CITY OF EDINBURG SOLID WASTE MANAGEMENT

PERMIT AMENDMENT APPLICATION

PERMIT AMENDMENT APPLICATION

Edinburg Regional Disposal Facility

Edinburg, Hidalgo County, Texas

TCEQ Permit MSW-956C

Volume 1 of 4

Prepared For: City of Edinburg
Department of Solid Waste Management
8601 North Jasman Road
Edinburg, Texas 78542 USA

Submitted By: Golder Associates Inc.
Professional Engineering Firm Registration Number F-2578
500 Century Plaza Drive, Suite 190
Houston, TX 77073 USA

July 2017
Revised: November 2017

Project No. 1401491

Golder Associates

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Select all that apply	Received	Pending	Not Applicable
Ocean Dumping Permits under the Marine Protection Research and Sanctuaries Act	☐	☐	☒
Dredge or Fill Permits under the CWA	☐	☐	☒
Licenses under the Texas Radiation Control Act	☐	☐	☒
Other Environmental Permits			
Air New Source Permit Account No. (HN0018R)	☒	☐	☐
Air New Source Permit Registration (81830)	☒	☐	☐
Air Operating Permits (2841)	☒	☐	☐
	☐	☐	☐

12. General Facility Information

Facility Name: **Edinburg Regional Disposal Facility**

MSW Authorization No. (if available): **956C**

Regulated Entity Reference No. (if issued)*: RN**102217734**

Physical or Street Address (if available): **8601 North Jasman Road**

City: **Edinburg** County: **Hidalgo** State: **TX** Zip Code: **78542**

(Area Code) Telephone Number: **(956) 381-5635**

Latitude (Degrees, Minutes Seconds): **N 26° 23' 53.66"**~~N 26° 23' 52.4"~~

Longitude (Degrees, Minutes Seconds): **W 98° 07' 48.22"**~~W 98° 07' 47.2"~~

Benchmark Elevation (above mean sea level): **84.85**ft.

Provide a description of the location of the facility with respect to known or easily identifiable landmarks: **6.7 miles north of Edinburg City Limits**

Detail access routes from the nearest United States or state highway to the facility: **Exit US281 onto eastbound FM2812. Turn (left) (north) at Jasman Road.**

*If this number has not been issued for the facility, complete a TCEQ Core Data Form (TCEQ-10400) and submit it with this application. List the Facility as the Regulated Entity.

13. Facility Type(s)

☒ Type I ☐ Type IV ☐ Type V
☐ Type I AE ☐ Type IV AE ☐ Type VI

14. Activities Conducted at the Facility

☐ Storage ☐ Processing ☒ Disposal

CITY OF EDINBURG SOLID WASTE MANAGEMENT

PERMIT AMENDMENT APPLICATION

Part I

FACILITY AND APPLICANT INFORMATION

SUPPLEMENTARY TECHNICAL REPORT

Edinburg Regional Disposal Facility

Edinburg, Hidalgo County, Texas

TCEQ Permit MSW-956C

Submitted To: City of Edinburg
Department of Solid Waste Management
8601 North Jasman Road
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1.2.2 Access Routes

30 TAC §305.59(b)(2)

The facility entrance is located at 8601 Jasman Road north of FM 2812 and is shared with the City's Type IV Landfill TCEQ Permit MSW-2302. The access route to the facility from US Hwy 281 is eastbound on FM 2812 and north onto Jasman Road. An additional facility access route, used only for landfill operations and maintenance vehicles as well as for emergency response vehicles from US Hwy 281, is eastbound on Encinitos Road. Figure I-1 shows access routes via major roadways to facility.

1.2.3 Geographic Coordinates

30 TAC §305.59(b)(3)

Geographical coordinates of the facility represented by the permanent site benchmark are:

Latitude:	N 26° 23' 53.66"~~N 26° 23' 53.33"~~
Longitude:	W 98° 07' 48.22"~~W 98° 07' 48.25"~~
Elevation:	84.85 ft-msl

The permanent site benchmark monument, a bronze marker set in concrete with the benchmark elevation and survey date stamped on it, is established in an area that is readily accessible and will not be used for disposal. The monument elevation was surveyed from a known United States Coast and Geodetic Survey benchmark. Figure I-1 shows the location of the benchmark in relation to the facility.

1.3 Maps

30 TAC §§305.45(a)(6), 330.59(c)(1), & 330.59(c)(2)

Table I-1: Maps

Figure	Title	Citation
I-1	Facility Location Map	30 TAC §330.59(c)(1)
I-2	TxDOT County Map	30 TAC §330.59(c)(2)
I-3	USGS Topographic Map	30 TAC §305.45(a)(6)(A)
I-4	Land Use Map	30 TAC §305.45(a)(6)(B)
I-5	Land Ownership Map	30 TAC §305.45(a)(6)(D) & §330.59(c)(3)(A)
~~I-6~~	~~Facility Layout Map~~	~~30 TAC §305.45(a)(6)~~

Note: 1. No storm water intake or discharge structures are located within facility according to Part III2, Surface Water Drainage Report.

2. ~~Structures associated with the facility's disposal activities including an outline of the solid waste management units, interior road, and surface water drainage features as well as entrance facility structures including gatehouse and scales, office, maintenance buildings, and entrance road are depicted on Figure I-6.~~

2~~3~~. All waste disposal activities conducted on the tract are included in this application.

and the rate of waste disposal could reach approximately 1,625,000 tons per year. The total disposal capacity and site life calculations are provided in Part III3A, Volume and Site Life Calculations.

Table I-6: Permit Condition Comparison	TCEQ Permit MSW-956B	TCEQ Permit MSW-956C
Permitted Area (acre)	253.5	602.5
Waste Disposal Unit Area (acre)	192.9	406.0
Buffer/Other Area (acre)	60.6	196.5
Remaining Capacity (cubic yards)	5,738,691	~~81,562,465~~76,304,934
Remaining Projected Site Life (years)	8 years	64 years
Maximum Elevation (ft-msl)	213	398
Elevation of Deepest Excavation (ft-msl)	70	70

~~Refer to Figure I-5~~

2.3 Properties of Waste

30 TAC §305.45(a)(8)(B)(ii)

Waste authorized for acceptance at the facility in accordance with Part II, Waste Acceptance Plan will be appropriate for a Type I municipal solid waste disposal facility and will not have constituents or characteristics that will negatively impact or influence the design and operation of the facility.

2.4 Other Information

30 TAC §305.45(a)(8)(C)

Both the Edinburg Regional Disposal Facility, TCEQ Permit MSW-956B, and the Type IV Landfill, TCEQ Permit MSW-2302, share a common entrance and certain facilities and equipment. Existing structures/areas located at the facility, which will remain as part of this permit amendment application, include:

- Landfill administrative office
- Gatehouse and scales
- Citizen collection station
- Landfill gas to energy facility including landfill flare and blower
- Reusable material staging area
- Large item salvage and white goods storage area
- Fuel storage tank

APPENDIX IA1

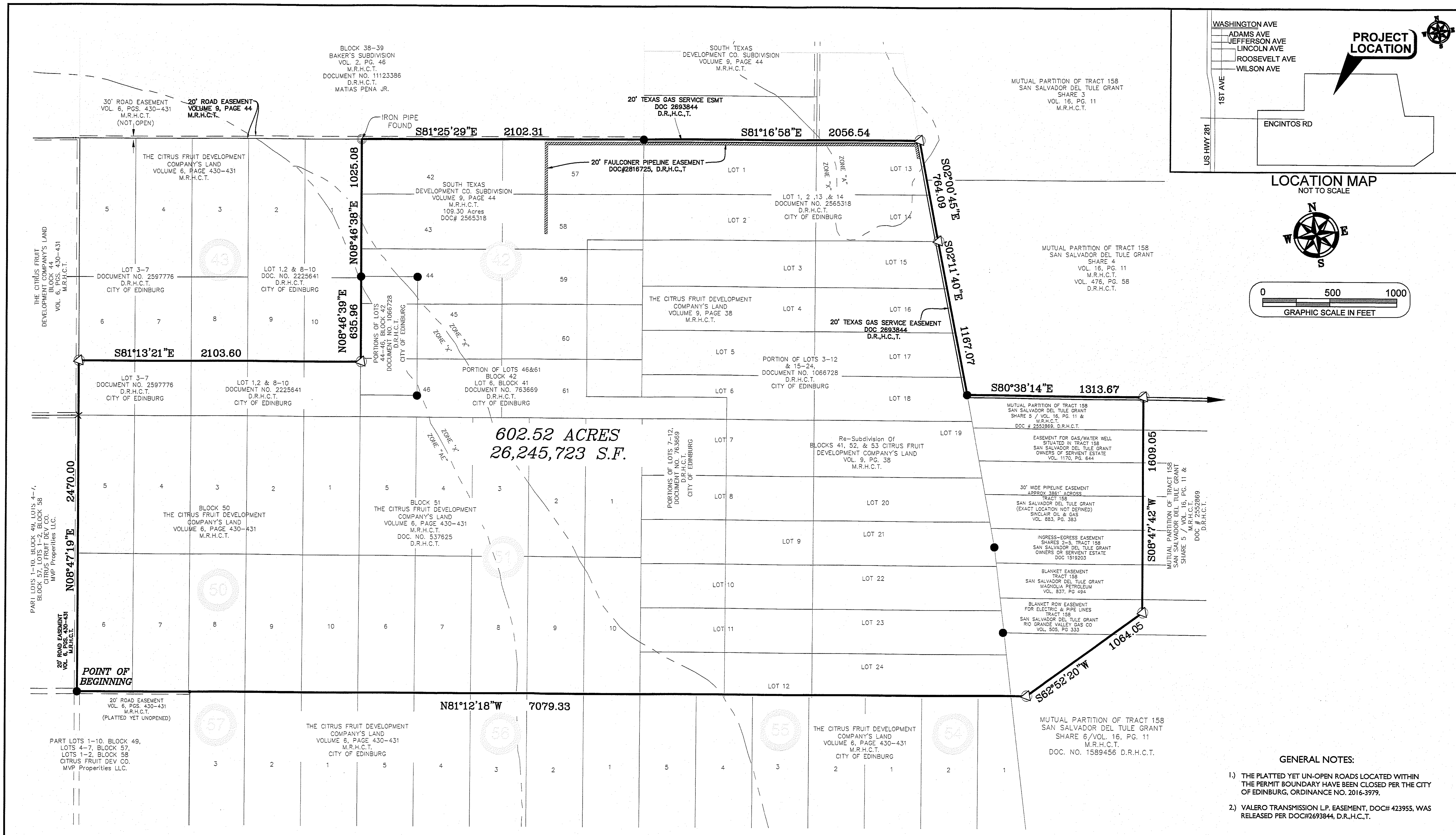
OWNERSHIP RECORDS

APPENDIX IA3

PERMIT BOUNDARY METES AND BOUNDS LEGAL DESCRIPTION

APPENDIX IA4

PERMIT BOUNDARY METES AND BOUNDS EXHIBIT



I, Stacey King Mora, Registered Professional Land Surveyor, hereby certify that this survey map was prepared from an actual on the ground survey made under my direction and supervision, and represents the facts found at the time of survey, and that this survey substantially complies with the current standards adopted by the Texas Board of Professional Land Surveying.

Stacey King Mora

Stacey King Mora
Registered Professional Land Surveyor
Texas Registration No. 6166

Naismith/Hanson Professional Services Inc.

Date: June 26, 2017

STATE OF TEXAS REGISTERED STACEY KING MORA 6166 PROFESSIONAL LAND SURVEYOR

- CALCULATED CORNER
- IRON PIPE FOUND
- 5/8" IRON ROD FOUND
- COTTON SPINDLE FOUND

GENERAL NOTES:

1.) THE PLATTED YET UN-OPEN ROADS LOCATED WITHIN THE PERMIT BOUNDARY HAVE BEEN CLOSED PER THE CITY OF EDINBURG, ORDINANCE NO. 2016-3979.

2.) VALERO TRANSMISSION L.P. EASEMENT, DOC# 423955, WAS RELEASED PER DOC#2693844, D.R.,H.C.,T.

3.) SINCLAIR OIL & GAS EASEMENT, DOC# 5798, VOLUME 886, PG 207 WAS RELEASED PER DOC#2824216, D.R.,H.C.,T.

4.) ALL BEARINGS ARE GRID BEARING BASED ON THE TEXAS COORDINATE SYSTEM FOR THE LAMBERT SOUTH ZONE NAD 1983

5.) SOME OBJECTS MAY BE DRAWN OUT OF SCALE FOR CLARITY.

6.) A METES A BOUNDS DESCRIPTION DATED MARCH 4, 2016 TO ACCOMPANY THIS SURVEY.

7.) PER FLOOD INSURANCE RATE MAP COMMUNITY-PANEL NUMBER 480334 0325 D, MAP REVISED JUNE 6, 2000, THE SUBJECT PROPERTY IS LOCATED PARTIALLY IN ZONES:

"A" AND "AE", DEFINED AS "SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD";

"X" - OTHER FLOOD AREAS, DEFINED AS "AREAS OF 500-YEAR FLOOD; AREAS OF 100-YEAR FLOOD WITH AVERAGE DEPTHS OF LESS THAN 1 FOOT OR WITH DRAINAGE AREAS LESS THAN 1 SQUARE MILE; AND AREAS PROTECTED BY LEVEES FROM 100-YEAR FLOOD";

"X" - OTHER AREAS, DEFINED AS "AREAS DETERMINED TO BE OUTSIDE 500-YEAR FLOODPLAIN"

THIS STATEMENT SHALL NOT CREATE LIABILITY ON THE PART OF THE SURVEYOR.

PERMIT BOUNDARY, CITY OF EDINBURG LANDFILL
602.52 ACRES
HIDALGO COUNTY, TEXAS

OWNER: CITY-OF-EDINBURG
ZONING: X
ENGINEER/SURVEYOR: STACEY KING MORA
PHONE: 361-814-9900
FAX: 361-814-4401
ENGINEER/SURVEYOR EMAIL: SMORA@HANSON-INC.COM

Naismith/Hanson
Engineering | Planning | Architecture | Allied Services
Now part of Hanson Professional Services Inc.
4501 GOLLIHAR RD. CORPUS CHRISTI, TEXAS 78411
TBPE FIRM #355 TBPLS FIRM #100395-00
PH. NO. 361-814-9900
www.hanson-inc.com
HANSON

DRAWN BY:	CHECKED BY:	APPR. BY:	SURVEY DATE:	DWG DATE:	PROJECT NO.:	DWG TITLE:	REV:
CDO	SKM	SKM	2/23/16	6/23/2017	9323-09	PERMIT BOUNDARY	2

SHEET 1 OF 1

APPENDIX IA5

PROPERTY OWNER AFFIDAVIT

THE CITY OF EDINBURG

PROPERTY OWNER'S AFFIDAVIT

I, Richard M. Hinojosa, as City Manager, as authorized signatory for City of Edinburg, acknowledge on behalf of City of Edinburg, the owner of record of the property herein described:

The permit boundary for TCEQ Permit MSW-956C, a 602.52 acre tract of land comprised of Lots 42-46 & 57-61, Block 42, South Texas Development Company Subdivision Hidalgo County, Texas, and Lots 1-24, Citrus Fruit Development Company's Land, Hidalgo County, Texas, Lots 1-10, Block 51, Lots 1-10, Block 50, and a portion of Lots 6-10, Block 43, all being of the Citrus Fruit Development Company's Land, Share 5 & 6, of the Mutual Partition of Tract 158, San Salvador Del Tule Grant, , Hidalgo County, Texas."

I acknowledge that City of Edinburg is applying for authorization to horizontally and vertically expand the existing municipal solid waste landfill facility under permit amendment application TCEQ Permit MSW-956C upon such property.

I acknowledge on behalf of City of Edinburg, that the State of Texas may hold the City of Edinburg either jointly or severally responsible for the operation, maintenance, closure, and ay required post-closure care of the site and facility.

I acknowledge on behalf of City of Edinburg, that it has responsibility to file with the deed records of Hidalgo County, an affidavit to the public advising that the Site has been used for a solid waste facility, prior to the time the Site begins operating as a municipal solid waste landfill facility, and to file a final recording upon completion of disposal operations and closure of the landfill units at the municipal solid waste facility in accordance with 30 TAC §330.19.

I acknowledge on behalf of City of Edinburg, the requirement that owner or operator of the Site and the State of Texas shall have access to the property described herein during the active life and post-closure care of the municipal solid waste facility for the purpose of inspection and maintenances.

WITNESS MY HAND on this 10th day of October, 2017.

Richard M. Hinojosa, City Manager

SWORN TO AND SUBCRIBED before me on this 10th day of October, 2017.

Martha Jenkins, For Hidalgo County, Texas

Notary Public

My Commission Expires: 7/15/18

MARTHA JENKINS
Notary Public, State of Texas
My Commission Expires
July 15, 2018

415 W. University Drive • P.O. Box 1079 • Edinburg, Texas 78540
Phone (956) 388-8204 • Fax (956) 383-7111

CITY OF EDINBURG SOLID WASTE MANAGEMENT

PERMIT AMENDMENT APPLICATION

Part II

WASTE ACCEPTANCE PLAN, EXISTING CONDITIONS SUMMARY, AND FACILITY LAYOUT

Edinburg Regional Disposal Facility

Edinburg, Hidalgo County, Texas

TCEQ Permit MSW-956C

Submitted To: City of Edinburg
Department of Solid Waste Management
8601 North Jasman Road
Edinburg, Texas 78541 USA

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Golder Associates

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1.2 Waste Parametric Limitations

30 TAC §330.61(b)(1)

Waste accepted at the facility will not have constituent concentrations or characteristics that will adversely impact or influence the design and operation of the facility. Special wastes accepted at the facility will meet the provisions of 30 TAC §330.171 and criteria outlined in Part IVH, Special Waste Acceptance Plan, including the waste management procedures set forth in Part IV, Appendix H-1, Waste Specific Special Waste Management Procedures.

1.3 Waste Source Generation

30 TAC §330.61(b)(1)(A)

The facility serves individuals, businesses, and communities in the Lower Rio Grande Valley, including the City of Edinburg and Hidalgo, Starr, Books, Kennedy, Willacy, and Cameron Counties. According to the Regional Solid Waste Management Plan Amendment developed by the Lower Rio Grande Valley Development Council, the waste types and percentage by weight are as follows.

Table II-2: Lower Rio Grande Valley Waste Characteristics

Types of Waste	Percentage	Description
Residential	40.73%	Durable goods - appliances and furniture Non-durable goods - papers, disposable diapers, clothing & footwear Containers and packaging Food wastes and yard wastes
Commercial	14.15%	Commercial waste - cardboard, office papers, food, disposable dinnerware, and other waste products. Disaster waste is included in this category.
Contaminated Soil	12.9%	Generated during remediation of spill sites, often in conjunction with removal of underground storage tanks.
Class II & Class III	10.8%	Waste imported from Mexico - A sub-category of industrial waste
C & D Waste	7.6%	Wastes resulting from construction and demolition processes
Brush	5.9%	Trees, shrubs and other yard waste debris
Institutional	3.93%	Institutional waste (schools, nursing homes and hospitals) generally considered the same as commercial waste.
Recreational	2.95%	Waste generated at parks and other recreational facilities.
Sludge	0.6%	Sludge from water and wastewater treatment plants and also septage (pumped from septic tanks) and grease and grit trap waste.
Class I Asbestos	0.44%	Asbestos generated during construction demolition or removal of asbestos from existing buildings and readily releases airborne particles.
Litter/Dumping	.006%	Waste generated by promiscuous dumping along road ways and other areas
Asbestos	.06%	Asbestos generated construction demolition or removal of asbestos from existing buildings and does not readily release airborne particles.

2.2.2 Compatibility with Surrounding Land Use, Zoning, Community Growth Patterns

30 TAC §330.61(h)

Sections 2.3 discusses site-specific land use characterization including surrounding land use, zoning in the vicinity, community growth patterns, and proximity to residents and other uses. As documented, the MSW facility is compatible with the surrounding area.

2.3 Land Use Characterization

2.3.1 Land Use Map

30 TAC §330.61(g)

Figure II-4, Land Use Map is a constructed map showing the facility boundary and land uses within 1 mile such as commercial, industrial, residential, recreational, institutional, and open areas used for agricultural, pastureland, or roadways. The map shows the location of approximately 972 residences, sixty commercial and industrial businesses, a school, a licensed daycare facility, four churches, a cemetery, and a recreational area within 1 mile of the facility boundary. There are no ponds or lakes, hospitals, or historic structures and sites within 1 mile of the facility boundary.

Any existing zoning on or surrounding the property is shown on Figure II-5, Zoning Map and any drainage, pipeline, and utility easements within the facility are shown on Figure II-6, Drainage, Pipeline, and Utility Easement Location Map. Access roads serving the facility are shown on the Figure II-4, Land Use Map and Figure II-11, Traffic Volumes.

2.3.2 Zoning Map

30 TAC §330.61(h)(1)

Figure II-5, Zoning Map shows the City's Official Zoning Map dated June 16, 2015 within 2 miles of the facility as well as property recently annexed by the City. The facility is located with the City of Edinburg limits zoned for industrial land use.

2.3.3 Drainage, Pipeline, and Utility Easement Location Map

30 TAC §330.61(c)(10)

Figure II-6, Drainage, Pipeline, and Utility Easement Location Map shows two deed recorded dedicated pipeline easements within and adjacent to the facility property. Deed records for both pipeline easements are located in Appendix IA, Legal Description. One 20-foot wide pipeline easement, owned by Texas Gas Services, runs adjacent to the eastern and northern facility property boundary. Another 20-foot wide pipeline easement, owned by Vernon E. Faulconer, Inc. (VEFI), runs adjacent to the Texas Gas Services pipeline along northern property boundary and continues south to the gas production well located approximately 675 feet from the north property boundary as shown on Figure II-6.

Electrical powerlines owned by Magic Valley Electric Cooperative currently run from the intersection of Encinitos Road and the west property boundary a distance of approximately 2,000 feet south along the west permit boundary and extend approximately 5,000 feet east. Another electrical powerline owned by American Electric Power is located adjacent to the entrance road into the facility. Both powerlines are not constructed on dedicated easements and may be relocated if necessary for future site development.

A City owned sanitary sewer line currently runs from the intersection of Encinitos Road and the west property boundary and extends approximately 1,900 feet east. Another City owned sanitary sewer line is located adjacent to the entrance road into the facility. Neither sewer line is constructed on dedicated easements and may be relocated if necessary for future site development.

No drainage easements are located within the facility.

2.3.4 Character of Surrounding Land Use

30 TAC §330.61(h)(2)

Information about the character of surrounding land uses within 1 mile of the facility is depicted on Figure II-4, Land Use Map. Portions of land are developed with a wide variety uses such as commercial, industrial, residential, recreational, institutional, and open areas used for agricultural, pastureland, or roadways. A breakdown of land use type and corresponding areas is summarized in Table II-5, Land Use within One Mile.

Table II-5: Land Use within One Mile

Land Use	Area in Acres	Percentage of Total Area
Open	2,773	52.4%
Industrial	1,554	29.3%
Residential	779	14.7%
Commercial	86	1.6%
Institutional	83	1.6%
Recreational	19	0.4%
Total	5,294	100.0%

2.3.5 Growth Trends

30 TAC §330.61(h)(3)

Information about growth trends within 5 miles of the facility with directions of major development is evaluated by area population projections, inspection of a series of aerial photographs, and local planning studies.

2.3.5.1 Population Projections

Population projection data is provided by Texas State Data Center (TSDC) Office of the State Demographer county level population projections. Such projections are based on recent and projected demographic trends, including the birth rates, survival rates, and net migration rates of population groups defined by age, gender and ethnicity. The TSDC strongly recommends use of their half migration scenario for long-term planning. Population projections for the facility's current market areas are presented in Table II-6, Population Projections and Annual Growth Rates by County. The average annual growth rate for Hidalgo County is 1.75 percent.

located on the southern boundary of the facility west of the entrance road. The flare station located directly north of the LFGTF on facility property may be moved for future site development to a location within the LFGTF permit boundary. The unused container storage pad and storage building will be removed as operational development progresses.

2.3.9 Prevailing Wind Direction

30 TAC §330.61(c)(1)

A wind rose is included as Figure II-10, Wind Rose to illustrate the prevailing wind direction for the Brownsville Airport located approximately 50 miles southeast for the period January 1, 1984 to December 31, 1992. The prevailing wind direction is from the south and southeast with a strength that can be greater than 21 knots. Calm winds are 5.23 percent of the time.

2.4 Transportation

2.4.1 Traffic

A traffic and location restrictions review and correspondence with Texas Department of Transportation (TxDOT) is included in Appenidx IIA, Traffic.

2.4.1.1 Access Road Availability and Adequacy

30 TAC §330.61(i)(1)

2.4.1.1.1 Access Road Availability

The facility entrance is located at 8601 Jasman Road north of FM 2812 and is shared with the City's Type IV Landfill, TCEQ Permit MSW-2302. The access route from US Hwy 281 is eastbound on FM 2812 and north onto Jasman Rd. An additional facility access route used only for landfill operations and maintenance vehicles as well as for emergency response vehicles from US Hwy 281 is eastbound Encinitos Rd. Figure II-11, Traffic Volume shows the access roads to facility.

2.4.1.1.2 Access Road Adequacy

Access road adequacy for US Hwy 281 and FM 2812, as provided by TxDOT, and a summary of their characteristics is presented in Table II-7, Access Road Characteristics. The portion of Jasman Rd located north of FM 2812 is owned, operated, and maintained by the City.

