

Appendix F
Closure and Post-Closure Cost Estimates

WEST HAWAII SANITARY LANDFILL
 CLOSURE & POST-CLOSURE COST ESTIMATES
 APRIL 2008

SECTION A - CLOSURE ACTIVITIES

1	Contractor mobilization, site cleanup and demobilization	\$ 50,000.00	LS
2	Maximum area to be capped and covered	50	ACRES
2a	Area w/ intermediate cover	25	ACRES
2b	Area w/o intermediate cover	25	ACRES
3	Volume of fill required for areas not at intermediate cover grades, but would require filling prior to capping:	40,333	CY
4	Earthen Materials - Quantities		
4a	Intermediate Cover	40,333	CY
4b	Cushioning Layer	40,333	CY
4c	Erosion Layer	121,000	CY
5	Synthetic Materials - Quantities		
5a	16 oz/sy Nonwoven Geotextile	2,178,000	SF
5b	40 mil LLDPE Liner	2,178,000	SF
6	Cap Penetrations: Estimate the number of cap penetrations that will need to be installed for closure	25	
7	Number of Passive Gas Vents to be Installed	20	
8	Number of Leachate Injection Wells to be Installed	5	
9	Unit cost to place or regrade material to reach final grades	\$ 2.39	\$/CY
10	Earthen Materials - Unit Costs		
10a	Intermediate Cover	\$ 23.00	\$/CY
10b	Cushioning Layer	\$ 34.00	\$/CY
10c	Erosion Layer	\$ 32.00	\$/CY
11	Synthetic Materials - Unit Costs		
11a	16 oz/sy Nonwoven Geotextile	\$ 0.405	\$/SF
11b	40 mil LLDPE Liner	\$ 0.576	\$/SF
12	Cap Penetration Boot Unit Cost	\$ 350.00	EACH
13	Passive Gas Vent Installation Unit Cost	\$ 2,500.00	EACH
14	Leachate Injection Well Unit Cost	\$ 6,000.00	EACH
15	Perimeter Gas Monitoring Probes to be Installed	20	
16	Unit cost to install perimeter gas monitoring probe	\$ 3,500.00	EACH
17	Cost Summary		
17a	Contractor mobilization, site cleanup and demobilization	\$ 50,000.00	
17b	Closure design, surveying and construction docs/drawings (use \$1000.00/acre of number 2).	\$ 50,000.00	
17c	Fill (line 3 x line 9)	\$ 96,396.00	
17d	Intermediate Cover (line 4a x line 10a)	\$ 927,659.00	
17e	Cushioning Layer (line 4b x line 10b)	\$ 1,371,322.00	
17f	Erosion Layer (line 4c x line 10c)	\$ 3,872,000.00	
17g	16 oz/sy Nonwoven Geotextile (line 5a x line 11a)	\$ 882,090.00	
17h	40 mil LLDPE Liner (line 5b x line 11b)	\$ 1,254,528.00	
17i	Penetrations (line 6 x line 12)	\$ 8,750.00	
17j	Passive Gas Vent Installation (line 7 x line 13)	\$ 50,000.00	
17k	Leachate Injection Well Installation (line 8 x line 14)	\$ 30,000.00	
17l	Perimeter Gas Monitoring Probes Installation (line 15 x line 16)	\$ 70,000.00	
	Subtotal	\$ 8,662,745.00	
	CQA costs (5% of subtotal)	\$ 433,137.00	
	Administrative fees (5% of subtotal)	\$ 433,137.00	
	Project Management (5% of subtotal)	\$ 433,137.00	
	Contingency (10% of subtotal)	\$ 866,275.00	
	Total (rounded to nearest hundred)	\$ 10,828,400.00	

WEST HAWAII SANITARY LANDFILL
 CLOSURE & POST-CLOSURE COST ESTIMATES
 APRIL 2008

SECTION B - GROUNDWATER MONITORING SYSTEM

1	Number of wells in the approved monitoring plan.		4	
2	Unit cost to install a well (assume average well depth, and include drilling, installation, developing and pump installation)	\$ 15,205.00		\$/WELL
3	Unit cost to replace a dedicated pump within an existing well	\$ 5,640.00		\$/WELL
4	Number of wells to be replaced over the life of the monitoring period (use 10% of line 1 and round up)		1	
5	Number of pumps to be replaced (use 25% of line 1 and round up)		1	
6	Unit cost to purge and sample a well (assumes average well depth, and includes record keeping and shipping)	\$ 205.00		\$/WELL
7	Unit cost to analyze sample	\$ 300.00		\$/WELL
8	Unit cost to analyze data (includes review of lab QA/QC data, database input, statistical analysis and data review, and report completion)	\$ 400.00		\$/WELL
9	Cost to purge, sample and analyze (line 6 + line 7 + line 8)	\$ 905.00		\$/WELL
10	Number of sampling events per year		2	
11	Number of years of sampling		31	YEARS
12	Cost Summary –Groundwater Monitoring System			
12a	Wells to be replaced (line 2 x line 4)	\$ 15,205.00		
12b	Pumps to be replaced (line 3 x line 5)	\$ 5,640.00		
12c	Cost of Monitoring (line 1 x line 9 x line 10 x line 11)	\$ 224,440.00		
	Total (rounded to nearest hundred)	\$ 245,300.00		

WEST HAWAII SANITARY LANDFILL
 CLOSURE & POST-CLOSURE COST ESTIMATES
 APRIL 2008

SECTION C - PERIMETER GAS MONITORING SYSTEM

1	Number of probes to be monitored	20
2	Number of probes to be replaced over the life of the monitoring period (use 5% of line 1 and round up)	1
3	Unit cost to install a probe	\$ 3,500.00 \$/PROBE
4	Unit cost to monitor a probe (includes monitoring, record keeping and report preparation)	\$ 83.00 \$/PROBE
5	Number of monitoring events per year	4
6	Number of years of monitoring	31 YEARS
7	Cost Summary – Perimeter Gas Monitoring System	
7a	Probe replacement (line 2 x line 3)	\$ 3,500.00
7b	Probe Monitoring (line 1 x line 4 x line 5 x line 6)	\$ 205,840.00
	Total (rounded to nearest hundred)	\$ 209,300.00

L:\work\SW\PROJECTS\103556 West Hawaii LF\Closure - Post Closure Plan\{WHSL CPC cost est.xls}C

WEST HAWAII SANITARY LANDFILL
 CLOSURE & POST-CLOSURE COST ESTIMATES
 APRIL 2008

SECTION D - LEACHATE MANAGEMENT

1	Post-closure cost to inject leachate into the closed landfill	\$ 107,460.00	LS
2	Annual cost to provide electricity for the leachate management system	\$ 5,000.00	\$/YEAR
3	Annual cost for maintenance of the leachate management system	\$ 10,000.00	\$/YEAR
4	Unit cost to collect a leachate sample (includes record keeping and shipping)	\$ 88.00	\$/SAMPLE
5	Unit cost to analyze a leachate sample	\$ 300.00	\$/SAMPLE
6	Unit cost to analyze data (includes review of lab QA/QC data, database input, statistical analysis and data review, and report completion)	\$ 250.00	\$/SAMPLE
7	Total Unit Cost for Leachate Sampling (line 5 + line 6 + line 7)	\$ 638.00	\$/SAMPLE
8	Number of samples collected per monitoring event	6	
9	Number of sampling events per year	1	
10	Number of years of leachate management	10	YEARS
11	Cost Summary:		
11a	Cost to inject leachate into the closed landfill (line 1)	\$ 107,460.00	
11b	Electricity (line 2 x line 10)	\$ 50,000.00	
11c	Maintenance (line 3 x line 10)	\$ 100,000.00	
11d	Leachate Sampling (line 7 x line 8 x line 9 x line 10)	\$ 38,280.00	
	Total (rounded to the nearest hundred)	\$ 295,700.00	

WEST HAWAII SANITARY LANDFILL
 CLOSURE & POST-CLOSURE COST ESTIMATES
 APRIL 2008

SECTION E - INSPECTIONS AND SITE MAINTENANCE

1	Size of facility	300	ACRES
2	Size of waste placement footprint	149	ACRES
3	Number of years of site management (30 years + closure period)	31	YEARS
4	Unit cost to perform monthly site inspections and recordkeeping	\$ 720.00	\$/EVENT
5	Unit cost to perform semi-annual site inspection (includes site inspection report preparation)	\$ 3,000.00	\$/EVENT
6	Cost to repair cap and final cover during post-closure period	\$ 150,000.00	LS
7	Annual cost to maintain the water production well	\$ 1,000.00	LS
8	Annual cost to repair fences and gates	\$ 350.00	LS
9	Annual cost to maintain site roads		
9a	Length of site roads	15000	LF
9b	Annual length of site roads to be repaired (2% of line 9a)	300	LF
9c	Unit cost to repair roads	\$ 5.00	\$/LF
10	Cost Summary – Inspections and Maintenance		
10a	Cost for monthly site inspections & recordkeeping (line 3 x line 4 x "12")	\$ 267,840.00	
10b	Cost for semi-annual site inspections (line 3 x line 5 x "2")	\$ 186,000.00	
10c	Cost to repair repair cap and final cover (line 6)	\$ 150,000.00	
10d	Cost to maintain the water production well (line 3 x line 7)	\$ 31,000.00	
10e	Cost to repair fences and gates (line 3 x line 8)	\$ 10,850.00	
10f	Cost to maintain site roads (line 3 x line 9b x line 9c)	\$ 46,500.00	
	Total (rounded to the nearest hundred)	\$ 692,200.00	

L:\work\SW\PROJECTS\103556 West Hawaii LF\Closure - Post Closure Plan\WHSL CPC cost est.xls]E

WEST HAWAII SANITARY LANDFILL
CLOSURE & POST-CLOSURE COST ESTIMATES
APRIL 2008

SECTION F - SUMMARY

Closure Cost

A	Closure Activities	\$ 10,828,400.00
Closure-Cost - Total (rounded to nearest hundred)		\$ 10,828,400.00

Post-Closure Cost

B	Groundwater Monitoring System	\$ 245,300.00
C	Perimeter Gas Monitoring System	\$ 209,300.00
D	Leachate Management	\$ 295,700.00
E	Inspections & Maintenance	\$ 692,200.00

Post-Closure Cost - Subtotal **\$ 1,442,500.00**

Administrative fees (5% of subtotal)	\$ 72,125.00
Project Management (5% of subtotal)	\$ 72,125.00
Contingency (10% of subtotal)	\$ 144,250.00

Post-Closure Cost - Total (rounded to nearest hundred) **\$ 1,731,000.00**

L:\work\SW\PROJECTS\103556 West Hawaii LF\Closure - Post Closure Plan\[WHSL CPC cost est.xls]F

WEST HAWAII SANITARY LANDFILL
 CLOSURE & POST-CLOSURE COST ESTIMATES
 APRIL 2008

Post-Closure Leachate Generation Estimate

Year	Annual Leachate Generated (gallons/year)	Est. Number of Times to Empty Leachate Storage Tanks ³
1	303,300	17
2	191,373	11
3	120,750	7
4	76,189	5
5	48,073	3
6	30,333	2
7	19,139	2
8	12,076	1
9	7,620	1
10	4,808	1
11	3,034	N.A.
12	1,914	N.A.
13	1,208	N.A.
14	762	N.A.
15	481	N.A.
16	303	N.A.
17	191	N.A.
18	121	N.A.
19	76	N.A.
20	48	N.A.
21	30	N.A.
22	19	N.A.
23	12	N.A.
24	8	N.A.
25	5	N.A.
26	3	N.A.
27	2	N.A.
28	1	N.A.
29	1	N.A.
30	0	N.A.
31	0	N.A.
TOTALS:	821,879	50

Notes

1. GeoSyntec Consultants has developed a method for estimating leachate generation during post-closure. Leachate generation rate for Subtitle D areas will decline exponentially during post-closure according to the following equation:

$$G_T = G_C e^{-.4605T}$$

Where:

G_T is the leachate generation rate at any time after closure

G_C is the leachate generation rate at the time of closure

T is the time after closure in years

2. The leachate generated during Year 1 is G_C and is manually input into the table. The leachate generated in subsequent years is calculated automatically using the equation above.
3. The number of times to empty the leachate storage tanks each years is based on an assumed maximum on-site leachate storage capacity of 18,000 gallons. After Year 10, it is assumed that it will not be feasible to extract leachate from the landfill due to the low volume generated.

