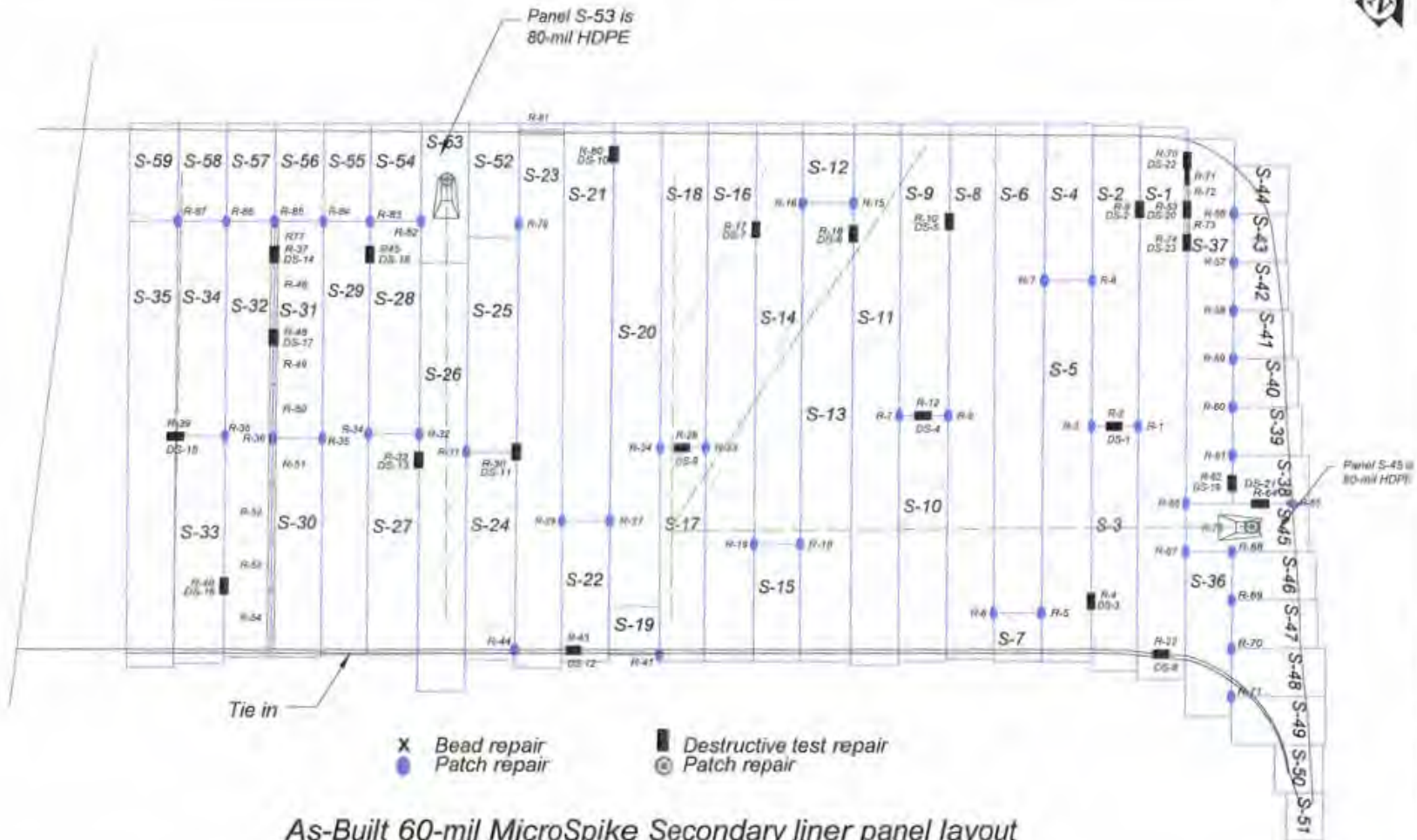


MAP SHOWS  
GAS PROBE LOCATIONS  
EEDAH, GULU, HAWAII  
Prepared for: [unclear]

