Geosyntec consultants

1111 Broadway, Sixth Floor
Oakland, California 94607
PH 510.836.3034
FAX 510.836.3036
www.geosyntec.com

20 March 2015

Mr. Jesse Frey, P.E.
Waste Management of Hawai'i, Inc.
92-460 Farrington Hwy
Kapolei, HI 96707

Mr. Donald Fujimoto, P.E.
Department of Public Works
County of Kaua'i
4444 Rice Street, Suite 275
Lihue, HI 96776

Subject: Summary of the Second Phase II Liner Investigation
Kekaha Sanitary Landfill, Kekaha, Hawai'i

Dear Messrs:

Geosyntec Consultants, Inc. (Geosyntec) has prepared this report to document the activities and findings of the second Phase II Liner Investigation at the Kekaha Sanitary Landfill near Kekaka, Hawai'i. This work was performed from 23 February through 27 February 2015 in general accordance with the Phase II Liner Investigation Work Plan (work plan) dated 10 October 2014 and proposal dated 7 January 2015.

Background

The Phase II containment system was originally constructed in 1993 and consists of a composite base liner and leachate collection and removal system (LCRS). According to the available on site construction files compiled by Harding Lawson Associates (HLA) in 1993, the floor containment system consisted of the following layers (from bottom to top):

- granular subbase soil;
- a Gundseal® geosynthetic clay liner (GCL) consisting of a layer of sodium bentonite adhered to a 20-mil smooth, high density polyethylene (HDPE) backer geomembrane. The material was installed with the bentonite surface facing upwards and adjacent panels were seamed by overlapping (not welding). The GCL was manufactured by Gundle Lining Systems, a predecessor of GSE Environmental;

- a 60-mil HDPE primary geomembrane (both sides smooth) manufactured by Serrot Corporation, also a predecessor of GSE Environmental; and
- a 2-foot thick drainage sand/operations layer.

The sideslope containment system consists of the following layers (from bottom to top):

- granular subbase soil;
- a 6-inch thick granular foundation layer (compacted sand);
- a Gundseal® GCL;
- a 60-mil, double sided textured (DST), Gundline HD® HDPE primary geomembrane also manufactured by Gundle Lining Systems;
- a layer of drainage sand; and
- at the top of the slope only, a half-roll-width layer of 16-oz/sy nonwoven cushion geotextile extends from the anchor trench to approximately 3 feet (ft) down the 3 horizontal to 1 vertical (3H:1V) sideslope.

Figure 1 shows the typical configuration of the geosynthetics and anchor trench at the perimeter of Phase II.

Leachate is collected in LCRS pipes located in drainage swales running from west to east[1] along the floor of the cell. At the east side of the floor, these pipes penetrate the sideslope containment system where the leachate flows by gravity to a series of cascading leachate collection manholes (LCMs). Seven of the LCMs (LCM-1 through LCM-7) flow by gravity to a pump station at Wet Well #1 where the leachate is pumped to the onsite leachate evaporation pond. LCM-8 through LCM-14 flow by gravity to Wet Well #2, where leachate is pumped to the same leachate evaporation pond. The locations of these components are shown in Figure 2. Phase II of the landfill has been receiving waste since 1993.

[1] The sides of the landfill are oriented approximately 45 degrees from the cardinal directions. For the purpose of this report and documentation, the mountain (mauka) direction is termed "east" and the ocean (makai) direction is termed "west." See Figure 2.

In March 2012, during the Phase II Leachate Management System Modifications construction project, Geosyntec field personnel observed damage in the existing Phase II geosynthetic containment system. The edge of the containment system had been exposed at discrete locations along the landfill perimeter near the LCMs for the construction. Damage was observed in and near the perimeter anchor trench near LCM-2, LCM-3, and Wet Well #1. At each location, the HDPE geomembrane was observed to have multiple, irregular holes that appeared to be mostly concentrated at the leading edge of the material, farthest from the landfill, and in the anchor trench.

In June 2014, after discussions with County of Kaua'i (County) and Waste Management of Hawai'i, Inc. (WMH), Geosyntec returned to the site to conduct a field investigation to assess the extent of damage. Of the 13 test pits (TP-1 through TP-13) excavated on the east, south, and west sides of the Phase II landfill, Geosyntec observed pre-existing damage in the geotextile, 60-mil HDPE geomembrane, and the bentonite layer component of the Gundseal GCL in five test pits located between LCM-1 and LCM-6 (near the southeast corner of Phase II). The remaining eight test pits around Phase II did not reveal any damage to the geosynthetics. During the investigation, Formosan subterranean termites (*Coptotermes formosanus)* were found within the GCL and were suspected to be the cause of damage. The June 2014 investigation was limited to the perimeter of the landfill and only an incidental amount of waste was moved. Prior to backfill of the test pits, an additional layer of cushion geotextile was placed over the exposed geomembrane. In test pits TP-1 through TP-5 where the geomembrane was cut to expose the underlying GCL, an additional layer of geomembrane was placed over the existing material. The investigative cutting of the geomembrane was all beyond the limits of waste and these cuts were not repaired during this initial investigation. Field activities and findings from the June 2014 investigation were documented in a separate report[2].

In July 2014, Mokihana Pest Control of Lihue (Mokihana) installed Sentricon® bait stations in the vicinity of the observed damage in order to eliminate the termite colony. At the start of the baiting process, Mokihana noted that excessive surface disturbance near a colony can cause the colony to move to adjacent areas, and that treatment is more successful when the colonies are left undisturbed long enough to deliver the bait throughout the colony and exterminate it. As such, additional investigation work was put on hold during the baiting and monitoring period. After

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[2] "*Summary of the Phase II Liner Investigation, Kekaha Sanitary Landfill, Kekaha, Hawai'i*" prepared by Geosyntec Consultants, Inc., 24 July 2014, revised 8 August 2014.

120 days, termite activity was found in one bait station, which after another 30 days was almost fully depleted. Mokihana did not observe activity in their auxiliary bait stations. Based on these observations, Mokihana concluded that the colony was exterminated (Attachment F).

Current Scope of Work

WMH and County staff met with the Hawai'i Department of Health (HDOH) on 22 August 2014 to discuss the results of the June 2014 investigation, and it was agreed to extend the investigation another 10 to 15 feet into the landfill in an area of known termite damage and help evaluate how much farther from the landfill edge the damage extends. The work plan and proposal (Attachment A) were developed with HDOH input, and included two main tasks: (i) excavate one test pit between LCM-2 and LCM-3 (hereafter referred to as TP-14), approximately 20 ft from the anchor trench, below the existing waste, and inspect and document the containment system layers for damage; and (ii) patch and weld, as needed, to restore the geosynthetic layers in the new test pit TP-14 as well as the previous test pits TP-1 through TP-5 to pre-investigation conditions.

Field Investigation

Mr. Chris Scott of Geosyntec mobilized to the site on Monday, 23 February 2015, to conduct the liner investigation alongside Earthworks Pacific, Inc. (EPI) and International Lining Technology (ILT). Geosyntec, EPI, and ILT performed the work under contract with WMH. EPI excavated test pit TP-14 approximately 15-ft wide, equidistant between LCM-2 and LCM-3, and extended approximately 20 ft from the perimeter anchor trench into the landfill waste. EPI used a Caterpillar mini excavator to clear and grub and then remove the cover soil, waste, and operations layer sand above the containment system within the test pit. During excavation, EPI's laborer guided the excavator operator to avoid damage to the containment system. After the bulk of the soil, waste, and operations layer were removed with the excavator, the remaining 3 in. of soil above the liner system was hand-dug and then the surface of the geosynthetics was swept with a broom to allow for inspection and documentation. The excavation exposed the flat liner "run-out" at the rim of the cell and the upper 5 to 6 ft (measured vertically) of the 3H:1V side slope (Figure 1).

Geosyntec observed and documented the condition of the geosynthetics within the test pit TP-14. Detailed information is presented in the photographs and daily field reports in Attachments B and C, respectively.

EPI also re-excavated test pits TP-1 through TP-5 (Figure 2), previously excavated in June 2014 to expose the previously cut geomembrane. The excavations proceeded in a similar manner as that for test pit TP-14. Once Geosyntec's observations and field documentation were completed, ILT performed the geosynthetic repairs to restore the containment system at all six test pit locations. Construction quality assurance (CQA) testing of the repairs, including trial welds and vacuum box tests, were performed and documented in Attachment D. Each location was then surveyed by Esaki Surveying and Mapping, Inc. (Esaki) prior to backfill of the test pits. Esaki plotted the repair locations on the Phase II LCRS Modification As-Built Drawing. This drawing showing the test pit repair locations is provided in Attachment E.

The test pits were all backfilled using the materials which had been removed from the test pits and stockpiled separately. Due to material loss from handling and segregation, additional sand and cover soil materials were needed to complete the operations layer and the cover construction. The additional sand and cover soil were hauled from onsite sources designated the "bird sanctuary" stockpile and "mud pond", respectively. Geosyntec visually observed backfilling operations to verify that:

- the operations layer sand was replaced and constructed to the original thickness of 24 inches on the sideslopes and 12 inches on the flat run-out adjacent to the anchor trench;
- all waste materials (TP-14 only) were returned the test pit excavation with exception of oversize materials (greater than approximately 2 ft) and metal and concrete rubble. The large material was hauled to the landfill active face for disposal;
- the cover soil was replaced, compacted, and constructed to the original thickness of 18 inches; and
- the existing soil berm, approximately 3-ft high, located between the anchor trench and the onsite road was restored at the end of construction.

Throughout the construction, EPI performed continuous air monitoring using an Industrial Scientific M40 four-gas meter that measured oxygen (O_2), carbon monoxide (CO), hydrogen sulfide, (H_2S), and the lower explosive limit (LEL) by percent. Geosyntec confirmed that the meter was calibrated prior to the start of work. No elevated readings of CO, H_2S, and percent LEL were detected during construction.

During the field investigation, 15 Sentricon® bait stations were temporarily removed to allow for the test pit excavation. The bait stations were set aside, and should be reinstalled as part of continued, defensive baiting as recommended by Mokihana (Attachment F).

Observations in Test Pit TP-14

Pre-existing damage to the geosynthetic containment system was observed in test pit TP-14. Similar to the previous damage seen in 2012 and 2014, the observed damage was a series of irregularly-shaped, rounded holes through the cushion geotextile, and/or through the underlying 60-mil HDPE geomembrane. In some of these holes, the bentonite layer of the GCL was partially missing. After exposing the surface of the GCL, a series of trails, or tunnels, was found within the bentonite layer. In one location, unlike in the previous investigation, an approximate 2.5-in. by 1.25-in. irregular hole was observed to penetrate through the 20-mil HDPE backer geomembrane of the GCL. Up to this point, all other observed damage to the GCL had been isolated to the bentonite layer. Photos of the damage are provided in Attachment B. While past termite activity was evident, no termites were found in TP-14.