Table II-7: Access Road Characteristics

Access Road	Maximum Weight (Pounds)	Number of Lanes[1]	Width of Lanes (ft)	Curb/ Shoulders[2]	Surface Type
US Hwy 281[3]	80,000	4	12	5 to 10-ft shoulder	Asphaltic concrete Pavement surface overlaying a limed caliche base
FM 2812[4]	80,000	2[4]	12	~10-ft shoulder	Asphaltic concrete Pavement surface overlaying a limed caliche base

1. The number of lanes represent the total in both directions.
2. Curb and shoulder exist in both directions.
3. Near the intersection with FM 2812, US Hwy 281 northbound frontage road has three 12-foot wide lanes.
4. For a distance of approximately 500 foot on the eastern side of the intersection with US Hwy 281, FM 2812 has four 12-foot wide lanes.

2.4.1.2 Volume of Vehicular Traffic

30 TAC §330.61(i)(2)

Volume of vehicular traffic on access roads within 1 mile of the proposed facility, both existing and future, during the expected life of the proposed facility is summarized in Table II-8, Volume of Vehicular Traffic and presented on Figure II-11, Traffic Volume. The expected life is estimated at 60 years with a 2 percent annual growth rate.

Table II-8: Volume of Vehicular Traffic

Access Road	Location	Existing Annual Average Daily Traffic	Future Annual Average Daily Traffic
US Hwy 281	North of FM 2812 intersection	18,954 VPD	667,605 VPD
US Hwy 281	South of FM 2812 intersection	32,674 VPD	1,150,856 VPD
FM 2812	West of Jasman Road intersection	9,610 VPD	58,286 VPD
FM 2812	East of Jasman Road intersection	8,420 VPD	51,069 VPD

2.4.1.3 Facility Traffic Volume

30 TAC §330.61(i)(3)

Volume of vehicular traffic expected to be generated by the facility on access roads within 1 mile of the proposed facility summarized in Table II-9, Facility Traffic Volume and presented on Figure II-11, Traffic Volume. The expected life is estimated at 60 years with a 2 percent annual growth rate.

Table II-9: Facility Traffic Volume

Access Road	Location	Existing Annual Average Daily Traffic	Future Annual Average Daily Traffic
Jasman	Facility Entrance	187 VPD	763 VPD

2.4.2.4 No Bird Hazards

30 TAC §§330.545(a) & 330.545(c)

The facility is located greater than 10,000 feet from the South Texas International Airport at Edinburg's runway end used by turbojet aircraft and greater than 5,000 feet from the Norman and White Airport's runway end used by piston-type aircraft. The facility is not located in an area where the attraction of birds can cause a significant bird hazard to low-flying aircraft, and the facility has been designed and will be operated so that the municipal solid waste landfill units do not pose a bird hazard to aircraft.

2.4.2.5 Notice to Airports and FAA

30 TAC §330.545(b)

In addition to the FAA, notification of the proposed landfill expansion was submitted to the South Texas International Airport at Edinburg and Norman and White Airport.

2.5 General Geology and Soils Statement

30 TAC §330.61(j)(1)-(4)

Detailed discussion of the site geology is included in Part III4, Geology Report.

2.5.1 Geology and Soils

30 TAC §330.61(j)(1)

2.5.1.1 Geology

In the Lower Rio Grande Valley (LRGV) the depositional stratigraphy described as the Gulf Coast Aquifer (GCA) are Quaternary and Neogene period sediments consisting primarily of fine to medium-grained materials deposited by fluvial and eolian processes. The outcrop of each progressively older, underlying unit is found to the west of the younger, overlying unit. Because of continental shelf differential subsidence, units typically thicken and dip toward the coastline of the Gulf of Mexico.

Figure II-12, Geologic Map presents the McAllen-Brownsville Sheet, Geologic Atlas of Texas prepared by the Bureau of Economic Geology. This map presents geologic units and structural features within the vicinity of the facility with text describing the stratigraphy and lithology of the map units. The facility is located on Neogene sediment overlain by Quaternary windblown sediment.

The generalized stratigraphic column of the area beneath the facility is presented to a depth of approximately 1,600 ft-bgs, which is the base of the Evangeline Aquifer. Based on Figure II-12, Geologic Map and Figure II-13, ~~Regional~~ Stratigraphic Cross-Section, the Goliad Formation outcrops in the vicinity and is overlain by a veneer of Holocene eolian deposits. A description of the stratigraphy, including geologic age, lithology including variations, thickness, depth, geometry, hydraulic conductivity, and depositional facies of each geologic unit as available through current geologic information is included in Table III4-1.

Table II-10: Stratigraphic Units Underlying Facility

System	Series	Age (M.Y.)	Stratigraphic Units	Lithology	Approx. Thickness (ft)	Approx. Depth (ft-bgs)	Geometry	Hydraulic Conductivity	Depositional Facies
Quaternary	Holocene	0.02	Stabilized Sand Dune Deposits	Sand; Silt	0-30	10	Sand sheets and dunes	Moderate to High	Eolian
Neogene	Miocene	4.4	Upper Goliad	Clay or Mud; Sandstone; Mudstone, Carbonate, Limestone, Conglomerate	400	400	Large planar, cross bedding, and lamination. Dips east towards gulf coastline; units thicken down dip	Moderate	Fluvial / Meander belt
		11.3	Lower Goliad		550	950			Lower Coastal Plain Fluvial / Coastal
		13.3	Upper Lagarto	Sandstone	650	1600			
		15.6	Middle Lagarto	Clay or Mud	700	2300		Low	

(Table compiled after Baker, 1979; Chowdhury and Mace, 2007; and Young et al., 2010)

2.5.1.2 Soils

Figure II-14, Soils Map presents the distribution of six soil series, predominantly loamy, located across the facility according to the Soil Survey of Hidalgo County, Texas. These soil series include: the Brennan, Hebbronville (#22, #23, and #24), Hidalgo, Racombs, and Willacy Series. Table II-11, Soil Types lists sixteen soil types within the facility boundary, percentage of area covered, and potential for water and wind erosion.

Table II-11: Soil Types

Soil	Unit Name	Area Covered[1] (%)	Water Erosion Hazard	Wind Blowing Hazard
3	Brennan fine sandy loam, 0 to 1 percent slopes	7.8	Slight	Moderate
9	Delfina loamy fine sand, warm, 0 to 2 percent slopes	4.2	Moderate	Severe
16	Hargill fine sandy loam, 0 to 1 percent slopes	9.5	Slight	Moderate
17	Hargill fine sandy loam, 1 to 3 percent slopes	6.6	Moderate	Moderate
22	Hebbronville sandy loam, 0 to 1 percent slopes	7.7	Slight	Moderate

2.5.3 Seismic Impact Zone Assessment

30 TAC §330.61(j)(3) & §330.557

New municipal solid waste landfill units and lateral expansions shall not be located in seismic impact zones. A seismic impact zone is defined as an area with a 10-percent or greater probability that the maximum horizontal acceleration in lithified earth material, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10 g in 250 years.

The 2014 U.S. Geological Survey (USGS) National Seismic Hazard Maps display earthquake ground motions for various probability levels across the United States up to 50 years. According to the USGS, ground motion values having a 2% probability of exceedance in 50 years should be approximately the same as those having 10% probability of being exceeded in 250 years. Figure II-15, Seismic Impact ~~Zone~~ Map shows the maximum horizontal acceleration is approximately 0.02g at the location of the facility. Because the maximum horizontal acceleration is less than 0.1g, the facility is not located in a seismic impact zone.

2.5.4 Unstable Areas Assessment

30 TAC §§330.61(j)(4) & 330.559

An unstable area is defined to be a location that is susceptible to natural or human-induced events or forces capable of impairing the integrity of some or all of a landfill's structural components responsible for preventing releases from the landfill; unstable areas can include poor foundation conditions, areas susceptible to mass movement, and karst terrains. No unstable areas exist within the vicinity of the facility that would impair the integrity of any landfill components.

2.5.4.1 Local Soil Conditions

The soils within vicinity of the facility are predominantly sandy loam and have similar soil properties. They are well drained because of high infiltration rates and lack natural drainage features. No significant differential settling is anticipated.

2.5.4.2 Local Geologic or Geomorphologic Features

The lithology within the vicinity of the facility is moderately consistent and no indication of any karst conditions, active geological faulting, or presence of salt domes; therefore no differential subsidence is anticipated.

2.5.4.3 Local Human-Made Features

In Part III3, Waste Management Unit Design analyses were performed to assess the performance of the landfill with respect to slope stability and settlement using very conservation assumptions. Results of the analyses indicate slope stability and long-term settlement would not impair the integrity of the landfill's

2.8 Floodplains

30 TAC §§330.61(m)(1) & 330.547(b)

The facility's northern boundary extends into two small unnamed ponding areas designated as a 100-yr flood zone without floodways. Construction of the facility's perimeter berm and storm water management structures—placement of fill in the 100-yr flood zone without floodways—will not restrict the flow of the 100-year flood, reduce the temporary water storage capacity of the floodplain, or result in washout of solid waste so as to pose a hazard to human health and the environment. The City of Edinburg has jurisdiction over the facility and adjacent properties and the Director of Public Works has reviewed and approved the construction of the facility's perimeter berm and storm water management structures.

2.8.1 Location

The facility's property boundary is located on the Flood Insurance Rate Map (FIRM) panel number 480334 0325D dated June 6, 2000 as depicted in Figure IIC-1, Flood Insurance Rate Map (FIRM). A Flood Insurance Study (FIS) and FIRM for the Unincorporated Ares of Hidalgo County, Texas, have been revised by a Letter of Map Revision (LOMR) case number 01-06-1095P dated May 17, 2001 to reflect revised hydrologic and hydraulic analyses, and more accurate topographic information. Figure IIC-2, Revised FIRM to Reflect LOMR depicts the facility's property boundary on the revised FIRM based on LOMR 01-06-1095P with revised Special Flood Hazard Areas (SFHA). The most current SFHA delineations available are FEMA Quality Level 3 (Q3) Flood Data files. Figure IIC-3, FEMA Q3 Flood Data shows the facility's northern boundary extends into two small unnamed ponding areas designated as SFHA Zone A, 100-year flood with no base flood elevations determined.

2.8.2 Data Source

The Facility's property boundary is located on the Flood Insurance Rate Map (FIRM) panel number 480334 0325D dated June 6, 2000, which was revised by LOMR 01-06-1095P dated May 17, 2001. The SFHA changes made by subsequent Letter of Map Changes (LMOCs) have not yet been incorporated into FEMA's National Flood Insurance Program (NFIP) National Flood Hazard Layer (NFHL) digital database and does not yet contain high resolution flood hazard mapping data for Hidalgo County. The most current SFHA delineations available for the project area are FEMA Quality Level 3 (Q3) Flood Data files as verified by FEMA.

2.8.3 Floodplain Evaluation

A floodplain evaluation for TCEQ Permit MSW-956B was performed using FIRM revised by a LOMR case number 01-06-1095P dated May 17, 2001 as depicted on Figure IIC-2, Revised FIRM to Reflect LOMR. Appendix IIC1, Floodplain Evaluation for TCEQ Permit MSW-956B includes floodplain correspondence in

Appendix IIC1-1 and documentation that the development of TCEQ Permit MSW-956B was certified not to violate floodplain restrictions in Appendix IIC1-2.

A floodplain evaluation was performed for the expansion property for TCEQ Permit MSW-956C as depicted in Figure IIC-3, FEMA Q3 Flood Data and a request for Conditional Letter of Map Revision Based on the Placement of Fill (CLOMR-F) was submitted to FEMA. Appendix IIC2, Floodplain Evaluation for TCEQ Permit MSW-956C Expansion Area includes Appendix IIC2-1, FEMA CLOMR-F Request which includes a detailed evaluation of proposed fill in the two SHFA Zone A areas, figures detailing facility design plan and profiles, and required documentation to demonstrate compliance with each applicable requirement of 30 TAC §§330.63(c)(2), 330.307(b), and 330.547.

As discussed in Appendix IIC2-1, FEMA CLOMR-F Request, the facility's stormwater management system will incorporate ponds with adequate capacity to hold all runoff, and there will be no offsite stormwater discharge except the insignificant runoff from the exterior slope of the access road berm. The facility perimeter berms are designed to protect deposited waste from flooding. The diversion structures route stormwater run-off to the stormwater ponds along the perimeter of the facility and the access roads prevent run-on from entering the facility.

As detailed in Appendix IIC2-1, FEMA CLOMR-F Request, FEMA's Q3 Flood Data Zone A delineation was used to determine a 100-year base flood elevation (BFE) of 86 feet above mean sea level (ft-msl) for the two small unnamed ponding areas designated (SFHA) Zone A without floodways using contour interpolation as described in FEMA's guide, Managing Floodplain Development in Approximate Zone A Areas. Figure 4 in Appendix IIC2-1, FEMA CLOMR-F Request presents Sections A and B for profile views of the northeast Zone A SFHA and northwest Zone A SFHA, respectively. Section A shows that the construction in the northeast Zone A SFHA includes the waste buttressed by a landfill perimeter berm, a facility stormwater perimeter channel, and a perimeter access road with a crest elevation of 95 ft-msl. Section B shows the waste buttressed by a landfill perimeter berm, a stormwater perimeter channel, an access road with a minimum elevation of 89 ft-msl, a stormwater pond, and a facility perimeter berm with a minimum elevation of 89 ft-msl, i.e. a 3-ft minimum freeboard is maintained above the 100-year design flood (86 ft-msl) in accordance with 30 TAC 330.307(b). ~~The Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map (FIRM) for Hidalgo County, Texas, Map No. 480334, Panel 0325 D, Effective Date: September 26, 2008 and Zone A Special Flood Hazard Area (SFHA) boundaries from Quality Level 3 (Q3) Flood Data provided by FEMA Online Flood Maps, the facility's northern boundary extends into two small unnamed ponding areas designated SFHA Zone A without floodways~~

-As demonstrated in Appendix IIC2-1, FEMA CLOMR-F Request, c~~C~~onstruction of the facility's landfill perimeter berm and storm water management structures—placement of fill in the SFHA Zone A areas—

will not restrict the flow of the 100-year flood, reduce the temporary water storage capacity of the floodplain, or result in washout of solid waste so as to pose a hazard to human health and the environment.

2.8.4 Construction Approval

~~A request for Conditional Letter of Map Revision Based on the Placement of Fill (CLOMR-F) was submitted to FEMA. The submittal included a detailed discussion of proposed fill in the two SHFA Zone A areas, figures detailing facility design plan and profiles, and required documentation.~~ Appendix IIC2-2, FEMA Response to CLOMR-F Request states ~~FEMA responded that~~ the proposed development does not encroach on a FEMA designated floodway and no buildings are anticipated to be constructed on the site~~.~~ ~~In addition, FEMA noted that~~, there are no procedures under the NFIP regulations that require action on your requests by FEMA. Hidalgo County, or other agencies having jurisdiction of the site, may have requirements that apply. The City of Edinburg has jurisdiction over the facility and adjacent properties. The Director of Public Works reviewed and approved the request for CLOMR-F thus signing the Community Acknowledgement Form included in Appendix IIC2-3, Community Floodplain Management Review and Approval; therefore, no further action is required.

~~The CLOMR-F request submittal including the signed Community Acknowledgement Form and the FEMA response letter are included in Appendix IIC, Floodplains.~~

2.9 Wetlands

Appendix IID, Wetlands includes a wetlands evaluation and correspondence with the Department of Army, US Army Corps of Engineers (USACE).

2.9.1 Wetlands Determination

30 TAC §330.61(m)(2)

Appendix IID1, Wetlands Evaluation is a wetlands assessment for the facility's expansion area conducted by Naismith Engineering, Inc. (NEI) under applicable federal, state, and local laws. The assessment was conducted to determine if existing water features within the facility's expansion area meet federal 33 CFR §328.3(c)(4) and state 30 TAC §307.3(84) criteria for wetlands, and if any jurisdictional "waters of the US" are within the expansion area. Under the federal Clean Water Act § 404 (CWA § 404), the USACE regulates the discharge of dredged and fill material into "waters of the US". The phrase "waters of the US" defines the extent of the USACE's geographic jurisdiction of the CWA § 404. There are no known local laws or ordinances that would regulate or otherwise apply to wetlands within the proposed expansion area.

The wetlands assessment identified a potential wetland meeting the criteria of hydrology, vegetation, and hydric soils and performed a wetland delineation. The delineated isolated wetland is approximately 1/3 acre in size and located in the middle of the facility's expansion area. According to the wetlands assessment,

(5) any other graphic representations or marginal explanatory notes necessary to communicate the proposed construction sequence of the facility
(6) fencing
(7) provisions for the maintenance of any natural windbreaks, such as greenbelts, where they will improve the appearance and operation of the facility and, where appropriate, plans for screening the facility from public view
(8) all site entrance roads from public access roads
(9) for landfill units
    (A) sectors with appropriate notations to communicate the types of wastes to be disposed of in individual sectors
    (B) the general sequence of filling operations
    (C) sequence of excavation and filling
    (D) dimensions of cells or trenches
    (E) maximum waste elevations and final cover.

3.3 Facility Entrance Plan

The facility entrance and maintenance facilities are located south of the Type I disposal areas. Figure II-16, Facility Entrance Plan illustrates existing facility buildings and designated areas, existing fencing and screening, and site entrance roads.

3.3.1 Facility Buildings

30 TAC §330.61(d)(4)

Existing structures/areas located at the facility, which will remain as part of this permit amendment application, include:

- Landfill administrative office
- Maintenance buildings
- Gatehouse and scales
- Dumpster / roll off box storage area
- Citizen collection station
- Landfill gas to energy facility including landfill flare and blower
- Reusable material staging area
- Large item salvage and white goods storage area
- Fuel storage tank

3.3.2 Fencing

30 TAC §§330.61(d)(6) & 330.223(c)

~~Currently, fencing has been installed along the southern boundary of Type IV Landfill TCEQ Permit MSW-2302 and facility entrance, along the west side of the facility entrance, along the southern facility boundary from the site entrance to the west facility boundary, and along the west facility boundary as shown on Figure II-16, Facility Entrance Plan. The northern and eastern portions of the facility boundary are adjacent to City~~

~~owned property where the land use is primarily agricultural and the southern portion is adjacent to Type IV Landfill, TCEQ Permit MSW-2302, hence providing adequate control to public access. However, fencing will be incrementally installed along the northern facility boundary and east of the facility on City owned property to provide an additional barrier to control public access.~~Access to the facility is controlled by a perimeter fence, a composite of either a four-foot barbed wire fence or a six-foot steel-link mesh fence, currently installed around contiguous properties owned by the City. The perimeter fence encompasses the facility permit boundary as well as the Type IV Landfill TCEQ Permit MSW-2302 and landfill facilities to the south and additional City owned properties to the east as depicted on Figure II-16, Facility Entrance Plan.

A gate located at the facility entrance is locked by site personnel at the end of the day's operations. Another gate is located on the west side of the facility on Encinitos Road and is locked unless access is needed by site personnel.

3.3.3 Screening

30 TAC §330.61(d)(7)

Although there exist some visual screening of the along the southern portion of the facility boundaries, plans for screening the facility from public view is not required because the nearest high traffic roadway is located approximately 1,900 feet to the west and surrounding land use is primarily agricultural and industrial.

3.3.4 Site Entrance Roads

30 TAC §330.61(d)(8)

The facility entrance is located at 8601 Jasman Rd north of FM 2812 and is shared with the City's Type IV Landfill TCEQ Permit MSW-2302. Access to the facility entrance from US Hwy 281 is eastbound on FM 2812 and north onto Jasman Rd. The site entrance of the facility is on its southern permit boundary directly north of the scale house as shown on Figure II-16, Facility Entrance Plan

3.4 Facility Layout Plan

30 TAC §330.61(d)(9)(A)

Figure II-17, Facility Layout Plan illustrates an outline of the solid waste management units to receive waste accepted by facility as outlined in §1.0, Waste Acceptance Plan; general locations of main interior facility roadways that can be used to provide access to fills areas; surface water drainage features and ponds;

buffer zones; and location of monitoring wells. Figure II-17, Facility Layout Plan includes the location of the permanent site benchmark.

3.4.1 Outline of Solid Waste Management Units

30 TAC §330.61(d)(1)

Figure II-17, Facility Layout Plan illustrates an outline of the solid waste management units. Waste within Pre-Subtitle D Units 1-4 will either be relocated for development of Unit 8 or an Overliner will be constructed for vertical expansion. Therefore, Subtitle D waste disposal areas are 52.9 acres in Unit 5, 110.8 acres in Unit 6, 205.7 acres in Unit 7, and 36.6 acres in Unit 8/Overliner.

3.4.2 Interior Facility Roadways

30 TAC §330.61(d)(2)

The facility has interior roadways that can be used to provide access to the solid waste management units as shown on Figure II-17, Facility Layout Plan.

3.4.3 Monitoring Wells

30 TAC §330.61(d)(3)

Figure II-17, Facility Layout Plan shows the location of 38 monitoring wells used for the groundwater monitoring system outlined in Part III5, Groundwater Characterization Report.

3.5 Subgrade Layout Plan

30 TAC §330.61(d)(9)(D)

Currently active disposal areas are Unit 5, Cells SD-1 through SD-8 and Unit 6, Cells 1A through 6A. Figure II-18A, Subgrade Layout Plan – Overliner Option, depicts the subgrade elevations of the lateral expansion cells within Unit 7 and Overliner and lists their approximate dimensions. Likewise Figure II-18B, Subgrade Layout Plan –Unit 8 Option, depicts the subgrade elevations of the lateral expansion cells within Unit 7 and Unit 8 and lists their approximate dimensions. Cells may be divided into smaller areas for development. Resulting divisions will be labeled with parent cell designation appended with an incremental letter.

3.6 Final Contour Map

30 TAC §330.61(d)(9)(E)

Figure II-19, Final Contour Map depicts the maximum final cover elevation of approximately 398 ft-msl. The maximum waste elevation is the final cover elevation minus the thickness of final cover and is dependent on thickness of the final cover lining option used. Part III7, Closure Plan details final cover lining options.

APPENDIX IIC1

Floodplain Evaluation for TCEQ Permit MSW-956B

APPENDIX IIC1-1

FLOODPLAIN CORRESPONDENCE FOR TCEQ PERMIT MSW-956B

APPPENDIX IIC1-2

Floodplain Location Restriction Certification for TCEQ Permit MSW-956B

APPENDIX IIC2

~~FEMA RESPONSE~~FLOODPLAIN EVALUATION FOR TCEQ PERMIT MSW-956C EXPANSION AREA

APPENDIX IIC2-1

FEMA CLOMR-F REQUEST

APPENDIX IIC2-2

FEMA RESPONSE TO CLOMR-F REQUEST

APPENDIX IIC2-3

COMMUNITY FLOODPLAIN MANAGEMENT REVIEW AND APPROVAL

APPENDIX IIE2-3

TPWD RESPONSE TO RECOMMENDATIONS

Crowe, Kelly

To: Russell Hooten
Subject: RE: Threatened or Endangered Species Review

From: Russell Hooten [mailto:Russell.Hooten@tpwd.texas.gov]
Sent: Wednesday, October 25, 2017 2:14 PM
To: Crowe, Kelly <Kelly_Crowe@golder.com>
Subject: RE: Threatened or Endangered Species Review

Hi Kelly,

Yes, I did review it. Overall, TPWD is OK with the responses to our recommendations.

The letter to me indicates that there was an attachment, a letter from Ernesto Reyes dated October 20, 2015. I did not receive that attachment. Could you forward that to me so our records for this project can be complete?

Thank you,
Russell

PERMIT AMENDMENT APPLICATION

Part III

SITE DEVELOPMENT PLAN

Edinburg Regional Disposal Facility

Edinburg, Hidalgo County, Texas

TCEQ Permit MSW-956C

Submitted To: City of Edinburg
Department of Solid Waste Management
8601 North Jasman Road
Edinburg, Texas 78542 USA

Submitted By: Golder Associates Inc.
500 Century Plaza Drive, Suite 190
Houston, TX 77073 USA

July 2017
Revised: November 2017

Project No. 1401491

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CITY OF EDINBURG SOLID WASTE MANAGEMENT

PERMIT AMENDMENT APPLICATION

Part III, Attachment 1

GENERAL FACILITY DESIGN

Edinburg Regional Disposal Facility

Edinburg, Hidalgo County, Texas

TCEQ Permit MSW-956C

Submitted To: City of Edinburg
Department of Solid Waste Management
8601 North Jasman Road
Edinburg, Texas 78541 USA

Submitted By: Golder Associates Inc.
500 Century Plaza Drive, Suite 190
Houston, TX 77073 USA

July 2017
Revised: November 2017

Project No. 1401491

Golder Associates

1.0 GENERAL FACILITY DESIGN

1.1 Facility Access

30 TAC §§330.63(b)(1) & 330.223(c)

The facility shares and entrance with Type IV Landfill TCEQ Permit MSW-2302 where access to the facility is controlled by a perimeter fence, a composite of either a four-foot barbed wire fence or a six-foot steel-link mesh fence, currently installed around contiguous properties owned by the City. The perimeter fence encompasses the facility permit boundary as well as the Type IV Landfill TCEQ Permit MSW-2302 and landfill facilities to the south and additional City owned properties to the east as depicted on Figure II-16, Facility Entrance Plan.~~fencing has been installed along its southern boundary to provide continuous security and access control.~~ A gate located at the facility entrance is locked by site personnel at the end of the day's operations. Another gate is located on the west side of the facility on Encinitos Road and is locked unless access is needed by site personnel. ~~Additional fencing is not required because the surrounding land use is primarily agricultural and industrial.~~

1.2 Waste Movement

30 TAC §330.63(b)(2)

Figure III1-1, Waste Movement Flow Diagram and Figure III1-2, Schematic View of Various Waste Disposal, Processing, and Storage Areas illustrate a generalized process design and working plan of the overall facility.

1.2.1 Flow Diagram

30 TAC §330.63(b)(2)(A)

Figure III1-1, Waste Movement Flow Diagram is a flow diagram illustrating storage, processing, and disposal sequences for the types of waste accepted in accordance to Part II, §1.0 Waste Acceptance Plan.