CLIENT: Waste Management of HawaiiSUBJECT: Closure and Post-ClosurePrepared By TW Date 04/15/08PROJECT: West Hawai'i Sanitary LandfillCost EstimatesReviewed By JFG Date 04/16/08

Approved By _____ Date _____

TASK

To develop the closure and post-closure cost estimates for the West Hawai'i Sanitary Landfill (WHSL) in Waikoloa, Hawai'i

REFERENCES

1. West Hawaii Sanitary Landfill Permit Drawings, prepared by Harding Lawson Associates, dated August 1993 and revised June 1995.
2. Means CostWorks 2007 Interactive CD.
3. Wage Rate Schedule Bulletin No. 466, February 25, 2008 and Equipment Operator Groups, Revised 11/4/04, Hawaii Department of Labor and Industrial Relations.
4. "A Method of Estimating Leachate Generation for Post-Closure Accruals", prepared by GeoSyntec Consultants for Waste Management, Inc., dated September 7, 2001.
5. WHSL 2007 Annual Operation Report.

NOTES

1. Costs are in present worth dollars.
2. The unit costs taken from Means are specific to the location (967 zip code prefix).
3. Current prevailing wage rates for Hawai'i were used where applicable.
4. The list of attachments that provide supporting information for the cost estimates are as follows:

<u>Attachment</u>	<u>Description</u>
A	Unit Costs from Means CostWorks 2007 Interactive CD
B	Wage Rate Schedule Bulletin No. 466, February 25, 2008 and Equipment Operator Groups, Revised 11/4/04, Hawaii Department of Labor and Industrial Relations
C	"A Method of Estimating Leachate Generation for Post-Closure Accruals", prepared by GeoSyntec Consultants for Waste Management, Inc., dated September 7, 2001.
D	WHSL Post-Closure Leachate Generation Estimate

CLIENT: Waste Management of Hawaii SUBJECT: Closure and Post-Closure
PROJECT: West Hawai'i Sanitary Landfill Cost EstimatesPrepared By TW Date 04/15/08
Reviewed By JFG Date 04/16/08
Approved By _____ Date _____**Section A – Closure Activities**

1. This is an assumed cost for contractor mobilization, site cleanup, and demobilization.
2. For the “worst-case” closure scenario, it is assumed that 25 acres will require full capping (intermediate cover, cushioning layer, geosynthetic cap, and erosion layer) and 25 acres will have intermediate cover and will require the cushion layer, geosynthetic capping and erosion layer.
3. It is assumed that an average of 2 ft over half of the area requiring full capping (0.5 x 25.0 acres = 12.5 acres) will be re-graded to facilitate drainage and achieve stable intermediate grades for final cap installation.

$$(12.5 \text{ acres}) \times (2 \text{ ft}) \times (43,560 \text{ sf/acre}) \times (1 \text{ cy}/27 \text{ cf}) = 40,333 \text{ cy}$$

4. Earthen materials quantities are calculated as follows:

- a) Twelve (12) inches of intermediate cover soil will be placed over the 25 acres requiring full capping.

$$(25 \text{ acres}) \times (1 \text{ ft}) \times (43,560 \text{ sf/acre}) \times (1 \text{ cy}/27 \text{ cf}) = 40,333 \text{ cy}$$

- b) Six (6) inches of the cushioning layer will be placed over the entire 50 acres requiring final cap:

$$(50 \text{ acres}) \times (0.5 \text{ ft}) \times (43,560 \text{ sf/acre}) \times (1 \text{ cy}/27 \text{ cf}) = 40,333 \text{ cy}$$

- c) Eighteen (18) inches of the erosion layer will be placed over the entire 50 acres requiring final cap:

$$(50 \text{ acres}) \times (1.5 \text{ ft}) \times (43,560 \text{ sf/acre}) \times (1 \text{ cy}/27 \text{ cf}) = 121,000 \text{ cy}$$

5. Geosynthetic materials quantities are calculated as follows:

$$(50 \text{ acres}) \times (43,560 \text{ sf/acre}) = 2,178,000 \text{ sf}$$

6. It is assumed that twenty-five (25) geosynthetic cap penetrations will be required. This will include 20 penetrations for passive gas vents (2 vents every 5 acres) and 5 penetrations for leachate injection wells (1 well every 10 acres).
7. It is assumed that twenty (20) passive gas vents will be installed in the worst-case closure area of 50 acres (2 vents every 5 acres).
8. It is assumed that five (5) leachate injection wells will be installed for leachate management during post-closure in the worst-case closure area of 50 acres (1 well every 10 acres). See Section D – Leachate Management for details.
9. A unit cost to regrade and to compact the materials is estimated using Means (Attachment A).

$$\begin{aligned} \text{Unit Cost} &= \text{Grading} + \text{Compaction} \\ &= \$1.77/\text{cy} + \$0.62/\text{cy} \\ &= \$2.39/\text{cy} \end{aligned}$$

10. There is the possibility that there will be sufficient on-site supply of materials that can be processed and screened to

CLIENT: Waste Management of Hawaii **SUBJECT:** Closure and Post-Closure
PROJECT: West Hawai'i Sanitary Landfill Cost Estimates

Prepared By TW **Date** 04/15/08
Reviewed By JFG **Date** 04/16/08
Approved By _____ **Date** _____

satisfy the intermediate cover and erosion layer material requirements at the time of final closure. However, for the worst case closure scenario, it is assumed that all materials will be supplied by an off-site quarry. Unit costs for supply of the earthen materials for the final cover system were provided by a Hawai'i quarry. Unit costs for hauling, placement, and compaction were taken from Means (Attachment A). The unit costs are provided as follows:

	Intermediate Cover	Cushioning Layer	Erosion Layer
Supply:	\$14.47/cy	\$25.38/cy	\$23.73/cy
Hauling:	\$6.20/cy	\$6.20/cy	\$6.20/cy
Placement:	\$1.77/cy	\$1.77/cy	\$1.77/cy
Compaction:	\$0.51/cy	\$0.51/cy	No Compaction
Total Unit Cost:	\$22.95/cy Say \$23/cy	\$33.86/cy Say \$34/cy	\$31.70/cy Say \$32/cy

11. The geosynthetic material unit costs were provided by a geosynthetic manufacturer and include site-specific supply, freight, and installation costs.
12. The cap penetration unit cost was provided by a geosynthetic manufacturer.
13. The passive gas vent installation unit cost is an engineer's estimate.
14. The leachate injection well installation unit cost is an engineer's estimate.
15. The perimeter of the landfill is approximately 10,000-ft. Assume gas monitoring probes will be installed at 500-ft spacing around the perimeter of the landfill (10,000 ft / 500-ft spacing/probe = 20 probes).
16. The gas monitoring probe installation unit cost is an engineer's estimate.
17. The Cost Summary items are calculated as shown.

Section B – Groundwater Monitoring System

1. There are four (4) groundwater monitoring wells in the existing monitoring network (WHW-01 thru WHW-04).
2. The unit cost to install a well was developed using Means (Attachment A) assuming an average well depth of 200-ft.

Well Drilling/Installation:	(\$25/lf) x (200 lf/well)	=	\$5,000/well
Pump Supply/Installation:	(\$4,700/pump) x (1 pump/well)	=	\$4,700/well
Well Development:	(\$1,050/hr) x (3 hours/well)	=	\$3,150/well
<u>Pump Test Well:</u>	<u>(\$785/hr) x (3 hours/well)</u>	=	<u>\$2,355/well</u>
Total Unit Cost		=	\$15,205/well

3. The unit cost to replace a dedicated well pump was assumed to be the cost from Means for well pump supply and installation (See Item 2 above) with a 20% contingency for existing well pump removal:

$$\$4,700/\text{well pump} \times 1.20 = \$5,640/\text{well pump}$$

CLIENT: Waste Management of Hawaii SUBJECT: Closure and Post-Closure Prepared By TW Date 04/15/08
PROJECT: West Hawai'i Sanitary Landfill Cost Estimates _____ Reviewed By JFG Date 04/16/08
Approved By _____ Date _____

4. Calculated as shown.
5. Calculated as shown.
6. The unit cost to purge and sample a well assumes two Class I laborers at the 2008 prevailing wage rate for Hawaii (Attachment B) will require 2 hours to purge and sample a well (including recordkeeping) and includes additional costs as follows:

Labor:	(2 laborers) x (\$41.90/hr-laborer) x (2 hours/well)	=	\$167.60/well
Vehicle Usage:	(\$50/event) x (1 event/4 wells)	=	\$12.50/well
<u>Shipping:</u>	<u>(\$100/event) x (1 event/4 wells)</u>	=	<u>\$25.00/well</u>
Total Unit Cost		≈	\$205/well

7. This is an assumed unit cost to analyze the sample at a laboratory.
8. The unit cost to analyze the data and prepare the report is as follows:

Project Manager:	\$100/hr x 4 hours	=	\$400
Technician:	\$70/hour x 15 hours	=	\$1,050
Clerical:	\$50/hour x 2 hours	=	\$100
<u>Reproduction / Shipping Charges:</u>		=	<u>\$50</u>
Total		=	\$1,600
Unit Cost per Well (divide total by 4)		=	\$400/well

9. Calculated as shown.
10. Groundwater monitoring wells will be sampled on a semi-annual basis.
11. Monitoring assumes a 1-year closure period and a 30-year post-closure period for a total of 31 years.
12. The Cost Summary items are calculated as shown.

Section C – Perimeter Gas Monitoring System

1. The perimeter of the landfill is approximately 10,000-ft. Assume gas monitoring probes will be installed at 500-ft spacing around the perimeter of the landfill (10,000 ft / 500-ft spacing/probe = 20 probes).
2. Calculated as shown.
3. Same as Section A – Item 16.

CLIENT: Waste Management of Hawaii **SUBJECT:** Closure and Post-Closure
PROJECT: West Hawai'i Sanitary Landfill Cost Estimates

Prepared By TW **Date** 04/15/08
Reviewed By JFG **Date** 04/16/08
Approved By _____ **Date** _____

4. The unit cost to monitor the probes and prepare the report is as follows:

Technician to Monitor Probes:	\$70/hour x 10 hours	=	\$700
Technician to Prepare Report:	\$70/hour x 8 hours	=	\$560
Project Manager to Review Report:	\$100/hr x 2 hours	=	\$200
Clerical:	\$50/hour x 2 hours	=	\$100
Vehicle Usage:	\$50/event	=	\$50
<u>Reproduction / Shipping Charges:</u>		=	<u>\$50</u>
Total		=	\$1,660
Unit Cost per Well (divide total by 20)		=	\$83/probe

5. It is assumed that the perimeter gas monitoring probes will be monitored on a quarterly basis.
6. Monitoring assumes a 1-year closure period and a 30-year post-closure period for a total of 31 years.
7. The Cost Summary items are calculated as shown.