Also similar to the June 2014 investigation, the geotextile and geomembrane holes were most abundant at edge of the liner and the damage was less on the 3H:1V sideslope. All observed penetrations were confined to within 10 ft of the perimeter anchor trench. Likewise, the tunnels observed in the GCL were mostly at the rim of the landfill and diminished on the 3H:1V sideslope. A few trails were observed to extend down the slope approximately 14 ft from the anchor trench and then terminated. The limit of waste at TP-14 was measured at approximately 10.5 ft from the anchor trench. Therefore, below the waste, the only observed damage was a limited number of termite trails within the betonite layer of the GCL and both the underlying 20-mil backer geomembrane and overlying 60-mil primary geoemembrnae were intact.

All observations from the field investigation were discussed on site with representatives from WMH and the County.

Restoration of Phase II Containment System

In test pits TP-1 through TP-5 and TP-14, the 16 oz/sy nonwoven geotextile and the 60-mil HDPE geomembrane had been cut to expose the underlying GCL for investigation of damage. As part of this second liner investigation, ILT mobilized to the site to restore the geosynthetic layers to pre-investigation conditions. Additionally, at the one location where damage was observed in the 20-mil HDPE backer geomembrane of the GCL, ILT constructed a

geomembrane patch to repair the hole. Geosyntec performed CQA oversight of all the geosynthetic restoration work.

At each test pit location, the containment system restoration generally proceeded as follows:

GCL

In test pit TP-14 where one hole was observed in the 20-mil HDPE backer geomembrane, a geomembrane patch was constructed over the penetration. A 1-ft by 1-ft area around the penetration was first cleared of bentonite and cleaned. A 1-ft by 1-ft patch of GSE-manufactured 60-mil DST HDPE geomembrane was then extrusion welded to the 20-mil HDPE backer geomembrane. Prior to welding, ILT constructed an extrusion-weld trial seam using the site-specific materials to verify the welding method did not damage the 20-mil geomembrane and provided a bond between the geomembranes. Coupons were cut from the trial seam and tested for peal and shear using the calibrated field tensiometer. Once the patch was constructed, ILT perform vacuum box testing of weld to verify the integrity of the weld. Trial seam and vacuum box test results are provided in Attachment D.

Where termite trails/tunnels were observed (and above the welded patch described above), a layer of AGRU-manufactured GeoClay NN66 GCL was placed over the existing Gundseal GCL. The purpose of adding this extra GCL was to provide a full layer of bentonite where the original bentonite layer was damaged.

60-mil HDPE Geomembrane

The existing 60-mil HDPE geomembrane, previously cut, was folded back over the GCL. Patches using GSE-manufactured 60-mil DST HDPE geomembrane were placed on top of the previously-cut geomembrane and extrusion welded to the geomembrane. Prior to welding, ILT constructed extrusion-weld trial seams of the site-specific materials. Coupons were cut from the trial seam and tested for peal and shear using the calibrated field tensiometer. Once the patches were constructed, ILT perform vacuum box testing of welds to verify the integrity of the welds. Trial seam and vacuum box test results are provided in Attachment D.

16 oz/sy Nonwoven Geotextile

A layer of 16 oz/sy nonwoven geotextile was placed over the previously cut geotextile with an approximate 8- to 12-inch overlap.

Geosyntec verified that the geosynthetics construction and field testing was performed in accordance with the work plan and proposal. Details of the construction are presented in the field daily reports (Attachment C). Other CQA documentation, such as the tensiometer calibration and repair field logs, for the geosynthetics restoration are also provided in Attachment D.

Conclusions and Recommendations

This field investigation exposed one test pit located in the area of the greatest concentration of previously-observed termite damage. This location of greatest activity was selected in an attempt to show the westerly extent of damage to the Phase II containment system. Based on the damage observed in test pit TP-14, damage to the containment system from the subterranean termites appears limited to the perimeter of the containment system, along the anchor trench, the 3-ft liner run-out, and the upper portion of the 3H:1V sideslopes. All geomembrane damage seen thus far occurs within a zone, approximately 10 ft wide measured from the anchor trench. The observed geomembrane damage is beyond the limit of waste. GCL damage mostly consists of narrow trails or tunnels with the bentonite, concentrated near the anchor trench and 3-ft run out and is mostly beyond the limit of waste. Some trails were observed to extend between 4 and 5 ft below the waste footprint.

In order to restore the original containment system to the full liner limit, roughly 400 ft of the Phase II containment system along the landfill perimeter between LCM-1 and LCM-6 would need to be exposed. Once exposed, all GCL with termite trails should be replaced or repaired and the damage to the overlying the geomembrane and geotextile should also be repaired. Any repairs should be performed by qualified personnel and CQA should be performed under the supervision of a professional engineer in order to re-certify the repaired areas.

With the observed damage mostly beyond the limit of waste and the primary geomembrane observed to be intact below the waste footprint, Geosyntec considers the potential for a leachate release from these damaged areas to be low. Likely, this termite damage has existed for many years and Geosyntec is not aware of any evidence of a previous release. Therefore, the need to restore the containment system is not urgent. The restoration described above will require heavy equipment, a specialized liner installer, earthwork and liner CQA, and coordination with landfill operations. Therefore, Geosyntec recommends that the restoration work be performed in conjunction with a future landfill construction project, such as Cell 2 or Final Cover construction which would already include these components.

In the meantime, Geosyntec recommends continued termite control treatment and monitoring to reduce the potential for further damage to the existing containment system. This includes reinstalling the 15 bait stations removed for this field investigation and any ongoing baiting/monitoring.

The areas of observed damage coincide with the location of an existing swale where water can pond. This water source may be an attractant for the termites and Geosyntec recommends maintaining positive stormwater drainage in this area to prevent future ponding.

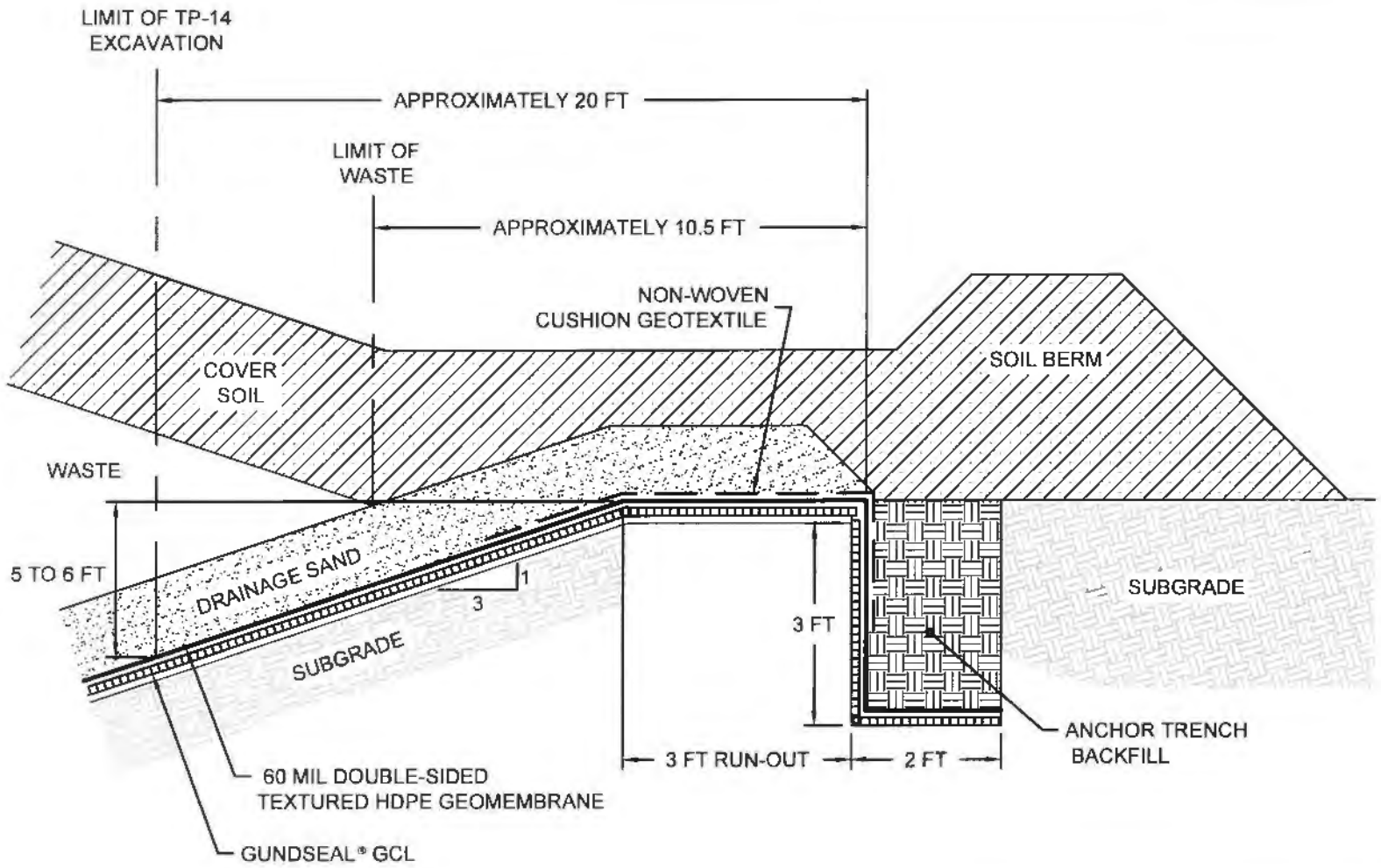
Geosyntec appreciates the opportunity to be of continued service to the WMH and the County. Please feel free to contact me with any questions regarding this investigation summary.