1.2.2 Schematic View Drawings

30 TAC §330.63(b)(2)(B)

Figure III1-2, Schematic View of Various Waste Disposal, Processing, and Storage Areas is a schematic view showing the various phases of collection, separation, processing, and disposal for the types of waste accepted in accordance to the Part II, §1.0 Waste Acceptance Plan. Structures/areas for the gatehouse and scales, citizen collection station, reusable material staging area, and large item salvage and white good storage area is located with the permit boundary of Type IV Landfill TCEQ Permit MSW-2302.

1.2.3 Ventilation and Odor Control

30 TAC §330.63(b)(2)(C)

The facility will follow measures outlined in Part IV, Site Operating Plan §4.14, Odor Management Plan for all storage, separation, processing, and disposal units.

1.2.4 Generalized Construction and Design Details

1.2.4.1 Storage and Processing

30 TAC §330.63(b)(2)(D)

Roll-off waste containers are used for temporary storage for citizen collection, reusable materials, and large item salvage. Roll-off waste containers are prefabricated to industry standards, therefore generalized construction details are not required.

1.2.4.2 Storage and Processing Component Slab and Subsurface Supports

30 TAC §330.63(b)(2)(E)

The foundation of designated areas for citizen collection, reusable materials, and large item salvage as depicted in Figure III1-2, Schematic View of Various Waste Disposal, Processing, and Storage Areas are maintained; no slab and subsurface supports for roll-off waste containers are required.

1.2.4.3 Storage and Processing Component Containment Dikes or Walls

30 TAC §330.63(b)(2)(F)

All storm water is contained within the facility boundary as well as within the Type IV Landfill TCEQ Permit MSW-2302 boundary with no discharge into surface water in the state as a result of any storm event; therefore containment dikes or walls are not required to enclose all storage and processing components and all loading and unloading areas.

1.3 Endangered Species

30 TAC §330.63(b)(5)

In response to Texas Parks and Wildlife Department (TPWD) recommendations, the facility will employ best management practices to minimize potential negative impacts to federally-listed and state-listed wildlife to include a “no kill” policy. In addition, the City of Edinburg (City) made an agreement with United States Fish and Wildlife Service (USFWS) to preserve a 200-foot wide corridor of dense native woodland along the northern property boundary established with native vegetation, connecting to the southern property boundary of dense native woodland owned by the City. The facility is designed with the following features to protect endangered species:

- Perimeter fencing, a composite of either a four-foot barbed wire fence or a six-foot chain-link fence, is currently installed around contiguous properties owned by the City. Any four-foot barbed wire fence along the perimeter will be replaced with a six-foot steel-link mesh fence designed to inhibit wildlife from entering project areas.
- Excavations and embankments are to be constructed with side slopes no steeper than 3 feet horizontal to 1 foot vertical to provide an adequate escape for wildlife.

Please refer to Part IIE, Endangered or Threatened Species for response to TPWD recommendations and agreement with USFWS.

PERMIT AMENDMENT APPLICATION

Part III, Attachment 2

SURFACE WATER DRAINAGE REPORT

Edinburg Regional Disposal Facility

Edinburg, Hidalgo County, Texas

TCEQ Permit MSW-956C

Submitted To: City of Edinburg
Department of Solid Waste Management
8601 North Jasman Road
Edinburg, Texas 78542 USA

Submitted By: Golder Associates Inc.
500 Century Plaza Drive, Suite 190
Houston, TX 77073 USA

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Project No. 1401491

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work and local regulations. Selected hydrologic methods and input parameters are presented in Appendix III2A, Detailed Drainage Calculations.

2.1.3 Peak Flow Rates and Runoff Volumes

30 TAC §330.63(c)(1)(D)

The HEC-HMS hydrologic model was used to determine the peak flows and volumes resulting from the 25-year, 24-hour design storm. The NRCS unit hydrograph transformation methodology was used for all drainage basins. Times of concentrations were calculated using TR-55 methodology. Peak flow rates were used to design stormwater channels required in the drainage design (perimeter channels, downchutes, and add-on berms). Channel calculations were performed using a spreadsheet that solves Manning's equation for normal depth. Culvert sizing calculations were carried out using HY-8 software developed by the U. S. Department of Transportation Federal Highway Administration. Peak flow rates and runoff volumes are included in Appendix III2A, Detailed Drainage Calculations.

2.2 Drainage Pattern Analyses

30 TAC §§330.63(c)(1)(C), 330.63(c)(1) (D)(iii) & 330.305(a)

Existing drainage patterns will not be adversely altered as a result of the proposed landfill development as demonstrated in the comparison of peak flow rates, runoff volumes, and velocities in the pre-development and post-development conditions. Analysis points were located for the pre-development and post-development conditions to represent locations where run-on flows enter the site or runoff exits the site. The analysis points and contributing drainage areas are shown on Figure III2-1, Pre-Development Drainage Plan and Figure III2-2, Post-Development Drainage Plan.

The determination of no adverse alteration of drainage patterns is based on three factors related to discharge of surface water: 1) peak flows, 2) velocities, and 3) volumes as measured at the permit boundary. The pre-development condition at the facility has only two discharge points – one at CP-3 and one at CP-9. In addition, there is one discharge point at CP-7 where water accumulates at a depression along the permit boundary. The following bullets address these three discharge points:

- CP-3: In the pre-development condition an approximately 8-acre area drained to a depression just west of the permit boundary in this part of the site. In the post-development condition the contributing area to this discharge point is routed to an on-site stormwater pond used to manage surface water. As a result, the flow to this depression is redirected to the pond. This does not impact a receiving stream or channel downstream as there is not one. The discharge velocity decreases from a non-erosive velocity to zero, resulting in minimal change in post-development conditions related to velocity. The volume of discharge is likewise routed to the stormwater pond and does not pond in the off-site depression, and does not adversely impact existing drainage patterns because the discharge volume is lower than in pre-development conditions and has no apparent beneficial use.

- CP-9: In the pre-development condition an approximately 8-acre area drained off site to the south. The elimination of this discharge does not impact a receiving stream or channel downstream as there is not one. The discharge velocity decreases from a non-erosive velocity to zero, resulting in minimal change in post-development conditions related to velocity. The removal of the volume of discharge at this location does not adversely impact existing drainage patterns because the discharge volume is lower than in pre-development conditions and has no apparent beneficial use.
- At discharge point CP-7 there is a depression in the surface topography where runoff ponds along the permit boundary. In the pre-development condition, the contributing area for this runoff is 19.8 acres. The post-development condition reduces this contributed area to 6.3 acres, but does not alter the drainage pattern into the depression. Since the contributing area is lower, the peak flows, velocities, and volumes will all be lower and therefore do not adversely alter existing drainage patterns. There is no apparent beneficial use of the runoff at this location either, therefore the reduced runoff volume does not have any adverse alteration to the drainage patterns.

2.2.1 Drainage Areas

30 TAC §330.63(c)(1)(A)

The pre-development and post-development contributing areas for all analysis points were evaluated. Subbasins for the pre-development condition were delineated using the final cover grades and drainage design within approved TCEQ Permit MSW-956B and existing topography within the lateral expansion area as shown on Figure III2-1, Pre-Development Drainage Plan. Likewise, subbasins for the post-development condition were delineated using the final cover design, the stormwater conveyance structure design (add-on berms, downchutes, perimeter channels, culverts, etc.), and existing topography as shown on Figure III2-2, Post-Development Drainage Plan. As demonstrated in Table III2-1, analysis points CP-3 and CP-9 are the only relevant off-site discharge points in the pre-development condition.

Table III2-1: Summary of Contributing Areas

Analysis/Control Point	Contributing Area (acre)		Runoff Flow Pattern during Pre-development Conditions
	Pre-Development	Post-Development	
CP-1	19.7	0	Ponding on-site
CP-2	205.8	276.9 (total to the west ponds)	
CP-3	8.2	0	Discharges to an off-site depression adjacent to Permit Boundary
CP-4	5.9	0	Accumulate at depressions along permit boundary
CP-5	59.9	0	
CP-6	84.5	0	
CP-7	19.8	6.3	
CP-8	19.3	319.3 (total for the east ponds)	Ponding on-site
CP-9	8.3	0	Discharges off-site
CP-10	39.9	0	Ponding on-site

allowing 0.5 feet of freeboard for the design storm event. Add-on berm locations are depicted on Figure III2-2, Post-Development Drainage Plan and add-on berm details are presented on Figure III2-3, Drainage Control Details I – Channels and Berms.

2.3.3 Downchutes

Downchutes are designed with a maximum slope of 25 percent and are formed by side berms with an internal 2H:1V sideslopes and a design depth allowing 0.5 feet of freeboard for the design storm event. Downchute channels are lined with 60-mil textured geomembrane; however a suitable alternative to geomembrane may be used provided that the design is verified by a professional engineer. Stormwater flow from the downchutes channel through energy dissipation structures into a low water road crossing before discharging into either a perimeter channel lined with riprap or directly into a stormwater pond.

Downchute locations are depicted on Figure III2-2, Post-Development Drainage Plan. A typical detail is shown on Figure III2-4, Drainage Control Details II – Stormwater Downchute Details and Crossings along with a schedule that describes the size, slope, water elevations, flow velocity, and length for each downchute. Flowline profiles showing grades, flow rates, water surface elevations, velocities, and flowline elevations along the entire length for the downchutes are provided in Figures III2-11 through III2-13.

2.3.4 Culverts

Adequacy of both existing and design culverts were evaluated using the Federal Highway Administration's HY-8 Culvert Analysis software. Culvert locations are depicted on Figure III2-2, Post-Development Drainage Plan. Typical culvert details are shown on Figure III2-5, Drainage Control Details III – Culverts.

2.3.5 Stormwater Ponds

Stormwater is collected into 11 ponds: 7 are located west of Unit 7 and north of Units 1 – 6 designated at Ponds W1 – W7; and 4 are located east of Unit 7 designated as Ponds E1 – E4 as depicted on Figure III2-2, Post-Development Drainage Plan. Figure III2-6, Drainage Control Details IV - West Ponds and Sections and Figure III2-7, Drainage Control Details V - East Ponds and Sections show pond profiles; and Figure III2-8, Drainage Control Details VI – Pond Details provides pond dimensions and design elevations. The ponds will be constructed in a phased manner as needed to contain the stormwater runoff on-site as dictated by the extent of landfill development. The stormwater ponds will be lined with 60-mil HDPE in accordance with Part III3F, Liner Quality Control Plan. Hydrostatic uplift of the stormwater pond liner is not anticipated because the pond liner~~it~~ is above seasonal high groundwater levels.

Based on the runoff volume of the receiving areas, the ponds will be interconnected via equalization pipes as follows: Ponds W1 through W3 will be equalized; Ponds W4 through W6 will be equalized; and Ponds E1, E2, E3, and E4 will be equalized. The estimated maximum water elevations for design storm event in feet above mean sea level (ft-msl) are summarized in Table III2-3. Comparison of the maximum water elevations in the ponds and the pond crest elevations demonstrates that the ponds have sufficient storage capacity and freeboards ranging from approximately of 5 feet to over 10 feet. Such design ensures the ponds have adequate capacity for more severe storms or consecutive storms. The designed ponds have adequate capacity to contain runoffs from two consecutive 25-year 24-hour storms as shown in Table III2-4. Furthermore, Pond~~s~~ W7 ~~and E3 are~~is not required for the design storm event, rather ~~they are~~it is designed as a contingency to provide additional storage capacity in case of extreme weather conditions. Pond W7 may be equalized with Ponds W4 through W6 when needed or may be utilized by pumping stormwater from other ponds under extreme weather conditions.

Table III2-3: Pond Water Elevations for 25-Year, 24-Hour Storm

Pond	Runoff Volume (ac-ft)	Maximum Pond Water El. (ft-msl)	Minimum Elev.of the Pond Levee (ft-msl)	Pond Freeboard (ft)
	25-year 24-hour storm	25-year 24-hour storm	-	25-year 24-hour storm
W1	29.2	85.1	91.0	5.9
W2	37.0	85.1	91.0	5.9
W3	6.5	85.1	91.0	5.9
W4	7.1	84.3	91.0	6.7
W5	7.1	84.3	91.0	6.7
W6	70.2	84.3	91.0	6.7
W7	7.8	78.5	91.0	12.5
E1	80.9	~~82.0~~77.4	94.0	~~12.0~~16.6
E2	87.2	~~82.0~~77.4	94.0	~~12.0~~16.6
E3	11.1	~~66.6~~77.4	94.0	~~27.4~~16.6
E4	8.5	~~82.0~~77.4	94.0	~~12.0~~16.6

Table III2-4: Pond Storage Capacity Vs. Two 25-Year, 24-Hour Storms

Pond	Runoff Volume (ac-ft)	Pond Storage Capacity (ac-ft)	Adequate Capacity to Contain Runoffs from Two 25-year 24-hour Storms?
	Two 25-year 24-hour Storms	-	
W1 through W3	146	220	YES
W4 through W6	170	283	YES
E1 through E4	374	882	YES

The semi-arid climate at the site allows for the evaporation pond design. The majority of the water in the ponds will evaporate, while a smaller portion will be used for site operations such as dust control. According to the 61-year historical weather data (from 1954 to 2014) published by Texas Water Development Board, the average annual lake evaporation rate is 62.60 inches and the average annual precipitation is 21.70~~8~~ inches. The weather conditions combined with the pond system design will ensure adequate storage and evaporation capacity at the site.

Further analysis has been performed to demonstrate the long-term performance of the ponds under the post-development conditions. The analysis uses the 61-year historical weather data to model the pond performance with consideration of evaporation. For conservative purposes, it is assumed that the average monthly rainfall will occur within a 24-hour time period and the fact the water may be used for irrigation of the final cover vegetation is omitted. As demonstrated in Appendix III2G, all ponds will have adequate long-term storage capacity for 30 years under the post-developments conditions. For the west ponds, Pond W1 through W6, the average annual evaporation potential surpasses the annual stormwater runoff volume. For the east ponds, Ponds E1 through E4, stormwater runoff may accumulate in the ponds, however, the pond capacity still exceeds the estimated stormwater volume in the ponds after 30 years. Beyond 30 years, i.e. at the end of post-closure care period, use of the pond water may be re-evaluated in conjunction with the land use at the time.

3.0 CONTAMINATED SURFACE WATER OR GROUNDWATER

30 TAC §330.305(g)

The City shall handle, store, treat, and dispose of surface or groundwater that has become contaminated by contact with the working face of the landfill or with leachate in accordance with 30 TAC §330.207, Contaminated Water Management.

3.1 Contaminated Water Storage Area Design

30 TAC §330.305(g)

Run-on and runoff controls for active disposal areas will be utilized to minimize the potential for stormwater contamination. The working face of the active disposal area will be encompassed by a run-on berm (top berm) and a runoff berm (toe berm) for the purpose of segregating potentially contaminated and non-contact stormwater. Daily disposal operations will include an evaluation of the existing containment berm's capability to manage stormwater run-on and runoff.

3.1.1 Run-on Control System

30 TAC §330.305(b)

The City shall design, construct, and maintain a run-on control system capable of preventing flow onto the active portion of the landfill during the peak discharge from at least a 25-year rainfall event. The run-on berms are designed to accommodate the 25-year, 24-hour storm, the equivalent of an 8.5-inch rainfall event

To guard against soil loss, the phased development plan for landfill cell construction and solid waste placement will be followed. The figures in Part II, §3.0 Facility Layout Plan describe in detail the planned sequence of development, including sequencing of drainage and runoff controls, to ensure adequate slope stability and limited erosion and soil loss.

4.4 Erosion and Sediment Control for Intermediate Cover Areas

30 TAC §330.305(e)(2)

This sub-section describes the interim controls that may be used during phased landfill development to minimize erosion of top dome surfaces and external embankment sideslopes with intermediate cover or that have reached the permitted elevations. Based on velocity and soil erosion analyses, a selection of BMPs is identified and general installation guidance is provided. Examples of standard published specifications are also provided. Standard published specifications, which will be discussed in the following sections, are provided in Appendix III2D, Example BMP Specifications. In accordance with 30 TAC §330.165(c) and TCEQ guidelines, temporary erosion and sedimentation controls will be implemented on intermediate cover areas within 180 days after placing intermediate cover, including a vegetative cover of at least 60 percent. Depending on the weather conditions and the season of the year when the intermediate cover is placed, methods of temporary control, as discussed in the following sections, will be implemented to provide for erosion protection. Pursuant to TCEQ guidelines, all calculations in support of this erosion and sedimentation control plan are based on 60 percent cover.

4.4.1 Erosion and Sedimentation Control Design – Intermediate Cover Areas

Since the exact conditions of the various interim conditions are impossible to predict due to daily changes in fill patterns, a conservative approach is taken to determine the worst-case slope conditions. Therefore, the built-out condition of the final cover scenario is used as the worst-case slopes. are determined from this scenario. Even though interim conditions that are this extreme are unlikely, this is a conservative assumption so that any possible interim slope conditions or lengths are covered by this extreme case. In accordance with 30 TAC §330.305(d), the effective erosional stability of top dome surfaces and external embankment side slopes of landfill operation, closure, and post-closure care was analyzed based on the following criteria:

- The estimated peak velocity should be less than the permissible non-erodible velocities under similar conditions. The applicable non-erodible velocities are 3.75 feet per second for bare soil slopes and 5.0 feet per second for grassed (60 percent vegetation) slopes, considering the soil types, grass types, grass conditions, and slope angles at the facility (refer to Appendix III2C, Interim Erosion and Sediment Control Analysis).
- The potential soil erosion loss should not exceed the permissible soil loss for comparable soil-slope lengths and soil-cover conditions. The 2007 TCEQ guidance document has specified that the permissible soil loss is not to exceed 50 tons/acre/year and the recommended cover is 60 percent.

The top dome surface is sloped at 5 percent with a maximum length of approximately 114 feet. The external embankment sideslopes are 4H:1V slopes. Analysis indicates that the stormwater velocity on the top dome surfaces will not exceed the permissible non-erodible velocity in the worst-case conditions, and the length of the 4H:1V slope will be limited to 240 feet to satisfy the flow velocity criteria. The velocity analyses are included in Appendix III2C, Interim Erosion and Sediment Control Analysis and are summarized in Table III2-~~4~~5.

Table III2-~~4~~5: Summary of Interim Slope Velocities

Cover Slope	Slope Segment	Flow Velocity (fps)
5% slope	Segment 1 ~114 ft	0.85
4H:1V slope	Segment 1 0–240 ft	1.89

If an intermediate slope in excess of 240 feet is constructed, then a portion of the slope must be converted to final cover with permanent erosion controls, or temporary soil berms can be installed at 60-foot vertical intervals (i.e. 240 feet along the slope) along the intermediate cover slopes.

The potential soil erosion loss was calculated using the Natural Resources Conservation Service of the United States Department of Agriculture (USDA) Revised Universal Soil Loss Equation (RUSLE). A permissible soil loss of 50 tons/acre/year and a cover of 60 percent are selected as the design criteria for interim erosion and sediment controls. Results of the soil erosion analyses demonstrate that both the top surfaces and the external embankment sideslopes can achieve effective erosional stability without any stormwater diversion structures provided that the soil surfaces are stabilized with at least 60 percent ground cover. Furthermore, since the flow velocities are the governing parameter for the maximum length of the 4H:1V slopes between the soil berms, the actual amount of soil loss will be reduced. Limiting the uninterrupted length of 4H:1V slopes to a maximum of 240 feet will reduce the maximum soil loss on the intermediate slopes to approximately 18.7 tons/acre/year.

The analyses for interim erosion and sediment controls are included in Appendix III2C-1, ~~Interim~~Intermediate Cover Soil Erosion Loss ~~and Sediment Control~~ Analysis.

4.4.2 Erosion and Sedimentation Control BMPs – Intermediate Cover Areas

There are numerous BMPs that can be implemented during landfill operations to meet the soil stabilization and stormwater diversion requirements. These BMPs can be used prior to establishing vegetation or in conjunction with vegetation. The selected BMPs for this site are commonly used and are discussed below. The common BMPs discussed below include a specification and/or detail for reference. The controls discussed below are available from several manufacturers. The site manager has the flexibility to purchase

Temporary downchutes will be required when soil diversion berms are installed. Based on the calculations included in Appendix III2C-2, Intermediate Cover Soil Berm Calculation the maximum allowable drainage area for the soil diversion berms yields a maximum berm length of 835 feet (corresponding to the maximum drainage area of 4.6 acres). The temporary downchute will be installed at the termination of the temporary soil diversion berm as necessary to collect runoff from the intermediate slope surface. The recommended minimum temporary downchute channels are 2-feet deep, with 2H:1V sideslopes. The downchute width will be determined based on the contributing drainage area as demonstrated in Appendix III2C-3, Intermediate Cover Downchute Channel Calculation. A geosynthetic lining material (e.g., geomembrane sheet) will be used to line the temporary downchute channels. ~~Other lining materials, such as riprap, gabion baskets, or interlocking concrete blocks, may also be used at the site manager's discretion if adequate hydraulic capacities are provided.~~ The hydraulic design of the temporary downchutes is included in Appendix III2C-3, Intermediate Cover Downchute Channel Calculation. A detail of the temporary downchute channels is shown on Figure III2-15, Erosion and Sedimentation Control Details - II. In lieu of downchute channels, corrugated plastic downchute pipes or metal pipes with equivalent flow capacity may be used. If pipes are used as downchutes, the demonstration of equivalency of downchute pipes will be maintained within the facility's site operating record, furnished upon request to the TCEQ, and made available for inspection by TCEQ personnel, as necessary.

For on-site stockpiles, the BMPs discussed previously, such as silt fence, hay bales, or rock or organic berms, may be used at the site manager's discretion to control erosion and runoff around the stockpile areas. Details of these BMPs are shown on Figures III2-14 and III2-15.

4.4.3 Placing and Removing Temporary BMPs

The BMPs discussed in the previous sections will be placed in accordance with the specifications as included in Appendix III2D, Example BMP Specifications or in accordance with the manufacturers' guidelines for that particular material. Since these BMPs are only temporary, they will be removed at the site manager's discretion when the specific situation warrants that the control is no longer needed or if a different control is implemented. Examples of when a control will be removed or replaced are as follows:

- 60 percent cover has been established.
- The BMP has been destroyed or damaged beyond repair.
- The BMP is not functioning efficiently.
- The intermediate cover area will become part of the active disposal area again.
- The intermediate cover area will receive final cover and permanent erosion controls.
- The BMP becomes a hindrance to daily site operations.

At other times, if deemed necessary by the site manager, the control may be removed to aid in the daily ongoing waste fill and construction activities that may not specifically be itemized in the above list. The placement and removal of temporary BMPs should not hinder the site operations, but should be considered by the site manager as an effective tool to minimize future maintenance or repairs.

BMPs will be removed or replaced as part of the site's daily operations. Removed BMPs that have been destroyed or damaged will be disposed of at the working face of the facility. The site manager will determine a location to store reusable BMPs so they are easily accessible for future construction.

4.5 Erosion and Sedimentation Control for Final Cover Areas

30 TAC §330.305(e)

4.5.1 Erosion and Sedimentation Control Design – Final Cover Areas

The final cover stormwater system design includes crownslope add-on berms along the 5 percent final cover top slopes and sideslope add-on berms spaced at 40-foot vertical intervals along the 4H:1V final cover slopes, or a maximum length of uninterrupted flow of 160 feet. The selection of stormwater management control structures will be a continual evolution of temporary and permanent control devices. The facility fill sequence plans included in Figures II-20, Operational Sequence Phases I – V will be used to properly select both temporary and permanent stormwater structural controls. The stormwater management structural controls were developed to provide low runoff velocities, to provide adequate storage and detention, and to limit sediment and soil loss impacts on stormwater discharge quality. Soil erosion loss and control was estimated using the Universal Soil Loss Equation in the USDA Handbook No. 703 – "Predicting Soil Erosion By Water: A Guide to Conservation Planning with the Revised Universal Soil Loss Equation (RUSLE)," 1997.

The design results in a maximum estimated soil loss of 2.1 tons/acre/year for the 4H:1V sideslopes of the landfill final cover. This estimate is equal to approximately 0.01 inches per year eroded from the final cover for this worst-case scenario. Soil loss calculations are presented in Appendix III2E, Final Cover Erosion Soil Loss Calculation.

4.5.2 Erosion and Sedimentation Control BMPs – Final Cover Areas

Permanent stormwater management controls include seeding, add-on berms, downchute channels, slope contours, perimeter berms, final cap design, detention ponds, and discharge control structures.

To stabilize the final cover soil, a 6-inch thick top soil layer that is capable of supporting native vegetation growth will be installed on the final cover surfaces. Maintenance and inspection, as addressed in §5.0 Inspection, Maintenance, and Restoration Plan of this report, will be implemented to ensure a minimum 90 percent ground cover on the final cover and to ensure that the diversion structures, including the detention ponds, function as designed.

4.6 Minimizing Off-site Vehicular Tracking of Sediments

To minimize the off-site vehicular tracking of sediments onto public roadways, traffic routing and site operation practices will be developed. The following preventative measures will be utilized to control sediment tracking:

- Maintain the site entrance to minimize the accumulation of excessive mud, dirt, dust, and rocks.
- Schedule maintenance and construction of paved and temporary roads to limit disruption of traffic flow patterns or create vehicular safety problems.
- Control traffic routing during wet weather conditions to limit the impact of sediment tracking.

5.0 INSPECTION, MAINTENANCE, AND RESTORATION PLAN

30 TAC §330.305(e)(1)

In addition to the design and operational considerations previously described in the §4.0 Erosion and Sedimentation Control Plan of this report, it is necessary to inspect and maintain the stormwater management system and erosion control measures to maintain the required effectiveness of the system components. The City will maintain the stormwater management system as designed and will restore and repair the drainage system in the event of washout or failure in accordance to Part IV, Site Operating Plan §4.22.6 Erosion of Cover. The inspection, maintenance, and repair guidelines as discussed in the following sections will be implemented into the employee training program as outlined in Part IV, Site Operating Plan §4.1 Personnel Training. Documentation of the inspections and repairs, as outlined below, will be denoted in the Cover Application Log and will be maintained as part of the site operating record, in accordance with the Part IV, Site Operating Plan §4.22.7 Cover Inspection Record.

