SKYLINE LANDFILL

APPENDIX D5-B
SLOPE STABILITY ANALYSES

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Includes pages D5-B-1 through D5-B-150

APPENDIX D5-B
SLOPE STABILITY ANALYSES

The results of the stability analyses indicate that the proposed slopes are stable under the conditions analyzed. The PCSTABL6 output files are presented on pages D5-B-8 through D5-B-106. The liner and final cover veneer stability calculations are provided on pages D5-B-3 through D5-B-7. Table D5-B-1 summarizes the results of the stability analyses and compares the calculated factor of safety to the recommended minimum factor of safety. The recommended minimum factors of safety were selected from the Corps of Engineers "Design and Construction of Levees" manual (EM 1110-2-1913).

Table D5-B-1
Summary of Slope Stability Analyses

Condition	Minimum Calculated Factor of Safety	Recommended Factor of Safety	Acceptable Factor of Safety
Excavated Slope			
Short Term	4.2	1.3	Yes
Long Term	4.3	1.5	Yes
Excavation with Waste Surcharge 1	2.9	1.3	Yes
Excavation with Waste Surcharge 2	2.8	1.3	Yes
Interim Waste Slope			
Circular Arc Failure	1.5	1.3	Yes
Sliding Block Failure	1.3	1.3	Yes
Final Waste Slope			
Circular Arc Failure	2.0	1.5	Yes
Sliding Block Failure	1.6	1.5	Yes
Liner Veneer			
Protective Cover/Geocomposite	3.5	1.3	Yes
Geocomposite/Geomembrane	4.4	1.3	Yes
Geomembrane/Soil Liner	4.4	1.3	Yes
Final Cover Veneer (Side Slope)			
Alternate Final Cover			
Erosion Layer/Geocomposite	2.8	1.5	Yes
Geocomposite/Infiltration Layer	2.8	1.5	Yes
Subtitle D Final Cover			
Erosion Layer/Geocomposite	2.8	1.5	Yes
Geocomposite/Geomembrane	3.9	1.5	Yes
Geomembrane/Infiltration Layer	3.9	1.5	Yes

Skyline Landfill
Slope Stability Analyses Parameters

Required: Select the appropriate soil parameters for the slope stability analyses.

References:
1) *Attachment E - Geology Report,* Skyline Landfill Permit Amendment Application.
2) *Attachment D5, Appendix D5-C - Direct Shear Test Results,* Skyline Landfill Permit Amendment Application.
3) Qian, X, Koerner, R.M., and Gray, and Donald H. *Geotechnical Aspects of Landfill Design and Construction,* Prentice Hall, 2002.

Solution: The following materials may be included in the slope stability analyses.

Material	Description	Moisture[a] %	Dry Wt[a] pcf	Wet Wt[b] pcf
Stratum I	Clay	25.0	95.8	119.8
Stratum II	Shale	20.4	97.7	117.6
Liner/Cover	Compacted Clay	25.0	95.8	119.8
Liner/Cover	Geosynthetics	N/A	N/A	N/A
Solid Waste	Solid Waste	N/A	N/A	50.0

[a] Reference 1
[b] Wet Wt = Dry Wt x (1 + Moisture)

Total stress parameters will be used to analyze short-term stability and effective stress parameters will be used to analyze long-term stability.

Strength parameters shown for the liner/cover geosynthetics are selected based on the 5,000-15,000 normal stress range and geomembrane/soil liner interface (most critical interface) from Reference 2; these parameters are used for the interim and final waste slope stability analyses using PCSTABL6.

Material	Total Stress		Effective Stress	
	cohesion (psf)	friction (deg)	cohesion (psf)	friction (deg)
Stratum I	538[a]	20.8[a]	840[a]	22.7[a]
Stratum II	1500[b]	25[b]	1500[b]	25[b]
Liner/Cover Compacted Clay	538[c]	20.8[c]	840[c]	22.7[c]
Liner/Cover Floor Geosynthetics	309[d]	9.6[d]	309[d]	9.6[d]
Liner/Cover Sidewall Geosynthetics	273[d]	13.5[d]	273[d]	13.5[d]
Solid Waste	250[e]	23[e]	250[e]	23[e]

[a] Reference 1
[b] Previous investigations
[c] Compacted Clay Liner/Cover will be constructed with material similar to Unit I Clay
[d] Reference 2
[e] Reference 3

Interface parameters for the sidewall geosynthetics will be used to evaluate the liner and cover veneer stability. The strength parameters included below are provided by Reference 2 based on the 100-500 psf normal stress range.