Sincerely,

Michael J. Minch, P.E.
Associate

Attachments: Figure 1. Configuration of the Perimeter of Phase II at Test Pit #14
Figure 2. Test Pit Locations
Attachment A Liner Investigation Work Plan, Kekaha Landfill, prepared by Waste Management of Hawai'i
Attachment B – Photographic Documentation
Attachment C Daily Field Reports
Attachment D Geosynthetics CQA
Attachment E – As-Built Survey
Attachment F Mokihana Pest Control, Inc., Sentricon Program Summary for Kekaha Waste Management

Figures



NOT TO SCALE

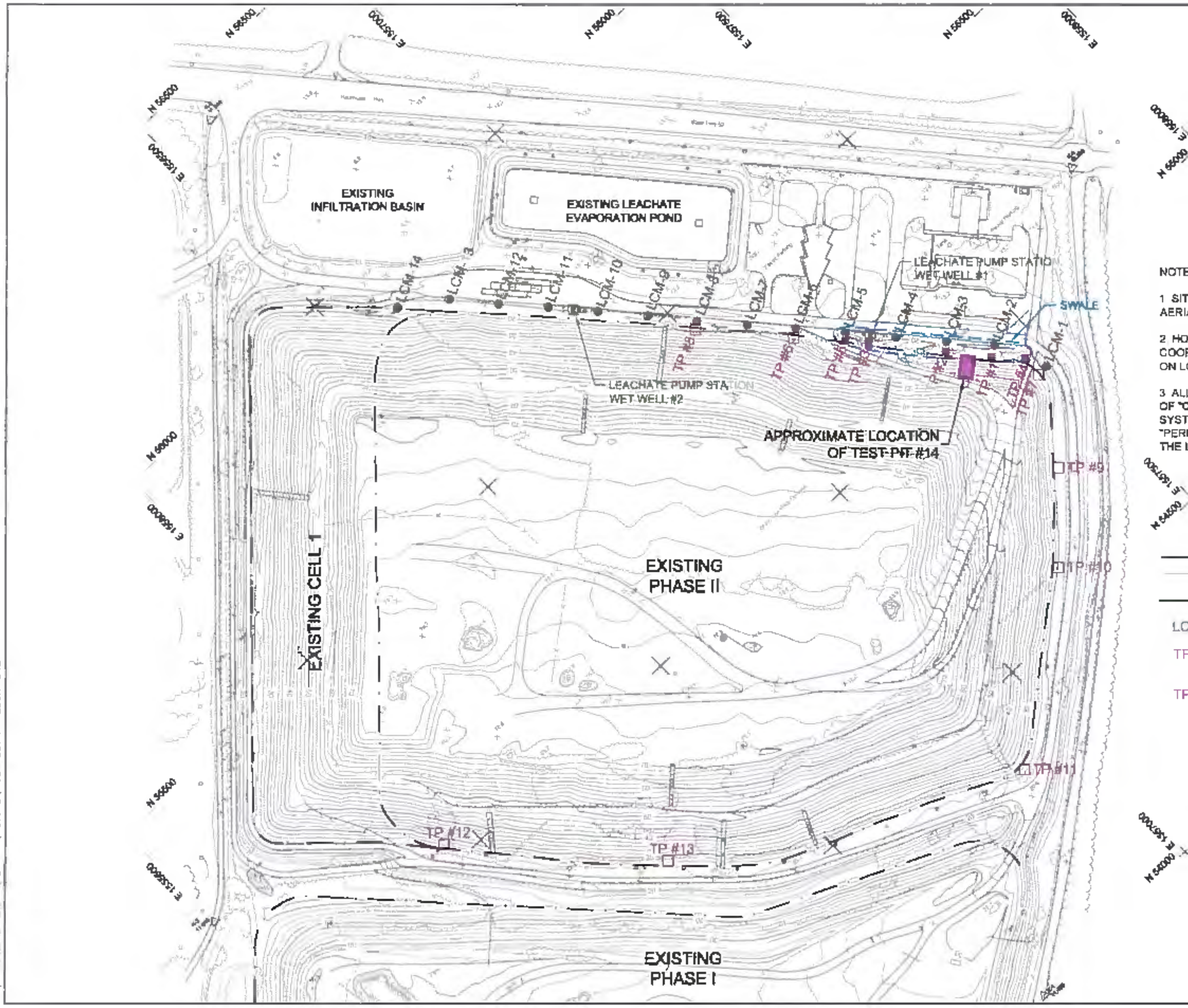
CONFIGURATION OF THE PERIMETER OF
PHASE II AT TEST PIT #14
KEKAHA SANITARY LANDFILL
KEKAHA, COUNTY OF KAUA'I, HAWAI'I

Geosyntec consultants

FIGURE
1

PROJECT NO: WG1985 | MARCH 2015

P:\CADD\CIVIL 3D\WM\KEKAHA\WG1548\FIG1-PHASE II CONFIGURATION



NOTES

1. SITE TOPOGRAPHY PROVIDED BY MILLER CREEK AERIAL MAPPING, LLC AERIAL PHOTO DATED 24 MARCH 2014

2. HORIZONTAL COORDINATES ARE BASED ON HAWAII STATE PLANE COORDINATE SYSTEM, ZONE 4, NAD 83 (1986). VERTICAL DATUM IS BASED ON LOCAL TIDAL.

3. ALL LOCATIONS ARE APPROXIMATE AND DERIVED FROM DRAWING NO. 2 OF "CONSTRUCTION DRAWINGS, PHASE II LEACHATE MANAGEMENT SYSTEM MODIFICATIONS", AECOM, OCTOBER 2010. NOTE THAT THE "PERMITTED WASTE LIMIT" FROM AECOM DOES NOT CORRESPOND WITH THE LIMIT OF LINER OBSERVED IN THE FIELD.

LEGEND

60	EXISTING GROUND ELEVATION (FEET) (NOTES 1 AND 2)
— · —	PERMITTED WASTE LIMIT (NOTE 3)
LCM-1 ●	EXISTING LEACHATE COLLECTION MANHOLE (NOTE 3)
TP #1 ■	APPROXIMATE TEST PIT LOCATION WITH DAMAGE OBSERVED
TP #9 □	APPROXIMATE TEST PIT LOCATION WITH NO DAMAGE OBSERVED

0 200' 400'

SCALE IN FEET

TEST PIT LOCATIONS
KEKAHA SANITARY LANDFILL
KEKAHA, COUNTY OF KAUA'I, HAWAI'I

Geosyntec consultants

FIGURE 2

PROJECT NO: WG1985 | MARCH 2015

P:\CADD\CIVIL 3D\WM\KEKAHA\WG1985\FIG2 TEST PIT LOCATIONS

Attachment A

Liner Investigation Work Plan, Kekaha Landfill
Prepared by Waste Management of Hawai'i

WASTE MANAGEMENT OF HAWAII, INC.
92-460 Farrington Highway
Kapolei, Hawaii 96707
(808) 668-2985

October 10, 2014

Mr. Donald Fujimoto, P.E.
Environmental Service Officer
County of Kauai
4444 Rice Street, Ste 295
Lihue, HI 96766

Subject: Phase II Liner Investigation,
Kekaha Sanitary Landfill, Kauai, Hawaii

Dear Mr. Fujimoto:

As you are aware, the County of Kauai (COK) has contracted with Waste Management of Hawai'i (WMH) to investigate and document the extent of liner damage that was discovered and reported to COK during the Leachate System Modifications Project at Kekaha Landfill. Waste Management of Hawai'i and Geosyntec Consultants conducted an initial test-pit investigation to evaluate the condition of the Phase II containment system at the Kekaha Landfill. The finding from this investigation were presented in a letter report which detailed observed damage to the cushion geotextile, 60-mil HDPE geomembrane, and damage to the bentonite layer of the geosynthetic clay liner (GCL). The damage was observed near the edge of the landfill over an approximate 400-ft length adjacent to the administration building. During the investigation, Formosan subterranean termites were found within the GCL and are suspected to be the cause of the damage. This investigation was limited to only the perimeter of the containment system (approximately 5 feet inward from the crest of the lined sideslope), and since waste had not been placed to the edge of the containment system in this area, only a small amount of waste was excavated at the time.

WMH and the County of Kaua'i (County) met with representatives from the Hawai'i Department of Health (HDOH) on August 22, 2014 to discuss the findings of the investigation and discuss the next steps. The result of that discussion was the request to extend the investigation another 10 feet to 15 feet into the landfill in an area of known damage to examine the liner materials and help evaluate how much farther from the landfill edge the damage extends. At this time, we are proposing to uncover and investigate the integrity of the geosynthetic liner materials an additional 15 feet into the

waste in Phase II between LCM-2 and LCM-3. The results of this additional investigation would then be used to evaluate the potential need to take further action.

Prior to embarking on this additional investigation, the following elements should be considered to maintain site containment of waste and leachate, protect worker health and safety, and maintain site access.

Status of the Termite Colony. Mokihana Pest Control began Sentricon® bait treatment of the existing termite colony in July 2014. Representatives of Mokihana advised that disturbance of the colony may prompt it to migrate to another area of the site. Based on this advice, ground disturbance should be minimized until the termite activity can be confirmed to have decreased through monitoring of the bait treatment system. If the termite activity has dropped off significantly in response to successful baiting (i.e. by extermination of the colony), then the risk of colony migration would be reduced. The 30-day follow up inspection of the bait treatment systems by Mokihana Pest Control showed no termites present in the treated area. Mokihana representatives stated that termite colony elimination usually takes between 1-3 months. Mokihana will continue to inspect the bait stations monthly. It is assumed that the colony will be eradicated from the area by the time this additional investigation activity will commence.

Repair of Investigative Damage. During the previous investigation, the geomembrane was cut open to inspect the condition of the underlying GCL. Since there was no overlying waste in these test pits, each test pit was closed by overlapping geosynthetic materials without welding. By extending the investigation an additional 15 feet into the waste, any investigative damage to the geosynthetics should be welded after inspection in order to restore the pre-investigation condition and maintain the existing containment. A liner crew with welding capabilities should be onsite with material and equipment ready to complete repairs. It is assumed that new geosynthetic liner materials would need to be procured, tested for conformance, and shipped to the site. The specific geosynthetic testing requirements, parameters, and frequencies would need to be verified by the County of Kauai's design engineer for Kekaha Landfill, assumed to be AECOM. The process of liner procurement, testing, and shipping of the materials to the site could take up to 90 days depending on material availability.

Location. The most logical place to conducte the additional test pit is between LCM-2 and LCM-3. This area was shown to bave the greatest amount of damage, and would be the most informative if no damage was observed farther down the sideslope.

Waste Slopes. The lined side slope descends into the landfill at 3H:1V. The existing waste slope in this area varies from 3H:1V to 3.5H:1V. In order to extend the excavation 10 feet beyond the previous investigation (i.e., a total of 15 feet from the crest of the lined sidelsope), the leading the liner will be exposed approximately 10 to 15 feet below the existing ground surface. For safety reasons and to allow for access for inspection and repairs, the waste slopes should be cut back at a 2H:1V slope. Assuming a 10-foot wide test pit, this could result in approximately 250 cubic yards of material being excavated in order to lay back the slopes. Alternatively, the test pit could be shored or braced to allow for a steeper cut.