Scale: 1 inch = 200 feet

BRAND SURVEYING & MAPPING, INC.  
Civil Engineers - Land Surveyors - Geographers

Sheet 1 of 1



**As-Built 60-mil MicroSpike Secondary liner panel layout  
 Phase II Cell 1C, 1D Lateral Expansion**

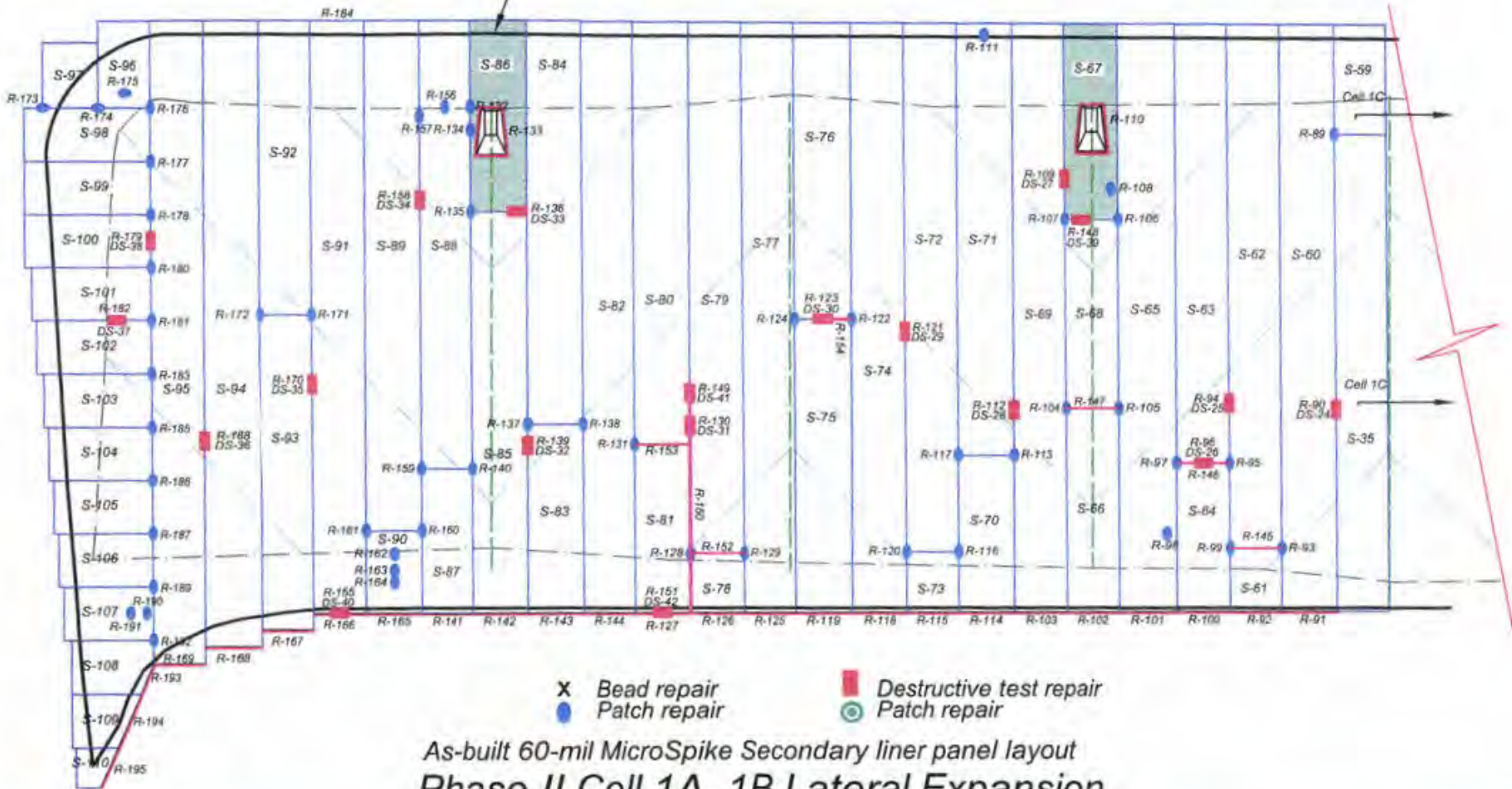
SHEET NO.	DETAIL 	<b>NORTHWEST LININGS &amp;          GEOTEXTILE PRODUCTS, Inc.</b> www.northwestlinings.com 21000 77TH AVE. SOUTH KENT, WA. 98032 (253) 872-0244 (253) 872-0245 FAX		JOB NAME: <b>Kekaha Sanitary Landfill</b>	
				JOB NO. 809150	
				DATE: 5 24 10	CHECKED: 5 28 01
				BY: 5 28 01	SCALE:







80-mil HDPE



As-built 60-mil MicroSpike Secondary liner panel layout  
Phase II Cell 1A, 1B Lateral Expansion

SHEET NO.