Material Interface	Cohesion (psf)	Friction Angle (deg)
Liner Interface		
Protective Cover/Geocomposite	12.0	32.6
Geocomposite/Geomembrane	59.0	31.8
Geomembrane/Soil Liner	60.0	31.8
Final Cover Interface		
Alternate Final Cover		
Erosion Layer/Geocomposite	12.0	32.6
Geocomposite/Infiltration Layer	12.0	32.6
Subtitle D Final Cover		
Erosion Layer/Geocomposite	12.0	32.6
Geocomposite/Geomembrane	59.0	31.8
Geomembrane/Soil Liner	60.0	31.8

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Geosynthetic Stability Analyses

Required:

1) Check tensile stress in geomembrane.
2) Size geomembrane anchor trench.
3) Perform veneer stability analysis of liner and cover systems.

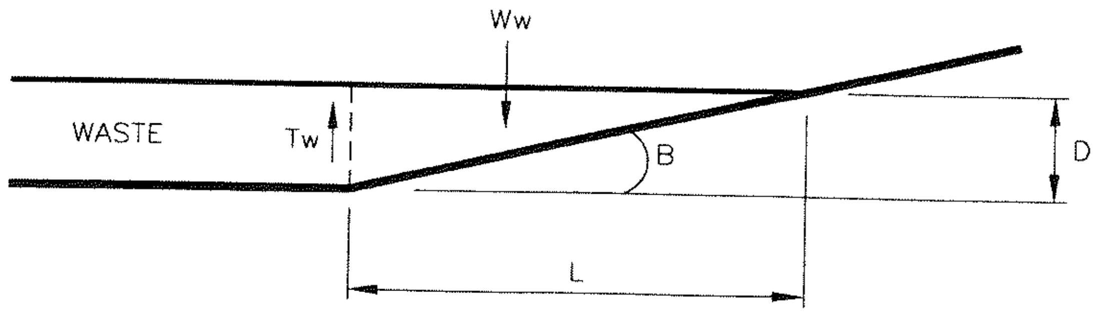
References:

1) *Designing with Geosynthetics,* 2nd Edition, Koerner, Prentice Hall.
2) *An Engineering Manual for Slope Stability Studies*, 2nd Edition, Duncan, Buchignani, Dept. of Civil Engineering, University of California.

Solution:

1) *Tensile Stress in Geomembrane*

Forces on the liner are shown below:

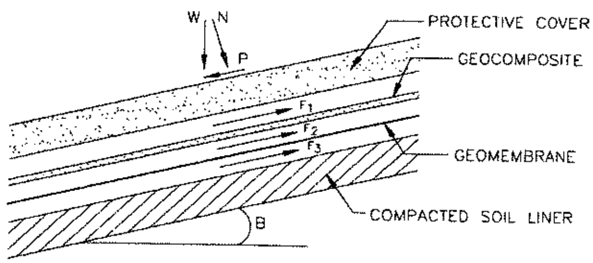


b =	slope angle =	11.3 deg
g_w =	unit weight of solid waste =	50.0 pcf
F =	internal angle of friction for solid waste =	23.0 deg
D =	waste lift thickness =	15.0 ft
L =	length of lift =	75.0 ft
ko =	$1 - \sin F$ =	0.6093

Calculate the forces on the liner:

W_w =	weight of solid waste = $DL g_w/2$ =	28,125 plf
T_w =	friction at edge of waste = $k_o(D^2 g_w/2)\tan F$ =	1,455 plf
W =	net force of waste = $W_w - T_w$ =	26,670 plf

Forces within the liner system are shown below:



A_1 =	friction angle between protective cover/geocomposite =	32.6 deg
A_2 =	friction angle between geocomposite/geomembrane =	31.8 deg
A_3 =	friction angle between geomembrane/soil liner =	31.8 deg
C_1 =	cohesion between protective cover/geocomposite =	12.0 psf
C_2 =	cohesion between geocomposite/geomembrane =	59.0 psf
C_3 =	cohesion between geomembrane/soil liner =	60.0 psf

Calculate the forces within the liner system:

N =	normal force on liner = $W\cos b$ =	26,153 plf
P =	shearing force on liner = $W\sin b$ =	5,226 plf

Calculate the resistance in the liner system:

F_1 = $N\tan A_1 + C_1 L/\cos b$ = 17,643 plf

Since $F_1 > P$ the protective cover is stable and the entire force P is transferred to the next layer.

F_2 = $N\tan A_2 + C_2 L/\cos b$ = 20,728 plf

Since $F_2 > P$ the geocomposite is stable and the entire force P is transferred to the next layer.

F_3 = $N\tan A_3 + C_3 L/\cos b$ = 20,805 plf

Since $F_3 > P$ the geomembrane is stable and the entire force P is transferred to the next layer.

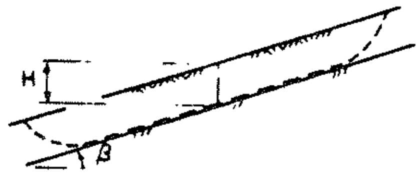
Therefore, there is no tensile stress in the gecomposite or in the geomembrane.

2) *Anchor Trench*

Since there is no tensile stress in the geosynthetics an anchor trench will not be required for stability. Anchor trenches will be provided for stability of the liner system during protective cover construction.

3) *Veneer Slope Analysis*

Use the procedures and charts from reference 2 to evaluate the stability of the liner and cover systems.



γ = total unit weight of soil

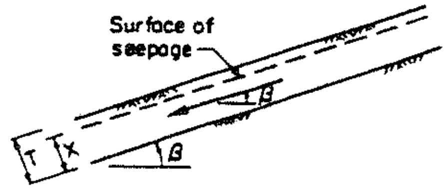
γ_w = unit weight of water

c' = cohesion intercept } Effective Stress

ϕ' = friction angle } Effective Stress

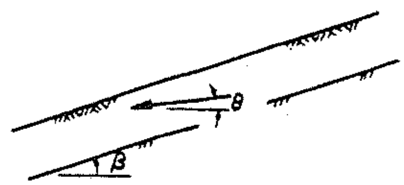
r_u = pore pressure ratio = $\frac{u}{\gamma H}$

u = pore pressure at depth H



Seepage parallel to slope

$$r_u = \frac{X}{T}\,\frac{\gamma_w}{\gamma}\cos^2\beta$$



Seepage emerging from slope

$$r_u = \frac{\gamma_w}{\gamma}\,\frac{1}{1+\tan\beta\tan\theta}$$

Steps:

① Determine r_u from measured pore pressures or formulas at right

② Determine a and b from charts below

③ Calculate $F = a\,\frac{\tan\phi'}{\tan\beta} + b\,\frac{c'}{\gamma H}$

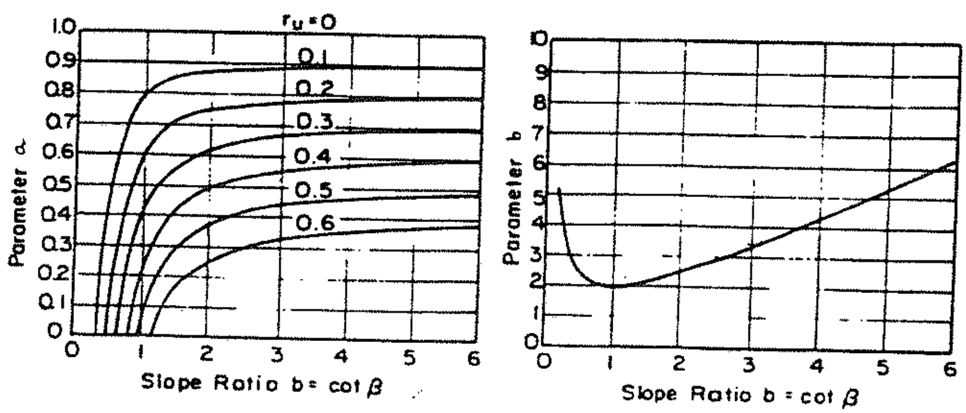


Fig.10 STABILITY CHARTS FOR INFINITE SLOPES.