Landfill Access. With the main access ramp onto the landfill located just uphill of this investigation area the 2H:1V cut slope which will start at the liner elevation will extend to the edge of the main landfill access road. Extending the investigation farther into the landfill may not be possible without blocking off the road so it can be partially cut out, or shoring the excavation at a steeper slope. It is assumed that the landfill will continue to operate during this investigative work so coordination with landfill operations on landfill access will be essential.

Asbestos. Contrary to the previous investigation, this work will require handling more than the incidental waste volume. Site asbestos records should be consulted to verify if asbestos will be encountered. A 45-day advance notification to the EPA may be required depending on the asbestos records.

Landfill Gas and Leachate Exposure. Field crews should be equipped with landfill gas meters, wear proper personal protective equipment, and he trained on the hazards of landfill gas and leachate. Crews should know how to operate the meters, and avoid exposure. If unsafe working conditions are encountered, work will stop so that hazards may be addressed and mitigated until they become safe to work again.

During this investigation, CQA personnel will be on site to document the findings and any associated liner repair work that may occur. Upon completion of this next phase of investigation, we will report our findings to you so that you may work with the Hawaii Department of Health (HDOH) to determine the next steps if necessary.

Once you have concurrence from HDOH on this next step in the investigation efforts, we will move forward with the field work at your direction.

Respectively submitted,

Jesse Frey, P.E.

Engineer
Waste Management of Hawaii

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

LINDA ROSEN, M.D., M.P.H.
DIRECTOR OF HEALTH

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

In reply, please refer to:
EMD/SHWB

October 28, 2014

S1060KMK

Mr. Donald Fujimoto
Environmental Service Officer
County of Kauai
4444 Rice Street, Suite 295
Lihue, HI 96766

Dear Mr. Fujimoto:

SUBJECT: Phase II Liner Investigation
Kekaha Sanitary Landfill
Solid Waste Management Permit No. LF-0052-13

The Department of Health (DOH), Solid and Hazardous Waste Branch, Solid Waste Section (SWS) acknowledges receipt of your October 15, 2014 e-mail. Attached to the e-mail was an October 10, 2014 letter from Mr. Jesse Frey of Waste Management of Hawaii requesting approval to investigate the integrity of the geosynthetic liner materials an additional fifteen (15) feet into the waste in Phase II between Leachate Conveyance Manhole (LCM) 2 and LCM3.

The SWS has reviewed the submittal and the request has been approved with respect to solid waste laws and regulations, subject to the following conditions:

1. The welding done to repair the investigative damage to the geosynthetic clay liner (GCL) will encompass both the GCL to be investigated and the GCL previously investigated, but not yet repaired. The liner repairs shall be performed in accordance with Special Condition B.4 of the subject permit, and item number 2 of this letter.

2. Upon completion of construction, the professional CQA engineer shall prepare a report for submittal to the DOH containing, at a minimum:

   a. Documentation of quality assurance/quality control testing procedures.
   b. Summary of field test results.
   c. Summary of results of laboratory analyses.

d. A map of each sector showing panel layouts as installed.
e. Certification that all weld test results and vacuum or pressure testing of all welded seams was visually observed.
f. Certification that the bottom liner and leachate collection system have been installed in accordance with the plans as approved by the DOH.
g. As-built and survey drawings documenting the cell construction, including the location and elevation of base grades, liner system, and leachate collection system.
h. Detailed documentation to show that panels were properly joined to liner in previous constructed sections, and/or the construction of anchor trenches and berms.
i. Identification of any deviations from the construction plan, reason for the deviation and effects on the integrity of the design.

3. The conditions of the subject permit shall be maintained, including the application of daily cover and proper dust control measures.

4. The location of the active disposal area will be a safe distance from the area to be investigated.

Our review of your proposal was limited to solid waste laws and regulations. The owner and operator are also responsible to comply with all other applicable regulations. If you have any questions regarding this letter, please contact Mr. Kevin Kihara 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

WASTE MANAGEMENT

January 7, 2015

Mr. Troy Tanigawa
Environmental Service Management Engineer
County of Kauai
4444 Rice Street, Ste 275
Lihue, HI 96766

Subject: Proposal for Phase II Geosynthetic Liner Investigation
Kekaha Sanitary Landfill, Kauai, Hawaii

Dear Mr. Tanigawa,

As requested by the County of Kauai (County), Waste Management of Hawaii (WMH) is providing this proposal for additional investigation of the geosynthetic liner damage in Phase II of the Kekaha Sanitary Landfill. During the initial field investigation in June 2014, Geosyntec Consultants, Inc. (Geosyntec) observed damage to the existing cushion geotextile, 60-mil HDPE geomembrane, and damage to the bentonite layer of the geosynthetic clay liner (GCL) near the edge of the landfill over an approximate 400-ft length adjacent to the administration building. During the investigation, Formosan subterranean termites were found within the GCL and are suspected to be the cause of the damage.

WMH and County staff met with the Hawaii Department of Health (HDOH) on August 22, 2014 to discuss the results of the June 2014 liner investigation and discuss the next steps. The result of that discussion was the request to extend the investigation another 10 feet to 15 feet into the landfill in an area of known damage to examine the liner materials and help evaluate how much farther from the landfill edge the damage extends. The scope of work and associated budget presented herein is based on WMH's general work plan outlined in our submittal to the County on October 10, 2014 along with the conditions of approval provided by the HDOH on October 28, 2014.

SCOPE OF WORK

WMH and its sub-contractors will perform the following scope of work:

- select one location between LCM-2 and LCM-3 and excavate one additional, 15-ft wide test pit an additional 15 feet into the waste of Phase II (i.e. 20 feet measured from the perimeter anchor trench) sloping the excavated slopes at an inclination of 2H:1V;

- monitor the work area for landfill gas, and hydrogen sulfide throughout the site work and take corrective actions if encountered;
- haul excavated waste materials (estimated to be about 250 CY) to the active face of the landfill for disposal by County personnel and equipment;
- near the liner surface, carefully expose the geosynthetic liner material using hand shovels and brooms to avoid damage to the geosythetics;
- inspect, photograph, and document the condition of the existing geomembrane;
- cut open the geomembrane to expose the underlying GCL taking care not to cut or damage the GCL[1];
- inspect, photograph, and document the condition of the GCL and extent of any termites or termite trails within the GCL bentonite;
- notify the County of the observed conditions;
- patch, or re-weld the geomembrane by extrusion welding to restore the pre-investigation condition. Material for any geomembrane patches will be from the onsite stockpile of surplus material from the Cell 1 construction;
- perform construction quality assurance measures on the geomembrane repairs (i.e. trial welds and vacuum box testing) to restore the pre-investigation condition. The CQA activities will be performed under the supervision of a registered professional engineer and documented in the report of findings;
- survey the location and limits of the test pit and repairs;
- backfill the test pit with operations layer soil which is assumed to be provided by the County from the existing onsite sand stockpile;
- backfill the remainder of the test pit to restore grade and match the surrounding topography using imported soil from the nearby "mud pond" borrow area.
- prepare a draft report of findings for review by the County;
- prepare a final report of findings incorporating the County's comments for the County's submittal to DOH.

With an earthwork contractor, liner crew, surveyor, and CQA firm onsite for the above scope, WMH also proposes to re-excavate test pits previous backfilled in June 2014 where the overlying geomembrane had been cut as part of the investigation. At these locations, the geomembrane

[1] Similar to the June 2014 investigation, WMH intends to leave the existing GCL in its existing condition and not damage it within the waste containment area. In the event that accidental damage is caused within the waste containment area, a patch will be made using a layer of 60-mil geomembrane welded to the existing 20-mil geomembrane backer component of the Gundseal GCL overlain by a piece of geotextile-backed GCL available from existing WMH's stockpiles on Oahu. Due to the long lead time, cost, and our intent to not damage the onsite GCL within the waste containment area, WMH does not propose to have Gundseal GCL onsite for patching purposes.

will also be patched, re-welded, and re-certified by the CQA engineer. As with the new test pit, these repairs will be surveyed and documented in the same report of findings.

BUDGET

WMH estimated a preliminary budget of $68,112 to complete the above scope of work. A detailed cost estimate is shown in Table 1.

Please contact us should you have any questions or comments, or if you need additional information.

Respectively submitted,

Jesse Frey, P.E.
Construction Manager

Attachments: Table 1. Preliminary Cost Estimate
Project Schedule

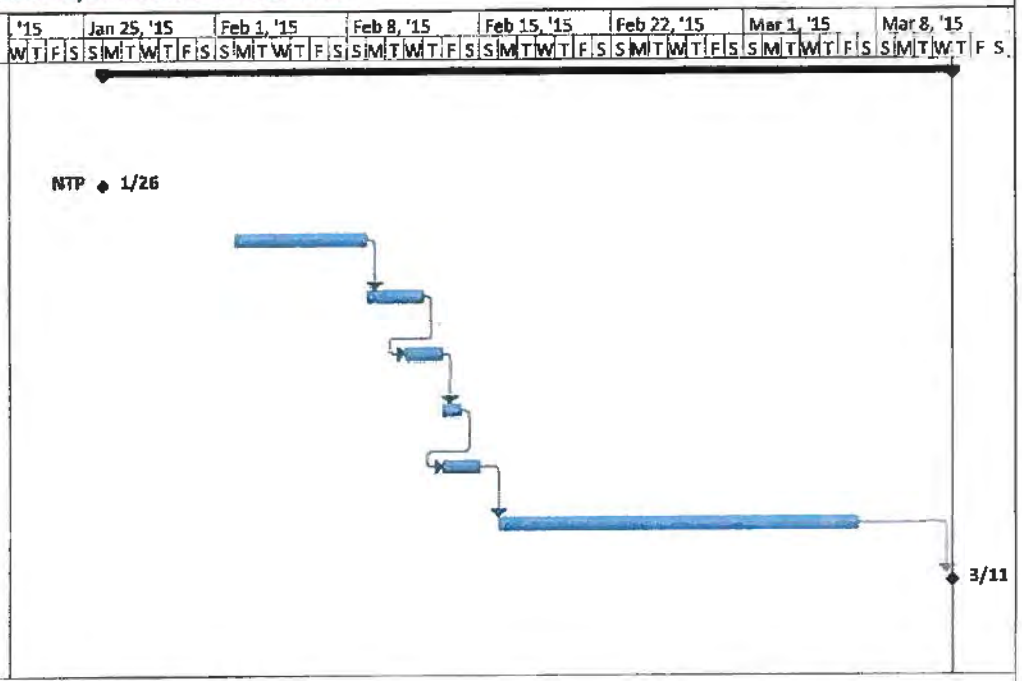
Kekaha LF Phase II Geosynthetic Liner Investigation
Preliminary Cost Estimate
Kekaha Sanitary Landfill, Kekaha, HI
January 7, 2016