5.1 Stormwater Management System

The site will be monitored to ensure the integrity and adequate operation of the stormwater collection, drainage, and storage facilities. On a weekly basis, all temporary and permanent drainage facilities will be inspected. Following a significant rainfall event (greater than 0.5 inches within 24 hours), all temporary and permanent drainage facilities will be inspected within 48 hours after the rain event, as ground conditions allow. In the event of a washout or failure, the drainage system will be restored and repaired. Plans and actions will be developed to address and remediate the problem to ensure protection to ground and surface waters. Sediment and debris will be removed from channels, ponds, and from around outfall structures, as needed, to maintain the effectiveness of the stormwater management system. Minor maintenance requirements, such as removing excessive sediment and vegetation, will be undertaken as required. Upon completion of sediment removal from lined stormwater ponds, the ponds' HDPE liner will be inspected for damage and, if necessary, repaired in accordance with Part III3F, Liner Quality Control Plan.

5.2 Landfill Cover Materials

Landfill cover soils are inspected on a regular basis. Daily cover soils are inspected and applied in accordance with the Part IV, Site Operating Plan §4.22.1 Daily Cover. During the active life of the site, inspections of intermediate and final cover also will be performed within 48 hours after a significant rain event (greater than 0.5 inches within 24 hours) in which runoff occurs, as ground conditions allow. During the post-closure maintenance period of the site, the final cover will be inspected quarterly. The inspections will include any temporary or permanent erosion measures that are in place at the time of the inspection. Reports of these inspections will be documented in the Cover Application Log and will be maintained as part of the site operating record, in accordance with Part IV, Site Operating Plan §4.22.7 Cover Inspection Record.

Erosion gullies or washed-out areas deep enough to jeopardize the intermediate or final cover must be repaired within 5 days of detection. An eroded area is considered to be deep enough to jeopardize the intermediate or final cover if it exceeds 4 inches in depth, as measured from the vertical plane from the erosion feature and the 90-degree intersection of this plane with the horizontal slope face or surface. Damage to any temporary or permanent erosion measures noted during the inspections will be repaired or replaced within 14 days of detection. The repair schedule, as outlined for the cover or the erosion measures, may be extended due to inclement weather conditions or the severity of the condition requiring an extended repair schedule. The TCEQ's regional office in Harlingen will be notified to coordinate a revised schedule in case an extended repair schedule is required.

6.0 FLOODPLAIN EVALUATION

Consistent with 30 TAC §§330.61(m)(1), 330.63(c)(2), 330.307, and 330.547, an evaluation of the 100-year floodplain has been prepared and discussed in Part II §2.8, Floodplains and ~~. Floodplain evaluation figures detailing facility design plan and profiles are included in~~ Part IIC, Floodplains.

6.1 100-year Floodplain Location

30 TAC §330.63(c)(2)(A)

As discussed in Part II §2.8.1, Location ~~T~~the permit boundary for the facility extends into two small unnamed ponding areas designated Special Flood Hazard Area (SFHA) Flood Zone A as shown in Figure IIC-3, FEMA Q3 Flood Data~~Part IIC, Floodplains~~. Note that these two SFHA areas are both localized small depressions and are not connected with any floodways. Future construction of the facility perimeter berm fill in the areas are required prior to any waste acceptance in the associated areas. As a result, the waste footprint will be outside the 100-year floodplain.

6.2 Data Source for Floodplain Determination

30 TAC §330.63(c)(2)(B)

As discussed in Part II §2.8.2, Data Source, the facility's property boundary is located on the Flood Insurance Rate Map (FIRM) panel number 480334 0325D dated June 6, 2000, which was revised by LOMR 01-06-1095P dated May 17, 2001. The SFHA changes made by subsequent Letter of Map Changes (LMOCs) have not yet been incorporated into FEMA's National Flood Insurance Program (NFIP) National Flood Hazard Layer (NFHL) digital database and does not yet contain high resolution flood hazard mapping data for Hidalgo County. The most current SFHA delineations available for the project area are FEMA Quality Level 3 (Q3) Flood Data files as verified by FEMA. ~~The facility property is located in Hidalgo County, National Flood Insurance Program (NFIP) community number 480338. The facility's property boundary is located on the Flood Insurance Rate Map (FIRM) panel number 480334 0325D, which was most recently revised by the Letter of Map Revision Based on Fill (LOMR-F) case number 03-06-153P in 2003. The SFHA changes made by LOMR-F 03-06-153P have not yet been incorporated into a FIRM revision and FEMA's National Flood Insurance Program (NFIP) National Flood Hazard Layer (NFHL) digital database does not yet contain high resolution flood hazard mapping data for Hidalgo County. The most current SFHA delineations available are FEMA Quality Level 3 (Q3) Flood Data files. The source information section of the Q3 Flood Data metadata file lists a modification in 2005 confirming the Q3 incorporates the 2003 LOMR-F 03-06-153P map changes in the SFHA delineations. Part IIC1, FEMA CLOMR-F Request presents the current Q3 Flood Data Zone A delineations (provided by Texas Natural Resources Information System Data Support Team in January 2016) overlaying the unrevised effective FIRM panel, annotated to show where the property is located.~~

6.3 Flood Protection of the Facility

30 TAC §330.63(c)(2)(C)

As demonstrated in Part IIC2-1, FEMA CLOMR-F Request, c~~C~~onstruction of the facility ~~'s landfill~~ perimeter berm and storm water management structures—placement of fill in the SFHA Zone A areas—will not restrict the flow of the 100-year flood, reduce the temporary water storage capacity of the floodplain, or result in washout of solid waste so as to pose a hazard to human health and the environment. The facility perimeter berm encompassing the entire waste footprint will provide a minimum of three feet of freeboard above the 100-year design flood.

6.4 ~~Preliminary Plan~~Construction Approval

A request for Conditional Letter of Map Revision Based on the Placement of Fill (CLOMR-F) was submitted to FEMA included in Part IIC2-2~~1~~, FEMA CLOMR-F Request. The submittal included a detailed discussion of proposed fill in the two SHFA Zone A areas, figures detailing facility design plan and profiles, and required documentation. FEMA responded that the proposed development does not encroach on a FEMA designated floodway and no buildings are anticipated to be constructed on the site~~. In addition, FEMA noted that~~ , there are no procedures under the NFIP regulations that require action by FEMA. Hidalgo County, or other agencies having jurisdiction of the site, may have requirements that apply.

The City of Edinburg has jurisdiction over the facility and adjacent properties. The Director of Public Works reviewed and approved the request for CLOMR-F and signed the Community Acknowledgement Form included in Appendix IIC2-3, Community Floodplain Management Review and Approval.

7.0 ALTERNATIVE SYNTHETIC GRASS FINAL COVER DRAINAGE DESIGN

The alternative synthetic grass final cover presented in Part III7, Closure Plan will consist of the following from top to bottom:

- HDPE synthetic grass
- Sand infill
- Woven geotextile filter backing
- 50-mil linear low density polyethylene (LLDPE) Super Gripnet® geomembrane with integrated drainage layer

A major consideration of the synthetic grass cover on the drainage system is that the surface runoff coefficient (CN) number is higher; a CN number of 98 for the entire final cover area was used for the analysis. Appendix III2F, Synthetic Grass Cover Drainage Calculation shows that the perimeter channels and the stormwater ponds have adequate capacity using analysis methods consistent with those discussed in Appendix III2A, Detailed Drainage Calculation.

APPENDIX III-2A

DETAILED DRAINAGE CALCULATION

DETAIL DRAINAGE CALCULATION

Made By: VJE
Checked by: MX
Reviewed by: CGD

1.0 OBJECTIVE

Develop a surface water management plan for the proposed development at the Edinburg Regional Disposal Facility (RDF) located in Hidalgo County, Texas. Compare pre- and post-development peak flows, volumes, and velocities for the 25-year, 24-hour storm event.

2.0 METHOD

The proposed Edinburg Regional Disposal Faciltiy expansion site is greater than 200 acres. Therefore, Golder utilizes the USACE HEC-HMS modeling software for the drainage analysis. Subbasins were delineated for pre- and post-development conditions using existing topography and proposed final cover topography respectively (see Figures III2A-1 and III2A-2). The pre-development conditions consist of the permittted final grades and drainage design in the currently permitted area and existing topography in the expansion area. The post-development conditions consist of the proposed final grades and drainage design.

Composite SCS curve numbers (CN) were estimated for each subbasin (USSCS, 1986). The SCS method was used to estimate a time of concentration (Tc) for each subbasin; lag times (required for HEC-HMS input) were calculated as 0.6 * Tc. Subbasin areas, curve numbers, and lag times were entered into HEC-HMS to estimate peak flows and runoff volumes.

Peak flows from the HEC-HMS hydrology model were used to design stormwater channels required for the surface water management plan (downchutes, perimeter channels, add-on berms, and perimeter drainage ditches). Channel calculations were performed using a spreadsheet that solves Manning's equation for normal depth. Culvert sizing calculations were carried out using HY8 software (FHWA, 1996).

Stage-storage relationships for all ponds were developed using site contours and spreadsheet calculations.

3.0 ASSUMPTIONS

- 24-hour rainfall depths (TR-55, 1986):
    - 2-year = 4.3 in (used in time of concentration calculations)
    - 25-year = 8.5 in
    - 100-year = 11.0 in (used in time of concentration calculations)
- 24-hour rainfall events have an SCS Type III synthetic temporal distribution (TR-55, 1986).
- Curve numbers (consistent with previous work and local regulations/practice):
    - Landfill final cover and other open areas, CN = 85
    - Paved areas, CN = 98
    - Areas where minimum infiltration are expected (ponds), CN = 98
    - Expansion area currently grassed or used for agricultural purposes, CN = 79
- Manning's roughness coefficients:
    - Grass-lined channels, n = 0.035
    - Riprap channels, n=0.040
- Landfill downchutes are armored with flexible Geomembrane.
    - Geomembrane lined channels, n = 0.012
- Landfill downchutes are sized to convey runoff from the 25-year, 24-hour storm event and allowing 0.5 feet of freeboard.
- Add-on berms have 2H:1V and 2H:1V side slopes and form triangular channels at 2 percent longitudinal slopes on the final cover slope.
- Add-on berms are sized to convey runoff from the 25-year, 24-hour storm event and provide a minimum of 0.5 feet of freeboard.
- Perimeter channels are trapezoidal with 3H:1V side slopes and varying bottom widths and longitudal slopes. Minimum longitudal slope is 0.1%.
- Perimeter channels are sized to convey runoff from the 25-year, 24-hour storm event and provide a minimum of 1.0 feet of freeboard.
- Perimeter channels are armored with riprap where flow velocities exceed 5 ft/s, as applicable.

4.0 CALCULATIONS

Tables 1A.1, 1A.2, 1B.1, and 1B.2 contain composite curve number and time of concentration calculations for the pre- and post-development conditions. The stage-storage relationships were developed in the spreadsheets shown in Tables 2A through 2D (proposed pond E1, E2, E3, E4, W1, W2, W3, W4, W5, W6, and W7). Table 3 contains calculations for the design of downchutes, add-on berm channels, and perimeter channels. Table 4 contains calculations of the run-off velocities at the control points for pre-development and post-development conditions. Table 5 includes time of concentration and manning's flow coefficients.

Attachment A contains HEC-HMS model input and output information including basin parameters, a routing diagram, and peak flows. HY8 reports summarizing the culvert sizing calculations are included as Attachment B. See Figures III2-A-1 and III2-A-2 for subbasin delineations and channel alignments.

5.0 CONCLUSIONS/RESULTS

The post-development downchutes, add-on berms and perimeter channels are designed to accommodate runoff from the 25-year, 24-hour storm event with 0.5' freeboard (design shown in Table 3). Riprap sizing and gradations are found in Appendix III2-A-3.

The post-development ponds (design shown in Tables 2A through 2D) are sufficiently sized to store the runoff from the 25-year, 24-hour storm event. The maximum water surface elevations in the ponds during the 25-year, 24-hour storm event are summarized below. The water surface elevation is below the pond crest in all ponds.

POND	**Runoff Volume (ac-ft)**	**Maximum Pond Water El. (ft-msl)**	**Minimum Elev.of the Pond Levee (ft-msl)**
	25-year 24-hour storm	25-year 24-hour storm	
W1	31.8	85.1	91.0
W2	34.6	85.1	91.0
W3	6.9	85.1	91.0
W4	7.1	84.3	91.0
W5	7.2	84.3	91.0
W6	70.8	84.3	91.0
W7	7.9	78.5	91.0
E1	80.2	77.4	94.0
E2	86.1	77.4	94.0
E3	11.5	77.4	94.0
E4	8.7	77.4	94.0

The culvert design for the post-development conditon is summarized in the table below:

Culvert ID	25-year, 24-hour Design Storm	
	Flow Rate (cfs)	**Culvert Design (number of barrels)**
C1	209.0	3 - 6' x 3' conc. box
C2	238.8	6 - 4' x 2' conc. box
C3	555.5	6 - 6' x 3' conc. box

Note: See Figure III2-A-2 for locations of the proposed culvert. Alternative designs may be utilized if they provide adequate flow capacity.

The flow rates and volumes at the control points for both the pre-development and post-development conditions are summarized below.

Run-off Control Point	Flow Rates Pre-Development 25-year, 24-hour (cfs)	Flow Rates Post-Development 25-year, 24-hour (cfs)	Volumes Pre-Development 25-year, 24-hour (cfs)	Volumes Post-Development 25-year, 24-hour (cfs)
CP1	47.5	0	9.8	0
CP2	548.8	0	115.2	164.9 (west ponds)
CP3	32.5	0	4.1	0
CP4	21.0	0	2.9	0
CP5	226.4	0	29.8	0
CP6	250.6	0	42.1	0.0
CP7	51.1	19.5	9.8	3.9
CP8	55.6	0	9.6	187.7 (east ponds)
CP9	19.6	0	4.1	0
CP10	117.6	0	19.9	0
CP11	324.0	0	41.0	0
CP12	89.3	0	10.2	0
CP13	117.9	0	17.4	0

6.0 REFERENCE

1. Texas State Department of Highways and Public Transportation. December 1985. *Bridge Division* Hydraulic Manual, 3rd Edition.
2. TR-55. June 1986. Urban Hydrology for Small Watersheds. Washington D.C.: Department of Agriculture for Natural Resources Conservation Service, Conservation Engineering Division.
3. U.S. Federal Highway Administration (FHWA). 1996. *HY8 - Culverts Version 7.3 FHWA Culvert Analysis*. Washington, D.C.: FHA Office of Technology Applications [software package].
4. U. S. Soil Conservation Service (USSCS). 1986. *Urban hydrology for small watersheds, 2nd edition*. (USSCS Technical Release Number 55). Washington D.C.: United States Department of Agriculture.
5. US Army Corps of Engineers. 2003. *HEC-HMS Hydrologic Modeling System* [computer software] May 2003 Version 4.0.
6. US Army Corps of Engineers *EM 1110-2-1601 Hydraulic Design of Flood Control Channels*. July 1991.

APPENDIX III-2A

TABLES

Date:	7/6/17
By:	VJE
Chkd:	MX
Apprvd:	CGD

Revised 11/2/2017

TABLE 2D: POND E1, E2, E3, & E4 STAGE-STORAGE VOLUME (25-YEAR STORM)

In order to calculate the total storage of the hydrologic reservoir routing, it is necessary to construct a storage-indication curve.
Construct an Elevation-Storage (E-S) curve using the working design drawing and the following formula:

$$S = \Delta h \frac{A_1 + A_2 + (A_1 A_2)^{0.5}}{3}$$

where:
S = pond volume (ft^3)
Δh = height of volume element (ft)
A_1 = surface area of bottom of volume element (ft^2)
A_2 = surface area of top of volume element (ft^2)

Pond E1

Elevation (ft MSL)	Area (ft^2)	Area (acres)	Inc. Volume (ft^3)	Inc. Volume (acre-ft)	Σ Volume (ft^3)	Σ Volume (acre-ft)
67.5	0	0.00	0	0	0	0
68.0	8,659	0.20	1,443	0.03	1,443	0.03
70.0	78,903	1.81	75,801	1.74	77,244	1.77
72.0	98,120	2.25	176,675	4.06	253,918	5.83
74.0	156,310	3.59	252,182	5.79	506,101	11.62
76.0	223,473	5.13	377,788	8.67	883,889	20.29
78.0	299,609	6.88	521,225	11.97	1,405,114	32.26
80.0	314,258	7.21	613,809	14.09	2,018,923	46.35
82.0	329,183	7.56	643,383	14.77	2,662,306	61.12
84.0	344,382	7.91	673,507	15.46	3,335,813	76.58
86.0	359,856	8.26	704,181	16.17	4,039,994	92.75
88.0	375,574	8.62	735,374	16.88	4,775,368	109.63
90.0	391,576	8.99	767,095	17.61	5,542,463	127.24
92.0	407,871	9.36	799,392	18.35	6,341,856	145.59
94.0	424,438	9.74	832,254	19.11	7,174,110	164.69

Pond E2

Elevation (ft MSL)	Area (ft^2)	Area (acres)	Inc. Volume (ft^3)	Inc. Volume (acre-ft)	Σ Volume (ft^3)	Σ Volume (acre-ft)
75.8	0	0.00	0	0	0	0
76.0	17,140	0.39	1,074	0.02	1,074	0.02
78.0	314,858	7.23	270,306	6.21	271,381	6.23
80.0	329,877	7.57	644,678	14.80	916,058	21.03
82.0	345,155	7.92	674,975	15.50	1,591,033	36.52
84.0	360,391	8.27	705,491	16.20	2,296,525	52.72
86.0	376,486	8.64	736,818	16.91	3,033,343	69.64
88.0	392,591	9.01	769,021	17.65	3,802,364	87.29
90.0	408,909	9.39	801,445	18.40	4,603,809	105.69
92.0	425,505	9.77	834,359	19.15	5,438,167	124.84
94.0	442,359	10.16	867,809	19.92	6,305,976	144.76

Combined Stage Storage Volumes for Ponds E1, E2, & E4 (Interconnected by Equalizing Pipes)

Elevation (ft MSL)	Σ Volume (acre-ft)
62.8	0
68.0	22.94
70.0	46.32
72.0	74.46
74.0	110.61
76.0	157.21
78.0	217.27
80.0	289.55
82.0	364.71
84.0	442.81
86.0	523.90
88.0	608.04
90.0	695.27
92.0	785.63
94.0	848.82

Volume required per HEC-HMS model:

Pond Name	Volume (acre-ft)
E1	80.2
E2	86.1
E4	8.7
E3	11.5
Σ Volume	186.5

Pond E3

Elevation (ft MSL)	Area (ft^2)	Area (acres)	Inc. Volume (ft^3)	Inc. Volume (acre-ft)	Σ Volume (ft^3)	Σ Volume (acre-ft)
62.8	0	0.00	0	0	0	0
64.0	36,899	0.85	14,760	0.34	14,760	0.34
66.0	263,730	6.05	266,184	6.11	280,944	6.45
68.0	462,503	10.62	716,990	16.46	997,934	22.91
70.0	478,420	10.98	940,878	21.60	1,938,812	44.51
72.0	494,599	11.35	972,974	22.34	2,911,786	66.85
74.0	511,041	11.73	1,005,595	23.09	3,917,381	89.93
76.0	527,745	12.12	1,038,741	23.85	4,956,122	113.78
78.0	544,712	12.50	1,072,413	24.62	6,028,535	138.40
80.0	561,942	12.90	1,106,610	25.40	7,135,145	163.80
82.0	579,435	13.30	1,141,332	26.20	8,276,477	190.00
84.0	597,190	13.71	1,176,580	27.01	9,453,057	217.01
86.0	615,208	14.12	1,212,353	27.83	10,665,410	244.84
88.0	633,488	14.54	1,248,651	28.66	11,914,061	273.51
90.0	652,031	14.97	1,285,475	29.51	13,199,535	303.02
92.0	670,837	15.40	1,322,823	30.37	14,522,359	333.39
94.0	689,909	15.84	1,360,702	31.24	14,560,237	334.26

Pond E4

Elevation (ft MSL)	Area (ft^2)	Area (acres)	Inc. Volume (ft^3)	Inc. Volume (acre-ft)	Σ Volume (ft^3)	Σ Volume (acre-ft)
69.3	0	0.00	0	0	0	0
70.0	6,724	0.15	1,461	0.03	1,461	0.03
72.0	84,064	1.93	76,374	1.75	77,836	1.79
74.0	247,310	5.68	317,040	7.28	394,876	9.07
76.0	368,657	8.46	611,943	14.05	1,006,819	23.11
78.0	383,892	8.81	752,498	17.27	1,759,318	40.39
80.0	399,413	9.17	783,254	17.98	2,542,572	58.37
82.0	415,220	9.53	814,582	18.70	3,357,154	77.07
84.0	431,313	9.90	846,482	19.43	4,203,636	96.50
86.0	447,691	10.28	878,953	20.18	5,082,589	116.68
88.0	464,356	10.66	911,996	20.94	5,994,585	137.62
90.0	481,306	11.05	945,611	21.71	6,940,196	159.32
92.0	498,542	11.44	979,798	22.49	7,919,994	181.82
94.0	516,080	11.85	1,014,572	23.29	8,934,567	205.11

Next, the water surface elevation of the peak volume for the 25 year - 24 hour storm event. The peak volume is calculated using the HEC-HMS program. The water surface elevation is calculated by interpolation based on the stage storage table.

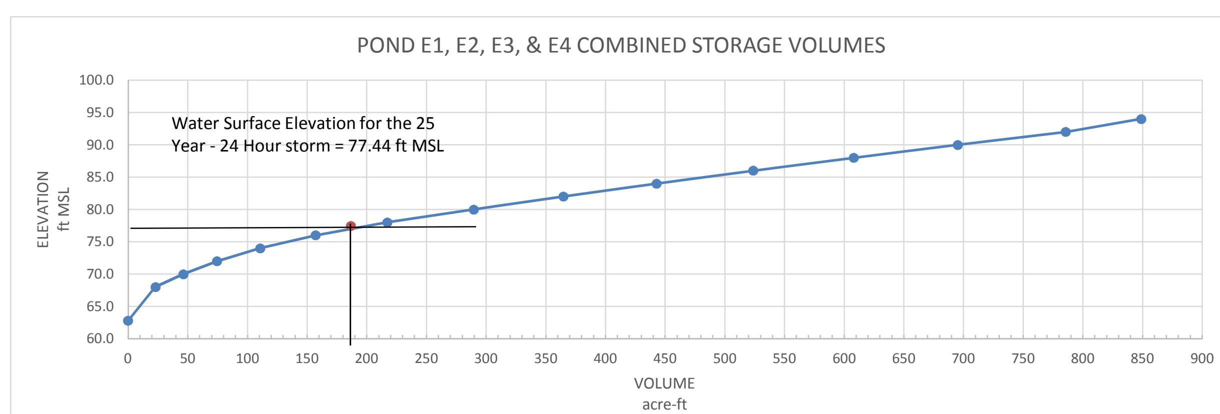
$$y_2 = \frac{(x_2 - x_1)(y_3 - y_1)}{(x_3 - x_1)} + y_1$$

y = elevations (ft MSL)
x = volume (ac-ft)

25 year - 24 hour storm event
Peak Volume = 186.50 ac-ft
Water Surface Elevation = **77.44** ft MSL

References:

1. US Army Corps of Engineers. 2003. *HEC-HMS Hydrologic Modeling System* [computer software] May 2003 Version 4.0.



APPENDIX III-2A

FIGURES

APPENDIX III-2B

ACTIVE FACE BERM SIZING

ACTIVE FACE BERM SIZING

Made By: VJE
Checked by: MX
Reviewed by: CGD

1.0 OBJECTIVE

Calculate the required size of the stormwater containment berm at the landfill active face as a function of plane area of the active area.

2.0 GIVEN

- Waste slope of 4H:IV
- 25 years, 24 hour storm event of 8.5 inches;
- Berm slope of 2H:1V;
- 1.0 ft. freeboard on berm

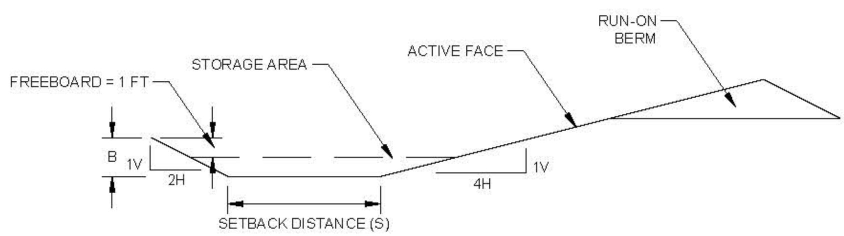
3.0 ASSUMPTIONS

- Stormwater run-on to the active face will not be allowed
- 50 percent run-off from the active face, i.e., 50% infiltration

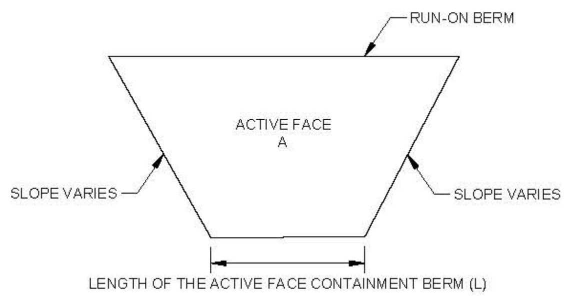
4.0 CALCULATION

Derive relationships for the amount of runoff from the 8.5 inch design storm and the available storage volume as a function of the active face area.