Calculate the factor of safety at each interface in the liner system. Assume typical values for interface strength parameters and the unit weight of soil. Assume that there is no pore water pressure because of the presence of the free draining layer of geocomposite.

Protective cover/geocomposite

F =	32.6 deg
b =	11.3 deg
C =	12.0 psf
u =	0.0
g =	119.8 pcf
r_u =	0.0
H =	2.0 ft
a =	1.0
b =	5.2

FS @ protective cover/geocomposite = 3.5

Geocomposite/geomembrane

F =	31.8 deg
b =	11.3 deg
C =	59.0 psf
u =	0.0
g =	119.8 pcf
r_u =	0.0
H =	2.0 ft
a =	1.0
b =	5.2

FS @ geocomposite/geomembrane = 4.4

Geomembrane/soil liner

F =	31.8 deg
b =	11.3 deg
C =	60.0 psf
u =	0.0
g =	119.8 pcf
r_u =	0.0
H =	2.0 ft
a =	1.0
b =	5.2

FS @ geomembrane/soil liner = 4.4

Skyline Landfill
Geosynthetic Stability Analyses

Calculate the factor of safety at each interface in the cover systems. Assume typical values for interface strength parameters and the unit weight of soil. Assume that there is no pore water pressure because of the presence of the free draining layer of geocomposite.

Alternate Final Cover System

Erosion layer/geocomposite

F =	32.6	deg
b =	14.0	deg
C =	12.0	psf
u =	0.0	
g =	119.8	pcf
r_u =	0.0	
H =	1.5	ft
a =	1.0	
b =	4.2	

FS @ erosion layer/geocomposite = 2.8

Geocomposite/infiltration layer

F =	32.6	deg
b =	14.0	deg
C =	12.0	psf
u =	0.0	
g =	119.8	pcf
r_u =	0.0	
H =	1.5	ft
a =	1.0	
b =	4.2	

FS @ geocomposite/infiltration layer = 2.8

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Geosynthetic Stability Analyses

Subtitle D Final Cover System

Erosion layer/geocomposite

F =	32.6 deg
b =	14.0 deg
C =	12.0 psf
u =	0.0
g =	119.8 pcf
r_u =	0.0
H =	1.5 ft
a =	1.0
b =	4.2

FS @ erosion layer/geocomposite = 2.8

Geocomposite/geomembrane

F =	31.8 deg
b =	14.0 deg
C =	59.0 psf
u =	0.0
g =	119.8 pcf
r_u =	0.0
H =	1.5 ft
a =	1.0
b =	4.2

FS @ geocomposite/geomembrane = 3.9

Geomembrane/infiltration layer

F =	31.8 deg
b =	14.0 deg
C =	60.0 psf
u =	0.0
g =	119.8 pcf
r_u =	0.0
H =	1.5 ft
a =	1.0
b =	4.2

FS @ geomembrane/infiltration layer = 3.9

SKYLINE LANDFILL
CITY OF FERRIS
DALLAS AND ELLIS COUNTIES, TEXAS
TCEQ PERMIT APPLICATION NO. MSW 42D

PERMIT AMENDMENT APPLICATION

PART III – FACILITY INVESTIGATION AND DESIGN
ATTACHMENT D6
LEACHATE AND CONTAMINATED WATER MANAGEMENT PLAN

Prepared for

Waste Management of Texas, Inc.

April 2012

Revised August 2012

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APPENDIX D6-D
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cleaning the leachate collection pipes and sump risers. The leachate piping shall meet the criteria listed in Attachment D7 – Liner Quality Control Plan (LQCP).