	Units	Approx. Rate	Quantity	Dollars
Field Work				
Earthwork Contractor (excavate waste material, machine and hand labor)	lump sum	$17,500.00	1	$17,500
CM/CQA Oversight (project management and CQA services, including reporting)	lump sum	$24,634.00	1	$24,634
GeoSynthetic Liner material shipping (GCL, liner welding rod)	lump sum	$2,000.00	1	$2,000
GeoSynthetic Liner Installation/Repair Services	lump sum	$8,500.00	1	$8,500
Surveying	lump sum	$6,500.00	1	$6,500
Subtotal				$59,134

SUBTOTAL COST	**$59,134**
Contingency @ 10%	**$5,913**
Hawaii General Excise Tax @ 4.712%	**$3,065**
TOTAL ESTIMATED COST	**$68,112**

Kekaha Sanitary Landfill, Kauai, Hawaii

ID	Task Name	Duration	Start	Finish
1	**Phase II Geosynthetic Liner Investigation**	**45 days**	**1/26/15**	**3/11/15**
2	Notice to Proceed	0 days	1/26/15	1/26/15
3	Mobilization	7 days	2/2/15	2/8/15
4	Excavation/Investigation Work	3 days	2/9/15	2/11/15
5	Geosynthetics Repairs	2 days	2/11/15	2/12/15
6	Surveying	1 day	2/13/15	2/13/15
7	Backfill Excavation	2 days	2/13/15	2/14/15
8	Findings Report Preparation	19 days	2/16/15	3/6/15
9	Findings Report Submittal to County of Kauai	0 days	3/11/15	3/11/15



Project: Kekaha Phase II Geosynthetic Liner Investigation
Date: 1/7/15

Task	External Tasks	Manual Task	Finish-only		
Split	External Milestone	Duration-only	Deadline		
Milestone	Inactive Task	Manual Summary Rollup	Progress		
Summary	Inactive Milestone	Manual Summary			
Project Summary	Inactive Summary	Start-only			

Attachment B

Photographic Documentation

Photo 1. Test pit location TP-14 (between LCM-2 and LCM-3) prior to construction

Photo 2. Excavating existing cover soil at TP-14

Photo 3. Excavating existing operations layer sand at TP-14

Photo 4. Holes in both the 16 oz/sy non-woven cushion geotextile and 60-mil HDPE geomembrane

Photo 5. Holes in the existing 60-mil HDPE geomembrane were confined to the anchor trench, flat run-out, and upper portion of the 3H:1V sidelope (dashed white lines marks approximately 10.5 ft from anchor trench)

Photo 6. Limit of waste shown beyond area of damage (to right of white line)

Photo 7. Trails/tunnels in the bentonite layer of the Gundseal GCL

Photo 8. One hole observed in the 20-mil HDPE backer geomembrane of the Gundseal GCL

Photo 9. Prior to welding repair patches, trial seams are performed using the extrusion welder and site-specific materials; a trial seam (above) was prepared for the 20-mil HDPE geomembrane and 60-mil HDPE geomembrane.

Photo 10. Trial weld seam strengths are measured destructively using the field tensiometer

Photo 11. Abrading 20-mil backer geomembrane surface before extrusion welding a repair patch

Photo 12. Extrusion welding the 60-mil HDPE geomembrane patch to the 20-mil HDPE backer geomembrane

Photo 13. Non-destructive vacuum box testing to verify integrity of the patch extrusion weld

Photo 14. Placing AGRU-manufactured GCL over existing Gundseal GCL

Photo 15. Extrusion welding the 60-mil HDPE geomembrane patch to the existing 60-mil HDPE geomembrane

Photo 16. Non-destructive vacuum box testing to verify integrity of extrusion weld

Photo 17. Restoring the operations layer sand material above the repaired geosynthetics

Photo 18. Test pits TP-1 through TP-5 from the June 2014 investigation were all similarly restored; AGRU-manufactured GCL placed over existing Gundseal GCL (above)

Photo 19. Extrusion welding 60-mil HDPE geomembrane patch in test pit from the June 2014 investigation

Photo 20. Non-destructive vacuum box testing of extrusion patch in test pit from the June 2014 investigation

Photo 21. Placing waste back in test pit TP-14 to its original limits

Photo 22. Oversize particles and metal/concrete rubble which might damage geosynthetics were removed for disposal at the active face.

Photo 23. Placing, compacting, and restoring cover soil above waste and operations layer sand

Attachment C

Daily Field Reports

Geosyntec consultants

Kekaha Sanitary Landfill
Kekaha, Kauai, Hawaii

DAILY FIELD REPORT **Report Sequence No.: 001**

PROJECT: Kekaha Sanitary Landfill

LOCATION: Kekaha, Kaua'i, Hawai'i PROJECT NO.: WG1985 TASK NO.: 1

DESCRIPTION: Phase II Liner Investigation CONTRACTOR: Earthworks Pacific, Inc.

DAY OF WEEK: Monday DATE: DAY: 23 MONTH: February YEAR: 2014

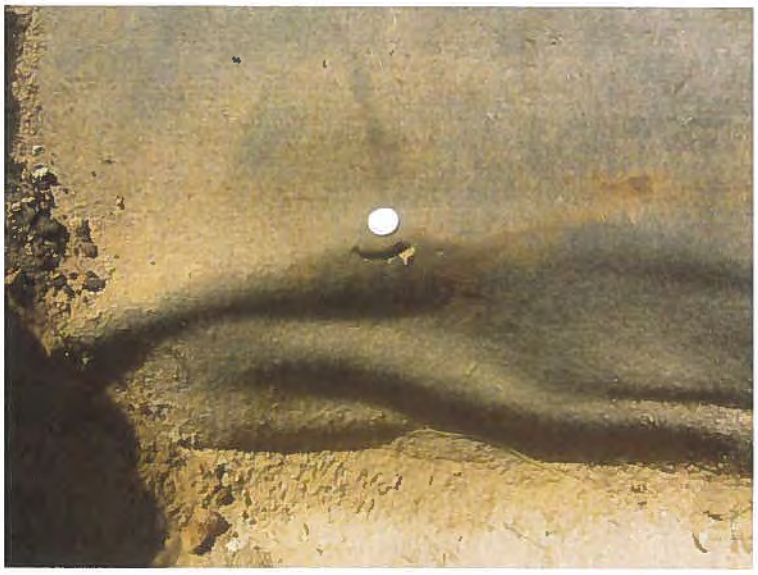
WEATHER: Sunny and warm.

0700	I arrived on site. Bryan Davidson (Project Manager), one operator, and one laborer (all of Earthworks Pacific, Inc. [EPI]) are already on site. EPI is on site today to begin implementing the scope of work as described in the Kekaha Landfill Phase II Liner Investigation Work Plan dated 7 January 2015. As noted in the work plan, the goals of the Phase II Liner Investigation are to (i) help further evaluate the extent of damage to existing Phase II composite liner system between LCM-2 and LCM-3, and (ii) repair the existing liner system in the test pits exposed during the previous June 2104 liner investigation.
	Equipment on Site: One Caterpillar mini excavator, and one Caterpillar Loader
	Tailgate Meeting I reviewed the project health and safety concerns, as identified in Geosyntec's health and safety plan, with the EPI crew and reminded them that landfill gas and leachate are concerns when working around the waste. The potential for exposure to methane, hydrogen sulfide, and other landfill gases will increase when excavations are performed within the landfill footprint. Significant excavation of waste is planned as part of this work. Proper personal protective equipment (PPE) and air monitoring equipment shall be utilized at all times. EPI will be performing air monitoring continuously during waste excavation using a four-gas meter. I reviewed the location of the nearest hospital in the event of an emergency and emphasized the need for everyone to be safe. No questions or concerns arose. It should be noted that the EPI crew is working under the guidance and protocols of EPI's health and safety program. I reviewed the scope of work with the crew. EPI will use the Caterpillar mini excavator to clear and grub the excavation area, and then remove the cover soil and all waste above the containment system between LCM-2 and LCM-3. The excavation is targeted to start at the perimeter anchor trench and then expose the flat liner "run-out", the lined 3H:1V side slope, and the toe of slope (approximately 20 ft measured from the landfill perimeter anchor trench). During excavation, the laborer will "spot" the operator to avoid damage to the containment system. After the bulk of the overlying soil and waste are removed, the remaining excavation adjacent to the liner system will be hand-dug, and then the surface of the geosynthetics will be swept with a broom to allow for inspection and documentation.
	Jesse Frey (Engineer, Waste Management of Hawai'i) arrived on site to observe field activities.
	Throughout the day, EPI continued working to remove the cover soil and waste to expose the existing composite liner system between LCM-2 and LCM-3. By the end of the day, EPI has removed all of the cover soil, waste, and operations layer sand along the crest of the 3H:1V side slope, 15 feet wide, and approximately

Chris Scott
Printed Name

Signature

cc: Mike Minch

	4 feet into the landfill. Based on visual observations, the cover soil was approximately 18 inches thick, and the operations layer sand was approximately 12 inches thick on the flat run-out and 24 inches thick on the slope.  During excavation a small hole adjacent to the anchor trench was observed in the cushion geotextile consistent with damaged observed during previous 2014 investigation. No other damage was observed as the containment system is still intact and will remain until the entire excavation area has been exposed and cleaned in accordance with the work plan.
	 Upon completion of the day's construciton activties, and the excavated waste areas were covered with a plastic tarp and secured with sand bags.
1600	I left the site.

Chris Scott
Printed Name

Signature

cc: Mike Minch

Geosyntec consultants

WASTE MANAGEMENT

Kekaha Sanitary Landfill
Kekaha, Kauai, Hawaii

DAILY FIELD REPORT

Report Sequence No.: 002

PROJECT: Kekaha Sanitary Landfill

LOCATION: Kekaha, Kaua'i, Hawai'i PROJECT NO.: WG1985 TASK NO.: 1

DESCRIPTION: Phase II Liner Investigation CONTRACTOR: Earthworks Pacific, Inc.

DAY OF WEEK: Tuesday DATE: DAY: 24 MONTH: February YEAR: 2014

WEATHER: Sunny and warm.