DETAIL



**NORTHWEST LININGS &  
GEOTEXTILE PRODUCTS, Inc.**

www.northwestlinings.com  
21000 72TH AVE. SOUTH  
KENT, WA, 98032  
(253) 872-0244 (253) 872-0245 FAX

JOB NAME:

**Kekaha Sanitary Landfill**

JOB NO.

**N 0 9 1 5 0**

DATE:

**9 10 10**

CHECKED:

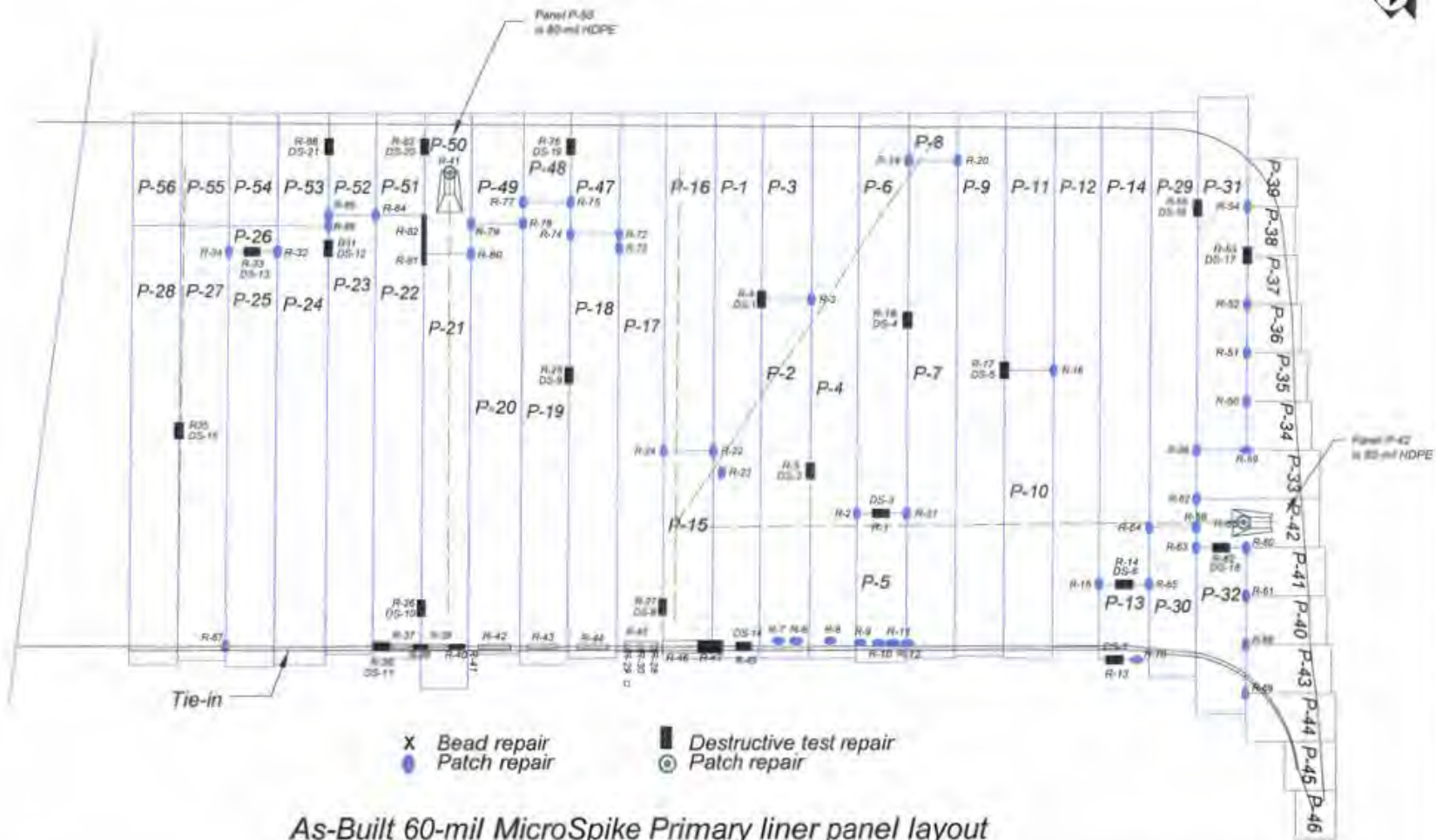
**KL**

BY:

**SG**

SCALE:

**AS SHOWN**

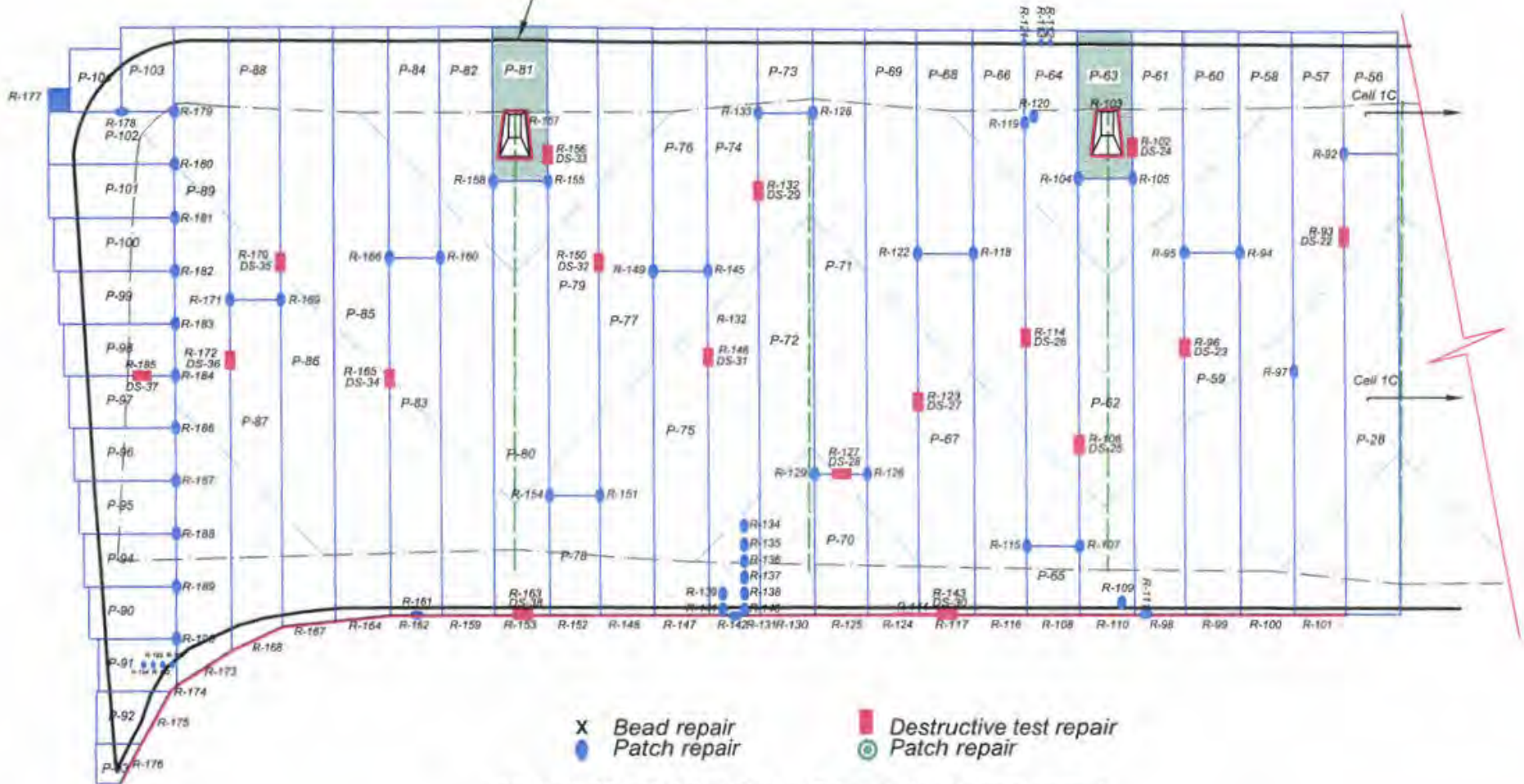


**As-Built 60-mil MicroSpike Primary liner panel layout  
Phase II Cell 1C, 1D Lateral Expansion**

SHEET NO.	DETAIL	<b>NORTHWEST LININGS &amp; GEOTEXTILE PRODUCTS, Inc.</b> www.northwestlinings.com 21000 77TH AVE. SOUTH KENT, WA. 98032 (253) 872-0244 (253) 872-0245 FAX	JOB NAME: <b>Kekaha Sanitary Landfill</b>	
			JOB NO. N 0 9 1 5 0	
			DATE: 5 24 10	CHECKED: 5 28 01
			BY: 5 28 01	SCALE:



80-mil HDPE



X Bead repair  
 ● Patch repair  
 ■ Destructive test repair  
 ⊙ Patch repair

As-built 60-mil MicroSpike Primary liner panel layout  
 Phase II Cell 1A, 1B Lateral Expansion

SHEET NO.

DETAIL



**NORTHWEST LININGS &  
 GEOTEXTILE PRODUCTS, Inc.**

www.northwestlinings.com  
 31000 77TH AVE. SOUTH  
 KENT, WA, 98032  
 (253) 872-0244 (253) 872-0245 FAX

JOB NAME:

**Kekaha Sanitary Landfill**

JOB NO.

**N 0 9 1 5 0**

DATE:

**9 10 10**

CHECKED:

**KL**

BY:


**SG**

SCALE:

**AS SHOWN**



**Appendix R**  
**Geosynthetic Samples**



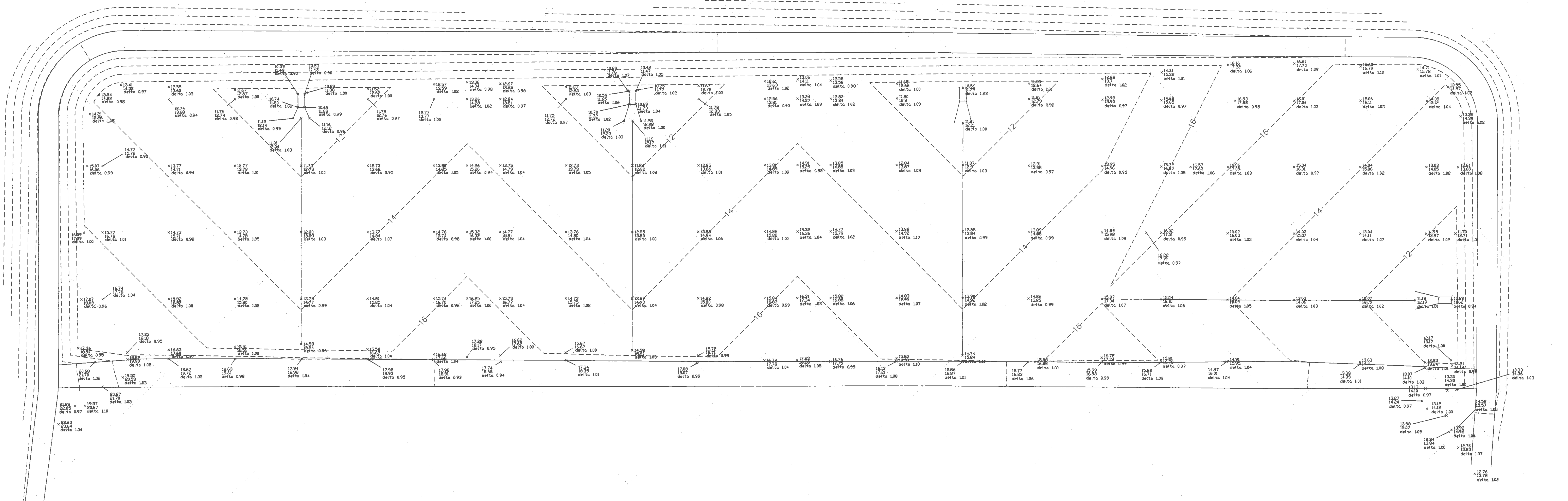
CETCO BENTOMAT® FLW GEOSYNTHETIC CLAY LINER

AGRU 60-MIL MICRO SPIKE® HDPE DOUBLE-SIDED  
TEXTURED GEOMEMBRANE

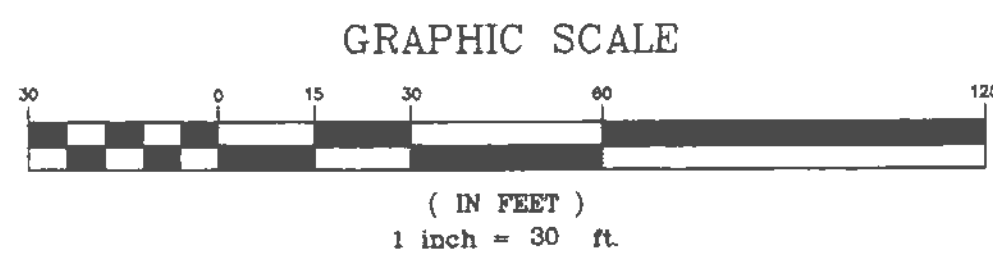