Section D – Leachate Management

1. The current on-site leachate disposal method is spray irrigation over the lined MSW disposal areas for dust control. For the post-closure condition, spray irrigation would not be feasible as the final cover system will prevent the re-introduction of the leachate into the waste mass. Therefore, for the post-closure condition, it is assumed that several leachate injection wells will be installed on the plateau of the final cover system to allow for the re-introduction of the leachate into the waste mass. Leachate will be loaded from the storage tanks into a tanker truck, which when then discharge the leachate into several injection wells on the landfill plateau. For this estimate, it was assumed that five (5) injection wells would be installed (See Section A).

Due to the generally low volume of leachate generated at the site (303,300 gallons of leachate managed during the 1-year period from 7/1/06 – 6/30/07 based on the 2007 Annual Operating Report for WHSL), it is expected that injection of the leachate into the landfill will be the most economically-feasible leachate disposal method during the post-closure period.

GeoSyntec Consultants has provided Waste Management with a report that details a method for estimating leachate generation during post-closure at Subtitle D landfills. The summary of the report is included as Attachment C. They have determined from actual data that leachate generation rates decline exponentially during post-closure and can be approximated by the following equation:

$$G_T = G_C e^{-0.4605T}$$

Where: G_T is the leachate generation rate for an area at any time after closure.
 G_C is the leachate generation rate for an area at the time of closure.
T is the time after closure in years.

For this evaluation, the leachate generation rate for the 1-year closure period (G_c) is assumed to be equivalent to the leachate volume generated from 7/1/06 – 6/30/07 as reported in the WHSL 2007 AOR (303,300 gallons). The active disposal area during the 2007 AOR period is roughly equivalent to the worst-case closure area described in Section A.

CLIENT: Waste Management of Hawaii SUBJECT: Closure and Post-Closure
PROJECT: West Hawai'i Sanitary Landfill Cost Estimates

Prepared By TW Date 04/15/08
Reviewed By JFG Date 04/16/08
Approved By _____ Date _____

Using the GeoSyntec model, the leachate generated during each year of post-closure is summarized in the table included as Attachment D. As shown by the model, after Year 10, it would most likely not be feasible to operate the leachate management system since it might not be feasible/possible to extract the leachate from the landfill due to the low volume of leachate generated. Therefore, ten (10) years was used as the post-closure leachate management and monitoring period.

Currently, the site has one (1) 3,000 gallon leachate storage tank for each of the leachate collection sumps. Assuming six (6) leachate collection sumps during the post-closure period, an on-site leachate storage volume of 18,000 gallons was assumed. From this, it was determined how many times each year during the 10-year leachate management post-closure period that the leachate storage tanks would need to be emptied and leachate re-introduced into the waste mass (see table in Attachment D).

The labor to empty the storage tanks and perform the leachate injection into the closed landfill would consist of one Water Truck Driver at the 2008 prevailing wage rate for Hawaii. The existing on-site water tanker would be used. It is assumed that the operator would require 40 labor hours for each event (includes recordkeeping). The estimated cost would be as follows:

$$(\$53.73/\text{hr}) \times (40 \text{ hours/event}) \times (50 \text{ events}) = \$107,460$$

2. The annual cost to provide electricity for the leachate management system is an assumed cost.
3. The annual cost for maintenance of the leachate management system is an assumed cost. It includes maintenance of the pumps, piping, storage tanks, leachate tanker, and leachate injection wells.
4. The unit cost to collect a leachate sample assume that one Class I laborer at the 2008 prevailing wage rate for Hawaii (Attachment B) will require 1.5 hours to collect, record and ship each sample and includes additional costs as follows:

Labor:	(\$41.90/hr) x (1.5 hours/sample)	=	\$62.85/sample
Vehicle Usage:	(\$50/event) x (1 event/6 samples)	=	\$8.33/sample
Shipping:	(\$100/event) x (1 event/6 wells)	=	\$16.67/sample
Total Unit Cost		≈	\$88/sample

5. This is an assumed unit cost to analyze the sample at a laboratory.
6. The unit cost to analyze the data and prepare the report is as follows:

Project Manager:	\$100/hr x 3 hours	=	\$300
Technician:	\$70/hour x 15 hours	=	\$1,050
Clerical:	\$50/hour x 2 hours	=	\$100
Reproduction / Shipping Charges:		=	\$50
Total		=	\$1,500
Unit Cost per Sample (divide total by 6)		=	\$250/sample

7. Calculated as shown.
8. It is assumed that one sample will be collected from each of the six (6) leachate collection sumps in the permitted

CLIENT: Waste Management of Hawaii SUBJECT: Closure and Post-Closure
PROJECT: West Hawai'i Sanitary Landfill Cost Estimates

Prepared By TW Date 04/15/08
Reviewed By JFG Date 04/16/08
Approved By _____ Date _____

design (Reference 1).

9. Leachate will be sampled on an annual basis.
10. It is assumed that leachate management will be required for ten (10) years, as described in Item 1 above.
11. The Cost Summary items are calculated as shown.

Section E – Inspections & Maintenance

1. The size of the facility is 300 acres.
2. The landfill footprint is 149 acres.
3. This assumes a 1-year closure period and a 30-year post-closure period for a total of 31 years.
4. The monthly cost for inspection and recordkeeping assumes that one Class I laborer at the 2008 prevailing wage rate for Hawaii (Attachment B) will require 16 hours for the following:
 - Inspection of the leachate management system to ensure that it is functioning;
 - Recordkeeping of the leachate volume collected from each of the leachate collection sumps; and,
 - Inspection of the final cover system and passive gas vent system to ensure the integrity of the final cover system.

The estimated cost for these monthly inspection and recordkeeping events is as follows:

Labor:	(\$41.90/hr) x (16 hours/event)	=	\$670/event
Vehicle Usage:		=	\$50/event
Total Cost:		=	\$720/event

5. It is assumed that a qualified individual will semi-annually perform a site inspection and prepare an inspection report to be submitted to the Hawaii DOH. The scope of the semi-annual site inspection is discussed in the Closure / Post-Closure Plan narrative. The estimated cost for the semi-annual inspection is as follows:

Site Inspection:	\$80/hour x 16 hours	=	\$1,280
Report Preparation:	\$80/hour x 14 hours	=	\$1,120
Report Peer Review:	\$100/hr x 3 hours	=	\$300
Clerical:	\$50/hour x 2 hours	=	\$100
Vehicle Usage:	\$100/event	=	\$100
<u>Reproduction / Shipping Charges:</u>		=	<u>\$100</u>
Total		=	\$3,000

6. The cost to repair the final cover and cap during the post-closure period is an assumed cost.
7. The annual cost to maintain the water production well is an assumed cost.

CLIENT: Waste Management of Hawaii SUBJECT: Closure and Post-Closure Prepared By TW Date 04/15/08
PROJECT: West Hawai'i Sanitary Landfill Cost Estimates Reviewed By JFG Date 04/16/08
Approved By _____ Date _____

8. The annual cost to repair fences and gates assumes that the main gate and 20 feet of fencing on each side of the gate will be replaced every 10 years. The unit costs were taken from Means (Attachment A).

Barbed Wire Removal:	(\$1.77/lf) x (40 ft/10 years)	=	\$7.08/year
Fence Removal:	(\$2.89/lf) x (40 ft/10 years)	=	\$11.56/year
Gate Removal:	(\$150/ea)(1 gate/10 years)	=	\$15.00/year
Rubbish Handling:	(Assumed cost) → (\$500/event)	=	\$50.00/year
Fence Placement:	(\$22/lf)(40 ft/10 year)	=	\$88.00/year
Gate Placement:	(\$1,775/each)(1 gate/10 years)	=	\$177.50/year
Total Annual Cost for Fence and Gate Repairs		≈	\$350/year

9. Calculated as follows:

- a) The length of site roads (15,000 ft) was estimated using the current site plan and permit drawings. It includes the perimeter road around the landfill, the access road from the site gate to the perimeter access road, and the access road to the water tank and production well.
- b) Calculated as instructed.
- c) This is an assumed unit cost.

10. The Cost Summary items are calculated as shown.

ATTACHMENT A

UNIT COSTS FROM MEANS COSTWORKS 2007 INTERACTIVE CD

CostWorks 2007 - West Hawaii Sanitary Landfill CPC Cost Estimate

Qty	CSI Number	Description	Crew	Daily Output	Labor Hours	Unit	Bare Mat.	Total Incl. O&P	Zip Code Prefix	Release	Note
1.000	332113108550	Wells, domestic water, pump test well	B23B	8	3	Hr.	\$88.50	\$785.00	967	2007	Section B, Item 02
1.000	024113620400	Selective demolition, chain link, gates, 20' width	B6	10	2.400	Ea.	\$0.00	\$150.00	967	2007	Section E, Item 08
1.000	323113205070	Chain link fence, double swing gates, 6' high, 20' opening	B80C	2.60	9.231	Opng.	\$1,175.00	\$1,775.00	967	2007	Section E, Item 08
1.000	323113200200	Chain link fence, industrial, galvanized steel, 3 strands barb wire, 2" posts @ 10' OC, 9 ga. wire, 6' high, schedule 40, includes excavation	B80C	240	.100	L.F.	\$14.95	\$22.00	967	2007	Section E, Item 08
1.000	024113601600	Fencing demolition, remove barbed wire, 3 strands	2 Clab	430	.037	L.F.	\$0.00	\$1.77	967	2007	Section E, Item 08
1.000	024113601755	Minor site demolition, chain link, to 6' high, remove only, excludes hauling	B6	520	.046	L.F.	\$0.00	\$2.89	967	2007	Section E, Item 08
		Totals					\$4,468.90	\$8,524.44			

CostWorks 2007 - West Hawaii Sanitary Landfill CPC Cost Estimate

Qty	CSI Number	Description	Crew	Daily Output	Labor Hours	Unit	Bare Mat	Total Incl. O&P	Zip Code Prefix	Release	Note
1.000	312323181600	Hauling, grading at dump, or embankment if required, by dozer	B10B	1,000	.012	L.C.Y.	\$0.00	\$1.77	967	2007	Section A, Item 09
1.000	312323235040	Compaction, riding, vibrating roller, 4 passes, 6" lifts	B10Y	1,900	.006	E.C.Y.	\$0.00	\$0.62	967	2007	Section A, Item 09
1.000	312316420260	Excavating, bulk bank measure, 2 C.Y. capacity = 130 C.Y./hour, backhoe, hydraulic, crawler mounted	B12C	1,040	.015	B.C.Y.	\$0.00	\$1.91	967	2007	Section A, Item 10
1.000	312323181245	Hauling, excavated or borrow material, loose cubic yards, 5 mile round trip, 1.1 loads/hour, 20 C.Y. dump trailer, highway haulers, excludes loading	B34D	143	.056	L.C.Y.	\$0.00	\$6.20	967	2007	Section A, Item 10
1.000	312323170020	Fill, dumped material, spread, by dozer, excludes compaction	B10B	1,000	.012	L.C.Y.	\$0.00	\$1.77	967	2007	Section A, Item 10
1.000	312323235020	Compaction, riding, vibrating roller, 3 passes, 6" lifts	B10Y	2,300	.005	E.C.Y.	\$0.00	\$0.51	967	2007	Section A, Item 10
1.000	332113105000	Wells, domestic water, pump, 1 HP, installed in wells, 4" submersible, to 180' deep	B21	1.10	25.455	Ea.	\$2,850.00	\$4,700.00	967	2007	Section B, Item 02
1.000	332113108320	Wells, domestic water, well screen assembly, slotted PVC, 2" diameter	B23A	273	.088	L.F.	\$5.45	\$25.00	967	2007	Section B, Item 02
1.000	332113108500	Wells, domestic water, develop well	B23B	8	3	Hr.	\$335.00	\$1,050.00	967	2007	Section B, Item 02