0700	I arrived on site. Dean Kohatsu (Foreman\Operator) and two laborers (all of Earthworks Pacific, Inc. [EPI]) are already on site. EPI is on site today to continue implementing the scope of work as described in the Kekaha Landfill Phase II Liner Investigation Work Plan (work plan) dated 7 January 2015. As noted in the work plan, the goals of the Phase II Liner Investigation are to (i) help further evaluate the extent of damage to existing Phase II composite liner system between LCM-2 and LCM-3, and (ii) repair the existing liner system in the test pits exposed during the previous June 2014 liner investigation.
	Equipment on Site: One Caterpillar mini excavator, and one Caterpillar loader
	Tailgate Meeting Before construction activities began this morning, I attended EPI's safety "tailgate" meeting. I reminded the crew of the landfill gas and leachate concerns and confirmed that EPI's four-gas meter was operational and calibrated. Upon completion of the safety meeting, no questions or concerns arose. I also reminded the EPI crew that while working around the containment system, care is to be taken to avoid damaging the underlying geosynthetics. Hand tools are to be used within 6 to 8 inches of the geosynthetic containment system, and machinery should not come in contact with the containment system.
	During the course of the day, Jesse Frey (Engineer, Waste Management of Hawai'i), Donald Fujimoto (County of Kaua'i), and Troy Tanigawa (County of Kaua'i) were all on site to observe the field activities for the Phase II liner investigation.
	EPI has completed the excavation to expose the Phase II containment system between LCM-2 and LCM-3. The excavation measured 15 ft wide along the termination anchor trench and 20 ft from the anchor trench, extending into the landfill towards the toe of the 3H:1V lined side-slope. The waste slope above the containment system was excavated and sloped back 2H:1V to provide safe access into the work zone. During excavation, all of the waste removed from above the operations layer of the containment system was placed in a pile and covered with a tarp. Once all of the waste was removed, the operations layer sand was carefully removed using the mini excavator and hand tools, and then stockpiled adjacent to the excavation to be re-used once the investigation is completed and the liner system restored. After all of the operations layer sand was removed, the existing nonwoven geotextile along the flat run-out and top of slope was cut and peeled back and the area was cleaned using a hand broom. The exposed 60 mil

Chris Scott
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cc: Mike Minch

double-sided textured (DST) HDPE geomembrane was then visually inspected for defects and/or penetrations.

16 penetrations through the exposed 60 mil HDPE geomembrane, ranging from approximately 1/16th of an inch to several inches in size, were observed and identified (see numbered white markings shown in the above photo). The observed damage to the 60 mil HDPE geomembrane was limited to within approximately 9 ft from the perimeter anchor trench, down into the 3H:1V side-slope of the containment system. No damage was observed in the geomembrane in the 9-ft to 20-ft stretch from the anchor trench. Based on visual observations during excavation, no waste was observed within 10.5 ft of the perimeter anchor trench. However, beyond 10.5 ft from the anchor trench, waste was encountered and removed for this investigation. The white painted dotted line seen in the above photo is the approximate start of waste based on visual observations of the excavated materials.

Underlying Gundseal Condition

I cut the 60 mil HDPE geomembrane and folded the material back to expose the underlying geosynthetic clay liner (GCL). The GCL is a Gundseal with 20-mil smooth HDPE geomembrane backer.

Chris Scott
Printed Name

Signature

cc: Mike Minch

PROJECT: Phase II Liner Investigation
LOCATION: Kekaha Landfill

PROJECT NO.: WG1985
DAY/DATE: 24 Feb 2015

I carefully examine the underlying Gundseal GCL and no active or dead termites were observed, however, termite trails are readily apparent, as shown in the above photo. The white painted line in the photo above represents the limits of observed waste approximately 10.5 ft from the perimeter termination anchor trench, extending into the landfill. Based on the observed trails, it appears that the termite activity was primarily limited to within10-ft of the anchor trench, with exception of two trails which extended further downslope to a distance of 14 ft from the anchor trench.

Chris Scott
Printed Name

Signature

cc: Mike Minch

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PROJECT: Phase II Liner Investigation
LOCATION: Kekaha Landfill

PROJECT NO.: WG1985
DAY/DATE: 24 Feb 2015

	 In addition to the termite trails within the GCL, one area of the GCL Gundseal 20-mil HDPE backer was observed to be penetrated. The penetration was approximately 2 ½ inches long and 1 ¼ inches wide and was 8.5 ft from the anchor trench.
	All findings during today's work were discussed with both WMH and County personnel. Upon completion of the day's construciton activties, the excavation and the excavated waste were covered with a plastic tarp and secured with sand bags.
1730	I left the site.

Chris Scott
Printed Name

Signature

cc: Mike Minch

Geosyntec consultants

Kekaha Sanitary Landfill
Kekaha, Kauai, Hawaii

DAILY FIELD REPORT **Report Sequence No.: 003**

PROJECT: Kekaha Sanitary Landfill

LOCATION: Kekaha, Kaua'i, Hawai'i PROJECT NO.: WG1985 TASK NO.: 1

DESCRIPTION: Phase II Liner Investigation CONTRACTOR: Earthworks Pacific, Inc.

DAY OF WEEK: Wednesday DATE: DAY: 25 MONTH: February YEAR: 2014

WEATHER: Sunny and warm.

0700	I arrived on site. Dean Kohatsu (Foreman\Operator) and two laborers (all of Earthworks Pacific, Inc. [EPI]) are already on site. EPI is on site today to continue implementing the scope of work as described in the Kekaha Landfill Phase II Liner Investigation Work Plan (work plan) dated 7 January 2015. As noted in the work plan, the goals of the Phase II Liner Investigation are to (i) help further evaluate the extent of damage to existing Phase II composite liner system between LCM-2 and LCM-3, and (ii) repair the existing liner system in the test pits exposed during the previous June 2104 liner investigation. Ruben Altramirano (International Lining Technology [ILT] Supervisor) is on site to restore the various containment system components as required in the work plan. I reviewed Geosyntec's project health and safety plan with Ruben to inform him of safety concerns while working on this project. No questions/concerns arose. It should be noted that Ruben is working under the guidance and protocols of ILT's health and safety program.
	Equipment on Site: One Caterpillar mini excavator, and one Caterpillar loader
	Tailgate Meeting Before construction activities began this morning, I attended EPI's safety "tailgate" meeting. I reminded the crew of the landfill gas and leachate concerns and confirmed that EPI's four-gas meter was operational and calibrated. Upon completion of the safety meeting, no questions or concerns arose.
	During the course of the day, Jesse Frey (Engineer, Waste Management of Hawai'i), Donald Fujimoto (County of Kaua'i), and Keith Suga (County of Kaua'i) were all on site to observe the field activities for the Phase II liner investigation.
	Liner investigation Between LCM-2 and LCM-3 - TP-14 Geosyntec Consultants has completed the investigation to further evaluate the extent of damage to the Phase II containment system. ILT begins restoration of the containment system at the locations of investigation, including the previous 2014 test pit locations. The following materials were used to restore the containment system: • AGRU GeoClay NN66, GCL roll number G14G225061, imported from off site; • GSE 60-mil HDPE double-sided textured (DST) geomembrane roll number HDT060ASO-2105192, on site material; and • 16 oz/yd^2 non-woven geotextile, on site material (no roll number available).

Chris Scott _____ cc: Mike Minch
Printed Name Signature

	Additionally, during the liner investigation, a small hole was observed to penetrate through the existing 20-mil HDPE backer component of the Gundseal GCL. The hole will be repaired by welding new 60-mil HDPE geomembrane to the 20-mil HDPE backer. Prior to performing the repair, Ruben obtained samples of the 20-mil HDPE geomembrane backer and the 60-mil HDPE geomembrane to prepare a trail weld to verify the extrusion weld method will not damage the thinner material (i.e., 20-mil HDPE backer) and provide a suitable bond between the materials. Upon completion of the trail weld, the weld was inspected and no damage to the 20-mil HDPE backer was observed. A specimen was cut from the trial weld and tested in both peel and shear using a calibrated field tensiometer. The measured peel and shear values were 42 lb/in and 44 lb/in, respectively; each test was an FTB failure of the 20-mil geomembrane. These values both exceed 90% of the yield tensile strength of the parent material. The weld was deemed acceptable. It should be noted that the existing installed Gundseal GCL panels are not welded together, but are instead overlapped. Once the trail weld was completed, the area around the penetration was cleaned and the bentonite component of the Gundseal GCL removed to expose the 20-mil HDPE backer geomembrane. A 1-ft wide by 1-ft long 60-mil HDPE geomembrane patch was then placed over the penetration and extrusion-welded to the 20-mil HDPE backer. The patch was then vacuum-box tested in accordance with the Work Plan. Ruben then placed a layer of Agru GCL above the existing Gundseal GCL to cover the area with observed termite trails in the bentonite. The Agru GCL extended across the width of the excavation (about 15 ft) and ran from the anchor trench to about 14 ft from the trench down the 3H:1V lined slope. Once the area was covered with Agru GCL, the existing 60-mil HDPE geomembrane (previously cut at the start of the investigation) was folded back to cover the GCL. Three GSE 60-mil HDPE geomembrane patches, of various lengths and widths, were then installed to restore the 60-mil HDPE geomembrane. Before the geomembrane patches were welded, a trail weld was prepared and tested in accordance with the work plan. All of the repair patches were constructed and vacuum box tested in accordance with the work plan. Once the 60-mil HDPE geomembrane was restored, a layer of 16 oz/yd^2 non-woven geotextile was installed along the run-out and down the upper portion of the 3H:1V slope to restore the geotextile removed for this phase of work. All of the construction activities completed today were monitored and verified to be in accordance with the scope of work as described in the work plan.
	Repairs to Previous Test Pit Locations EPI is working to remove the protective cover soil placed over the test pits previously excavated during June 2014 liner investigation. During construction today, the following test pits were un-covered in preparation for restoration of the liner system: • TP-1 adjacent to LCM-2; • TP-2 adjacent to LCM-3; • TP-3 adjacent to Wet Well 1; • TP-4 located about 50 feet east of LCM-2; and • TP-5 adjacent to LCM-5. EPI's operator removed the existing cover soil at each test pit using a Caterpillar mini excavator while a laborer spots the operator to ensure the excavation does not damage the underlying geosynthetics. At each of the test pit locations, the entire investigation area plus an additional 2 ft was removed to provide access for restoration of the underlying GCL and 60-mil HDPE geomembrane. At the end of the day, the excavated waste was covered with plastic tarps and secured with sand bags.
1800	I left the site.

Chris Scott
Printed Name

Signature

cc: Mike Minch

Geosyntec consultants

WASTE MANAGEMENT

Kekaha Sanitary Landfill
Kekaha, Kauai, Hawaii

DAILY FIELD REPORT

Report Sequence No.: 004

PROJECT: Kekaha Sanitary Landfill

LOCATION: Kekaha, Kaua'i, Hawai'i PROJECT NO.: WG1985 TASK NO.: 1

DESCRIPTION: Phase II Liner Investigation CONTRACTOR: Earthworks Pacific, Inc.