Cross-section of the Active Face and Containment Berm



Elevation View of the Active Face and Containment Berm



4.1 Runoff, R

$$R = .5\left(8.5 \div 12\,{}^{in}/_{ft}\right) \times A = \frac{.71}{2} \times A = .35 \times A$$

Where:

R = total runoff into the active area containment berm (cf)

A = total area of the active face (sf)

4.2 Storage, V

$$V = L \times \left(\frac{S + (S + (B-1) \times 2 \times (B-1) \times 4)}{2}\right) \times (B-1)$$

$$V = (3B^2 + (S-6) \times B - S + 3) \times L$$

Where:

V = storage capacity an active face containment berm (cf)

L = length of the active face containment berm (ft)

4.3 Height of Berm, B

Now set runoff, R, equal to storage, V, and solve for the height of berm, B.

$$B = \frac{6 - S + \sqrt{S^2 + 4.2\frac{A}{L}}}{6}$$

For typical site operations, the maximum berm height will be 6 ft. The operator can vary the berm length and setback distance to limit the berm height to 6 ft.

Now plot B versus L for various values of S and A. Figures 1 through 8 present the plots for active working areas of 10,000, 20,000, 30,000, 40,000, 50,000, 60,000, 70,000, and 80,000 sf, respectively.

4.4 Procedure To Select Berm Size

Procedure to select berm size using Figures 1 trough 8:

1) Determine the active face area (A);

2) Select a figure from Figures 1-8 that has an active area closest to, but no less than the actual A. For example, if A=25,000, choose Figure 3 (A=30,000);

3) Determine the minimum setback distance (S) for the daily operation, and select the corresponding curve. If the setback distance falls between the numbers shown on the figure, the closest but smaller value of S will be used. For example, if S=25 ft, choose the curve representing 20 ft; and

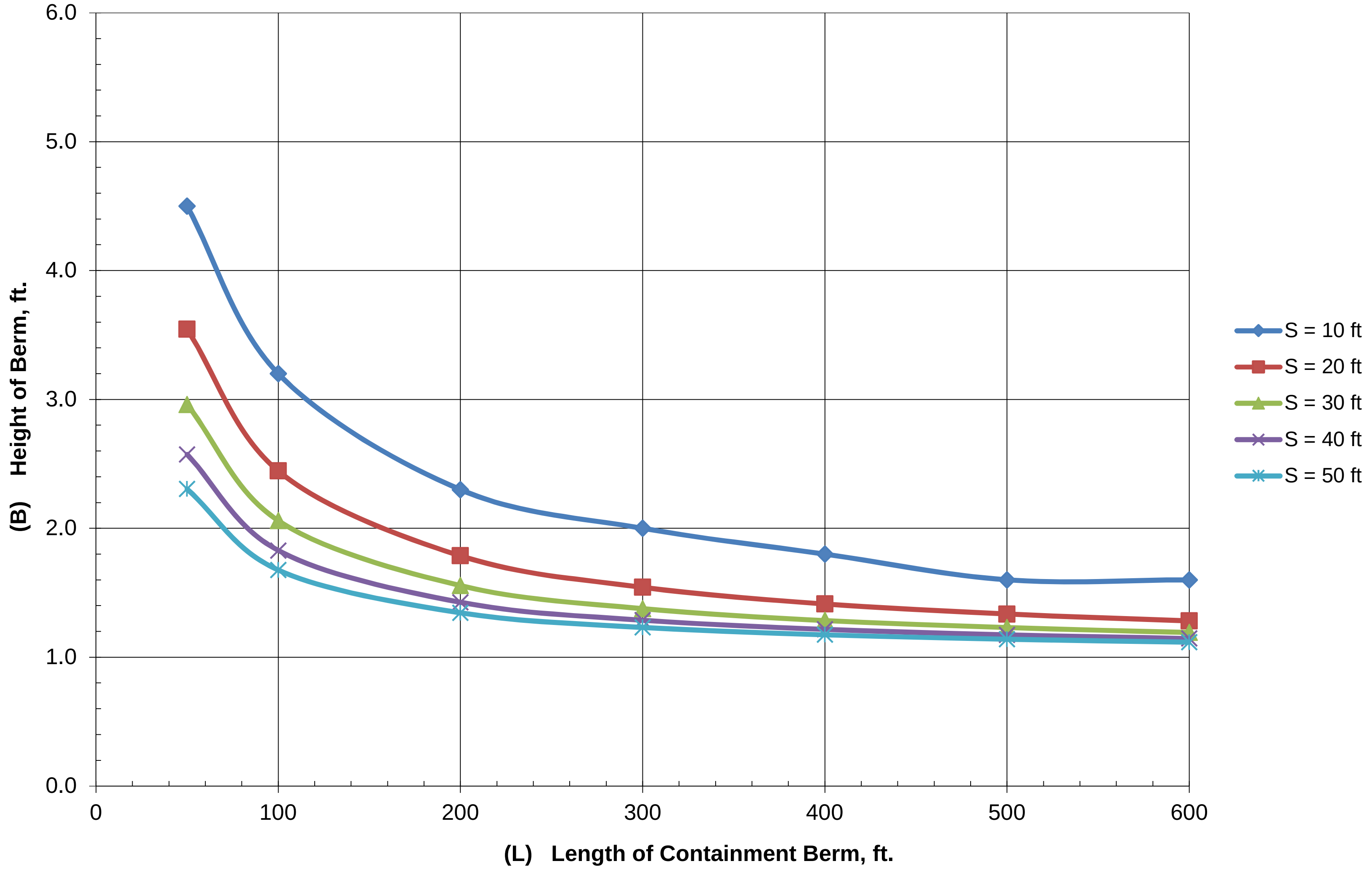
4) Measure the length of the active face containment berm, and determine the required berm height from the selected curve. Figures 1 through 8 cover a wide range of berm length (i.e. toe width of the active face) for normal waste fill operations. If the actual berm length is longer than the maximum value on the curve, the maximum berm length can be used to determine a conservative berm height. If the actual berm length is shorter than the minimum value on the curve, the operator can use equation (1) above to determine berm height.

Example using attached figures: A = 10,000 sf, s = 20 ft, L = 200 ft => B = 1.8 ft (from Figure 1, curve S = 20 ft).

5.0 CONCLUSION

Figures 1 through 8 and the procedure discussed above provide guidance for determining the size of the stormwater containment berm based on the height of the active face (runoff area), the length of the containment berm, and the setback distance from the active face. The equations presented in this calculation may be used to determine the required berm height for various active face areas, berm lengths, and setback distances.

Figure 1. Berm Height vs. Berm Length for Various Setbacks
A = 10,000 sf



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Submitted: July 2017
Revised: November 2017

Figure 2. Berm Height vs. Berm Length for Various Setbacks

A = 20,000 sf

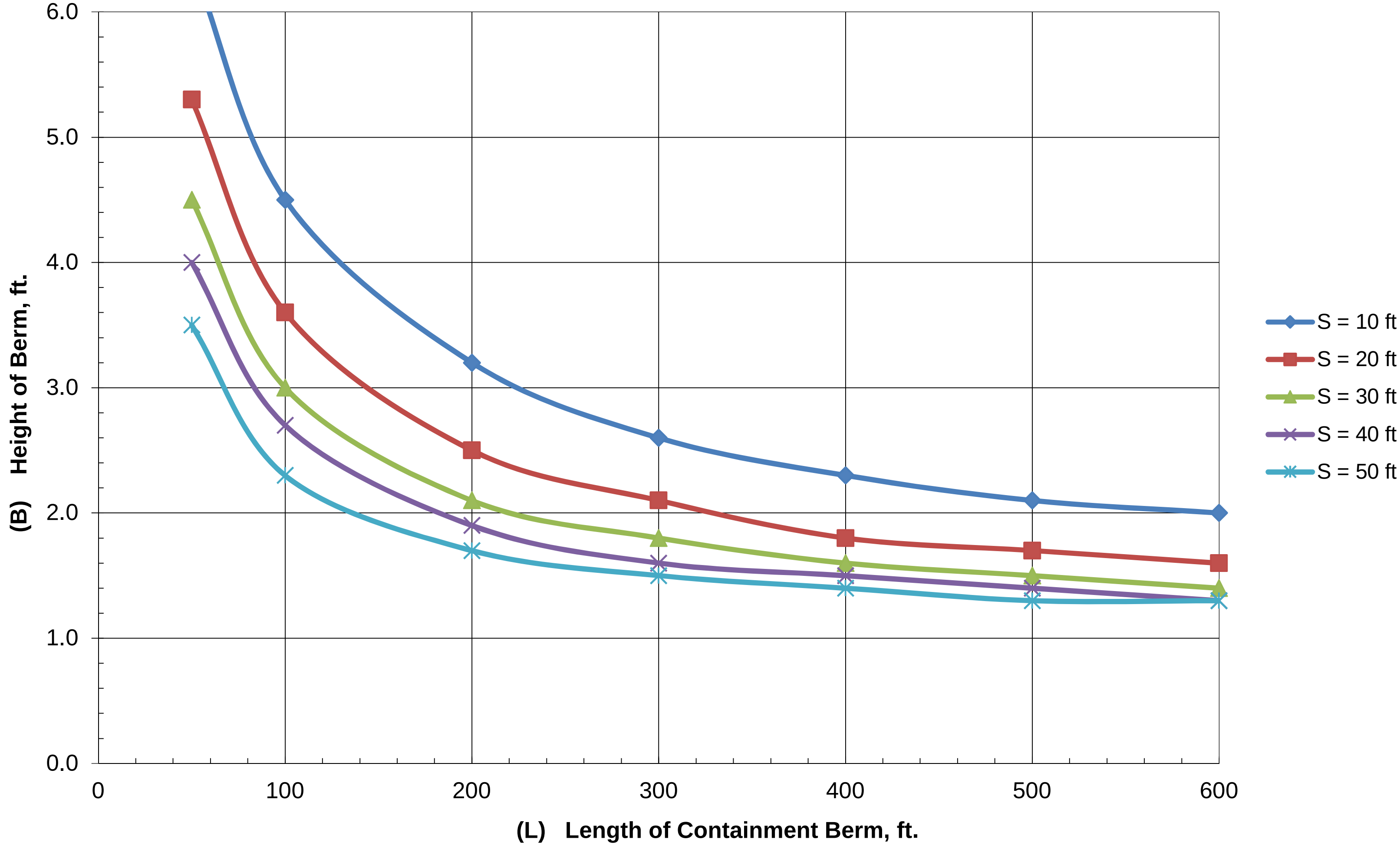

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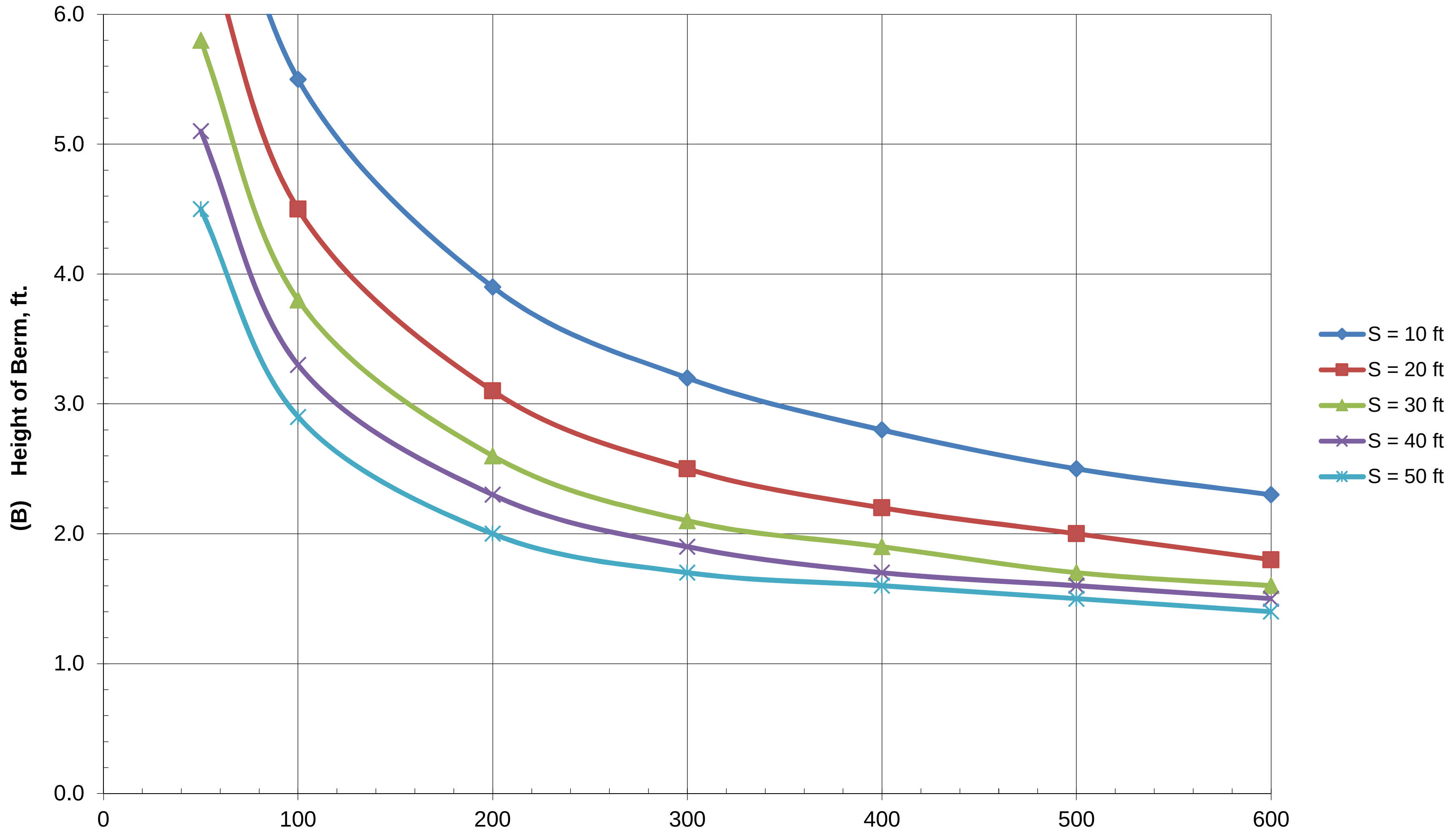
Figure 3. Berm Height vs. Berm Length for Various Setbacks

A = 30,000 sf



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Submitted: July 2017

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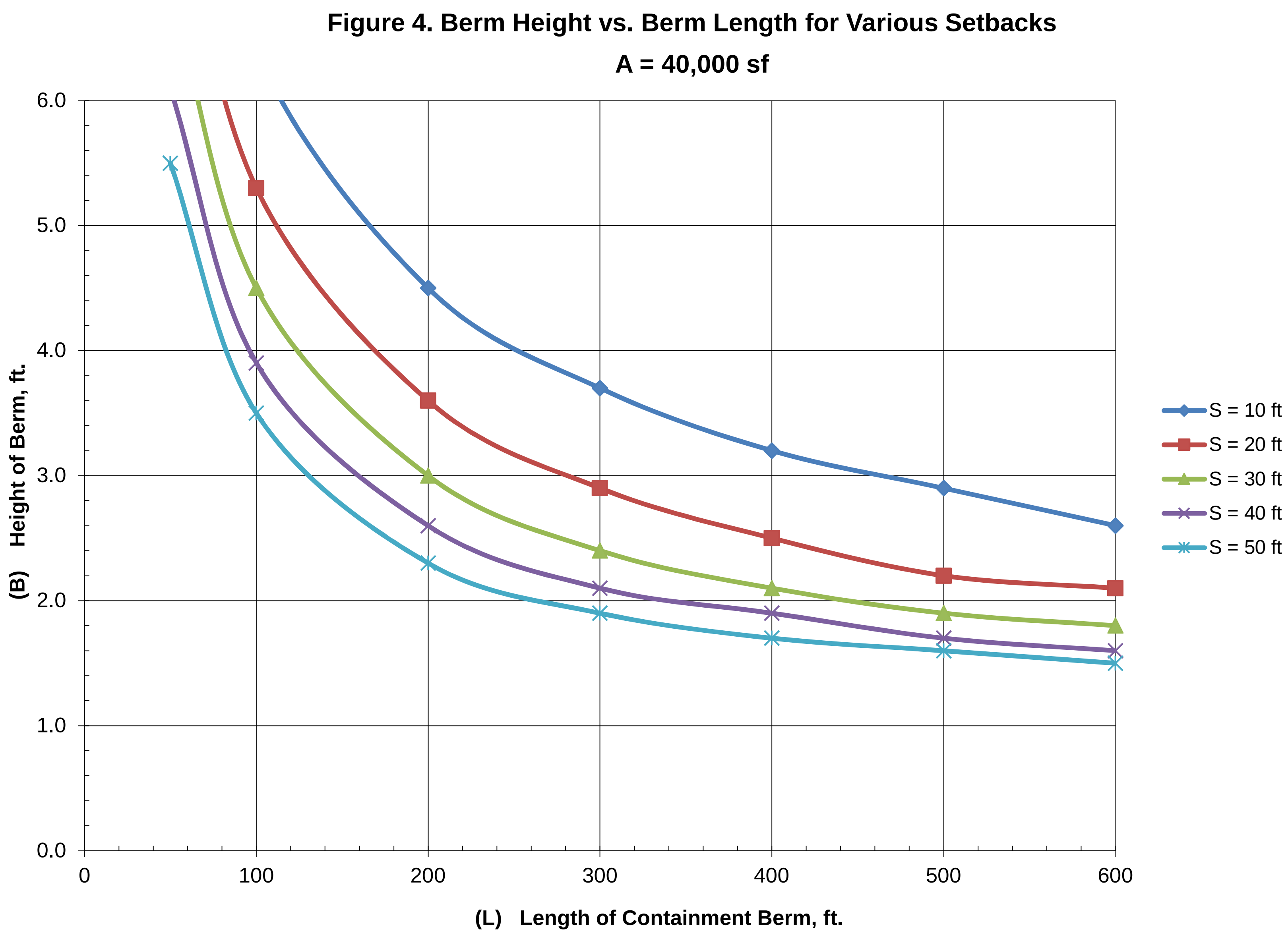

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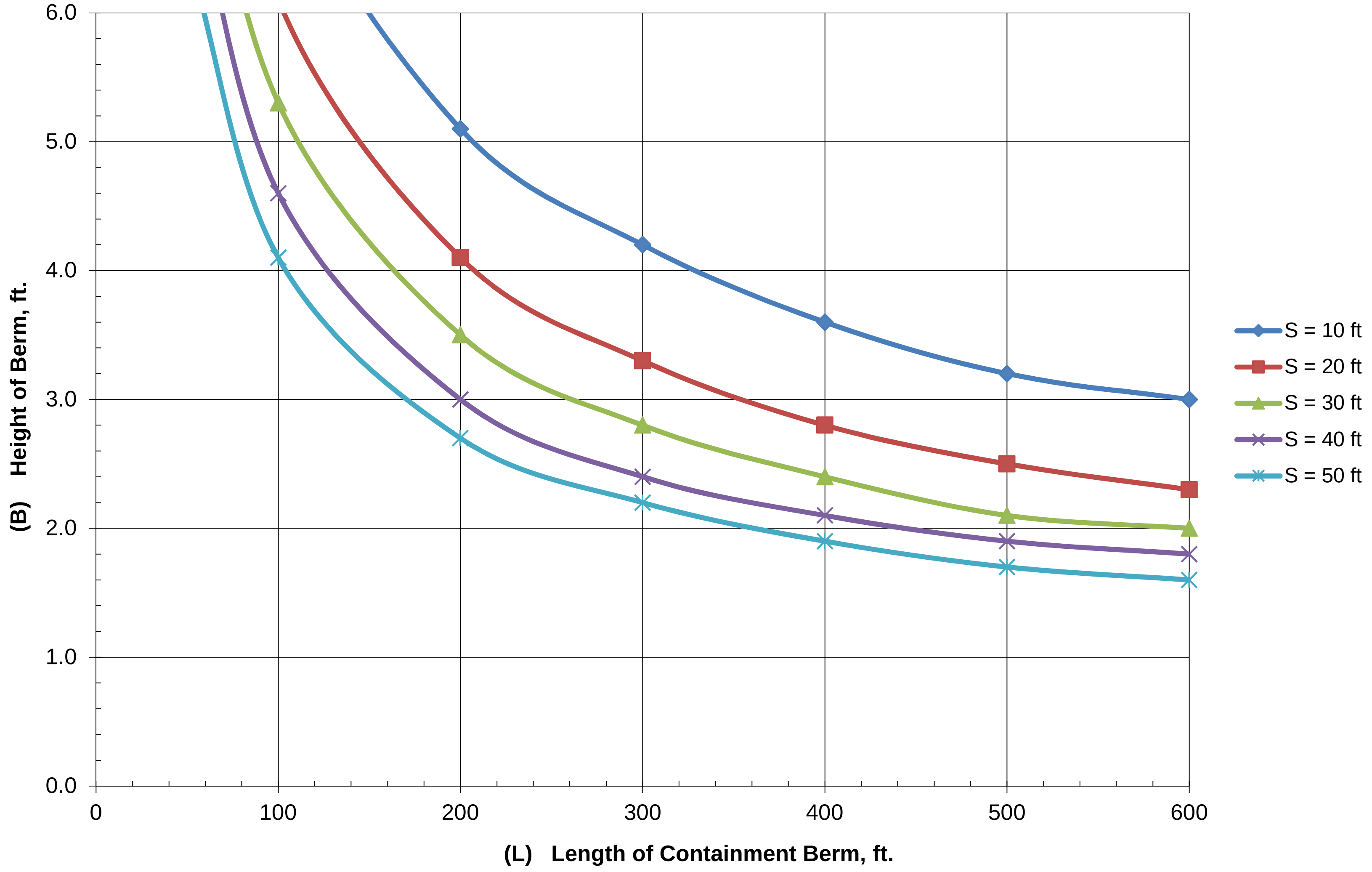
Figure 5. Berm Height vs. Berm Length for Various Setbacks

A = 50,000 sf



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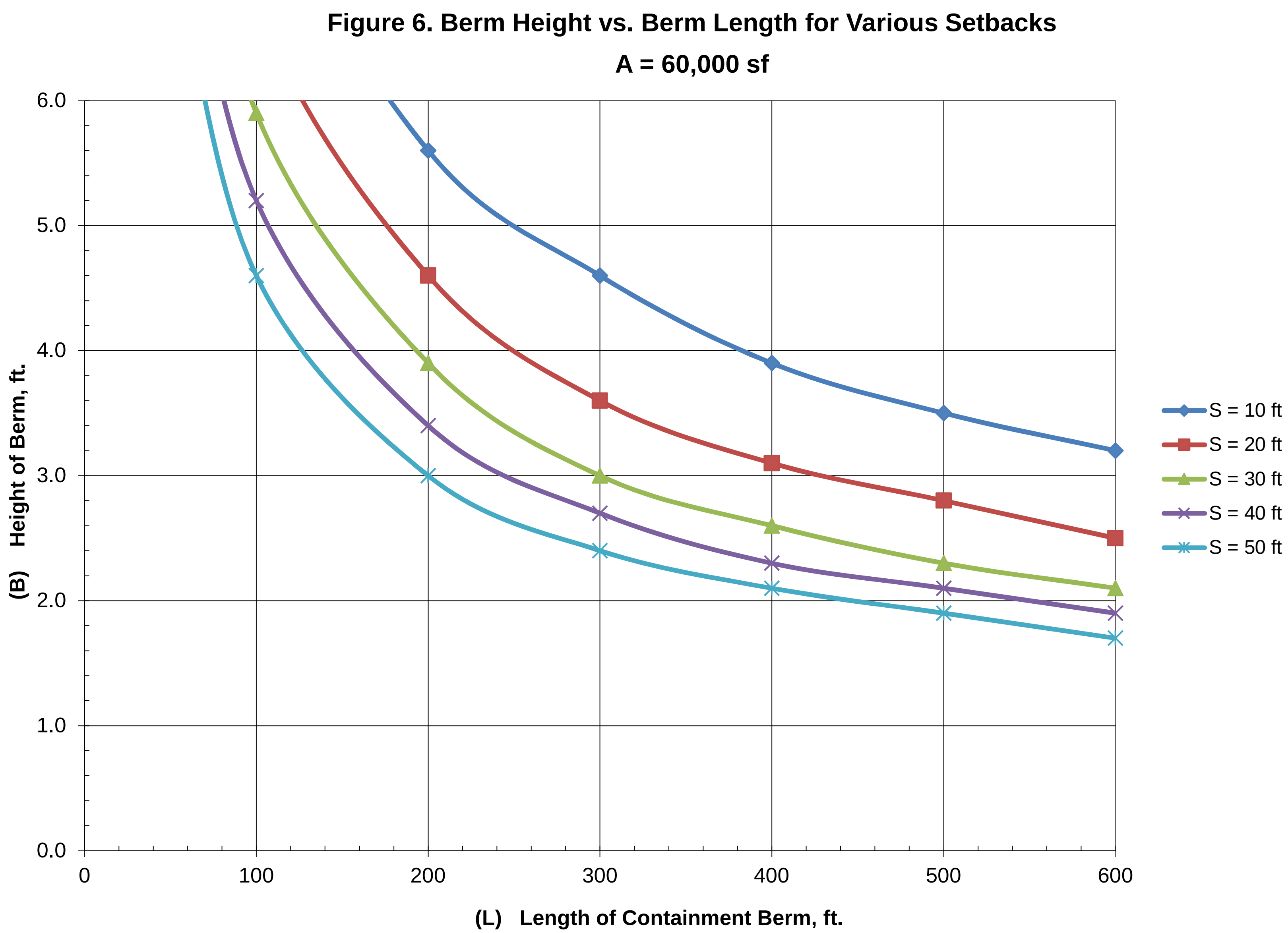