ATTACHMENT B

**WAGE RATE SCHEDULE BULLETIN NO. 466, FEBRUARY 25, 2008 AND EQUIPMENT OPERATOR GROUPS,
REVISED 11/4/04, HAWAII DEPARTMENT OF LABOR AND INDUSTRIAL RELATIONS**

WAGE RATE SCHEDULE BULLETIN NO. 466

Classification	Current						2008			2009			2010			Remarks See Pg 6-7
	Prevailing Wage Total	Basic Hourly Rate	Fringe Hourly Rate													
• ASBESTOS WORKER	\$64.19	\$33.60	\$20.59	-	-	-	-	-	-	-	-	-	-	-	-	1
• ASPHALT PAVING GROUP:																
Asphalt Raker	\$52.54	\$32.51	\$20.03	-	-	-	-	-	-	-	-	-	-	-	-	2,12
Asphalt Spreader Operator	\$54.02	\$33.99	\$20.03	-	-	-	-	-	-	-	-	-	-	-	-	2,12
Laborer, Hand Roller	\$52.04	\$32.01	\$20.03	-	-	-	-	-	-	-	-	-	-	-	-	2,12
Roller Operator (5 tons and under)	\$52.27	\$32.24	\$20.03	-	-	-	-	-	-	-	-	-	-	-	-	2,12
Roller Operator (over 5 tons)	\$53.70	\$33.67	\$20.03	-	-	-	-	-	-	-	-	-	-	-	-	2,12
Screed Person	\$53.50	\$33.47	\$20.03	-	-	-	-	-	-	-	-	-	-	-	-	2,12
EQUIPMENT OPERATOR:																
Concrete saws and/or Grinder (self-propelled unit on streets, highways, airports and canals)	\$53.50	\$33.47	\$20.03	-	-	-	-	-	-	-	-	-	-	-	-	2,12
Grader, Soil Stabilizer, Cold Planer	\$54.33	\$34.30	\$20.03	-	-	-	-	-	-	-	-	-	-	-	-	2,12
Loader (2-1/2 cu. yds. and under)	\$53.50	\$33.47	\$20.03	-	-	-	-	-	-	-	-	-	-	-	-	2,12
Loader (over 2-1/2 cu. yds. to and including 5 cu. yds.)	\$53.82	\$33.79	\$20.03	-	-	-	-	-	-	-	-	-	-	-	-	2,12
TRUCK DRIVER:																
Assistant to Engineer	\$52.27	\$32.24	\$20.03	-	-	-	-	-	-	-	-	-	-	-	-	2,12
Oil Tanker (double), Hot Liquid Asphalt Tanker	\$53.82	\$33.79	\$20.03	-	-	-	-	-	-	-	-	-	-	-	-	2,12
Semi-Trailer, Semi-Dump, Asphalt Distributor	\$53.50	\$33.47	\$20.03	-	-	-	-	-	-	-	-	-	-	-	-	2,12
Slip-in or Pup	\$53.82	\$33.79	\$20.03	-	-	-	-	-	-	-	-	-	-	-	-	2,12
Single or Rock Cans Tandem Dump Truck	\$52.54	\$32.51	\$20.03	-	-	-	-	-	-	-	-	-	-	-	-	2,12
(8 cu. yds. & under, water level)																
Single or Rock Cans Tandem Dump Truck	\$52.85	\$32.82	\$20.03	-	-	-	-	-	-	-	-	-	-	-	-	2,12
(over 8 cu. yds., water level)																
Tractor Trailer (hauling equipment)	\$53.93	\$33.90	\$20.03	-	-	-	-	-	-	-	-	-	-	-	-	2,12
Utility, Flatbed	\$52.27	\$32.24	\$20.03	-	-	-	-	-	-	-	-	-	-	-	-	2,12
BOILERMAKER	10/1/07	\$51.08	\$28.95	\$21.13	-	-	-	-	-	-	-	-	-	-	-	12
• CARPENTER:																
Carpenter, Patent Scaffold Erector (Over 14 feet);	9/17/07				9/1/08				8/31/09				8/30/10			
Piledriver, Pneumatic Nailer	\$53.45	\$34.95	\$18.50	\$55.20	\$36.20	\$19.00	\$56.65	\$37.45	\$19.20	\$58.10	\$38.70	\$19.40	\$58.35	\$38.95	\$19.40	3,12
Millwright	\$53.70	\$35.20	\$18.50	\$55.45	\$36.45	\$19.00	\$56.90	\$37.70	\$19.20	\$58.35	\$38.95	\$19.40	\$58.60	\$39.20	\$19.40	3,12
Power Saw Operator (2 h.p. & above)	\$53.50	\$35.10	\$18.50	\$55.35	\$36.35	\$19.00	\$56.80	\$37.60	\$19.20	\$58.25	\$38.85	\$19.40	\$58.50	\$39.15	\$19.40	3,12
CEMENT FINISHER:																
Cement Finisher, Curb Setter, Precast Panel Setter;	9/3/07															
Manhole Builder	\$49.27	\$28.60	\$20.67	-	-	-	-	-	-	-	-	-	-	-	-	3
Trowel Machine Operator	\$49.42	\$28.75	\$20.67	-	-	-	-	-	-	-	-	-	-	-	-	3
CHLORINATOR	9/17/07	\$23.19	\$21.04	\$2.15	-	-	-	-	-	-	-	-	-	-	-	

WAGE RATE SCHEDULE BULLETIN NO. 466

Classification	Current				2008				2009				2010				Remarks See Pg 6-7
	Prevailing Wage Total	Basic Hourly Rate	Fringe Hourly Rate		Prevailing Wage Total	Basic Hourly Rate	Fringe Hourly Rate		Prevailing Wage Total	Basic Hourly Rate	Fringe Hourly Rate		Prevailing Wage Total	Basic Hourly Rate	Fringe Hourly Rate		
*DIVER:	2/25/08	\$67.56	\$45.43	\$22.13	-	-	-	-	-	-	-	-	-	-	-	-	-
Diver (Aqua Lung)(Scuba)-Up to a depth of 30 feet		\$76.83	\$54.80	\$22.13	-	-	-	-	-	-	-	-	-	-	-	-	-
Diver (Aqua Lung)(Scuba)-Over a depth of 30 feet		\$58.18	\$38.05	\$22.13	-	-	-	-	-	-	-	-	-	-	-	-	-
Stand-by Diver (Aqua Lung)(Scuba)		\$76.93	\$54.80	\$22.13	-	-	-	-	-	-	-	-	-	-	-	-	-
Diver (Other than Aqua Lung)		\$58.18	\$38.05	\$22.13	-	-	-	-	-	-	-	-	-	-	-	-	-
Stand-by Diver (Other than Aqua Lung)		\$55.15	\$33.02	\$22.13	-	-	-	-	-	-	-	-	-	-	-	-	-
Tender (Other than Aqua Lung)																	
*DRAPERY INSTALLER	9/18/08	\$14.80	\$13.60	\$1.20	-	-	-	-	-	-	-	-	-	-	-	-	-
*DRYWALL INSTALLER	9/17/07	\$53.70	\$35.20	\$18.50	8/1/08	\$55.45	\$38.45	\$19.00	8/31/09	\$58.90	\$37.70	\$19.20	8/30/10	\$58.35	\$38.95	\$19.40	12
*ELECTRICIAN: (Note: 2 increases per year)	2/24/08	\$84.46	\$41.20	\$23.26	8/31/08	\$85.88	\$41.81	\$23.97	3/1/09	\$87.39	\$42.88	\$24.71	2/28/10	\$70.23	\$44.17	\$26.06	5
Cable Splicer (inside/outside)		\$47.34	\$28.08	\$19.25		\$48.48	\$28.58	\$19.90		\$49.65	\$29.10	\$20.55		\$51.86	\$30.11	\$21.75	5
Ground Worker (outside)		\$54.68	\$33.71	\$20.97		\$55.83	\$34.29	\$21.54		\$57.26	\$34.92	\$22.34		\$59.74	\$36.14	\$23.60	5
Heavy Equipment Operator (outside)		\$58.58	\$37.45	\$21.11		\$60.91	\$38.10	\$22.81		\$62.32	\$38.80	\$23.62		\$64.98	\$40.15	\$24.83	5
Line Installer (outside); Wire Installer (inside)		\$61.02	\$38.57	\$22.45		\$62.40	\$39.24	\$23.16		\$63.84	\$39.96	\$23.88		\$66.54	\$41.35	\$25.19	5
Technician (inside/outside)																	
*ELEVATOR CONSTRUCTOR MECHANIC	2/25/08	\$62.285	\$46.00	\$16.285	-	-	-	-	8/30/08	\$68.83	\$43.40	\$25.43	-	-	-	-	-
*EQUIPMENT OPERATOR:	2/25/08	\$52.87	\$30.74	\$22.13	-	-	-	-	-	-	-	-	-	-	-	-	-
Group 1		\$52.98	\$30.85	\$22.13	-	-	-	-	-	-	-	-	-	-	-	-	-
Group 2		\$53.15	\$31.02	\$22.13	-	-	-	-	-	-	-	-	-	-	-	-	-
Group 3		\$53.42	\$31.29	\$22.13	-	-	-	-	-	-	-	-	-	-	-	-	-
Group 4		\$53.73	\$31.60	\$22.13	-	-	-	-	-	-	-	-	-	-	-	-	-
Group 5		\$54.38	\$32.25	\$22.13	-	-	-	-	-	-	-	-	-	-	-	-	-
Group 6		\$54.70	\$32.57	\$22.13	-	-	-	-	-	-	-	-	-	-	-	-	-
Group 7		\$54.81	\$32.68	\$22.13	-	-	-	-	-	-	-	-	-	-	-	-	-
Group 8		\$54.92	\$32.79	\$22.13	-	-	-	-	-	-	-	-	-	-	-	-	-
Group 9		\$55.15	\$33.02	\$22.13	-	-	-	-	-	-	-	-	-	-	-	-	-
Group 9A		\$55.21	\$33.08	\$22.13	-	-	-	-	-	-	-	-	-	-	-	-	-
Group 10		\$55.36	\$33.23	\$22.13	-	-	-	-	-	-	-	-	-	-	-	-	-
Group 10A		\$55.51	\$33.38	\$22.13	-	-	-	-	-	-	-	-	-	-	-	-	-
Group 11		\$55.67	\$33.74	\$22.13	-	-	-	-	-	-	-	-	-	-	-	-	-
Group 12		\$56.23	\$34.10	\$22.13	-	-	-	-	-	-	-	-	-	-	-	-	-
Group 12A																	