DAY OF WEEK: Thursday DATE: DAY: 26 MONTH: February YEAR: 2014

WEATHER: Sunny and warm.

0700	I arrived on site. Dean Kohatsu (Foreman\Operator) and two laborers (all of Earthworks Pacific, Inc. [EPI]) are already on site. EPI is on-site today to continue implementing the scope of work as described in the Kekaha Landfill Phase II Liner Investigation Work Plan (work plan) dated 7 January 2015. As noted in the work plan, the goals of the Phase II Liner Investigation are to (i) help further evaluate the extent of damage to existing Phase II composite liner system between LCM-2 and LCM-3, and (ii) repair the existing liner system in the test pits exposed during the previous June 2014 liner investigation. Ruben Altramirano (International Lining Technology [ILT] Supervisor) is on-site to restore the various containment system components as required in the work plan.
	Equipment on Site: One Caterpillar mini excavator, and one Caterpillar loader
	Tailgate Meeting Before construction activities began this morning, Ruben and I attended EPI's safety "tailgate" meeting. I reminded the crew of the landfill gas and leachate concerns and confirmed that EPI's four-gas meter was operational and calibrated. Upon completion of the safety meeting, no questions or concerns arose.
	During the course of the day, Donald Fujimoto (County of Kaua'i) was on site to observe the field activities for the Phase II liner investigation.
	Repairs to Previous Test Pit Locations TP-1, TP-2, TP-3, TP-4 and TP-5 EPI has excavated test pits TP-1, TP-2, TP-3, TP-4, and TP-5, which were all previously excavated during the June 2014 liner investigation. Once the existing Phase II containment system was exposed at each test pit location, the existing, previously cut 16 oz/sy nonwoven geotextile and 60-mil HDPE geomembrane were opened and folded back to expose the underlying Gundseal GCL layer. A layer of AGRU GCL was placed above the Gundseal GCL to cover areas of impacted bentonite (i.e., bentonite with observed termite trials). Following this, the existing 60-mil HDPE geomembrane was folded back and a GSE 60-mil HDPE geomembrane patch was extrusion-welded to the existing 60-mil HDPE geomembrane. Before the geomembrane patch was extrusion welded, a trail weld was prepared and tested using the calibrated field tensiometer. The 60-mil HDPE geomembrane cut and removed at each of the 5 test pit locations was restored using a patch; the patches had various lengths and widths. All of the repairs were constructed and vacuum-box tested in accordance with the work plan. Once the 60-mil HDPE geomembrane was restored and tested, a layer of 16

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	oz/yd^2 non-woven geotextile was installed to restore the geotextile removed for this phase of work. All of the construction activities completed today were monitored and verified to be in accordance with the scope of work as described in the work plan.
	Survey Charles Soriano (Esaki Surveying Party Chief) arrived on site to survey the 5 test pit locations previously excavated in June 2014 and newly restored, as well as the additional test pit TP-14 between LCM-2 and LCM-3.
	Ruben has completed the geosynthetic construction to restore the Phase II Containment System to the pre-investigation condition as required by the work plan.
1800	I left the site.

Chris Scott
Printed Name

Signature

cc: Mike Minch

Geosyntec consultants

WM WASTE MANAGEMENT

Kekaha Sanitary Landfill
Kekaha, Kauai, Hawaii

DAILY FIELD REPORT

Report Sequence No.: 005

PROJECT: Kekaha Sanitary Landfill

LOCATION: Kekaha, Kaua'i, Hawai'i PROJECT NO.: WG1985 TASK NO.: 1

DESCRIPTION: Phase II Liner Investigation CONTRACTOR: Earthworks Pacific, Inc.

DAY OF WEEK: Friday DATE: DAY: 27 MONTH: February YEAR: 2014

WEATHER: Sunny and warm.

0700	I arrived on site. Dean Kohatsu (Foreman\Operator) and one laborer (both of Earthworks Pacific, Inc. [EPI]) are already on site. EPI is on-site today to complete the scope of work as described in the Kekaha Landfill Phase II Liner Investigation Work Plan (work plan) dated 7 January 2015.
	Equipment on Site: One Caterpillar mini excavator, and one Caterpillar loader
	Tailgate Meeting Before construction activities began this morning, I attended EPI's safety "tailgate" meeting. I reminded the crew of the landfill gas and leachate concerns and confirmed that EPI's four-gas meter was operational and calibrated. Upon completion of the safety meeting, no questions or concerns arose.
	Backfill Test Pit TP-14 between LCM-2 and LCM-3 EPI is working to place and restore the operations layer above the Phase II containment system using previously excavated and stockpiled operations layer sand. EPI's operator placed the sand onto the Phase II containment system using a Caterpillar mini excavator while a laborer spots the operator to ensure no damage occurs to the underlying geosynthetics. Additionally, sand from an on-site stockpile was used to supplement the operations layer material to restore thickness and match existing surrounding grade. 

Chris Scott
Printed Name

Signature

cc: Mike Minch

Once all of the restored operations layer sand was uniformly graded, the waste previously excavated from this area was returned to the excavation. Before placing the waste into the excavation, the larger particles greater than approximately 2 ft and any metal and concrete rubble were removed for disposal at the active face.

The waste removed from TP-14 was return to the original location, within the same footprint maintaining an approximate 11 feet offset from the anchor trench.

After all of the waste was placed back into the excavation and the oversize particles were taken to the active landfill area for disposal, the backfilled waste slope was graded and covered with previously excavated and stockpiled cover soil supplemented with material obtained from the "mud pond" stockpile. The cover soil was

Chris Scott
Printed Name

Signature

cc: Mike Minch

placed in thin lifts and compacted using a walk-behind jumping jack compactor. The slope was graded to approximately restore the original topography.

Backfill Test Pit Locations TP-1, TP-2, TP-3, TP-4 and TP-5

All of the 5 test pit locations (TP-1, TP-2, TP-3, TP-4 and TP-5) were repaired in accordance with the work plan. Once the area was repaired, sand obtained from an on-site stockpile was placed into each of the test pits to restore the operations layer to the original thickness.

Once the operations layers were restored, the excavated waste was returned to the test pits. The backfilled waste slope was then covered with previously excavated and stockpiled cover soil supplemented with soil material obtained from the "mud pond" stockpile. The cover soil was placed in thin lifts and compacted using a walk-behind jumping jack compactor. The slope was graded to approximately restore the original topography.

Chris Scott
Printed Name

Signature

cc: Mike Minch

PROJECT: Phase II Liner Investigation
LOCATION: Kekaha Landfill

PROJECT NO.: WG1985
DAY/DATE: 27 Feb 2015

	
	Based on the availability of haul trucks to the site, a limited amount of "mud pond" material was delivered today to restore the original topography. I contacted Jesse Frey (Engineer, Waste Management of Hawai'i) and informed him of this issue. Jesse recommended using on-site gravel covered with mud pond soil to restore the cover soil and soil berm at the toe of slope beyond the anchor trench. EPI constructed the berm as discussed.
1800	I left the site.

Chris Scott
Printed Name

Signature

cc: Mike Minch

P:\PRJ2003GEO\WMI\KEKAHALANDFILL\WG1985\DAILYS\.DOC

Attachment D

Geosynthetics CQA

DEMTECH Services Inc.

Thermoplastic welding and testing equipment for the geosynthetics industry

CALIBRATION CERTIFICATE

Customer Name:	International lining	110 Volt	X
Unit Make & Model Number:	Tekorneter	220 Volt	
Tensiometer Serial Number:	T11-11-04	Lbs.	X
		Kg.	

Device Calibrsted:	Artec Load Cell	Calibration Apparatus:	
Range:	0-1000 lbs. Tension	Dead Weight system w/	
Model No:	30310-1K	Fluke Model 187 Multimeter	
Serial No:	349588		
		N/A	N/A
Readout Model No:	Micron Meters	N/A	N/A
Readout Serial No:	MM-900867	N/A	N/A
Channel No:	N/A		

Indicator reading with no load: 0

Applied Force lbs.	Output (mv):	Display reading:	Deviation Error:
2	0.094	2	0.00
52	1.8	52	0.00
102	3.102	102	0.00
152	4.608	152	0.00
202	6.114	202	0.00
252	7.681	252	0.00
302	9.122	302	0.00

Total Deviation Error (%): 0.00%

Temperature at time of calibretion: 73 degrees F

Exitation Voltage: 10v V DC

N/A	N/A
N/A	N/A
N/A	N/A

This calibration conforms to the standards set by ASTM E4 and is traceable to NIST standards

Note: Readout and load cell above have been systems calibrated and are considered a matched pair. In general, calibrated readouts and load cells are not interchangeable.

Calibrated by: MR Date: 02/04/15

Matthew B

Toll Free: (888) 324-9353 • Office: (530) 621-3200 • Fax: (530) 621-0150
P.O. Box 2165, Placerville, CA 95667 • 6414 Capitol Ave., Diamond Springs, CA 95619
www.demtech.com

Geosyntec consultants

Trial Seam Log - Extrusion

Project: Kekaha Landfill Phase II Liner Investigation
Location: Kekaha Sanitary Landfill ProjNo: WG1985 TaskNo: 01
Description: Phase II Liner Investigation Repairs

Tensiometer Description: T11-11-04 Tekometer

Material Type gml : 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*		
1-001	2/25/2015	12:00	1164	RA	T/T	550	500	132	128	PPI	P	-	CAS
								128	125	PPI	P	-	CAS
								128	134	PPI	P	-	CAS
1-002	2/26/2015	8:21	1164	RA	T/T	550	500	155	166	PPI	P	-	CAS
								144	160	PPI	P	-	CAS
								161	162	PPI	P	-	CAS
1-003	2/26/2015	13:00	1164	RA	T/T	550	500	136	166	PPI	P	-	CAS
								144	153	PPI	P	-	CAS
								146	137	PPI	P	-	CAS
2-001	2/25/2015	11:55	1164	RA	S/T	410	510	42	44	PPI	P	-	CAS

60mil to 60mil

60mil to 20mil

Geosyntec consultants

Repair Summary Log

Project: Kekaha Landfill Phase II Liner Investigation
Location: Kekaha Sanitary Landfill
ProjNo: WG1985
TaskNo: 01
Description: Phase II Liner Investigation Repairs
Installer: International Lining Technology