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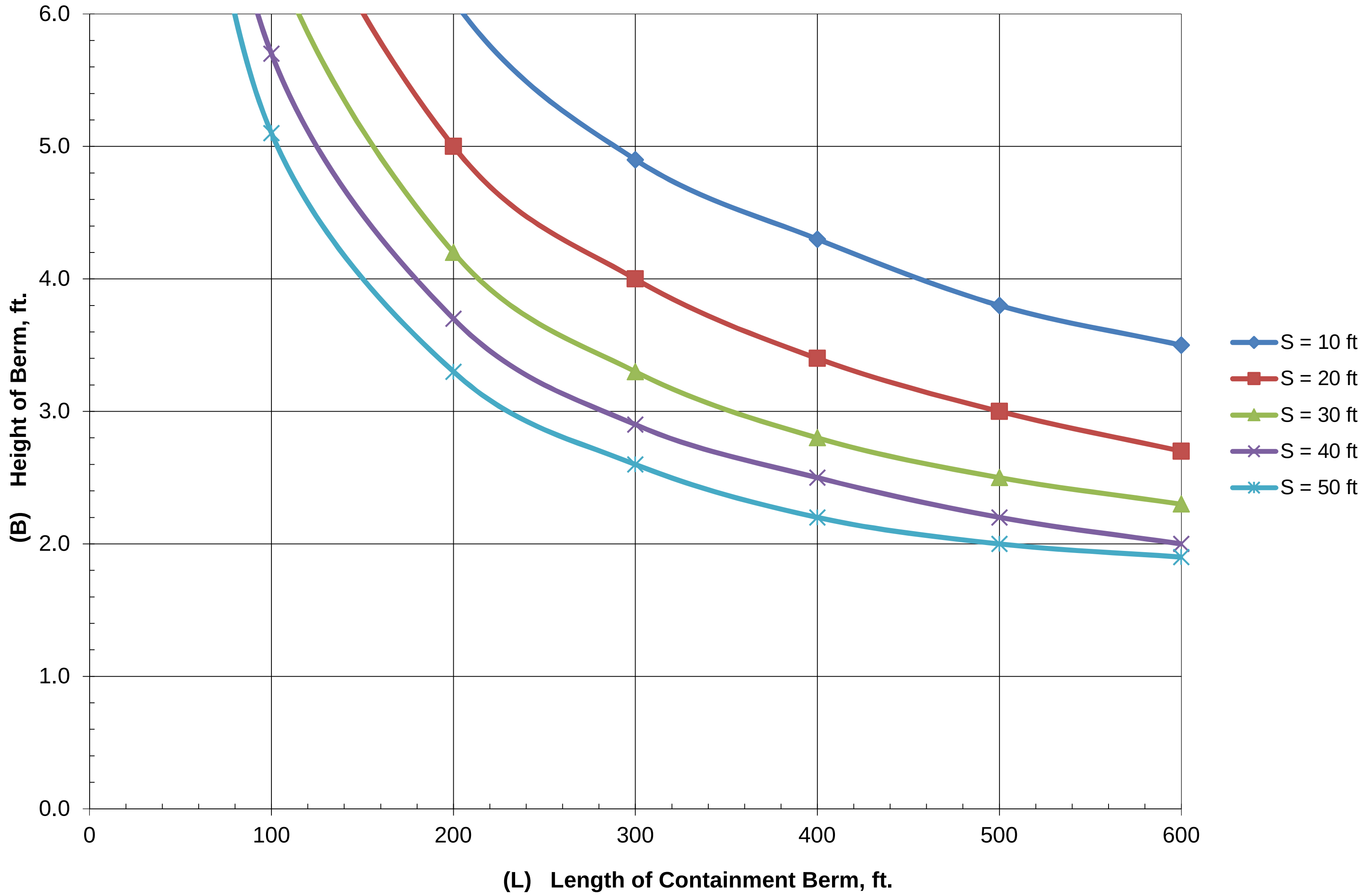
Figure 7. Berm Height vs. Berm Length for Various Setbacks

A = 70,000 sf



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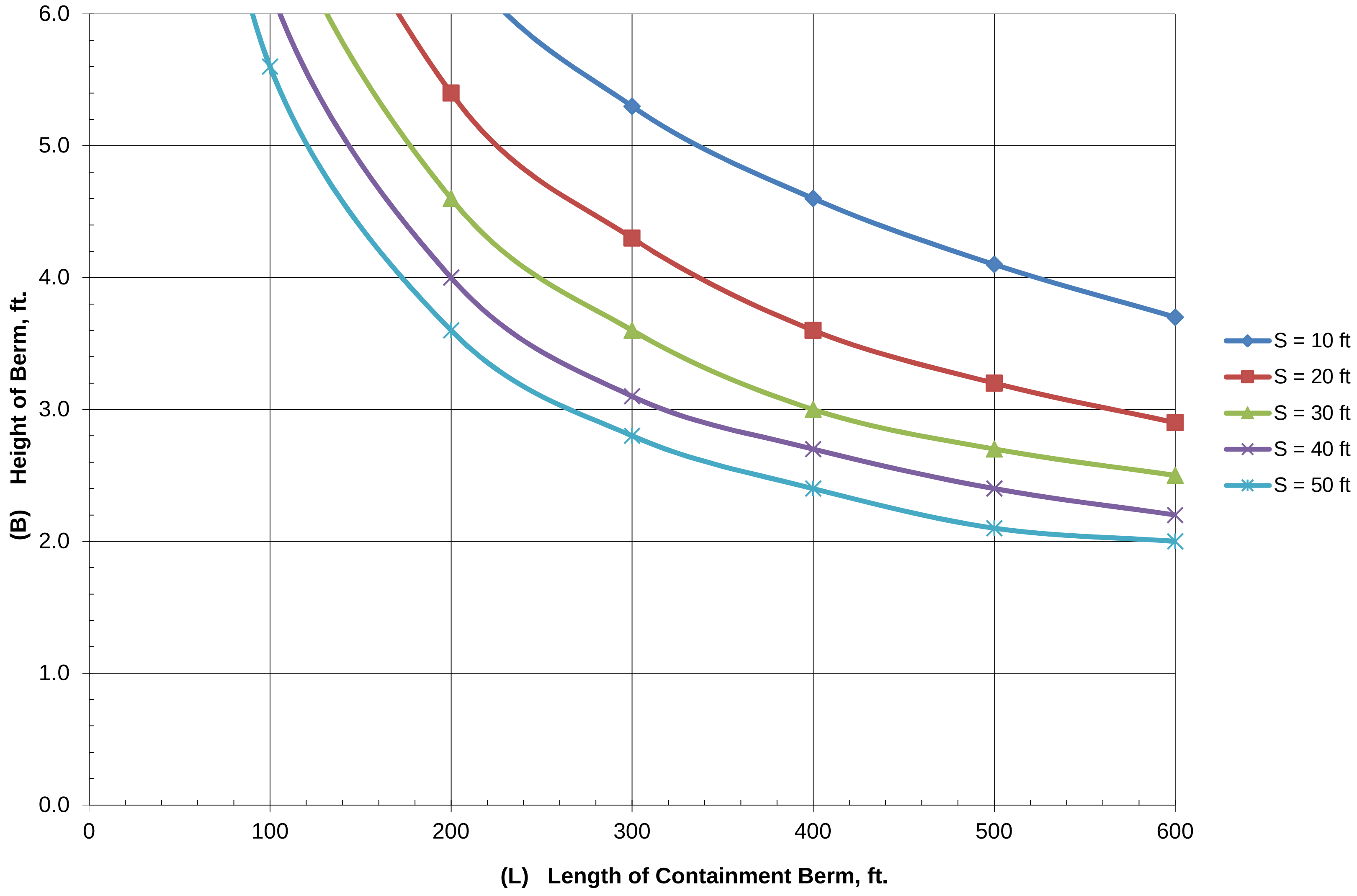
Submitted: July 2017

Revised: November 2017

Figure 8. Berm Height vs. Berm Length for Various Setbacks

A = 80,000 sf



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Revised: November 2017

APPENDIX III-2F

FIGURES

APPENDIX III2G

LONG-TERM POND STORAGE CAPACITY ANALYSIS

LONG-TERM POND STORAGE CAPACITY ANALYSIS

Made By: MX
Checked by: CEI
Reviewed by: CGD

1.0 OBJECTIVE

Evaluate the long-term storage capacity, considering both the rainfall runoff and evaporation, of the stormwater storage and evaporation Ponds W1-W3, Ponds W4-W6, and Ponds E1-E4.

2.0 GIVEN

The proposed post-development ponds at the facility are retention ponds, designed to store the stormwater runoff. Additionally, the semi-arid weather at the site allows for the evaporation pond design.

The proposed ponds have been demonstrated to have adequate storage capacity to contain the runoff from the 25-year 24-hour design storm with adequate freeboard. Discussion is included in Part III2 § 2.3.5, Stormwater Ponds and calculations are provided in Part III2A, Detailed Drainage Calculations.

Precipation and gross lake evaporation data published by Texas Water Development Board are used for the evaluation. Based on 61-year the histroical weather data (from years 1954 to 2014) (Reference 1), the average annual lake evaporation is 62.6 inches and the average annual precipitation is 21.7 inches. Both the average monthly precipitation and total average annual precipitation are provided in the table below.

Precipitation (inches)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Annual Total**
	1.10	1.20	0.75	1.28	2.36	2.31	1.69	1.90	4.20	2.51	1.22	1.18	**21.70**

To estimate the runoff volume to the ponds, we conservatively assumed that the average rainfall for each month occurs within 24 hours.

3.0 CALCULATIONS

The runoff volume was calculated using the NRCS Curve Number Method (Reference 2).

Composite SCS Curve Number	**S = (1000/CN)-10**
88	1.36

Runoff Volume (ac-ft)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Annual Total**
Ponds W1-W3	3.20	3.85	1.27	4.39	12.94	12.51	7.40	9.07	29.88	14.25	3.98	3.72	**106**
Ponds W4-W6	3.70	4.44	1.46	5.06	14.94	14.44	8.55	10.48	34.50	16.45	4.59	4.29	**123**
Ponds E1-E4	8.30	9.98	3.29	11.38	33.56	32.44	19.20	23.54	77.49	36.95	10.32	9.64	**276**

Pond	Runoff Watershed Area (ac)	Annual Evaporation Volume from the Ponds (ac-ft)	Pond Storage Capacity (ac-ft)	25-Year 24-Hr Storm Runoff Volume (ac-ft)	Does Pond have Adequate Capcity to Contain the 25-Yr 24-Hr Storm Runoff?	Average Annual Runoff Volume (ac-ft)	Cumulative Stormwater Remain in Pond After 30 Years	Does Pond Have Adequate Capacity to Store the 30-Yr Cumulative Storwater Volume?
	(a)	(b)	(c)	(d)	(c) > (d)?	(e)	(f)= ((e)-(b))*30	(c) > (f)?
Ponds W1-W3	123	127	220	73	YES	106	0	YES
Ponds W4-W6	142	150	283	85	YES	123	0	YES
Ponds E1-E4	319	249	882	187	YES	274	764	YES

4.0 CONCLUSION/RESULTS

The above calculations demonstrate that all the ponds will have adequate long-term storage capacity for a minimum of 30 years under the post-development conditions. As disussed earlier, this analysis is based on conserative assumptions (assuming the monthly rainfall occur within 24 hours). Furthermore, the pond water may be used for site use to irrigate the final cover surfaces. After a 30-year period, water use in the ponds may be re-evaluated in conjunction with the land use at the time.

5.0 REFERENCES

1) Texas Water Development Board Weather Data.

2) U.S. Soil Conservation Service (TR-55). 1986. Urban Hydrology for Small Watersheds, 2nd Edition. (USSCS Technical Release Number 55). Washington D.C.: United States Department of Agriculture.

CITY OF EDINBURG SOLID WASTE MANAGEMENT

PERMIT AMENDMENT APPLICATION

Part III, Attachment 3

WASTE MANAGEMENT UNIT DESIGN

Edinburg Regional Disposal Facility

Edinburg, Hidalgo County, Texas

TCEQ Permit MSW-956C

Submitted To: City of Edinburg
Department of Solid Waste Management
8601 North Jasman Road
Edinburg, Texas 78542 USA

Submitted By: Golder Associates Inc.
500 Century Plaza Drive, Suite 190
Houston, TX 77073 USA

July 2017
Revised: November 2017

Project No. 1401491

Golder Associates

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design top of waste grades. New landfill cells will be developed adjacent to existing filled areas and waste placement operations will continue below grade.

1.3 Landfill Unit Elevations

30 TAC §330.63(d)(4)(C)

Figure III3-1, Facility Layout Plan illustrates an outline of the solid waste management units. Waste within Pre-Subtitle D Units 1-4 will either be relocated for development of Unit 8 or an Overliner- will be constructed for vertical expansion. Figure III3-2A, Subgrade Layout Plan – Overliner Option depicts the subgrade elevations of the lateral expansion cells within Unit 7 and Overliner. Likewise Figure III3-2B, Subgrade Layout Plan –Unit 8 Option, depicts the subgrade elevations of the lateral expansion cells within Unit 7 and Unit 8. The elevation of deepest excavation (EDE) for the facility is 70 ft-msl located at the bottom of leachate collection sumps for each cell within Units 6, 7, and 8 as depicted on Figures III3-2A and III3-2B.

Figure III3-3, Final Contour Map depicts the maximum final cover elevation of approximately 398 ft-msl. The maximum waste elevation is the final cover elevation minus the thickness of final cover and is dependent on thickness of the final cover lining option used. Part III7, Closure Plan details final cover lining options.

1.4 Estimated Rate of Solid Waste Deposition and Operating Life

30 TAC §330.63(d)(4)(D)

Disposal capacity as referenced in 30 TAC §330 Subchapter P is amount of waste that a facility can dispose. Similarly, the EPA defines landfill capacity as the amount of airspace volume. The maximum total disposal capacity of the facility is 87,301,156 cubic yards, and the maximum remaining disposal capacity will be 76,304,934 cubic yards of waste and daily cover, based on the FY 2016 MSW Annual Report. It is anticipated that the rate of waste disposal will reach approximately 1,500,000 tons per year and that the facility will have a site life of approximately 63.5 years. The total disposal capacity and operational life calculations are provided in Appendix III3A, Volume and Site Life Calculations.

As population, economic conditions, and available landfill disposal capacity change within the region, the volume of incoming waste could vary considerably. The facility will maintain quarterly records to document waste acceptance rates. If the rate exceeds the estimated rate and is not due to a temporary occurrence, the City will file a permit modification application consistent with 30 TAC §330.125(h). As provided by rule, the estimated waste acceptance rate is not a limiting parameter of the permit.

1.5 Landfill Unit Cross-Sections

30 TAC §330.63(d)(4)(E) & (F)

Figure III3-4A, Fill Cross-Sections Location Map is a map showing a sufficient number of cross-sections across the facility, both latitudinally and longitudinally, so as to accurately depict the existing and proposed depths of all fill areas within the site. These fill cross-sections go through or very near soil borings where boring logs obtained from Part III4B, Soil Boring Logs are shown on the plan profiles, Figures III3-4B – III3-4E, Fill Cross-Sections. These plan profile figures provide an inset key map of the fill cross-section plan and clearly show the following content provided in Table III3-1, Fill~~e~~ Cross-Section Figures III3-4B – III3-4E.

Table III3-1: Fill Cross-Section Figures III3-4B – III3-4E

Plan Profile Content	A – A'	B – B'	C – C'	D – D'
Plan Inset Key Map	✓	✓	✓	✓
Boring Logs	✓	✓	✓	✓
Top of Levee	✓	✓	✓	✓
Top of Proposed Fill (Top of Final Cover)	✓	✓	✓	✓
Maximum Elevation of Proposed Fill	✓	✓	✓	✓
Top of the Wastes	✓	✓	✓	✓
Existing Ground	✓	✓	✓	✓
Bottom of the Excavations (Subgrade)	✓	✓	✓	✓
Side Slopes of Trenches and Fill Areas	✓	✓	✓	✓
Gas Vents or Wells	✓		✓	
Groundwater Monitoring Wells	✓	✓	✓	✓
Initial and Static Levels of Any Water Encountered	✓	✓	✓	✓
Compacted Perimeter Berms	✓	✓	✓	✓

Notes: 1. Items not checked are not applicable.
2. Perimeter berm design dimensions shown on figures.

2.0 WASTE MANAGEMENT UNIT ENGINEERING ANALYSES

Analyses were performed to assess the performance of the landfill with respect to settlement and slope stability. Each of these analyses is described in detail in the following sections.

2.1 Settlement Analysis

Facility floor settlement will occur in Strata I through III. Review of the excavation plan indicates that much of Stratum I will be removed prior to construction of the liner system and that much of the Edinburg Regional Disposal Facility floor will be founded on a thin layer of remaining Stratum I. For this analysis, settlement critical cross-sections are cut through a section of the Edinburg Regional Disposal Facility with the thickest waste above and the most critical subsurface conditions. Intermittent points along the critical cross-section are analyzed for settlement and post-settlement to define slopes. The cross-section location is referred to as Line A, located in Unit 7, Cell 2A and 2B on a north-south direction. The cross-section begins at the facility perimeter and progress toward the facility center where the proposed final elevation is highest.

The settlement analyses indicate that the minimum total settlement will be approximately 4 feet and the minimum post-settlement grade on the floor will be 0.6%. The post-settlement grade was used in the leachate header pipe sizing calculations (Appendix III3D-3A).

The post-settlement floor grades will maintain positive drainage and allow the leachate to drain towards the leachate collection system under the conditions analyzed. The results of the settlement analysis are presented in Appendix III3B-1, Settlement Analysis.

2.2 Stability Analysis

The results of the stability analyses indicate that the proposed slopes are stable under the conditions analyzed. For each condition analyzed, the minimum calculated factor of safety exceeds the recommended factor of safety.

Based on the Corps of Engineers "Design and Construction of Levees" manual (EM 1110-2-1913), the recommended factors of safety are 1.3 for short-term and 1.5 for long-term conditions, respectively. Short term conditions include:

- Excavated slopes (undrained conditions);
- Sideslopes; and
- Interior waste slopes.

All other conditions are long-term.

Slope stability analyses were performed using limit equilibrium methods to assess the stability of the proposed landfill. In particular, stability of the proposed excavated landfill sideslopes, stability of the protective cover on landfill sideslopes, stability of the interior waste slopes, overall stability of the final filled landfill, and stability of the final cover system were evaluated.

In general, the analyses consist of the following:

- Characterization of the critical cross-section (e.g., the geometry, geology, geosynthetic interfaces, and groundwater conditions).
- Selection of appropriate strength parameters.
- Analysis under anticipated critical conditions.

The analyses are summarized in the following sections.

Using settlement results, the difference in liner length between prior and post settlement was analyzed. The evaluation showed the liner will mainly be under compression with liner shortening. A very limited portion will experience a lengthening with a strain of 0.3 percent, well below the allowable strain of 5 percent.

An evaluation of strain in the overliner due to localized depressions (subsidence) near the surface of the old waste was performed, and is included as Appendix III3B-3B, Strain Analysis. A parametric analysis, comparing the diameter of the subsidence area and depth at its center to the allowable strain of the overliner components, indicates that the ratio of depth to diameter is approximately 0.14 for 5 percent strain and 0.20 for 10 percent strain.

Depressions of this magnitude would only be expected if voids or highly compressible material are present immediately below the overliner. To reduce the potential for subsidence below the overliner system, the existing waste will be surcharged by placing at least 20 feet of soil for a minimum 3-month period. The surcharge will collapse voids and compress the underlying material.

2.3.3 Stability Analysis

Final filled configuration stability analyses were performed using limit equilibrium methods to determine the factors of safety against sliding or failure. Based on a review of the design grades, the reasonable worst-case configuration was assumed to consist of a section along the western side of Units 3 and 4, having 4H:1V final cover slopes to a crest and maximum fill elevation of approximately 312.6 ft-msl. Compared to other sections through the pre-Subtitle D area, the chosen section exhibits thicker existing waste. Additionally, the toe of the future waste along the chosen section is less supported by the perimeter berm.

Potential failure surfaces were analyzed and the minimum factor of safety was computed based on limit equilibrium methods following Spencer's and GLE/Morgenstern-Price methods of analysis using SLIDE Version 7.0, an integrated slope stability analysis program for personal computers. The strength parameters are conservatively estimated or based on test results for similar conditions, and the reasonable worst case configuration.

The results from the method providing the least factor of safety is presented Appendix III3B-3C. The factor of safety is 2.0 for block sliding and 3.0 for circular failure. These values indicate the final-filled configuration will be stable.

3.0 LINER DESIGN CRITERIA

30 TAC §§330.331(a)(2) & 330.331(b)

The P~~p~~re-Subtitle D ~~cells (~~Units ~~1-4~~1 – 4~~)~~ consist of ~~trenches~~cells extending to a depth of approximately 15 feet below original ground surface. Some of the cells are reported to include a single geomembrane liner.

None of the cells include a leachate collection system. The approximate grades of the ~~P~~pre-Subtitle D cells are shown on Figure III3B-3A-1.

The liner design for the facility is not composed of "composite liner" components defined by 30 TAC §330.331(b); consisting of at least a 2-foot layer of re-compacted soil with a hydraulic conductivity of no more than $1x10^{-7}$ cm/s and a 60-mil high density polyethylene (HDPE) geomembrane liner component.

An alternative liner design is currently approved under permit TCEQ Permit MSW-956B for remaining Subtitle D construction and is the liner design to be used for expansion cells in Unit 7 and Unit 8. The alternative liner design consists of, from bottom up, a geosynthetic clay liner (GCL), a 60-mil high-density polyethylene (HDPE) geomembrane liner, double-side geocomposite composed of a geonet bonded to geotextile on both sides, and 2 feet of protective cover soil. The overliner design discussed in §2.3, Overliner will use 60-mil linear low-density polyethylene (LLDPE) instead of HDPE because its elastic properties are better suited for potential waste settlement. Alternative liner details are included on Figure III3-7, Alternative Liner System Details. Overliner design details and cross-sections are shown on Figures III3-9B, III3-9C, and III3-9D.

As discussed in §4.0, Leachate Collection and Removal System (LCRS) is designed to maintain less than a 30-centimeter depth of leachate over the alternative liner system.

Portions of the landfill excavation extend below the seasonal high water table. Consistent with current practice at the site, toe drains and a geocomposite underdrain along the sideslopes will be installed to control groundwater. The underdrain will be maintained and operated until sufficient ballast is in place to resist the uplift pressures below the liner system. The underdrain analyses are included in Appendix III3E-2. The underdrain system layout and details are shown on Figures III3-6A, III3-6B, and III3-8.

3.1 Alternative Liner Design

30 TAC §330.335

Alternative liner designs, which must include a leachate management system, may be authorized by the TCEQ if a demonstration by computerized design modeling that the maximum contaminant levels detailed in 30 TAC §330.331, Table 1 will not be exceeded at the point of compliance. At the discretion of the TCEQ, a field demonstration may be required to prove the practicality and performance capabilities of an alternative liner design.

The alternative liner design is currently approved under permit TCEQ Permit MSW-956B. The aforementioned factors and any factors not addressed in this application shall be provided to the TCEQ upon request to aid in considerations.

4.0 LEACHATE COLLECTION AND REMOVAL SYSTEM

30 TAC §§330.331(a)(2) & 330.333

The leachate collection and removal system (LCRS) is designed and constructed to maintain less than a 30-centimeter depth of leachate over the alternative liner system and eliminate potential migration of landfill leachate into groundwater and to meet the requirements of 30 TAC §330.333. The LCRS will collect and remove leachate from the top of the alternative liner, channel leachate to designated leachate collection sumps, and pump leachate from the leachate collection sump into a leachate force main for disposal.

The LCRS drainage layer is comprised of a double-sided geocomposite: a high density polyethylene (HDPE) geonet bonded with geotextile on both sides. The leachate collection system details are presented on Figure III3-8, Leachate Collection and Removal System and Underdrain Details. Leachate is collected from the drainage layers into a leachate collection trench constructed of perforated HDPE piping encased by a drainage aggregate and wrapped in a geotextile filter. The leachate collection trench discharges into leachate collection sumps likewise constructed of drainage aggregate and wrapped in geotextile filter. From with the leachate collection sumps, an HDPE upslope riser pipe houses a pump that removes accumulated leachate from within the leachate collection sumps into a leachate force main for discharge to the public sewer system as depicted on Figures III3-5A and III3-5B.

The LCRS is designed and operated to function through the scheduled closure and post-closure care period of the landfill considering the following factors:

- constructed of materials that are chemically resistant to the leachate expected to be generated
- of sufficient strength and thickness to prevent collapse under the pressures exerted by overlying wastes, waste cover materials, and by any equipment used at the landfill
- estimated rate of leachate removal;
- capacity of sumps;
- pipe material and strength, if used;
- pipe network spacing and grading, if used;
- collection sump materials and strength;
- drainage media specifications and performance; and
- demonstration that pipes and perforations will be resistant to clogging and can be cleaned.

4.3.10 Leachate Collection Sump Capacity

30 TAC §330.333(3)(B)

Appendix III3D-4, Sump Capacity Calculations utilizes typical sump dimensions and porosity of the drainage aggregate to determine leachate capacity. The maximum leachate generated, based on the maximum contributing area and the maximum leachate generation rate provided by Appendix III3D-1, Help Model Evaluation was compared to the sump leachate capacity to determine an estimated time to fill the sump. Based on results, the leachate collection sump design provides adequate capacity and cycle time for leachate pumping.

5.0 BALLAST AND DEWATERING SYSTEM

30 TAC §330.337(e)

Waste management unit excavations extend below the seasonal high water table resulting in upward or inward hydrostatic forces on the alternative liner. The alternative liner and the waste placed above it will provide the ballast (weight) to protect the liner system from uplift forces from groundwater. To offset hydrostatic uplift during construction, an active dewatering system will be constructed and operated until sufficient ballast is in place.