WAGE RATE SCHEDULE BULLETIN NO. 466

Classification	Current				2008				2009				2010				Remarks See Pg 6-7
	Prevailing Wage Total	Basic Hourly Rate	Fringe Hourly Rate	Prevailing Wage Total	Basic Hourly Rate	Fringe Hourly Rate	Prevailing Wage Total	Basic Hourly Rate	Fringe Hourly Rate	Prevailing Wage Total	Basic Hourly Rate	Fringe Hourly Rate	Prevailing Wage Total	Basic Hourly Rate	Fringe Hourly Rate		
FENCE ERECTOR (CHAIN-LINK TYPE)	9/17/07	\$15.00	\$5.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FLOOR LAYER (CARPET, LINOLEUM & SOFT TILE)	9/17/07	\$44.50	\$25.55	\$18.95	3/2/08	\$45.60	\$28.00	\$19.60	-	-	-	-	-	-	-	-	12
GLAZIER	9/17/07	\$49.27	\$27.65	\$21.62	-	-	-	-	-	-	-	-	-	-	-	-	7
HELICOPTER WORK:	2/25/08	\$56.73	\$34.60	\$22.13	-	-	-	-	-	-	-	-	-	-	-	-	-
Airborne Hoist Operator		\$58.87	\$34.74	\$22.13	-	-	-	-	-	-	-	-	-	-	-	-	-
Co-Pilot		\$57.04	\$34.91	\$22.13	-	-	-	-	-	-	-	-	-	-	-	-	-
Pilot																	
IRONWORKER:	2/25/08	\$54.01	\$30.00	\$24.01	9/1/08	\$56.76	\$31.25	\$25.51	9/1/09	\$58.51	\$32.50	\$28.01	9/1/10	\$59.78	\$33.75	\$28.01	8,12
Reinforcing, Structural																	
LABORER:	9/17/07	\$41.35	\$27.20	\$14.15	9/1/08	\$42.90	\$28.25	\$14.65	8/31/09	\$44.45	\$29.30	\$15.15	8/30/10	\$46.25	\$30.35	\$15.90	3
Driller		\$40.85	\$26.70	\$14.15	\$42.40	\$27.75	\$14.65	\$43.95	\$43.95	\$28.80	\$15.15	\$45.75	\$45.75	\$29.85	\$15.90	\$15.90	3
Gunitie Operator		\$40.85	\$26.70	\$14.15	\$41.90	\$27.25	\$14.65	\$43.45	\$43.45	\$28.30	\$15.15	\$45.25	\$45.25	\$29.35	\$15.90	\$15.90	3
High Scaler (Working Suspended)		\$37.75	\$23.60	\$14.15	\$39.30	\$24.65	\$14.65	\$40.85	\$40.85	\$25.70	\$15.15	\$42.65	\$42.65	\$26.75	\$15.90	\$15.90	3
Laborer I		\$27.55	\$17.60	\$9.95	\$29.10	\$18.85	\$10.45	\$30.65	\$30.65	\$19.70	\$10.95	\$32.45	\$32.45	\$20.75	\$11.70	\$11.70	3
Laborer II		\$41.35	\$27.20	\$14.15	\$42.90	\$28.25	\$14.65	\$44.45	\$44.45	\$29.30	\$15.15	\$46.25	\$46.25	\$30.35	\$15.90	\$15.90	3
Light Clean-up (Janitorial) Laborer		\$39.85	\$25.70	\$14.15	\$41.40	\$26.75	\$14.65	\$42.95	\$42.95	\$27.80	\$15.15	\$44.75	\$44.75	\$28.85	\$15.90	\$15.90	3
Powder Blaster																	
Window Washer (Outside) (On bosun's chair, cable-suspended scaffold or work platform)																	
LANDSCAPER:	10/1/07	\$27.18	\$18.86	\$7.32	10/5/08	\$28.18	\$20.38	\$7.82	10/5/09	\$29.23	\$20.86	\$8.37					12
Landscape & Irrigation Laborer A		\$27.68	\$20.36	\$7.32	\$28.88	\$20.86	\$7.82	\$29.73	\$29.73	\$21.38	\$8.37	\$6.37					12
Landscape & Irrigation Laborer B		\$23.78	\$18.46	\$7.32	\$24.73	\$18.91	\$7.82	\$25.73	\$25.73	\$17.36	\$6.37	\$6.37					12
Landscape & Irrigation Maintenance Laborer																	
LATHER	9/17/07	\$53.70	\$35.20	\$18.50	9/1/08	\$55.45	\$36.45	\$19.00	8/31/09	\$56.90	\$37.70	\$19.20	8/30/10	\$58.35	\$38.95	\$19.40	12
MASON: Bricklayer.	9/3/07	\$48.32	\$28.65	\$20.67	-	-	-	-	-	-	-	-	-	-	-	-	3
Cement Blocklayer, Stone Mason, Precast Sill Setter		\$49.57	\$28.90	\$20.67	-	-	-	-	-	-	-	-	-	-	-	-	3
Pontier-Caulker-Weatherproof																	
PAINTER: (Note: 2 increases per year)	2/25/08	\$51.25	\$29.35	\$21.90	7/1/08	\$52.15	\$30.25	\$21.90	1/1/09	\$53.05	\$31.15	\$21.90	1/1/10	\$55.35	\$32.20	\$23.15	12
Painter		\$51.25	\$29.35	\$21.90	\$52.15	\$30.25	\$21.90	\$53.05	\$53.05	\$31.15	\$21.90	\$55.35	\$55.35	\$32.20	\$23.15	\$23.15	12
Spray Painter; Sandblaster or Waterblaster																	
Painter																	
Spray Painter, Sandblaster or Waterblaster																	

WAGE RATE SCHEDULE BULLETIN NO. 466

Classification	Current			2008			2009			2010			Remarks See Pg 6-7
	Prevailing Wage Total	Basic Hourly Rate	Fringe Hourly Rate	Prevailing Wage Total	Basic Hourly Rate	Fringe Hourly Rate	Prevailing Wage Total	Basic Hourly Rate	Fringe Hourly Rate	Prevailing Wage Total	Basic Hourly Rate	Fringe Hourly Rate	
PLASTERER	9/3/07 \$50.11	\$29.44	\$20.67	-	-	-	-	-	-	-	-	-	3
PLUMBER: Plumber; Pipefitter; Refrigeration Fitter; Heating & Air Conditioning Fitter; Sprinkler Fitter; Steamfitter	2/25/08 \$53.50	\$33.60	\$19.90	-	-	-	-	-	-	-	-	-	9
ROOFER: Shingle, Tile, Built-up Roofing Coal Tar Pitch	4/28/07 \$44.93 \$76.03	\$31.10 \$62.20	\$13.83 \$13.83	-	-	-	-	-	-	-	-	-	
SANDBLASTER OR WATERBLASTER: Use wages of craft to which sand or water blasting is incidental.													
SHEETMETAL WORKER	9/2/07 \$52.50	\$33.67	\$18.83	3/2/08 \$53.53	\$33.67	\$19.86	-	-	-	-	-	-	10
TAPER	1/1/08 \$52.30	\$36.00	\$16.30	-	-	-	-	-	-	-	-	-	12
TERMITE TREATER	9/17/07 \$13.31	\$11.00	\$2.31	-	-	-	-	-	-	-	-	-	
TERRAZZO: Terrazzo Setter Terrazzo Base Grinder Certified Terrazzo Floor Grinder and Tender Terrazzo Floor Grinder	9/3/07 \$49.57 \$47.76 \$46.21 \$44.71	\$28.90 \$27.09 \$25.54 \$24.04	\$20.67 \$20.67 \$20.67 \$20.67	-	-	-	-	-	-	-	-	-	3 3 3 3
TILE SETTER: Ceramic Hard Tile; Marble Setter Certified Ceramic Tile & Marble Helper	9/3/07 \$49.57 \$48.21	\$28.90 \$25.54	\$20.67 \$20.67	-	-	-	-	-	-	-	-	-	3 3
TRUCK DRIVER: Concrete Mixer Concrete Mixer/Booster	9/17/07 \$28.68 \$37.13	\$27.00 \$28.43	\$1.66 \$8.70	-	-	-	-	-	-	-	-	-	
• Dump Truck, 8 cu. yds. & under (water level); • Water Truck (up to & including 2,000 gallons) • Flatbed, Utility, etc. • End Dump, Unlicensed (Euclid, Mack, Caterpillar, or similar); Tractor Trailer (hauling equipment) • Semi-Trailer, Rock Cans, or Semi-Dump • Slip-in or Pup • Tandem Dump Truck over 8 cu. yds. (water level); • Water Truck (over 2,000 gallons)	2/25/08 \$53.42 \$53.15 \$54.81 \$54.38 \$54.70	\$31.28 \$31.02 \$32.68 \$32.25 \$32.57	\$22.13 \$22.13 \$22.13 \$22.13 \$22.13	-	-	-	-	-	-	-	-	-	
	\$53.73	\$31.60	\$22.13	-	-	-	-	-	-	-	-	-	

WAGE RATE SCHEDULE BULLETIN NO. 466

Classification	Current				2008				2009				2010				Remarks See Pg 6-7
	Prevailing Wage Total	Basic Hourly Rate	Fringe Hourly Rate	9/17/07	Prevailing Wage Total	Basic Hourly Rate	Fringe Hourly Rate	9/17/08	Prevailing Wage Total	Basic Hourly Rate	Fringe Hourly Rate	8/31/09	Prevailing Wage Total	Basic Hourly Rate	Fringe Hourly Rate	8/30/10	
*UNDERGROUND LABORER:																	
Worker in a raise, shaft, or tunnel.																	
Group 1	\$40.95	\$26.80	\$14.15		\$42.50	\$27.85	\$14.65		\$44.05	\$28.90	\$15.15		\$45.85	\$29.95	\$15.90		
Group 2	\$42.45	\$28.30	\$14.15		\$44.00	\$29.35	\$14.65		\$45.55	\$30.40	\$15.15		\$47.35	\$31.45	\$15.90		
Group 3	\$42.95	\$28.80	\$14.15		\$44.50	\$29.85	\$14.65		\$46.05	\$30.90	\$15.15		\$48.85	\$31.95	\$15.90		
Group 4	\$43.95	\$29.80	\$14.15		\$45.50	\$30.85	\$14.65		\$47.05	\$31.90	\$15.15		\$48.85	\$32.95	\$15.90		
Group 5	\$44.20	\$30.05	\$14.15		\$45.75	\$31.10	\$14.65		\$47.30	\$32.15	\$15.15		\$49.10	\$33.20	\$15.90		
Group 6	\$44.30	\$30.15	\$14.15		\$45.85	\$31.20	\$14.65		\$47.40	\$32.25	\$15.15		\$49.20	\$33.30	\$15.90		
Group 7	\$44.55	\$30.40	\$14.15		\$46.10	\$31.45	\$14.65		\$47.85	\$32.50	\$15.15		\$49.45	\$33.55	\$15.90		
Group 8	\$45.00	\$30.85	\$14.15		\$46.55	\$31.90	\$14.65		\$48.10	\$32.95	\$15.15		\$49.90	\$34.00	\$15.90		
*WATER FRONT CONSTRUCTION (DREDGING):																	
CLAMSHELL OR DIPPER DREDGES:																	
Ciamsell or Dipper Operator	\$55.87	\$33.74	\$22.13														
Mechanic; Welder; Watch Engineer	\$55.21	\$33.08	\$22.13														
Deckmate; Bergemate	\$54.81	\$32.68	\$22.13														
Fire Person; Oiler; Deckhand; Barge Worker	\$53.15	\$31.02	\$22.13														
HYDRAULIC SUCTION DREDGES:																	
Lever Operator	\$55.51	\$33.38	\$22.13														
Mechanic; Welder	\$55.21	\$33.08	\$22.13														
Watch Engineer (steam or electric)	\$55.36	\$33.23	\$22.13														
Dozer Operator	\$55.15	\$33.02	\$22.13														
Deckmate	\$54.81	\$32.68	\$22.13														
Winch Operator (stem winch on dredge)	\$54.70	\$32.57	\$22.13														
Fire Person; Oiler; Deckhand (can operate anchor saw under direction of deckmate); Levee Operator	\$53.15	\$31.02	\$22.13														
DERRICKS:																	
Operator; Derrick; Piledriver; Crane	\$55.87	\$33.74	\$22.13														
Deckmate; Saurman Type Dragline (up to & including 5 yds.)	\$54.81	\$32.68	\$22.13														
Saurman Type Dragline (over 5 cu. yds.)	\$55.21	\$33.08	\$22.13														
Fire Person; Oiler; Deckhand	\$53.15	\$31.02	\$22.13														
BOAT OPERATORS:																	
Master Boat Operator	\$55.51	\$33.38	\$22.13														
Boat Operator	\$55.36	\$33.23	\$22.13														
Boat Deckhand	\$53.15	\$31.02	\$22.13														
WELDER:																	
Use wages of craft to which welding is incidental.																	
WATER WELL DRILLER:																	
Water Well Driller	\$30.56	\$28.00	\$2.56														
Water Well Driller Helper	\$21.38	\$19.00	\$2.38														

Comments: Overtime must be paid at one and one-half times the basic hourly rate plus the hourly cost of required fringe benefits.