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
2/25/2015	1-001		P					17	9	0	1164	RA	CAS	2/26/2015	RA	P		CAS
2/25/2015	1-002		P					8	4	0	1164	RA	CAS	2/26/2015	RA	P		CAS
2/25/2015	1-003		P					13	4	0	1164	RA	CAS	2/26/2015	RA	P		CAS
2/26/2015	1-004		P					6	4	0	1164	RA	CAS	2/26/2015	RA	P		CAS
2/26/2015	1-005		P					8	5	0	1164	RA	CAS	2/26/2015	RA	P		CAS
2/26/2015	1-006		P					4	3	0	1164	RA	CAS	2/26/2015	RA	P		CAS
2/26/2015	1-007		P					4	4	0	1164	RA	CAS	2/26/2015	RA	P		CAS
2/26/2015	1-008		P					4	4	0	1164	RA	CAS	2/26/2015	RA	P		CAS
2/26/2015	1-009		P					4	2	0	1164	RA	CAS	2/26/2015	RA	P		CAS

Geosyntec consultants

Repair Summary Log

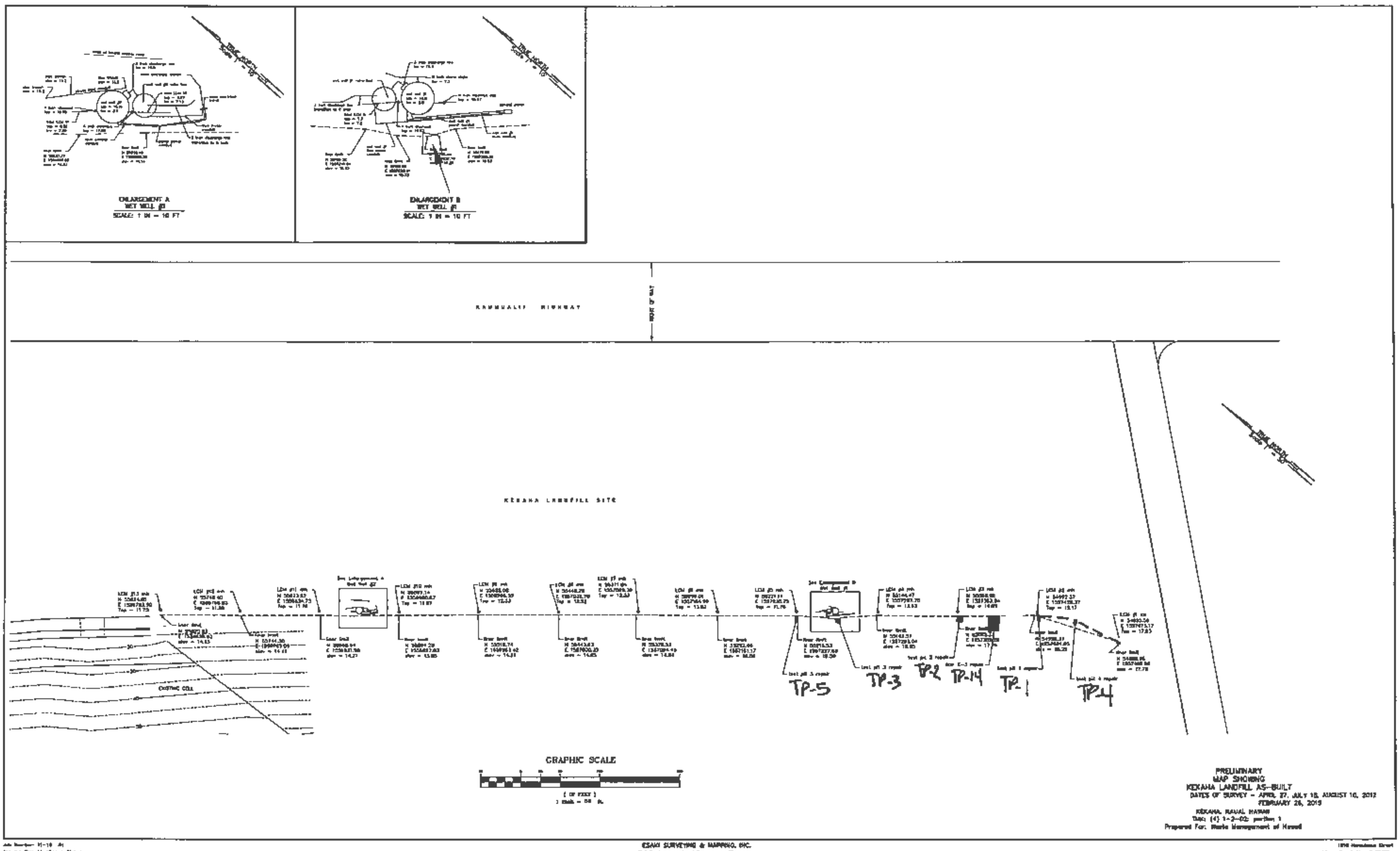
Project: Kekaha Landfill Phase II Liner Investigation
Location: Kekaha Sanitary Landfill ProjNo: WG1985 TaskNo: 01
Description: Phase II Liner Investigation Repairs
Installer: International Lining Technology

Primary / Secondary: Secondary 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
2/25/2015	2-001		P					1	1	0	1164	RA	CAS	2/25/2015	RA	P		CAS

Attachment E

As-Built Survey



ENLARGEMENT A
WET WELL #3
SCALE: 1 IN = 10 FT
ENLARGEMENT B
WET WELL #1
SCALE: 1 IN = 10 FT
KAUMUALII HIGHWAY
RIGHT OF WAY
KEKAHA LANDFILL SITE
TP-5
TP-3
TP-2
TP-14
TP-1
TP-4
EXISTING CELL
GRAPHIC SCALE
(IN FEET)
PRELIMINARY
MAP SHOWING
KEKAHA LANDFILL AS-BUILT
DATES OF SURVEY - APRIL 27, JULY 18, AUGUST 10, 2012
FEBRUARY 26, 2015
KEKAHA, KAUAI, HAWAII
TMK: (4) 1-2-02: portion 1
Prepared For: Waste Management of Hawaii
ESAKI SURVEYING & MAPPING, INC.
Civil Engineers - Land Surveyors - Planners

Attachment F

Mokihana Pest Control, Inc., Sentricon® Program
Summary for Kekaha Waste Management

Mike Minch

From: Gary Smith [garykali2@yahoo.com]
Sent: Thursday, March 12, 2015 5:47 PM
To: Mike Minch
Cc: Craig Smith; Donald Fujimoto
Subject: Kekaha Waste termite summary

Aloha e Mike, Donald could not open so I will include my report in the body of this letter. Mahalo Gary

Mokihana Pest Control, Inc.
Sentricon* Program Summary for Kekaha Waste Management 3/12/2015

Based on our initial consultation with the County of Kauai and Geosyntec Consultants in mid July 2014, we strongly advised that Sentricon* was the only effective method to solve the Formosan Subterranean Termite (here after referred to as "FST") situation at the Kekaha Waste Management site. It was also the safest product to use. However, Sentricon has no FST attraction quality, the termites must find it on their own. This species constant need for optional food sources by continuous and random foraging practically assures eventual location of the stations by them. Unfortunately customers are not always so patient. Due to hesitancy on the clients part as well as our inexperience in this very unusual circumstance, we agreed to a limited installation of Sentricon for 500 lineal feet of the refuse mound perimeter at the site where the activity was originally discovered.

Due to soil conditions and lack of any above ground termite evidence as well as the disturbance of the foraging termites by the excavation work that initially uncovered the problem, we were faced with a challenging situation. As challenging as it might have been we knew the only option was Sentricon. As a result our initial installation on 7/16/2014 included the placement of 50 bait stations 10 feet apart. We also did a complete exterior inspection of all structures for possible evidence of FST tunnels as well as inspecting the entire property for evidence of FST in Kiawe trees, discarded wood or any other visible source of termite evidence. (a moderate sized colony, 1million members, can forage over 1 acre of land) If we had discovered any above ground activity we would have directly baited these sites with Sentricon Above Ground Bait Stations* and the elimination process would begin that day. Unfortunately none were found so we had to rely on the termites to find at least one of the 50 stations. These checks continued for nearly 4 months where we observed extremely dry soil conditions and an unfavorable environment to encourage feeding in stations that are inserted per label, 10 inches into the ground. Early on we also placed eight (8) 3 foot' long sections of 4"x4" wood posts 2 feet vertically into the ground at random locations away from the baited site and later along the active site six (6) 2"x4" of similar length . This was to enhance our chance of getting an above ground baiting site if the termites did not go to our stations for the reasons previously mentioned. Those wooden monitors were checked along with our station checks, none of them have been attacked to date.

Finally after 120 days we got a hit in one station. To ensure adequate coverage, if the colony was large, our technician installed 3 more stations around the active one as auxiliaries. On the next check, 30 days later, none of the auxiliaries were attacked and the activity in the one station had ended with nearly one tube consumed. Our experience shows that this amount is adequate to eliminate a moderate sized colony. Lack of activity on auxiliary stations were also indicative of our conclusion.

As explained in our initial discussions with the client, elimination is an assumed conclusion after baiting has subsided. The land fill is a unique situation as there is no feasible way to assess whether the subterranean termites had been eliminated since there is no structure to check. Only continued checks of our stations and above ground sites serve as indicators of elimination. To date no other stations or wood monitors have been hit. We also gave C of K the green light to start the investigatory work, but advised them to stop immediately upon seeing any live evidence and call us to devise a baiting plan for the active site. No live evidence was found in the excavation work. This added credence to our assumption of elimination.

The elimination assumption and the need to have assurances of elimination are of little value in the bigger picture as FST can recolonize an area of land at any time. That conclusion is just a snapshot in time. Future hits on our stations and wood monitors are NOT considered set backs but opportunities to know of FST presence and their real time elimination.

As for the future, the current contract will expire in July 16, 2015. Sentricon is used as a defensive tool to thwart FST incursion by utilizing an "always active bait matrix" which upon discovery by the termites, is consumed and then becomes an extremely effective offensive tool for FST colony elimination. We strongly recommend that the entire refuse mound perimeter be baited for other possible FST and future activity. Mind you, our initial work covered only 1/10th of the area. Thereafter, the use of this system should be continued as it does not provide any future protection if it is not in place and maintained. Future infestations could occur from other FST colonies in outlying areas that find the site due to this termite's nature of continual and random foraging for sources of cellulose. Due diligence in combating any possible other unknown activity and future activity is imperative. The FST have demonstrated an ability to breach the membrane. Sentricon is the only product that can successfully stop them from continuing to do that. The product's safety is irrefutable as well.

We have forwarded our contract to Waste Management for their review as well as the estimated annual cost to maintain the Sentricon service. This service would be renewed annually for as long as the refuse site requires monitoring to protect the environment from contamination or until a more effective product comes along in the future.

Gary E. Smith
President
Mokihana Pest Control, Inc.

*Trademark of DowAgroSciences