5.1 Ballast

30 TAC §330.337(b)(1)

To offset hydrostatic uplift, the weight of the alternative liner and the waste placed above it will provide the ballast (weight) to protect the liner system from uplift forces from groundwater. The ballast counteracting the hydrostatic forces include the soil materials from the leachate collection system components, the protective cover, waste above the liner and leachate collection system, and the soil materials from the interim cover. The weight of the geosynthetic components of the leachate collection system and any geosynthetic components of the interim cover is considered negligible. Appendix III3E-1, Ballast Calculations demonstrate that the ballast, including waste, offset hydrostatic uplift by a factor greater than 1.5. A Ballast Evaluation Report (BER) must be submitted to the TCEQ when the ballast verification demonstrates that further ballasting or dewatering is no longer necessary as outlined in Appendix III3F §8.3, Ballast Evaluation Report.

5.2 Dewatering System

30 TAC §330.337(b)(2)

During construction of the alternative liner, groundwater will be controlled by installing an active dewatering system, which includes an underdrain composed of toe drains, a geocomposite along the sideslopes, and an underdrain sump where removed groundwater will be pumped into adjacent drainage perimeter channel. Appendix III3E-2, Dewatering System Calculations estimates groundwater flow into the underdrain using SEEP/W, a 2-dimensional finite element analysis program, using the worst-case scenario and designs the underdrain system to reduce upward or inward hydrostatic forces on the alternative liner to achieve factor of safety greater than 1.2 against uplift. Figures III3-6A, III3-6B, and III3-8 present design layout and details of the dewatering system.

6.0 LINER QUALITY CONTROL PLAN

30 TAC §330.339(a)

Appendix III3F, Liner Quality Control Plan (LQCP), is prepared under the direction of a licensed professional engineer by a Professional Engineer, and it shall be the basis for the type and rate of quality control testing performance and reported in the geosynthetic liner evaluation report (GLER) as required in §30 TAC §330.341. The plan provides operating personnel adequate procedural guidance for assuring continuous compliance with groundwater protection requirements. The plan specifies construction methods employing good engineering practices for installation and testing of components of the alternative liner including geosynthetic clay liner (GCL), geomembrane (GM), leachate collection and removal system (LCRS), and protective cover soil. As discussed in §3.1, the alternative liner design does not include at least a 2-foot layer of re-compacted soil with a hydraulic conductivity of no more than $1\text{x}10^{-7}$ cm/s; therefore, liner quality control testing procedures for a compacted clay liner are not provided within the LQCP in accordance with 30 TAC §330.339. Also included within the LQCP are special considerations for excavations below the seasonal high groundwater table.

APPENDIX III3A-1

VOLUME CALCULATIONS

VOLUME CALCULATIONS

Made by: JCW
Checked by: CEI
Reviewed by: JBF

1.0 SUMMARY

The table below summarizes total disposal capacity (i.e. airspace) for each cover option for the landfill expansion.

Total Airspace (CY)		Construction Options	
		Overliner	*Unit 8*
Final Cover Options	*Standard*	84,997,400	84,831,321
	Alternative	85,981,680	85,815,599
	Closure Turf	87,301,156	87,135,076

2.0 OBJECTIVE

To determine the airpsace gained from the expansion of Edinburg Regional Disposal Facilty for two options for the Pre-Subtitle D Units 1 through 4: construction of an overliner above existing Units 1 - 4, and relocation of existing Pre-Subtitle D waste and construction of Unit 8. In addition, three final cover options outlined in Part III7, Closure Plan are considered in the volume calculation.

3.0 GIVEN

Approved TCEQ Permit MSW-956B final cover grades and composite lining system grades, expansion design top of waste grades and top of composite lining system grades, and total airspace for approved TCEQ Permits MSW-956A and MSW-956B.

4.0 METHOD

Use AutoCAD Civil 3D, a civil engineering software, to compare the expansion top of waste grades to the top of permitted waste grades combined with expansion top of composite lining system grades.

5.0 CALCULATIONS

5.1 Previously Approved Airspace Capacities

Permit	Capacity (CY)	Description
956A	1,027,858	Pre-Subtitle D Units 1-4
956B	16,734,913	Addition of Units 5 and 6

5.2 Expansion Airspace Gained

To determine the expansion volume gained, two surface models are compared: bottom of waste surface developed by combining top of approved TCEQ Permit MSW-956B waste surfaces with expansion top of protective cover surface, and expansion top of waste surfaces.

5.2.1 Construction of Overliner option

Comparison of developed bottom of waste surface (combination of expansion protective cover grades including Overliner with TCEQ Permit MSW-956B waste grades) to expansion top of waste grades (developed from expansion final cover grades and thicknesses of the final cover options).

Final Cover	Thickness (ft)	Capacity (CY)
Standard	3.5	68,262,487
Alternative	2	69,246,767
Closure Turf	0	70,566,243

5.2.2 Relocation of Pre-Subtitle D waste and construction of Unit 8 option

Comparison of developed bottom of waste surface (combination of expansion protective cover grades including Unit 8 with TCEQ Permit MSW-956B waste grades) to expansion top of waste grades (developed from expansion final cover grades and thicknesses of the final cover options). Please note that airspace gained will be reduced by volume of relocated Pre-Subtile D waste.

Final Cover	Thickness (ft)	Volume (CY)	Capacity (CY)
Standard	3.5	69,124,266	68,096,408
Alternative	2	70,108,544	69,080,686
Closure Turf	0	71,428,021	70,400,163

6.0 CONCLUSION

The total airspace capacity is the sum of TCEQ Permit MSW-956B and expansion airspace gained.

Total Airspace (CY)		Construction Options	
		Overliner	*Unit 8*
Final Cover Options	*Standard*	84,997,400	84,831,321
	Alternative	85,981,680	85,815,599
	Closure Turf	87,301,156	87,135,076

APPENDIX III3B-2E-1

FINAL COVER SYSTEM STABILITY

FINAL COVER SYSTEM STABILITY CALCULATION

Made by: JCW
Checked by: CEI
Reviewed by: JBF

1.0 OBJECTIVE

Evaluate the stability of the final cover liner system.

2.0 GIVEN

The maximum head over the geomembrane is less than the thickness of the geocomposite drainage layer as demonstrated in Appendix III3B-2E-2, Final Cover Drainage Layer Capacity.

Final cover slopes are 4H:1V with a maximum length of 1200 ft.

The failure mechanism will be sliding along one of the liner interfaces.
The final cover system consists of (from top to bottom):

24-inch Soil Cover consisting of on-site soils
Double-sided Geocomposite Drainage Layer
40-mil LLDPE textured Geomembrane
Geosynthetic Clay Liner (GCL)

OR

18-inch Soil Cover consisting of on-site soils
Double-sided Geocomposite Drainage Layer
40-mil LLDPE textured Geomembrane
18-inch Clay Liner

Based on a review of available data at low normal stresses, the following parameters were assigned to the materials.

Table III3B-2E-1: Final Cover Component Interface Unit Weight and Strength Parameters

Soil	Unit Weight (pcf)		Strength Parameters		Reference
	Moist	Saturated	ϕ degrees	c (psf)	
Soil Cover	115	132	28	0	Estimate
Soil Cover / Geocomposite	–	–	28	0	Golder*
Geocomposite/Textured Geomembrane**	–	–	21	0	Golder*
Textured Geomembrane/GCL	–	–	24	0	Golder*
GCL/Clay Liner	–	–	35	0	Golder*

* Based on unpublished data from tests performed in Golder's laboratory, on similar geosynthetic materials. Strength parameters were conservatively assigned to be equal to or a percentage of the peak strength (lower bound) to account for testing material variability (see pages 3 and 4).

**The data indicates a lower-bound angle of 24°, but since the final cover pertains to a long-term condition a conservative angle of 21° is assumed for the calculation.

Based on the shear strength parameters, the critical interface occurs along the geocomposite/ textured geomembrane interface; this interface was assigned a conservative friction angle of 21 degrees.

4.0 METHOD

Create a model representing the sideslope situation and use it in conjunction with limit equilibrium concepts to determine the minimum factor of safety against a sliding block failure along the critical interface.

Infinite Slope Analysis

$$FS = \frac{c + (\gamma b \cos\beta - \gamma_w d \cos\beta)\tan\phi}{\gamma b \sin\beta}$$

Sliding at Geocomposite-Textured Geomembrane Interface

ϕ =	21	interface friction angle
β =	14.0	slope angle (degrees)
c =	0	adhesion (psf)
γ =	115	unit weight of soil (pcf)
b =	2.0	thickness (ft)
d =	0	water depth in cover (ft)
γ_w =	62.4	unit weight of water (pcf)
FS =	**1.54**	

Based on the Corps of Engineers "Design and Constuction of Levees" manual (EM 1110-2-1913) and the "EPA Guilde to Technical Resources for the Design of Land Disposal Facilities", the recommended factor of safety is 1.5 for the veneer slope stabiltiy of the final cover.

5.0 RESULTS

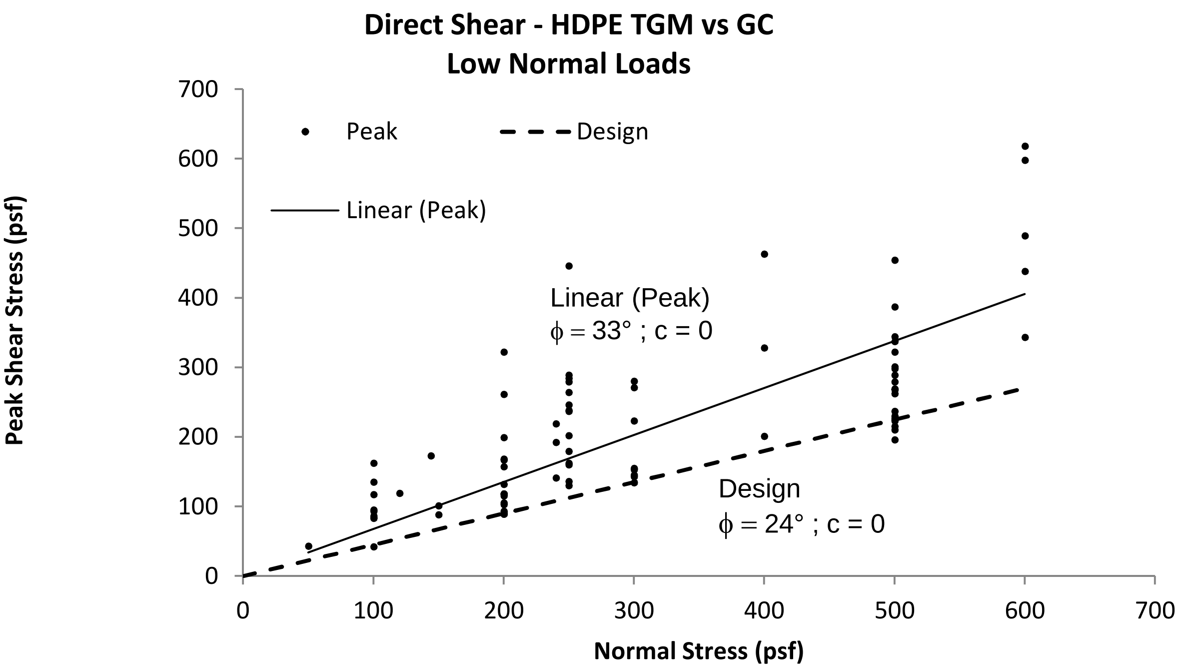
Using the Golder Associates interface friction angle database as a guide, the most critical internal friction angle of the final cover liner system was conservatively assumed to be 21 degrees. The resulting minimum factor of safety was calculated to be 1.54

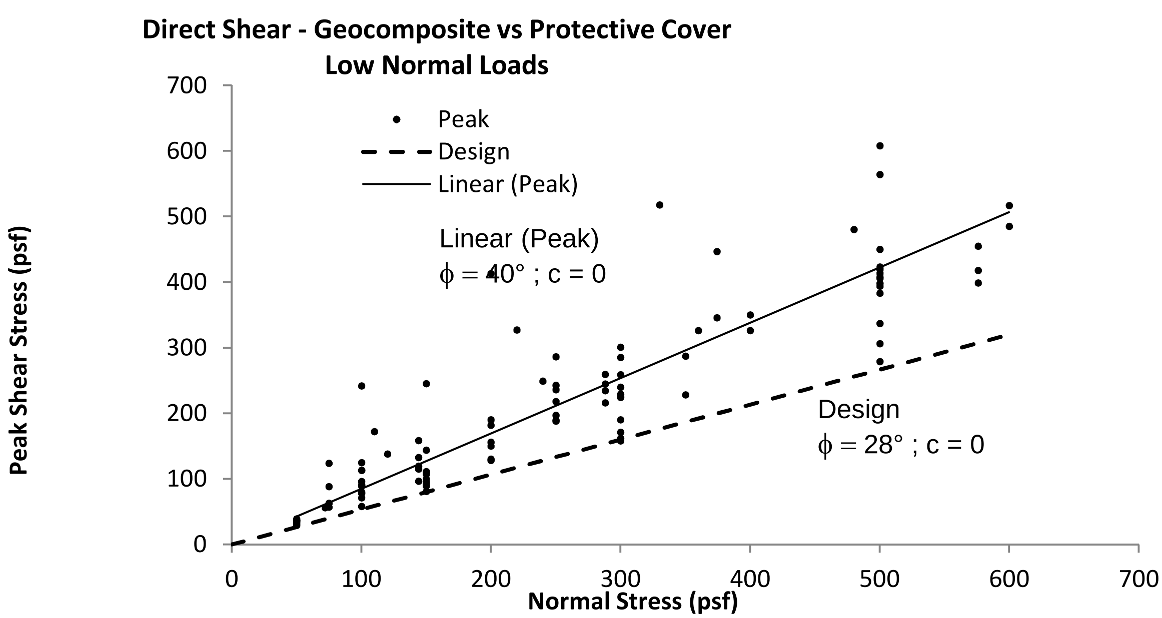
6.0 CONCLUSION

The slope stability analysis indicates that the final cover slope is stable.

7.0 REFERENCES

Shear-Normal plots from unpublished data from tests performed in Golder's laboratory.





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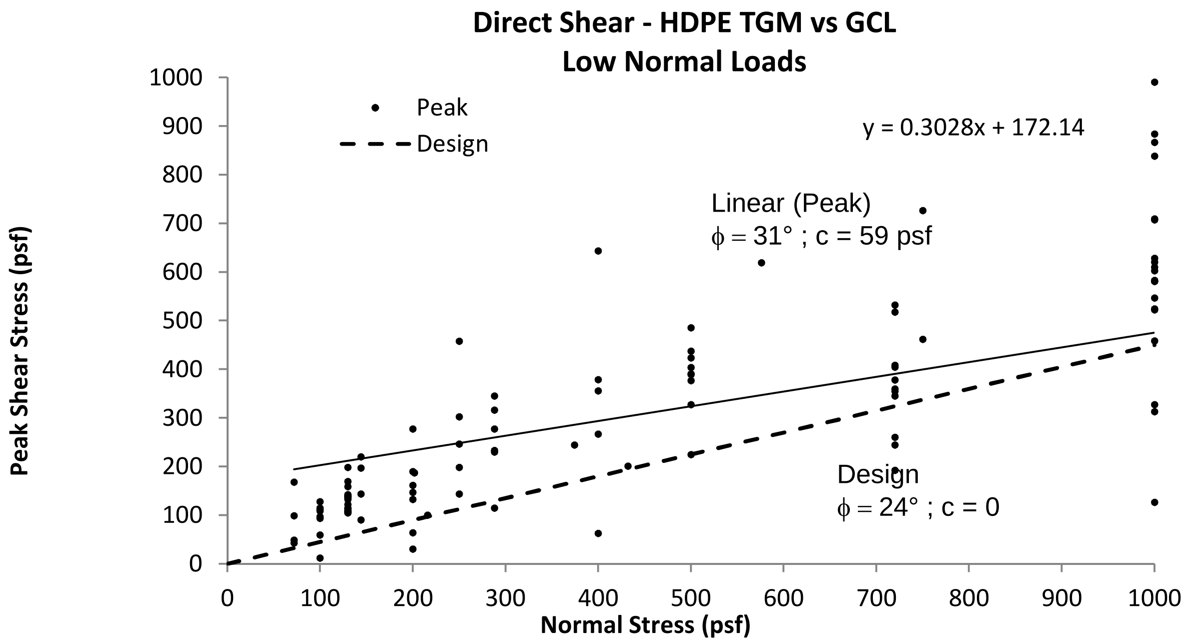
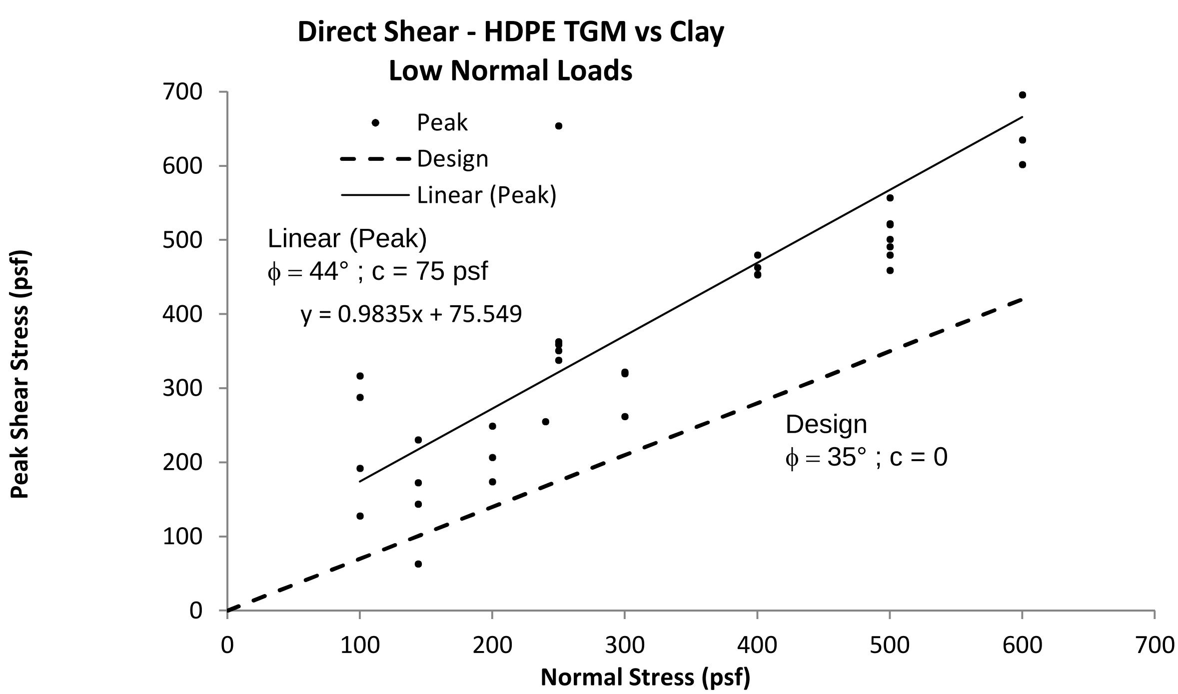
Revised: November 2017





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Submitted: July 2017
Revised: November 2017

Golder Associates

APPENDIX III3D-4

LEACHATE COLLECTION SUMP CAPACITY

LEACHATE COLLECTION SUMP CAPACITY

Made by: CEI
Checked by: MX
Reviewed by: JBF

1.0 OBJECTIVE

Calculate the volume and capacity of a typical leachate collection sump and, with this quantity, estimate the sump cycle time.

2.0 GIVEN

The typical dimensions for the lateral expansion sumps are provided below. Because sumps for the overliner option are larger in size, their capacities are not evaluated for the purpose of this calculation.

Sump base dimensions:	30	ft long
	24	ft wide
	2	ft deep
Sideslopes in sump:	3	:1 (horizontal:vertical)
Sump gravel porosity:	0.3	

Typically, the transducer and control panel is set to shut down the pump with 1 foot of leachate left in the sump to keep the pump from overheating. Likewise, to maintain less than 30 cm of leachate above the liner system, the transducer and control panel is set to turn on at 0 ft to a maximum of 1 ft above liner. To be conservative the for the sump cycle calculations, 0 ft above liner is used.

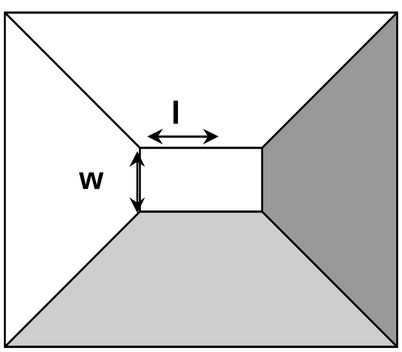
Tranducer Start/Stop Elevations from bottom of sump:	2	ft (start level)
	1	ft (stop level)

3.0 CALCULATIONS

3.1 Total Sump Volume & Sump Capacity

$V = 1/3\ (A_1+A_2+(A1A2)^{1/2})\ D$ where

A_1 = area at base of sump
A_2 = area at top of sump
D = depth of sump



Plan View

Profile View

Sump Capacity=Gravel Porosity * Total Sump Volume

Assuming leachate remains at the base of the sump at the set tranducer elevation, the remaining void volume in the sump is:

Base Area	Top Area	Depth	Total Vol.	Sump Capacity	
(ft^2)	(ft^2)	(ft)	(ft^3)	(ft^3)	gallons
1,080	1,512	1	1,290	387	2,895

3.2 Time to Fill Sump, Worst-case Conditions

The time it takes to fill the sump when leachate remains at the sump base and worst-case conditions exist is:

q_{max}	$Area_{max}$	Maximum flow into sump			Time to fill sump		
ft^3/acre/day	acre	ft^3/day	gal/day	gal/min	day	hr	min
956	20.9	19,980	149,453	104	0.02	0.5	28

The maximum leachate generation rate was computed by the HELP model to be 956 ft^3/acre/day.

The maximum contributing area is Cell 12A of 20.9 acres.

3.3 Time to Fill Sump, Typical Conditions

The time it takes to fill the sump when leachate remains at the sump base and typical conditions exist is:

q_{ave}	$Area_{max}$	Average flow into sump			Time to fill sump		
ft^3/acre/yr	acre	ft^3/day	gal/day	gal/min	day	hr	min
12,494	20.9	715	5,351	4	0.15	3.5	209

The maximum average annual leachate generation rate was computed by the HELP model to be 12,494 ft^3/acre/yr.

The maximum contributing area is Cell 12A of 20.9 acres.

3.4 Sump Cycle Times

Sump cycles times should be greater than 15 minutes or number of cycles should not be greater than 100 cycles per day to prevent overheating and complete failure. The cycle time is the time to remove two sump volumes.

Worse-case Condition			Typical Condition		
min	day	cycles/day	min	day	cycles/day
56	0.04	26	418	0.29	3

4.0 CONCLUSION

Each sump will have a capacity of approximately 2,895 gallons. Under worst-case conditions, leachate will reach the crest of the sump approximately 0.5 hours after pumping. Under typical conditions, leachate will reach the crest of the sump approximately 3.5 hours after pumping. Therefore, the sump design will provide adequate time for sump cycling.

APPENDIX III3E-1

SUFFICIENT BALLAST CALCULATIONS

SUFFICIENT BALLAST CALCULATIONS

Made by: CEI
Checked by: MX
Reviewed by: JBF

1.0 OBJECTIVE

Provide ballast calculations in accordance with Appendix III3F, Liner Quality Control Plan (LQCP).

2.0 APPROACH

The factor of safety against hydrostatic uplift is defined as the sum of the resisting forces provided by the ballast (weight) of overlying materials including protective soil cover, waste, and final cover, divided by the hydrostatic uplift forces acting at the base of the geomembrane liner. As described in the LQCP, a factor of safety of 1.5 is required when waste is being used as the ballast material.

3.0 EXAMPLE BALLAST CALCULATIONS

Provided below are example calculations demonstrating the factor of safety in the final fill condition and the waste thickness required to achieve a factor of safety of 1.5.

Final-Filled Condition		**Ballast Offset (lb)**			**Hydrostatic Force (lb)**	
Slope of Alternative Liner at Evaluation Point	3 H:1V	*Final Cover*	*Waste*	*Protective Cover*	*Alternate Liner*	*Ground-water*
Top Elevation (ft-msl)		120.0	116.5	74.0	72.0	75.8
Thickness (ft)		3.5	42.5	2.0	-	3.8
Unit Weight (pcf)		115.0	44.0	105.0	-	62.4
Hydrostatic Offset Factor	**9.4**	2234.3			237.1	

Waste Thickness Required		**Ballast Offset (lb)**		**Hydrostatic Force (lb)**	
Slope of Alternative Liner at Evaluation Point	3 H:1V	*Waste*	*Protective Cover*	*Alternate Liner*	*Ground-water*
Top Elevation (ft-msl)		79.9	74.0	72.0	76.5
Thickness (ft)		**5.9**	2.0	-	4.5
Unit Weight (pcf)		44.0	105.0	-	62.4
Hydrostatic Offset Factor	**1.5**	421.2		280.8	

4.0 CALCULATIONS AND RESULTS

Final filled condition and waste thickness required ballast calculations for each evaluation point within the lateral expansion area of Units 7 and 8 as well as remaining cell construction in Unit 6 as depicted in Figure III3E-1-1 is summarized in the tables below. The evaluation points provided represent the worse-case locations for each unit cell. The final cover, protective cover, and alternate liner elevations are the same for each ballast evaluation point. In addition, the final cover and protective cover thickness as well as associated unit weight is assumed to be the same as the sample calculation provided above.