Each collection trench will contain a 6-inch-diameter perforated leachate collection pipe surrounded by drainage aggregate. The leachate collection trench will convey the leachate to sumps located along the toe of the side slopes. The leachate collection pipes have been designed for the critical loading condition expected at the site. Both the overburden load (due to the weight of the waste and soil layers over the pipe) and the construction load (due to the weight of equipment and operations layers) were considered. Cleanout risers are provided on each end of every leachate collection trench to facilitate cleanout of the collection pipes if needed. Leachate collection system details are provided in Attachment D3 – Construction Design Details. Leachate collection pipe design calculations are provided in Appendix D6-A – Leachate Collection System Design Calculations.

Existing leachate collection pipes in Phase 1 and Phase 2 cells will be extended to connect to the leachate collection pipe to be constructed in Cells 11 through 13. The leachate collection layer will be maintained at a minimum grade of 2 percent and the leachate collection pipe grades will be maintained at a minimum grade of 0.5 percent.

2.2.6 Leachate Sumps

The leachate sumps will consist of a 3-foot-deep rectangular area. The sumps have different minimum dimensions for various cells due to the significant difference in the amount of contributing area. Details of the leachate sumps and varying minimum dimensions are provided in Attachment D3 – Construction Design Details. Each sump will be backfilled with leachate drainage aggregate. Sump capacity and strength calculations are presented in Appendix D6-A – Leachate Collection System Design Calculations. Leachate will be transferred from the sumps by submersible pumps, as discussed in Section 2.4. The submersible pumps will be equipped with internal pressure transducers to measure the depth of the leachate in the sumps. A leachate level readout will be provided in the pump control panel. ~~The pumps may be operated manually or by an automatic start switch. In either case, the pumps will be operated to limit the leachate level to the top of the sump.~~The pumps are capable of being operated in either manual or automatic mode via an electronic start switch set to come on when leachate levels in the sump approach the compliance level and turn off when leachate levels are lowered to the operational limits of the pump. The default mode will be automatic operation and the manual mode will be used during maintenance and repair operations. The allowable maximum leachate head (compliance level) is ~~12 inches on the liner (or 48 inches in the sump)~~36 inches in the sump. Existing leachate sumps in the Phase 1 and Phase 2 fill area will be exposed during construction of Cells 11 through 13, removed, and the area will be regraded to collect existing leachate collection lines to the collection lines in Cells 11 through 13. Documentation of the reconstruction will be provided in the SLER and GLER submittals for Cells 11 through 13. Leachate sump material requirements are provided in Attachment D7 – Liner Quality Control Plan (LQCP).

2.3 Leachate Storage

Primary leachate storage will be provided by the leachate sumps, which are located within each landfill cell. Leachate will be pumped from the sumps through a leachate forcemain to a direct connection to publicly owned treatment works (POTW). Existing storage tanks provide a minimum of approximately 38 hours of temporary leachate storage in the event that the direct connection to the POTW is not functional; the storage tanks will be emptied from the tanks into tanker trucks for transport based on leachate production and storage needs in the event that they are used.

The tanks are located in the area as shown in Attachment D1 – Landfill Unit Design – Site Layout Plan, Drawing D1.5 – Entrance Road and Entrance Facilities Plan. The storage facility consists of one 24,500-gallon storage tank and one 17,000-gallon storage tank. The calculations in Appendix D6-D – Secondary Containment Volume Calculations demonstrate that the secondary containment area provides containment, with 6 inches of freeboard, for the leachate storage tanks and precipitation from the 25-year, 24-hour storm event. The secondary containment area consists of 2 feet of compacted soil liner overlain by a 60-mil HDPE geomembrane for the floor and sidewall of the containment area.

2.4 Leachate Disposal

Leachate will be pumped from the sumps through a leachate forcemain to a direct connection to a POTW. Leachate may be recirculated to active areas of the landfill, consistent with §§330.177 and 330.207. Leachate sampling and analysis will be limited to the POTW's requirements. The results of any monitoring required by the disposal facility will be placed in the site operating record.