AGRU 80-MIL MICRO SPIKE® HDPE DOUBLE-SIDED  
TEXTURED GEOMEMBRANE

TNS E160 16 OZ/YD<sup>2</sup> NON-WOVEN GEOTEXTILE

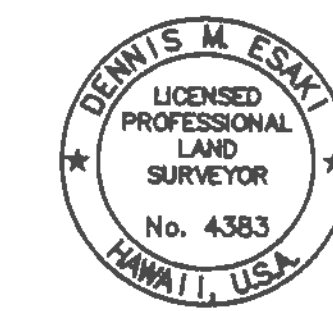
TNS E060 6 OZ/YD<sup>2</sup> NON-WOVEN GEOTEXTILE



Note:  
 PER CONSTRUCTION DRAWINGS PHASE II LATERAL EXPANSION CELL 1 BASE LINER CONSTRUCTION KEKAHA SANITARY LANDFILL  
 PREPARED BY ACCOM DATED APRIL 2009  
 HORIZONTAL DATUM IS BASED ON NAD83 (1986), HAWAII ZONE 4.  
 VERTICAL DATUM BASED ON LOCAL TIDAL.



Legend  
 8.00 Subbase As-Built Elevation  
 8.05 15" Minus Granular Drainage Layer  
 Delta 0.05 Delta (Gravel - Subgrade) Value



THIS WORK WAS PREPARED BY ME  
 OR UNDER MY SUPERVISION

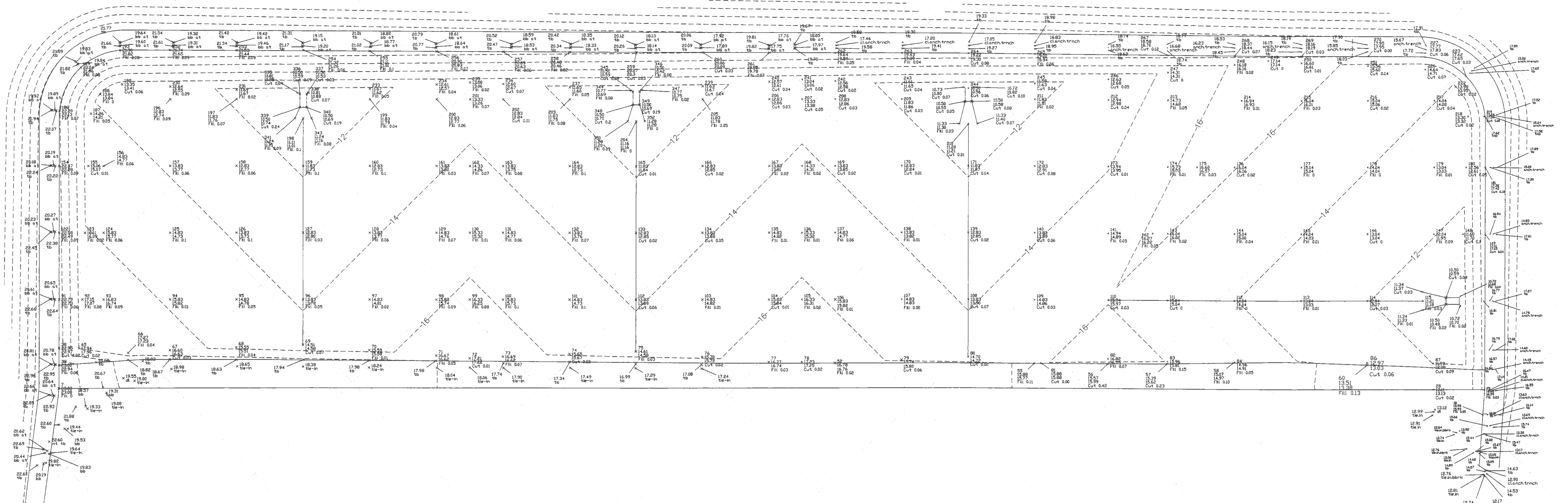
*[Signature]*  
 Signature  
 ESAKI SURVEYING & MAPPING, INC.  
 EXPIRES: APRIL 30, 2012