* Indicates a wage, fringe benefit, remark, or title change from the previous bulletin.

REMARKS

1. Asbestos Worker. Six percent per hour shall be added to the hourly wage for hazardous pay while working from a boatswain chair, staging or free standing scaffolding erected from the ground up or mezzanine floor subject to a free fall and skylimber suspended from a permanent structure and when working above 40 feet.
2. Asphalt Paving: \$.75 per hour shall be added to the hourly wage while working to scale the quarry face.
 Note: Oil Tanker has been renamed to Hot Liquid Asphalt Tanker.
3. Carpenter, Cement Finisher, Laborer (excluding High Scaler, Window Washer), Mason, Plasterer, Terrazzo, Tile Setter. \$.50 per hour shall be added to the regular straight-time rate for height pay for each hour while working from a bosun's chair and/or from a cable-suspended scaffold or work platform which is free swinging (not attached to building) for each hour worked on said rig.
4. Diver:
 - A. On any dive exceeding 50 feet, the diver shall in addition be paid the following amount of "depth money":

50 feet to 100 feet	\$1.50 per foot in excess of 50 feet
100 feet to 150 feet	\$100.00 plus \$2.00 per foot in excess of 100 feet
150 feet to 200 feet	\$200.00 plus \$3.00 per foot in excess of 150 feet
 - B. When it is necessary for a Diver to enter any pipe, tunnel or other enclosure, the said Diver shall in addition to the hourly rate, receive a premium in accordance with the following schedule for distance traveled from the entrance of the pipe, tunnel or other enclosure:
 - 1) When able to stand erect, but in which there is no vertical ascent:

5 feet to 50 feet	\$5.00 per day
50 feet to 100 feet	\$7.50 per day
100 feet to 150 feet	\$12.50 per day
 - 2) When unable to stand erect and in which there is no vertical ascent:

5 feet to 50 feet	\$5.00 per day
50 feet to 100 feet	\$7.50 per day
100 feet to 150 feet	\$12.50 per day
150 feet to 200 feet	\$36.75 per day
200 feet to 300 feet	\$1.00 per foot
300 feet to 450 feet	\$1.50 per foot
450 feet to 600 feet	\$2.50 per foot
5. Electrician:
 - A. One and one-half times the straight-time rate while working in a tunnel under construction; under water with aqualung equipment; in a completed tunnel which has only one entrance or exit providing access to safety and where no other personnel are working; or in an underground structure having no access to safety or where no other personnel are working.
 - B. Double the straight-time rate shall be paid for the following types of hazardous work:
 - 1) While working from trusses, stacks, towers, tanks, bosun's chairs, swinging or rolling scaffolds, supporting structures, and open platforms, over 70 feet from the ground where the employee is subject to a free fall; provided, however, that when work is performed on stacks, towers or permanent platforms where the employees are on a firm footing within an enclosure, a hazardous condition does not exist regardless of height;
 - 2) While working outside of a railing or enclosure, or temporary platforms extending outside of a building, or from scaffolding or ladder within an enclosure where an employee's footing is within one foot of the top of such railing, and the employee is subject to a free fall of over 70 feet;
 - 3) Working on buildings while leaning over the railing or edge of the building, and is subject to a free fall of 70 feet; or
 - 4) Two hours minimum hazardous pay per day shall be paid while climbing to a stack, tower or permanent platform which exceeds 70 feet from the ground but where the employee is on a firm footing within an enclosure.
 - C. Five percent per hour shall be added to the hourly wage for height pay while working above 9,000 feet elevation.

REMARKS

6. Equipment Operator:
 A. Operators and Assistants to Engineer (climbing a boom) of cranes (under 50 tons) with booms of eighty feet or more (including jib) or of cranes (under 50 tons) with leads of one hundred feet or more, shall receive additional premium according to the following schedule:

	Per Hour
Booms of 80 feet up to, or leads of 100 feet up to, but not including 130 feet	\$0.50
Booms and/or leads of 130 feet up to, but not including 180 feet	\$0.75
Booms and/or leads of 180 feet up to and including 250 feet	\$1.15
Booms and/or leads over 250 feet	\$1.50

Operators and Assistants to Engineer (climbing a boom) of cranes (50 tons and over) with booms of 180 feet or more (including jib) shall receive additional premium according to the following schedule:

	Per Hour
Booms of 180 feet up to and including 250 feet	\$1.25
Booms over 250 feet	\$1.75

Note: The boom shall be measured from the center of the heel pin to the center of the boom or jib point sheave.

B. \$1.25 per hour shall be added to the hourly wage while operating a rig suspended by ropes or cables or to perform work on a Yo-Yo Cat.

C. In a raise or shaft, a premium of \$.40 per hour will be paid in addition to the regular straight time wage.

A raise is defined to be an underground excavation (lined or unlined) whose length exceeds its width and the inclination of the grade from the excavation is greater than 20 degrees from the horizontal.

A shaft is defined to be an excavation (lined or unlined) made from the surface of the earth, generally vertical in nature, but may decline up to 75 degrees from the vertical, and whose depth is greater than 15 feet and its largest horizontal dimension. Includes an underground silo.

In a tunnel, a premium of \$.30 per hour will be paid in addition to the regular straight time wages.

D. A tunnel is defined to be an underground excavation (lined or unlined) whose length exceeds its width and the inclination of the grade from the excavation is no greater than 20 degrees from the horizontal.

7. Glazier: \$.50 per hour shall be added to the hourly wage for exterior glazing work performed from a scaffold or rigging 25 feet or more above the ground level.

8. Ironworker: \$.50 per hour shall be added to the hourly wage while working in tunnels or coffer dams. \$1.00 per hour shall be added to the hourly wage while working under or covered with water (submerged), or on the summits of Mauna Kea, Mauna Loa or Haleakala.

9. Plumber: One and one-half times the straight-time rate for height pay while working from OSHA approved trusses, stacks, towers, tanks, bosun's chair, swinging or rolling scaffolding, supporting structures or on open platforms where the employee is subject to direct fall of 40 feet or more. Provided, however, that when said work is performed where the employee is on a firm footing within an enclosure, a hazardous condition does not exist regardless of height. \$1.00 per hour shall be added to the straight time rate while working with flame cutting or any type of welding equipment on any galvanized material or product for at least an hour.

10. Sheetmetal Worker: A. For overtime purposes: (Basic hourly rate less \$2.87) multiplied by 1.5) + \$2.87 + Fringe total

B. Add \$.06 to the total fringe benefit hourly rate per Hawaii Revised Statutes, Section 104-2 (b)(2)

11. Giamshell or Dipper Operator: \$.50 per hour shall be added to the straight-time rate while working with boom (including jib) over 130 feet.

12. Possible wage/fringe option increases:

Asphalt Paving: Effective WRS 467 - \$2.60; 8/31/09 - \$2.00; 8/30/10 - \$2.25

Boilermaker: Effective 10/1/08 - \$2.75; 10/1/09 - \$2.75

Carpenter, Drywall Installer, Lather: Effective 8/31/09 - \$0.30; 8/30/10 - \$0.30

Elevator Constructor Mechanic: Effective 1/1/09 - \$3.00; 1/1/10 - \$3.00

Floor Layer (Carpet, Linoleum, & Soft Tile): Effective 3/1/09 - \$1.25; 2/28/10 - \$1.25

Ironworker: Effective 9/1/09 - \$0.75; 9/1/10 - \$0.75

Landscaper: Effective 10/6/08 - \$0.10; 10/5/09 - \$0.15

Painter: Effective 7/1/09 - \$0.25; 1/1/10 - \$0.25; 7/1/10 - \$0.25

Taper: Effective 1/1/09 - \$1.50; 1/1/10 - \$1.50

Equipment Operators Classifications

- GROUP 1: Fork Lift (up to and including 10 tons)
Parts Worker (heavy-duty repair shop parts room when needed)
Repairer Helper
- GROUP 2: Conveyor Operator (handling building materials)
Hydraulic Monitor
Mixer Box Operator (concrete plant)
- GROUP 3: Assistant to Engineer (Oiler, Gradechecker) (Hy-Ram (refer to Group 2 wage rate))
Concrete Curing Machine (self-propelled, automatically-applied unit on streets, highways, airports and canals)
Roller (5 tons and under)
Tugger Hoist
- GROUP 4: Boom Truck or Dual Purpose "A" Frame Truck (5 tons or less)
Concrete Placing Boom (building construction)
Elevator Operator
Hoist and/or Winch (one drum)
Rod Worker or Chain Worker (upgraded from Group 3)
Straddle Truck (ross carrier, hyster, and similar)
- GROUP 5: Asphalt Plant Fire Worker
Compressors, Pumps, Generators, and Welding Machines ("Bank" of 9 or more, individually or collectively)
Concrete Trailer Pump or Pumpcrete Guns
Lubrication and Service Engineer (grease rack)
Screed Worker
- GROUP 6: Boom Truck or Dual Purpose "A" Frame Truck (over 5 tons)
Combination Loader/Backhoe (up to and including 3/4 cu. yd.)
Concrete Batch Plant (wet or dry)
Concrete Cutter, Groover, and/or Grinder (self-propelled unit on streets, highways, airports, and canals)
Concrete Truck Pump Boom or equipment mounted
Conveyor or Concrete Pump (truck or equipment mounted)
Drilling Machinery (not to apply to waterliners, wagon drills, or jack hammers)
Fork Lift (over 10 tons)
Loader (up to and including 3-1/2 cu. yds.)
Lull High Lift (under 40 feet)
Lubrication and Service Engineer (mobile)
Magginnis Internal Full Slab Vibrator (on airports, highways, canals, and warehouses)
Worker or Material Hoist
Mechanical Concrete Finisher (large clary johnson, bidwell, bridge deck, and similar)
Mobile Truck Crane Driver
Porta Shotblast Concrete Cleaning Machine
Portable Boring Machine (under streets, highways, etc.)
Portable Crusher
Power Jumbo Operator (setting slip forms, etc., in tunnels)
Power Sweeper
Roller (over 5 tons)
Self-Propelled Compactor (single engine)
Self-Propelled Pavement Breaker

Equipment Operators Classifications

GROUP 6 (continued):

Skidsteer Loader with attachments
 Slip Forms Pump (power-driven by hydraulic, electric, air, gas, etc., lifting device for concrete forms)
 Small Rubber-Tired Tractor
 Trencher (up to and including 6 feet)
 Underbridge Personnel Aerial Platform (50 feet of platform or less)