Leachate may be recirculated into an on-site landfill unit that is designed and constructed with a leachate collection system and a composite liner in accordance with §330.177. Leachate may be discharged into shallow pits or trenches excavated into the waste as described in the site operating plan. Leachate may also be recirculated by transferring into a tanker and spraying on the active face. Leachate will not be recirculated to the active face during rainy or wet periods. The automated leachate pump system will prevent leachate depth greater than 30 cm from accumulating on the liner system and will be in operation during leachate recirculation activities. The application of leachate will not cause accumulation, ponding, or other operational problems. The Skyline Landfill will ensure that recirculating will not result in vectors, odor, and other nuisance conditions.

3 CONTAMINATED WATER MANAGEMENT

30 TAC §330.207

3.1 Contaminated Water Generation

Surface water that comes into contact with waste, leachate, or gas condensate is considered to be contaminated water. Best management practices will be used to minimize contaminated water generation. Temporary diversion berms will be constructed around areas of exposed waste to minimize the amount of surface water that comes into contact with waste. Design calculations and typical details for temporary diversion berms are presented in Appendix D6-C – Containment/Diversion Berm Design. Daily cover and intermediate cover will be placed over filled areas to minimize the area of exposed waste. Procedures for verifying the adequacy of daily and intermediate cover placement are provided in Part IV – Site Operating Plan. If waste is exposed in areas where daily or intermediate cover has been previously placed, runoff from these areas will be considered to be contaminated water. Leachate will be collected and segregated from surface water by the LCS as described in Section 2. Secondary containment will be provided around the leachate storage facility to contain leachate in case of a spill or leak. Gas condensate will be collected and segregated from surface water as described in Section 4.

3.2 Contaminated Water Collection and Containment

Temporary containment berms will be constructed around the active face to collect and contain surface water that has come into contact with waste. In addition to the planned containment berms around the active face, temporary containment berms will be constructed wherever needed to collect contaminated water. The design calculations and typical details for containment berms for a 25-year, 24-hour storm event are provided in Appendix D6-C – Containment/Diversion Berm Design. The calculations show the dimensions for typical conditions, but additional storage capacity will be provided as site operating conditions dictate.

3.3 Contaminated Water Storage

Primary contaminated water storage will be provided by the containment berms, which will provide storage for the 25-year, 24-hour storm event.

3.4 Contaminated Water Disposal

Contaminated water will not be allowed to discharge into waters of the United States or discharged offsite without prior written approval. Contaminated water may be pumped into the leachate collection system, leachate storage tanks, or transported to a POTW for treatment and disposal in accordance with §330.207(f). Sampling and analysis will be limited to the POTW's requirements. The results of any monitoring required by the disposal facility will be placed in the site operating record.

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APPENDIX D6-A
LEACHATE COLLECTION SYSTEM
DESIGN CALCULATIONS

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Includes pages D6-A-1 through D6-A-21

Required: Demonstrate the adequacy of the LCS to handle additional flow from groundwater infiltration.

References: 1) *Hydrologic Evaluation of Landfill Performance (HELP),* Engineering Documentation.

Solution: For good liner contact, soil leakage will occur from pinholes and installation defects.

Radius of leakage

Pinholes $R = 0.174h^{0.45}K^{-0.13}$ — Ref. 1, Equation 163

where: R = radius of wetted area around pinhole (in)
h = hydraulic head beneath liner = 80 ft
K = hydraulic conductivity of clay liner = 1.00E-07 cm/sec
0.0034 in/day

R = 8.01 in

Defects $R = 0.222h^{0.45}K^{-0.13}$ — Ref. 1, Equation 164

where: R = radius of wetted area around defect (in)
h = hydraulic head beneath liner = 80 ft
K = hydraulic conductivity of clay liner = 1E-07 cm/sec
0.0034 in/day

R = 10.22 in

Average hydraulic gradient

$i = 1 + [h / (2T\ln(R / r))]$ — Ref. 1, Equation 152

where: i = average hydraulic gradient (in)
h = hydraulic head beneath liner = 80 ft
T = thickness of controlling layer = 24 in
R = radius of wetted area (in)
r = radius of flaw (in)