MAP SHOWING  
 CELL 1 TOP OF GRANULAR DRAINAGE LAYER  
 DATES OF SURVEY - MAY 5, MAY 12,  
 MAY 17, AUGUST 17,  
 and AUGUST 20, 2010

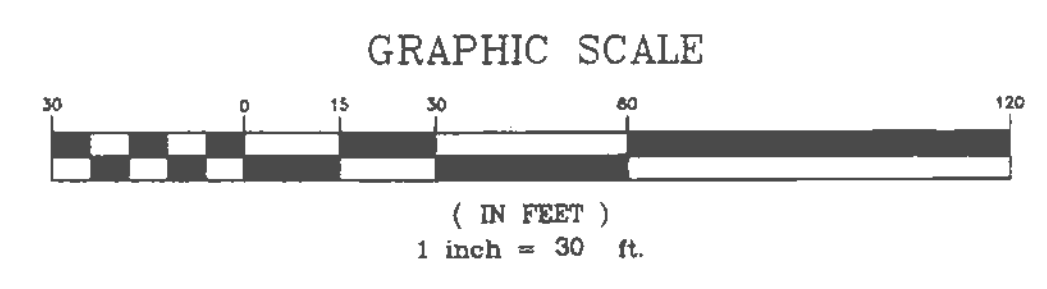
KEKAHA, KAUAI, HAWAII  
 Prepared For: Goodfellow Bros.



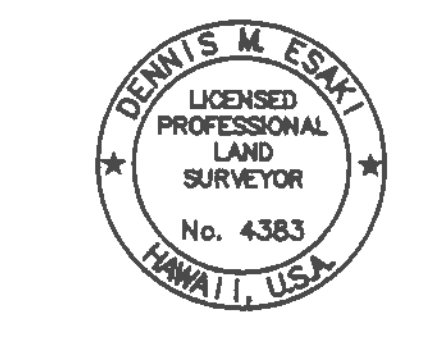
TRUE NORTH  
Scale 1" = 30'



Note:  
 PER CONSTRUCTION DRAWINGS PHASE II LATERAL EXPANSION CELL 1 BASE LINER CONSTRUCTION KEKAHA SANITARY LANDFILL  
 PREPARED BY ACCDM DATED APRIL 2009  
 HORIZONTAL DATUM IS BASED ON NAD83 (1986), HAWAII ZONE 4.  
 VERTICAL DATUM BASED ON LOCAL TIDAL.