GROUP 7:

Crusher Plant Engineer
 Dozer (D-4, Case 450, John Deere 450, and similar)
 Dual Drum Mixer
 Extend Lift
 Hoist and/or Winch (2 drums)
 Loader (over 3-1/2 cu. yds. up to and including 6 cu. yds.)
 Mechanical Finisher or Spreader Machine (asphalt) (barber greene and similar)
 Mine or Shaft Hoist
 Mobile Concrete Mixer (over 5 tons)
 Pipe Bending Machine (pipelines only)
 Pipe Cleaning Machine (tractor propelled and supported)
 Pipe Wrapping Machine (tractor propelled and supported)
 Roller Operator (asphalt)
 Self-Propelled Elevating Grade Plane
 Tractor (with boom) (D-6 or similar)
 Trencher (over 6 feet and less than 200 H.P.)
 Water Tanker (pulled by euclids, t-pulls, DW-10, 20, 21, or similar)

GROUP 8:

Asphalt Plant Operator
 Cast-in-Place Pipe Laying Machine
 Concrete Batch Plant (multiple units)
 Conveyor Operator (tunnel)
 Dozer (D-6 and similar)
 Finishing Machine Operator (airports and highways)
 Gradesetter
 Horizontal Directional Drill (HDD) Locator
 Hydraulic Backhoe (over 1/2 cu. yd. up to and including 3/4 cu. yd.)
 Kolman Loader (and similar)
 No-Joint Pipe Laying Machine
 Portable Crushing and Screening Plant
 Power Blade Operator (under 12)
 Saurman Type Dragline (up to including 5 yds.)
 Stationary Pipe Wrapping, Cleaning, and Bending Machine
 Surface Heater and Planer Operator
 Tractor (D-6 and similar)
 Tri-Batch Paver
 Tunnel Badger
 Tunnel Mole and/or Boring Machine Operator
 Underbridge Personnel Aerial Platform (over 50 feet of platform)

GROUP 9:

Combination Mixer and Compressor (gunite)
 Do-Mor Loader and Adams Elegrader
 Dozer (D-7 or equal)
 Wheel and/or Ladder Trencher (over 6 feet and 200 to 749 H.P.)

Equipment Operators Classifications

- GROUP 9A: Dozer (D-8 or similar)
 Gradesetter (When working from drawings, plans or specifications without the direct supervision of a Lead Person or Superintendent.)
 Instrument Worker (upgraded from Group 7)
 Push Cat
 Scraper (up to and including 20 cu. yds.)
 Self-Propelled Compactor with Dozer
 Self-Propelled, Rubber-Tired Earthmoving Equipment (up to and including 20 cu. yds.) (621B and similar)
 Sheep's Foot
 Tractor with Boom (larger than D-6, and similar)
- GROUP 10: Chicago Boom
 Cold Planers
 Heavy Duty Repairer or Welder
 Hoist and/or Winch (3 drums)
 Hydraulic Scooper (Koehring and similar)
 Loader (over 6 cu. yds. up to and including 12 cu. yds.)
 Self-Propelled, Rubber-Tired Earthmoving Equipment (over 20 cu. yds. up to and including 31 cu. yds.) (637D and similar)
 Soil Stabilizer (P&H or equal)
 Sub-Grader (Gurries or other automatic type)
 Tractors (D-9 or similar) (all attachments)
 Tractor (Tandem Scraper)
 Watch Engineer
- GROUP 10A: Boat Operator
 Cable-Operated Crawler Crane (up to and including 25 tons)
 Cable-Operated Power Shovel, Clamshell, Dragline, and Backhoe (up to and including 1 cu. yd.)
 Gradall (up to and including 1 cu. yd.)
 Hydraulic Backhoe (over 3/4 cu. yd. up to and including 2 cu. yds.)
 Mobile Truck Crane Operator (up to and including 25 tons)
 Self-Propelled Boom-Type Lifting Device (center mount) (up to and including 25 tons) (grove, drott, p&h, pettibone, and similar)
 Trencher (over 6 feet and 750 H.P. or more)
 Watch Engineer (steam or electric)
- GROUP 11: Automatic Slip Form Paver (concrete or asphalt)
 Band Wagon (in conjunction with wheel excavator)
 Cable-Operated Crawler Crane (over 25 tons but less than 50 tons)
 Cable-Operated Power Shovel, Clamshell, Dragline, and Backhoe (over 1 cu. yd. up to 7 cu. yds.)
 Chief of Party (upgraded from Group 10)
 Directional Drill Operator
 Dozer D-10 (or similar) (upgraded from Group 10A)
 Gradall (over 1 cu. yd. up to 7 cu. yds.)
 DW-10, 20, etc. (tandem)
 Earthmoving Machine (multiple propulsion power unit and 2 or more scrapers) (up to and including 35 cu. yds. "struck" m.r.c.)
 Hydraulic Backhoe (over 2 cu. yds. up to and including 4 cu. yds.)
 Lift Slab Machine

Equipment Operators Classifications

GROUP 11 (continued):

Loader (over 12 cu. yds.)
 Mobile Truck Crane Operator (over 25 tons but less than 50 tons)
 Pre-Stress Wire Wrapping Machine
 Self-Propelled Boom Type Lifting Device (center mount) (over 25 tons m.r.c.)
 Self-Propelled Compactor (with multiple-propulsion power units)
 Single Engine Rubber-Tired Earthmoving Machine (with tandem scraper)
 Tandem Cat
 Trencher (pulling attached shield)

GROUP 12:

Clamshell or Dipper Operator
 Derrick
 Drill Rig
 Multi-Propulsion Earthmoving Machine (2 or more scrapers) (over 35 cu. yds. "struck" m.r.c.)
 Operators (derricks, piledrivers and cranes)
 Power Shovel and Dragline (7 cu. yds. m.r.c. and over)
 Self-Propelled, Rubber-Tired Earthmoving Equipment (over 31 cu. yds.) (657B and similar)
 Wheel Excavator (up to and including 750 cu. yds. per hour)

GROUP 12A:

Dozer (D-11 or similar or larger)
 Hydraulic Excavators (over 4 cu. yds.)
 Lifting Cranes (50 tons and over)
 Pioneering Dozer/Backhoe (Initial clearing and excavation for the purpose of providing access for other equipment where the terrain worked involves 1 to 1 slopes that are 50 feet in height or depth. The scope of this work does not include normal clearing and grubbing on usually hilly terrain nor the excavation work once the access is provided.)
 Power Blade Operator (Cat 12 or equivalent or over)
 Straddle Lifts (over 50 tons)
 Tower Crane, Mobile
 Traveling Truss Cranes
 Universal, Liebherr, Linden, and similar types of Tower Cranes
 Yo-Yo Cat or Dozer

NOTICE

In an effort to reduce costs, the Research and Statistics Office plans to discontinue auto-faxing and hard copy mail out of the Wage Rate Schedule. The Wage Rate Schedule is available on our Internet website at <http://hawaii.gov/labor/rs>.

To receive notification by e-mail when new bulletins are added to the site, please fill in the information below and return by March 30, 2008 to:

State of Hawaii
Department of Labor & Industrial Relations
Research & Statistics Office – OMI
830 Punchbowl Street, Room 304
Honolulu, HI 96813

Telephone: (808) 586-9017
Fax: (808) 586-9022
E-mail: DLIR.RS.WRS@hawaii.gov

Company: _____
Address: _____
City: _____ State: _____ Zip Code: _____
Telephone: () _____
Contact Person: _____
E-mail address: _____

Please call the Research and Statistics Office if you have any questions or concerns.

ATTACHMENT C

**“A METHOD OF ESTIMATING LEACHATE GENERATION FOR POST-CLOSURE ACCRUALS”,
PREPARED BY GEOSYNTEC CONSULTANTS FOR WASTE MANAGEMENT, INC.,
DATED SEPTEMBER 7, 2001.**

Waste Management, Inc.

A Method of Estimating Leachate Generation for Post-Closure Accruals

**Prepared By: Phillip A. Smith
September 7, 2001**

Introduction

GeoSyntec Consultants has provided Waste Management a copy of Chapter 5 and 6 and Appendices E and F of the report entitled "Assessment and Recommendations for Optimal Performance of Waste Containment Systems" (the report). The Geosynthetic Research Institute, the University of Illinois, and GeoSyntec Consultants are preparing the report for the United States Environmental Protection Agency under grant number CR-821448-01-0. The report has not yet been published.

One of the primary objectives of the report was to determine how much leachate is generated in modern (effectively Subtitle D) landfills, both during active operations and after closure. This was accomplished by collection and analysis of liquids management data at 187 active or closed double-lined cells at 54 modern landfills located throughout the USA.

Based on the data and results of the report, a systematic and uniform method for estimating post-closure leachate generation rates has been developed (the method). This paper describes the basis and assumptions incorporated into the method.

Relevant Report Conclusions

The following relevant conclusions can be drawn from the EPA report:

- After the initial period of operation, leachate generation rates tend to decrease and stabilize throughout the active period of operation. During this period, there is a correlation between leachate generation rates, average annual precipitation, geographic location, and primary waste type.
- After a composite final cap is installed, leachate generation rates tend to decline in an exponential manner at an approximate rate of one order of magnitude every three to five years.

Leachate Generation Rates for Post-Closure Accrual Purposes

The cost associated with leachate management over the post-closure period requires an accurate estimate of both the leachate generation rate at the time of closure and how the leachate generation rate changes during the post-closure period.

Leachate Generation Rate at Time of Final Closure for Subtitle D Areas

Based on information contained in the report, a correlation between the leachate generation rate and geographic area, primary waste type, and average annual precipitation can be established according to the following equation and table. The method is based on actual data and provides an overall reasonable basis for estimating leachate generation rates prior to installing a composite final cap.

$$G_c = P * PF * 74.3951$$

Where: G_c is the leachate generation rate for an area at the time of closure in gallons/acre/day.
 P is the average annual precipitation at the landfill in inches.
 PF is the precipitation fraction becoming leachate.
74.3951 is the conversion factor from inches/year to gallons/acre/day.

Precipitation Fraction (PF) Guidance		
Location	Waste Type	Precipitation Fraction (PF)
All Bioreactors	MSW	0.130
Northeast	MSW	0.130
Northeast	C&D/SW	0.340
Southeast	MSW	0.080
Southeast	C&D/SW	0.210
West, < 30" Annual Precipitation	MSW	0.007
West, < 30" Annual Precipitation	C&D/SW	0.020
West, > 30" Annual Precipitation	MSW	0.130
West, > 30" Annual Precipitation	C&D/SW	0.340

The above PF values are the mean values provided in the report with the exception of the following adjustments:

- Most of the landfills studied in the report are located in the Northeast and Southeast US as shown on Figure E-1.3 from the report. The data used in developing the PF values for the Western US was limited to two cells at one landfill for MSW and ten cells at three landfills for Hazardous Waste. Because these facilities were located in arid areas, they are probably not appropriate for the areas in the Western US receiving a reasonable amount of precipitation (predominately the pacific northwest). Therefore, it is assumed that the PF values obtained for the Northeast are more appropriate for facilities in the West receiving an average annual precipitation of more than 30" per year.