Pinholes
R = 8.01 in
r = 0.02 in
i = 4.34 in/in

Defects
R = 10.22 in
r = 0.22 in
i = 6.21 in/in

Leakage rate

$q = 0.877[(K i n p R^2) / 6,276,640]$ — Ref. 1, Equation 151

where: q = leakage rate (in/day)
i = average hydraulic gradient (in)
n = density of flaws (no./ac)
T = thickness of controlling layer = 24 in
R = radius of wetted area (in)
K = hydraulic conductivity of clay liner = 0.0034 in/day

Skyline Landfill
Groundwater Infiltration

Geomembranes will be manufactured under strict quality control and installed with full time construction quality assurance so pinhole and defect values will be based on good quality. Reference 1 provides documentation on the installation quality, defect per acre, and pinhole density selected.

Pinholes	n =	0.5	holes/ac
	i =	4.34	in/in
	R =	8.01	in
	q_p =	2.076E-07	in/day/ac
Defects	n =	1	holes/ac
	i =	6.21	in/in
	R =	10.22	in
	q_d =	9.678E-07	in/day/ac

Vapor diffusion

$q = K_m\ [(h + T) / T]$ — Ref. 1, Equation 141

where: q = leakage rate (in/day)
T = thickness of geomembrane = 0.06 in
h = hydraulic head beneath liner = 80 ft (Assumes head at highest measured to toe of liner)
K_m = hydraulic conductivity of geomembrane = 6.8E-09 in/day

q = 0.0001088 in/day/ac

Inflow rate $Q = q + q_p + q_d$ =
1.1E-04 in/day/ac
4.0E-01 cf/day/ac
4.6E-06 cfs/ac

Inflow will occur after the ballast is in place and the temporary dewatering system is turned off.

Cell 13 contributing area	145.4	ac
Cell 13 peak leachate rate =	0.1610	cfs
Groundwater inflow rate =	4.6E-06	cfs/ac
Total required inflow capacity =	**0.16**	**cfs**
Provided inflow capacity =	**10.30**	**cfs**

Since the leachate collection pipe for Cell 13 provides for an inflow capacity of 10.3 cfs, the pipe has sufficient capacity to handle the peak leachate rate and groundwater inflow after the temporary dewatering system is turned off. Cell 18 has a much smaller contributing area so the provided capacity will be sufficient in Cell 18 also.

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APPENDIX D6-C
CONTAINMENT/DIVERSION BERM DESIGN

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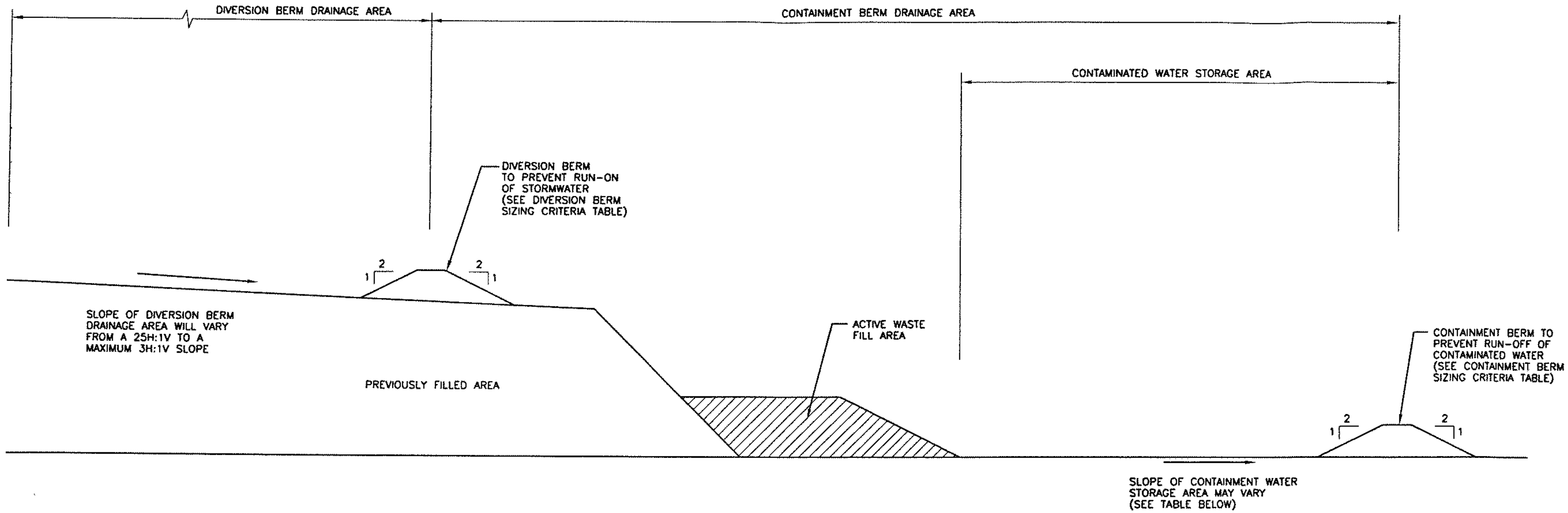
8-21-12