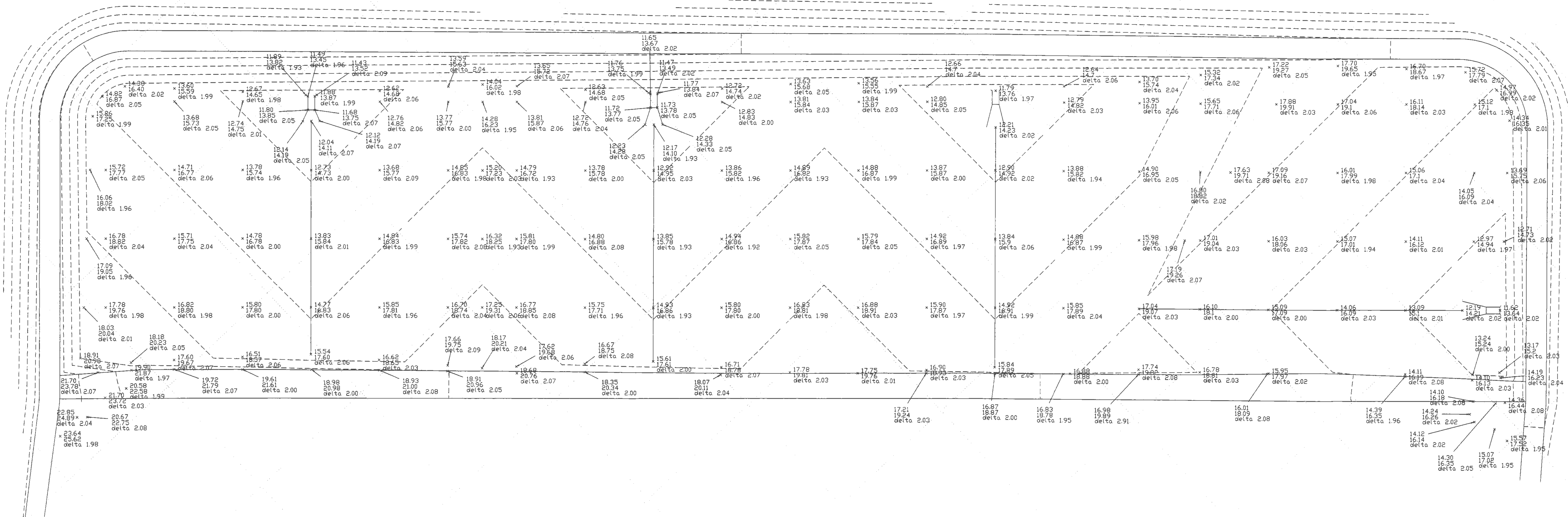


Legend  
 300 Point Number  
 8.00 Design Elevation  
 8.05 Subbase As-Built Elevation  
 Cut 0.05 Cut/Fill Value

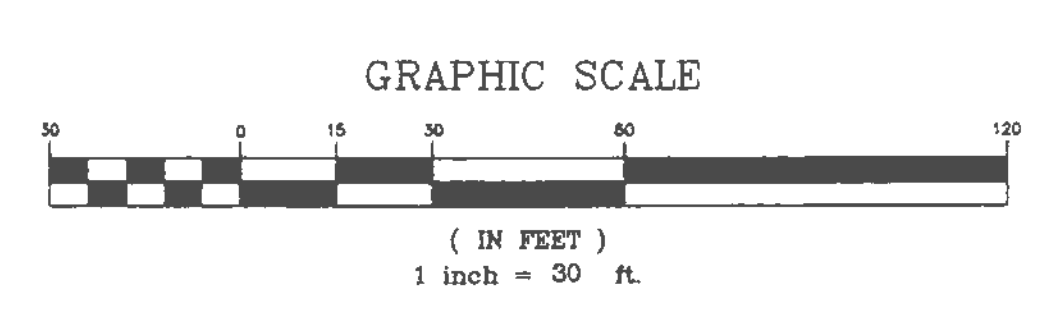


THIS WORK WAS PREPARED BY ME  
 OR UNDER MY SUPERVISION  
 Signature  
 ESAKI SURVEYING & MAPPING, INC.  
 EXPIRES APRIL 30, 2012

MAP SHOWING  
 CELL I SUBBASE AS-BUILT ELEVATIONS  
 DATES OF SURVEY - March 15 -  
 May 7, 2010  
 July 27 - 30, and  
 August 2, 2010  
 KEKAHA, KAUAI, HAWAII  
 Prepared For: Goodfellow Bros.



Note:  
 PER CONSTRUCTION DRAWINGS PHASE II LATERAL EXPANSION CELL 1 BASE LINER CONSTRUCTION KEKAHA SANITARY LANDFILL  
 PREPARED BY AECOM DATED APRIL 2009  
 HORIZONTAL DATUM IS BASED ON NAD83 (1986), HAWAII ZONE 4.  
 VERTICAL DATUM BASED ON LOCAL TIDAL.



Legend  
 8.00 1.5' Granular Drainage Layer As-Built Elevation  
 8.05 Operations Layer As-Built Elevation  
 delta 0.05 Delta (Operations - Granular) Value



THIS WORK WAS PREPARED BY ME  
 OR UNDER MY SUPERVISION

*[Signature]*  
 Signature  
 ESAKI SURVEYING & MAPPING, INC.  
 EXPIRES: APRIL 30, 2012

MAP SHOWING  
 CELL 1 OPERATIONS LAYER AS-BUILT ELEVATIONS  
 DATES OF SURVEY - MAY 26, 2010  
 SEPTEMBER 8, 2010

KEKAHA, KAUAI, HAWAII  
 Prepared For: Goodfellow Bros.