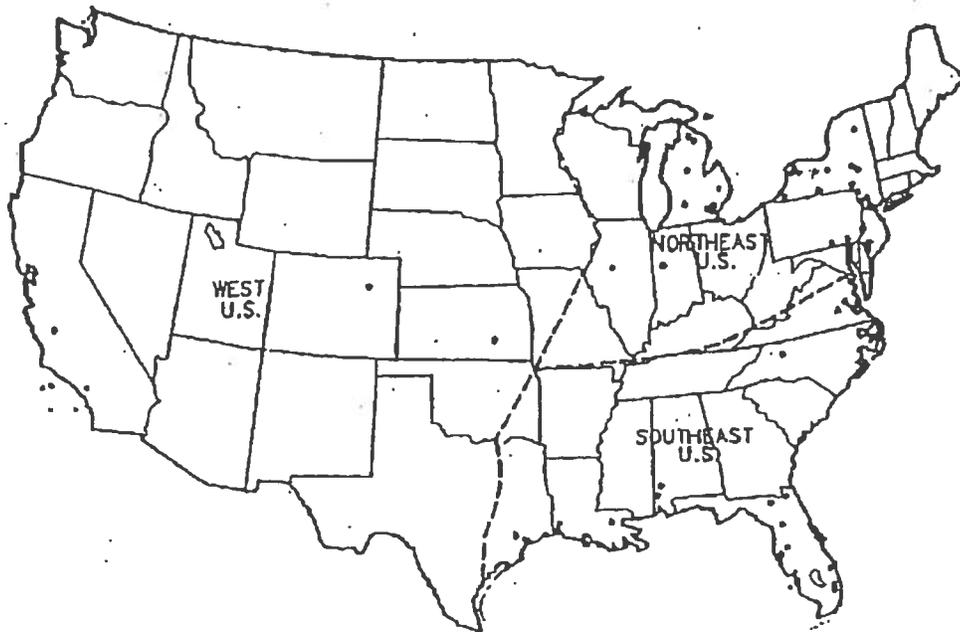


Figure E-1.3. Geographic Regions and Locations of Landfills Evaluated in this Study.

- For C&D landfills, the report only contained PF values from facilities located in the Northeast. Therefore, PF values for C&D facilities located in the Southeast and West were estimated by applying the equivalent percentage difference between Northeast C&D and MSW PF values to the Southeast and West MSW values.
- The report did not contain PF values for special waste (SW) facilities. It is assumed that PF values for these facilities are the same as the C&D values in each geographic location.
- The report did not address leachate generation rates and PF values at bioreactor landfills. It is assumed that PF values for bioreactors located in all geographic locations are equal to that of conventional MSW landfills located in the Northeast.

If necessary, the average PF values may be further adjusted to reflect site-specific conditions. In general, wastes with the ability to absorb additional water have lower values and those that do not have higher values. Likewise, conditions that favor infiltration of precipitation through the daily and intermediate cover have higher values and conditions that do not have lower values.

Post-Closure Leachate Generation Rates for Subtitle D Areas

A reasonably conservative analysis of the data presented in Figure E-5.6 of the report indicates that leachate generation rates for Subtitle D areas can be expected to decline at a rate of approximately one order of magnitude every five years after installation of a composite cap. This analysis can be reduced to the following equation:

$$G_t = G_c e^{-.4605T}$$

Where: G_t is the leachate generation rate for an area at any time after closure.
 G_c is the leachate generation rate for an area at the time of closure.
 T is the time after closure in years.

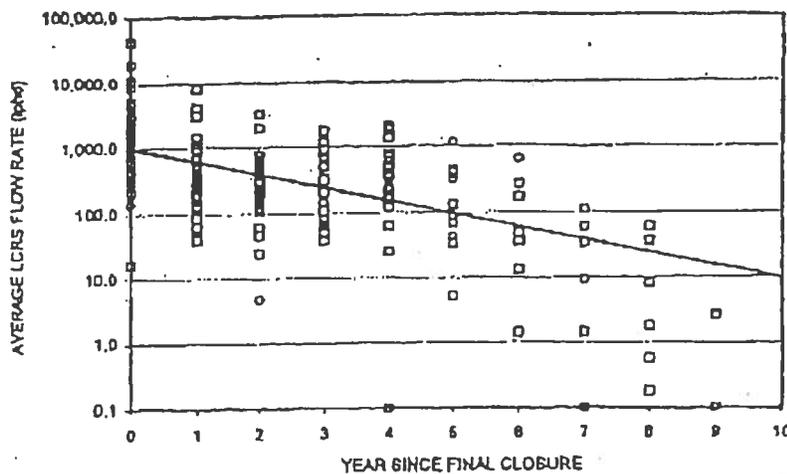


Figure E-5.8. Average LCRS Flow Rates (lphd) After Closure for Eleven MSW Cells (Shown as Circles) and 22 HW Cells (Shown as Squares) (Note: Flow Rates of 0.0 lphd are Shown as 0.1 lphd).

Note: The decline line shown on this figure is by WMI and not part of the referenced report.

Because of the exponential decline rate and the fact that landfills are typically closed in phases over periods of many years, it is reasonable to expect that leachate generation rates from large portions of the landfills will have decreased substantially (possibly to near zero) prior to the landfills entering the post-closure period. Post-closure leachate generation rate estimates need to account for this behavior. The method accomplishes this by modeling the leachate generation decline rate for each closure phase separately. The sum of the predicted leachate generation rates for each closure phase at the time the entire landfill is closed becomes the initial Subtitle D Post-Closure Leachate Generation Rate. This value declines throughout the post-closure period according to the above equation.

Post-Closure Leachate Generation Rates for Non-Subtitle D Areas

Leachate collected from Non-Subtitle D areas are likely to be functions of: groundwater entering the landfill and/or infiltration of precipitation due to the lack of a composite liner or cap, respectively; lack of a comprehensive leachate collection and recovery system; or a large hydraulic head within the landfill. As a result, leachate generation rates from these areas are not likely to decline substantially after closure. Therefore, the equations described above are not appropriate for these areas. However, given the elapsed period since Subtitle D went into effect, site-specific leachate collection data for these areas should be reasonably available in most cases. The method assumes that these generation rates remain constant throughout the post-closure period.

Leachate Generation Worksheet

The method described above has been reduced to a simple EXCEL worksheet.

Worksheet Input

The following information is required by the worksheet to estimate post-closure leachate generation rates, most of which are obtained from the Rate Workbook.

- **Landfill Identification** (Name, Location, District No., etc. from the Rate Workbook)
- **Total Remaining Site Life, Years** (From Cell E37 on the "LFdata" sheet of the Rate Workbook)
- **Total Waste Footprint, Acres** (From Cell E8 on the "LFdata" sheet of the Rate Workbook)
- **Area Remaining to be Capped, Acres** (From Cell E14 on the "LFdata" sheet of the Rate Workbook)
- **Exit Closure Cap Area, Acres** (From Cell E15 on the "LFdata" sheet of the Rate Workbook)
- **Average Incremental Cap Area, Acres** (From Cell I4 on the "Cap" sheet of the Rate Workbook)
- **Subtitle D (or equivalent) Leachate Disposal Area Size, Acres**
- **Post-Closure Period, Years** (From Cell C7 on the "PC" sheet of the Rate Workbook)
- **Average Annual Precipitation, Inches** (From provided precipitation maps or other sources)
- **Precipitation Fraction Resulting in Leachate** (From provided table based on geographic area and primary waste type)
- **Non-Subtitle D Leachate Generation Rate, Gallons/Day**

The following information is optional.

- **Year and Area of Each Subtitle D Closure Phase** (past and/or projected)

Input of site-specific information provides more accurate results. However, if this information is not available or provided, the worksheet can automatically generate default values based on the following assumptions:

- All Non-Subtitle D leachate disposal areas are capped before any Subtitle D areas are capped. This is conservative because it delays the predicted exponential decline in leachate generation rates in the Subtitle D areas.
- Portions of the leachate disposal area already capped were capped in the year prior to the current year. This is conservative because it delays the predicted decline in the leachate generation rates.
- The exit closure area is within the Subtitle D leachate disposal area. This is conservative because it delays the predicted exponential decline in leachate generation rates in the Subtitle D areas.
- Final cap phasing is distributed evenly between the current year and the estimated closure year based on the area remaining to be capped, average cap increment, and exit closure cap area provided.
- The number of cap phases is adjusted upward and the average cap increment is adjusted downward, if necessary, to produce a whole number of cap increments. For example, 6.6 cap increments of 25 acres each are modeled as 7 cap increments of 23.6 acres each because it is impossible to have 0.6 of a cap increment.

Worksheet Output

Because the Rate Workbooks currently assume a "straight line" decline of leachate generation rates for discounting purposes, the worksheet computes an equivalent straight-line leachate generation decline rate and leachate management period based on the total estimated leachate generation volume and initial and final leachate generation rates. This produces a conservative leachate accrual because it reduces the period in which the costs associated with leachate management are discounted.

The following values are generated by the worksheet for manual input into the Rate Workbook:

- Total Disposal Area Size, Acres (Input into Cell C57 on the "PC" sheet of the Rate Workbook)
- Initial Generation Rate, Gal./Ac./Day (Input into Cell C58 on the "PC" sheet of the Rate Workbook)
- Final Generation Rate, Gal./Ac./Day (Input into Cell C59 on the "PC" sheet of the Rate Workbook)
- Total Gallons Generated, Gallons (Input into Cell C60 on the "PC" sheet of the Rate Workbook)
- Leachate Management Period, Years (Input into Cell C9 on the "PC" sheet of the Rate Workbook)

Exit Closure Accrual

The Rate Workbook calculates the leachate management exit closure accrual based on the initial post-closure leachate generation rate remaining constant throughout the exit closure period. To prevent the Rate Workbook from underestimating the exit closure accrual, the Leachate Generation Worksheet disregards the exit closure period. If this period were not disregarded, the initial post-closure leachate generation rate would be lower than the average leachate generation rate during the exit closure period. By disregarding the exit closure period, the calculated initial post-closure leachate generation rate is higher than the average leachate generation rate during the exit closure period, resulting in a conservative exit closure accrual calculation.

ATTACHMENT D

WHSL POST-CLOSURE LEACHATE GENERATION ESTIMATE

**WEST HAWAII SANITARY LANDFILL
CLOSURE & POST-CLOSURE COST ESTIMATES
APRIL 2008**

Post-Closure Leachate Generation Estimate

Year	Annual Leachate Generated (gallons/year)	Est. Number of Times to Empty Leachate Storage Tanks ³
1	303,300	17
2	191,373	11
3	120,750	7
4	76,189	5
5	48,073	3
6	30,333	2
7	19,139	2
8	12,076	1
9	7,620	1
10	4,808	1
11	3,034	N.A.
12	1,914	N.A.
13	1,208	N.A.
14	762	N.A.
15	481	N.A.
16	303	N.A.
17	191	N.A.
18	121	N.A.
19	76	N.A.
20	48	N.A.
21	30	N.A.
22	19	N.A.
23	12	N.A.
24	8	N.A.
25	5	N.A.
26	3	N.A.
27	2	N.A.
28	1	N.A.
29	1	N.A.
30	0	N.A.
31	0	N.A.
TOTALS:	821,879	50

Notes

1. GeoSyntec Consultants has developed a method for estimating leachate generation during post-closure. Leachate generation rate for Subtitle D areas will decline exponentially during post-closure according to the following equation:

$$G_T = G_C e^{-.4805T}$$

Where:

G_T is the leachate generation rate at any time after closure
 G_C is the leachate generation rate at the time of closure
 T is the time after closure in years

2. The leachate generated during Year 1 is G_C and is manually input into the table. The leachate generated in subsequent years is calculated automatically using the equation above.
3. The number of times to empty the leachate storage tanks each years is based on an assumed maximum on-site leachate storage capacity of 18,000 gallons. After Year 10, it is assumed that it will not be feasible to extract leachate from the landfill due to the low volume generated.