Includes pages D6-C-1 through D6-C-3



CONTAINMENT BERM SIZING CRITERIA

CONTAINMENT BERM DRAINAGE AREA (ACRES)	CONTAINMENT WATER STORAGE AREA (ACRES)	FLOOR SLOPE OF CONTAMINATED WATER STORAGE AREA	REQUIRED MINIMUM HEIGHT OF CONTAINMENT BERM INCLUDES FREEBOARD (FT)
0.5	0.35	1 %	1.5
	0.25	2 %	2.2
	0.20	4 %	3.5
1.0	0.50	1 %	2.2
	0.35	2 %	3.0
	0.25	4 %	4.4
1.5	0.60	1 %	2.6
	0.40	2 %	3.5
	0.30	4 %	5.2

NOTE: CONTAINMENT BERMS WILL BE SIZED TO CONTAIN STORMWATER FROM THE 25 YEAR, 24 HOUR STORM EVENT. THE CRITERIA ARE BASED ON A MINIMUM DOWNSLOPE CONTAINMENT BERM LENGTH OF 100 FEET AND A FREEBOARD OF 0.5 FT.

DIVERSION BERM SIZING CRITERIA

DIVERSION BERM DRAINAGE AREA (ACRES)	MINIMUM 4%			MAXIMUM 33%		
	FLOW RATE (CFS)	FLOW DEPTH (FT)	REQUIRED MINIMUM DIVERSION BERM HEIGHT INCLUDES FREEBOARD (FT)	FLOW RATE (CFS)	FLOW DEPTH (FT)	REQUIRED MINIMUM DIVERSION BERM HEIGHT INCLUDES FREEBOARD (FT)
0.5	3.3	0.5	1.5	3.3	0.9	1.9
1.0	6.5	0.6	1.6	6.5	1.1	2.1
1.5	9.8	0.7	1.7	9.8	1.3	2.3

NOTE: DIVERSION BERMS WILL BE SIZED TO DIVERT STORMWATER FROM THE 25 YEAR, 24 HOUR STORM EVENT AND A FREEBOARD OF 1 FT.

STATE OF TEXAS
DAVID L. CLARK
81905
REGISTERED PROFESSIONAL ENGINEER
8-21-12

ISSUED FOR PERMITTING PURPOSES ONLY

CONTAMINATED WATER RUNON/RUNOFF DETAILS

WASTE MANAGEMENT OF TEXAS, INC.
SKYLINE LANDFILL
MAJOR PERMIT AMENDMENT

BIGGS & MATHEWS ENVIRONMENTAL
CONSULTING ENGINEERS
MANSFIELD • WICHITA FALLS
817-563-1144

TBPE FIRM NO. F-256 | TBPG FIRM NO. 50222

REVISIONS

REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY
1	8/12	NOD NO. 1 RESPONSE	SRC	DLC	DLC	DLC

DSN. SAB	DATE : 04/12	DRAWING
DWN. SRC	SCALE : GRAPHIC	D6–C1
CHK. DLC	DWG : D6_C1.dwg	

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