Final-Filled Condition	Factor of Safety	Component Elevations				
		Final Cover	*Waste*	*Protective Cover*	*Alternate Liner*	*Ground-water*
Point 1 - Unit 7, Cell 1	**8.5**	120.0	116.5	74.0	72.0	76.2
Point 2 - Unit 7, Cell 2	**8.7**	120.0	116.5	74.0	72.0	76.1
Point 3 - Unit 7, Cell 3	**9.4**	120.0	116.5	74.0	72.0	75.8
Point 4 - Unit 7, Cell 4	**9.2**	120.0	116.5	74.0	72.0	75.9
Point 5 - Unit 7, Cell 5	**8.5**	120.0	116.5	74.0	72.0	76.2
Point 6 - Unit 7, Cell 6	**NA**	120.0	116.5	74.0	72.0	70.2
Point 7 - Unit 7, Cell 7	**NA**	120.0	116.5	74.0	72.0	71.8
Point 8 - Unit 7, Cell 8	**19.9**	120.0	116.5	74.0	72.0	73.8
Point 9 - Unit 7, Cell 9	**10.9**	120.0	116.5	74.0	72.0	75.3
Point 10 - Unit 7, Cell 10	**9.2**	120.0	116.5	74.0	72.0	75.9
Point 11 - Unit 7, Cell 11	**8.3**	120.0	116.5	74.0	72.0	76.3
Point 12 - Unit 7, Cell 12	**8.0**	120.0	116.5	74.0	72.0	76.5
Point 13 - Unit 8, Cell 1A	**6.8**	120.0	116.5	74.0	72.0	77.3
Point 14 - Unit 8, Cell 1B	**5.3**	120.0	116.5	74.0	72.0	78.7
Point 15 - Unit 8, Cell 2A*	**7.0**	120.0	116.5	74.0	72.0	77.1
Point 16 - Unit 8, Cell 2B*	**6.1**	120.0	116.5	74.0	72.0	77.9
Point 17 - Unit 6, Cell 5B	**7.2**	120.0	116.5	74.0	72.0	77.0
Point 18 - Unit 6, Cell 7A	**7.6**	120.0	116.5	74.0	72.0	76.7
Point 19 - Unit 6, Cell 6B	**7.5**	120.0	116.5	74.0	72.0	76.8

NA: Groundwater elevation is below liner elevation.

* Unit 8 evaluation point similar to that of overliner option.

Waste Thickness Required	Waste Thickness	*Factor of Safety*	Component Elevations			
			Waste	*Protective Cover*	*Alternate Liner*	*Ground-water*
Point 1 - Unit 7, Cell 1	**5.2**	1.5	79.2	74.0	72.0	76.2
Point 2 - Unit 7, Cell 2	**4.9**	1.5	78.9	74.0	72.0	76.1
Point 3 - Unit 7, Cell 3	**4.2**	1.5	78.2	74.0	72.0	75.8
Point 4 - Unit 7, Cell 4	**4.4**	1.5	78.4	74.0	72.0	75.9
Point 5 - Unit 7, Cell 5	**5.2**	1.5	79.2	74.0	72.0	76.2
Point 6 - Unit 7, Cell 6	**0.0**	1.5	74.0	74.0	72.0	70.2
Point 7 - Unit 7, Cell 7	**0.0**	1.5	74.0	74.0	72.0	71.8
Point 8 - Unit 7, Cell 8	**0.0**	1.5	74.0	74.0	72.0	73.8
Point 9 - Unit 7, Cell 9	**3.0**	1.5	77.0	74.0	72.0	75.3
Point 10 - Unit 7, Cell 10	**4.4**	1.5	78.4	74.0	72.0	75.9
Point 11 - Unit 7, Cell 11	**5.4**	1.5	79.4	74.0	72.0	76.3
Point 12 - Unit 7, Cell 12	**5.9**	1.5	79.9	74.0	72.0	76.5
Point 13 - Unit 8, Cell 1A	**7.8**	1.5	81.8	74.0	72.0	77.3
Point 14 - Unit 8, Cell 1B	**11.1**	1.5	85.1	74.0	72.0	78.7
Point 15 - Unit 8, Cell 2A*	**7.3**	1.5	81.3	74.0	72.0	77.1
Point 16 - Unit 8, Cell 2B*	**9.2**	1.5	83.2	74.0	72.0	77.9
Point 17 - Unit 6, Cell 5B	**7.0**	1.5	81.0	74.0	72.0	77.0
Point 18 - Unit 6, Cell 7A	**6.3**	1.5	80.3	74.0	72.0	76.7
Point 19 - Unit 6, Cell 6B	**6.6**	1.5	80.6	74.0	72.0	76.8

* Unit 8 evaluation point similar to that of overliner option.

5.0 CONCLUSION

A ballast calculation was performed at each evaluation point depicted on Figure III3E-1-1 within the lateral expansion area of Unit 7. The evaluation point number 12 selected within Cell 12 where the difference between the seasonal high groundwater surface and the design basegrade is the greatest is the worst-case scenario. The final filled condition has a factor of safety of 8.0 and 5.9 ft is the thickness of waste required to achieve a factor of safety of 1.5. Review of the results indicate that long-term ballast is adequate for the proposed design.

APPENDIX III3F

LINER QUALITY CONTROL PLAN

PERMIT AMENDMENT APPLICATION

Part III, Attachment 3, Appendix F

LINER QUALITY CONTROL PLAN

Edinburg Regional Disposal Facility

Edinburg, Hidalgo County, Texas

TCEQ Permit MSW-956C

Submitted To: City of Edinburg
Department of Solid Waste Management
8601 North Jasman Road
Edinburg, Texas 78542 USA

Submitted By: Golder Associates Inc.
500 Century Plaza Drive, Suite 190
Houston, TX 77073 USA

July 2017
Revised: November 2017

Project No. 1401491

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1.0 PURPOSE

1.1 Purpose

30 TAC §330.339(a)

This Liner Quality Control Plan (LQCP), is prepared under the direction of a licensed professional engineer, and it is the basis for the type and rate of quality control testing performance and reported in the ~~geosynthetic~~ liner evaluation report (~~G~~LER) as required in §30 TAC §330.341. The plan provides operating personnel adequate procedural guidance for assuring continuous compliance with groundwater protection requirements. The plan specifies construction methods employing good engineering practices for installation and testing of components of the alternative liner including geosynthetic clay liner (GCL), geomembrane (GM), leachate collection and removal system (LCRS), and protective cover soil. In addition, dewatering plans are included.

1.2 Liner Quality Control Testing Procedures

30 TAC §330.339(a)(2)

The liner quality control testing procedures, including sampling frequency, are provided in this LQCP. All field sampling and testing, both during construction and after completion, shall be performed by a person acting in compliance with the provisions of the Texas Engineering Practice Act and other applicable state laws and regulations. The professional of record who signs the ~~G~~LER or his representative should be on site during all liner construction. Quality control of construction and quality assurance ~~of~~ sampling and testing procedures should follow the latest technical guidelines of the TCEQ~~ 30 TAC 330.339(a)(2)~~.

2.0 GEOSYNTHETIC CLAY LINER

This section presents general procedures, quality control testing requirements, and installation procedures for geosynthetic clay liner (GCL) construction. The GCL approved for use at the site consists of sodium bentonite encapsulated between two geotextile layers, needle-punched or stitched-bonded together.

2.1 Pre-Installation Material Evaluation

2.1.1 Manufacturer's Quality Control Certificates

Prior to the installation of the GCL, the manufacturer or installer shall provide the POR with quality control certificates signed by a responsible party employed by the manufacturer. The manufacturer must provide documentation certifying the material was continuously inspected for broken needles, and is needle free. Each quality control certificate shall include roll identification numbers, testing procedures, and results of quality control tests. The quality control tests shall be performed in accordance with project-specific testing methods and subject to the minimum testing frequency shown in Table III3F-1, GCL QC Submittal Frequency & Material Specifications. The owner may require more frequent testing at his discretion.

The quality control testing may be performed in the manufacturing plant. The POR shall review the test results prior to accepting the GCL to ensure that the certified minimum properties meet the values presented in Table III3F-1, GCL QC Submittal Frequency & Material Specifications.

2.1.2 Conformance Testing

In addition to the manufacturer's quality control certificates, samples of rolls of GCL will be obtained for conformance testing. The samples shall be tested by an independent third party laboratory in accordance with Table III3F-2, GCL Conformance Test Schedule. The POR shall review the test results to ensure that they meet the values presented in Table III3F-1, GCL QC Submittal Frequency & Material Specifications.

The POR shall compare measured shear strength values to those used in the stability analyses included in Appendix III3B-2B, III3B-2C, and III3B-2D. If the measured interface shear strength is less than the values used in the analyses, the stability of the liner system shall be reassessed and revised calculations shall be included in the ~~Geosynthetic~~ Liner Evaluation Report (~~G~~LER).

2.1.3 Shipping and Unloading

In order to prevent premature hydration, the GCL rolls shall be shipped in plastic wrapping that shall remain intact until material installation. Rolls shall be labeled with the manufacturers name, product identification, roll and lot number, roll dimensions, weight and any other information to trace the quality assurance documentation. Upon delivery of the GCL, storage and handling procedures shall be documented. The rolls will be stacked, stored above ground, covered, and handled in accordance with ASTM D5888 or manufacturer's recommendations. If any rolls is damaged during shipping, unloading or storage or if the outer portion becomes partially hydrated, the damaged portion shall be removed before the roll is deployed.

Table III3F-1: GCL QC Submittal Frequency & Material Specifications

Bentonite					
Property	**Qualifier**	**Unit**	**Value**	**Test Method(1)**	**Frequency**
Fluid Loss	max.	ml	18	ASTM D5891	1 per 50 tons or every truck or railcar
Free Swell	min.	ml	24	ASTM D5890	
Geotextile					
Property	**Qualifier**	**Unit**	**Value**	**Test Method(1)**	**Frequency**
Mass per Unit Area	—	g/cc	—	ASTM D5261	1 per 200,000 ft^2
Tensile Properties:	—	lb	—	ASTM D4632	
GCL Product					
Property	**Qualifier**	**Unit**	**Value**	**Test Method(1)**	**Frequency**
Bentonite Mass	min.	lb/ft^2	0.8	ASTM D5993	1 per 40,000 ft^2
Bentonite Moisture Content	—	%	—	ASTM D5993	
Grab Tensile Strength	—	lb	—	ASTM D6768	1 per 200,000 ft^2
Hydraulic Flux	max.	m^3/m^2-s	1×10^{-8}	ASTM D5887	1 per week for each production line(2)
Lap Joint Permeability	Max	cm/sec	1×10^{-8}	Flow Box or other suitable device	1 per material and lap type

Notes:
1. Updated methods may be implemented based on a review by the POR.
2. Report last 20 test values, ending on production date of supplied GCL.
3. For those properties that do not indicate a value, the GCL material must meet the manufacturer's minimum specification.

Table III3F-2: GCL Conformance Test Schedule

TEST	**METHOD(1)**	**FREQUENCY**
Bentonite Mass/Unit Area	ASTM D5993	Not less than 1 test per 100,000 ft^2
Hydraulic Flux	ASTM D5887	
Direct Shear(2)(3)	ASTM D6243	1 test per GCL/adjoining material

Notes:
1. Updated methods may be implemented based on a review by the POR.
2. Direct shear testing shall be performed on the GCL/geomembrane/geocomposite sandwich. Soak interface and apply normal stresses of 1000, 5000, and 18,000 psf for at least 1 hour prior to shearing at a displacement rate of 0.04 in/min.
3. The testing results shall be compared to the values used in the stability analyses included in the Appendix III3B-3B. If the measured interface shear strength is less than the values used in the analyses, the stability of the liner system shall be reassessed and revised calculations shall be included in the GLER.
4. Test results from materials used during one construction event may be used in subsequent events provided the materials used are the same and approved by the POR.

2.2 Installation Procedures

2.2.1 GCL Subgrade Preparation

Surfaces to be lined should be smooth and free of all rocks greater than 0.75-inch diameter (or as recommended by the manufacturer, if less than 0.75 inches), sharp/angular objects, sticks, roots, or debris of any kind. The surface should provide a firm, unyielding foundation for the GCL with no sudden, sharp, or abrupt changes or break in grade. The subgrade surface shall be prepared by rolling with a smooth-drum roller to minimize the roughness and press down protruding soil or rock particles prior to GCL deployment. Loose rocks and/or dry soil particles that could damage the GCL shall be removed. Excessive voids or dimples shall be filled with soil.

Standing water or excessive moisture on the subgrade will not be allowed. The subgrade shall be maintained in a smooth, uniform, and drained condition.

2.2.2 Anchor Trench Construction

The anchor trench shall be constructed according to the project plans and specifications, and the excavation and backfilling operations shall be documented. If the anchor trench is excavated in a clay material susceptible to desiccation, the amount of anchor trench open at any time should be minimized. The inside edge of the trench shall be rounded so as to avoid stresses from sharp bends in the GCL. The GCL will not be placed into the anchor trench on top of any rocks greater than 0.75-inch diameter, sharp/angular objects, sticks, roots, or debris of any kind. The anchor trench shall be adequately drained to prevent ponding or hydration of the GCL while the trench is open. The anchor trench shall be backfilled and compacted according to the project plans and specifications; however, backfilling shall be performed, at a minimum, with ordinary compaction as deemed suitable by the POR.

2.2.3 GCL Deployment

Equipment used to deploy GCL must not cause excessive rutting of the subgrade. Deployed GCL panels should contain no folds or excessive slack. Installation personnel must not smoke or wear damaging shoes on GCL. GCL should not be placed during excessive winds. Sand bags should be used to anchor deployed GCL when necessary. In general, only low ground pressure rubber-tired support equipment approved by the POR may be allowed on the GCL. If the POR or CQA monitor observes any potential damage done to the liner by the support equipment, use of the equipment will cease and the damage will be repaired. Generators, gasoline or solvent cans, tools, or supplies must not be stored directly on the GCL. GCL must be rolled into position, not drug across the subgrade. Deployed GCL must not be used as a work area without adequate protection such as a rub sheet.

Panels should be overlapped and seamed, as recommended by the manufacturer. End-to-end seams on sideslopes are not allowed. Care must be taken to assure the GCL is installed with the proper side up.

~~should be kept to a minimum. If end-to-end seams on sideslopes are necessary (i.e., if the GCL roll lengths are insufficient to cover the entire slope length), a minimum overlap of 5 feet will be required and may be placed only in the lower half of the slope and must be staggered.~~

GCL deployment shall be limited to the amount that can be covered with the overlying geomembrane liner the same day. GCL deployment shall not be undertaken during precipitation or when there is an impending threat of precipitation. GCL deployed on 5H~~h~~:IV or steeper slopes shall be rolled down the slopes, not cross slope.

Following deployment, the CQA monitor shall visually examine the entire surface of the GCL for even bentonite distribution, thin spots, or other panel defects. All defects will be recorded and repaired in accordance with this LQCP. The QA/QC representative shall also verify the following:

- Proper overlap during deployment
- Seams between GCL panels are constructed per manufacturer's recommendations
- Defects are patched and overlapped properly
- The bentonite has not become excessively hydrated
- No stones, tools, cutting blades or other objects that could damage the GCL are present on the GCL.

Excessively hydrated GCL shall be removed and replaced with new material. Geomembrane shall not be placed on hydrated GCL.

GCL panels shall be given an identification code, mapped, and logged to record relevant installation information.

2.2.4 GCL Repairs

Torn or otherwise damaged geosynthetic facing must be patched with the same type of geosynthetic. The geosynthetic patch must extend at least 12 inches beyond the damaged area and must be heat bonded, or otherwise attached to the main GCL to avoid shifting during placement of overlying geosynthetics. If the GCL damage includes loss of bentonite, the patch must consist of full GCL extending at least 12 inches beyond the damaged area. Lapping procedures must be the same as specified for original laps of GCL panels.

2.2.5 GCL Protection

The overlying geosynthetics and soil layers shall be deployed in such a manner as to ensure that the GCL is not damaged. Textured geomembranes shall not be dragged across previously installed GCL. A smooth rubsheet shall be placed between the GCL and textured geomembrane to prevent damage. The rubsheet will be removed when the geomembrane is in position. Other methods may be employed at the POR's discretion.

To avoid local bentonite displacement, and the possible impact on the hydraulic performance of a GCL, the protective cover soil of suitable thickness should be placed over the geomembrane and geocomposite overlying the GCL as soon as practicable following completion of the geomembrane and leachate collection system construction.

3.0 GEOMEMBRANE LINER

This section presents general procedures, quality control testing requirements, and construction specifications for geomembrane liner construction. The alternative liner design includes the use of a 60-mil high-density polyethylene (HDPE) geomembrane liner with an exception for the overliner option which includes the use of a 60-mil linear low-density polyethylene (LLDPE) because its elastic properties are better suited for potential waste settlement.

3.1 Pre-installation Material Evaluation

3.1.1 Manufacturer's Quality Control Certificates

Prior to the installation of any geomembrane, the manufacturer or installer shall provide the POR with quality control certificates signed by a responsible party employed by the manufacturer. Each quality control certificate shall include roll identification numbers, testing procedures, and results of quality control tests. The quality control tests shall be performed in the manufacturing plant using the test methods and frequencies listed in the most recent version of the Geosynthetic Research Institute (GRI) test method GM13 for HDPE geomembrane and GM17 for LLDPE geomembrane. Recycled or reclaimed materials must not be used in the manufacturing process. The owner may require more frequent testing at his/her discretion.

The POR shall review the test results prior to accepting the geomembrane to assure that the certified minimum properties meet the minimum values for textured geomembranes, as determined by the most recent GRI test method GM13 or GM17. The current versions of the GRI test methods are included in Appendix III3F-1.

~~The rolls delivered to the site shall be inventoried, recording the manufacturer's name and product identification, and the roll thickness, number, and dimensions. Manufacturer's certificates should be cross-referenced to rolls delivered on-site.~~

Resumes of the installer's supervisor(s) or Master Seamer(s) shall be obtained to verify that adequate seaming experience will be utilized on the project. The installer's supervisor or Master Seamer shall have had experience totaling a minimum of 2,000,000 square feet of geomembrane installation.

~~Upon delivery of geosynthetic materials, storage and handling procedures shall also be documented. Rolls of geosynthetic materials shall be handled and stored in such a way as not to damage the material. As a general rule, rolls of geosynthetic materials should not be stacked more than four rolls high.~~

3.1.2 Conformance Testing

In addition to the manufacturer's quality control certificates, samples of the geomembrane will be obtained either at the manufacturing facility or upon delivery to the site for conformance testing. The test samples shall be obtained for conformance testing in accordance with the testing schedule shown in Table III3F-3, Geomembrane Conformance Test Schedule. Testing must be performed by an independent third party laboratory.

The POR shall review the test results to ensure that they meet the values presented in Table III3F-3, Geomembrane Conformance Test Schedule.

TABLE III3F-3: Geomembrane Conformance Test Schedule

TEST	METHOD(1)	FREQUENCY
Thickness (laboratory measurement)	ASTM D5994 (Textured)	Not less than 1 test per 50,000 ft^2 and every resin lot.
Density	ASTM D1505 or D792	Not less than 1 test per 100,000 ft^2 with not less than 1 per resin lot
Carbon black content	ASTM D4218	
Carbon black dispersion	ASTM D5596	
Tensile properties	ASTM D6693, Type IV	

Notes:
1. Updated ASTM or GRI methods may be implemented based on a review by the POR.

3.1.3 Shipping and Storage

Each roll shall be labeled with the manufacturing name, product identification, roll and lot number, dimensions, weight and any other informantion to trace quality assurance documentation. Upon delivery, storage and handling procedures shall be documented. Rolls shall be stacked, stored and handled in accordance with ASTM D5888 or the manufacturers recommendations. As a general rule, rolls should not be stacked more than four rolls high, and must be handled in a manner that does not damage the material. If any roll is observed to be damaged during shipping, unloading or storage, the damaged portion shall be removed before the roll is deployed.

The rolls delivered to the site shall be inventoried, recording the manufacturer's name and product identification, and the roll thickness, number, and dimensions. Manufacturer's certificates should be cross-referenced to rolls delivered on-site.

3.2 Installation Procedures

3.2.1 Geomembrane Deployment

The geomembrane shall be installed in direct and uniform contact with the GCL. The geomembrane shall not be placed during inclement weather, such as high winds or rain. Deployment of the geomembrane must not damage the underlying GCL. Geomembrane shall be unrolled, not drug across the GCL.

Geomembrane seaming should generally not take place when ambient temperatures are below 32 degrees Fahrenheit (°F), unless preheating is used. For extrusion welding, preheating will be required if the temperature is below 32°F and follow the procedures in the Geosynthetic Research Institute (GRI) Test Method GM-9. For fusion welding, preheating may be waived if the installer demonstrates that quality welds may be obtained without preheating. Seaming shall not be permitted at ambient temperatures above 104°F, unless the installer can demonstrate that seam quality is not compromised.

In general, only low ground pressure rubber-tired support equipment approved by the POR may be allowed on the geomembrane or GCL. If the POR observes any potential damage done to the liner by the support equipment, use of the equipment will cease and the damage will be repaired. Personnel working on the geomembrane shall not smoke, wear damaging shoes, or engage in any other activity likely to damage the geomembrane. Only those sections that are to be placed and seamed in one day should be unrolled. Panels left unseamed should be anchored with sandbags or other suitable weights. In general, seams should be oriented parallel to the line of maximum slope (i.e., oriented up and down, not across the slope). In corners and odd-shaped geometric locations, the number of field seams should be minimized. If end seams are necessary on the sideslope, locate them in the lower half of the slope. Seams that join the side slope panels to the floor should be located at least 5 feet from the toe of the slope.

Panels should be overlapped, as recommended by the manufacturer, as appropriate for the type of seam welding to be performed; however, overlapping shall be no less than ~~2~~ 3 inches and shall be verified by the POR or the CQA monitor. Field seaming shall only be performed by the method(s) approved by the manufacturer, either by extrusion welding or double-tracked fusion welding. No seaming shall take place without the installer's supervisor or Master Seamer and CQA monitor being present. Fishmouths, or wrinkles at the seam overlap, shall be cut along the ridge of the wrinkle to achieve a flat overlap. The cut shall be seamed and/or patched. Seams shall extend to the outside edge of panels placed in the anchor trench.

Panel layout and field seams shall be given an identification code, mapped, and logged to record relevant installation information. Inspection and testing records shall be logged as well as repair and retest data. Section 7.0 includes a thorough list of items to be documented during geomembrane construction and testing.

3.3 Installation Monitoring and Testing

3.3.1 Trial Seams

Each day prior to commencing field seaming, trial seams shall be made on pieces of geomembrane material to verify that conditions are adequate for production seaming. Trial seams shall be made at the beginning of each seaming period and shift (generally, at least twice each day) for each combination of production seaming machine and operator to be used that day. The trial test seam shall be at least 3 feet long by 1 foot wide (after seaming) with the seam centered lengthwise. Four 1-inch wide specimens shall be die-cut from the trial seam sample using a calibration field extensometer. Two specimens shall be tested in the field for shear and two for peel (test both inner and outer welds for dual track fusion welding) and shall be compared to the minimum seam strength requirements specified in the most current version of the Geosynthetic Research Institute, GRI Test Method GM19. The current versions of the GRI test methods are included in Appendix III3F-1. A copy of the current calibration certificate for the extensometer must be provided by the installer.

If any of the trial seam specimens fail, the entire trial seam operation shall be repeated. If an additional specimen fails during the second trial seam, the seaming machine and seamer shall not be used for seaming until the deficiencies are corrected and two consecutive successful trial seams are achieved. Additional trial seams shall be performed if frequent field seaming problems are experienced or if power to the seaming machines is interrupted sufficiently long to require rewarming.

3.3.2 Non-Destructive Testing

Continuous, non-destructive testing shall be performed on all seams by the installer. All leaks must be isolated and repaired by following the procedures described in this LQCP.

> Air Pressure Testing – ASTM D5820. The ends of the air channel of the dual-track fusion weld must be sealed and pressured to approximately 30 pounds per square inch (psi), if possible. The air pump must then be shut off and the air pressure observed after ~~2~~ 5 minutes. A loss of less than ~~3~~ 4 psi is acceptable if it is determined that the air channel is not blocked between the sealed ends. A loss greater or equal to ~~3~~ 4 psi indicates the presence of a seam leak that must then be isolated and repaired by following the procedures described in this LQCP. The POR or his/her qualified representative must observe and record all pressure gauge readings.
>
> Vacuum-Box Testing – ASTM D5641. Apply a vacuum of approximately 4 to 8 psi to all extrusion welded seams that can be tested in this manner. The seam must be observed for leaks for at least 10 seconds while subjected to this vacuum. The POR or his/her qualified representative must observe 100% of this testing.
>
> Other Testing. Other non-destructive testing must have prior written approval from the TCEQ.

3.3.3 Destructive Seam Testing

Destructive samples shall be taken at a minimum frequency of one test location, selected randomly, within each 500 linear feet of seam length, inclusive of both primary longitudinal and cross seams, cap strips, and repairs 20 square feet or larger. Each test sample should be of sufficient length and 12 inches wide with the seam located in the middle. Test specimens, approximately 1 inch wide, shall be cut from both ends of the sample for field testing (peel and shear). The remaining sample should be cut into three parts (one for quality assurance laboratory testing, one for installer quality control laboratory testing, and one for archive storage to be maintained at a location selected by the owner).

The field tests shall be conducted on a certified calibrated ~~tensiometer~~ extensometer capable of maintaining a constant extension rate of 2 inches per minute. If one of the field test specimens from the ends of the destructive sample fails, then the seam will be considered to have failed, and repairs shall be initiated as described below. If both specimens pass, then a sample for laboratory testing will be sent to the quality assurance laboratory for testing in both peel and shear. Seam strengths for HDPE geomembranes shall meet the minimum values specified in the most current version of the Geosynthetic Research Institute, GRI Test Method GM19 "Seam Strength and Related Properties of Thermally Bonded Polyolefin Geomembranes".

Destructive test results for both field and laboratory tests shall include qualitative data, including the location of the failure and locus-of-break code, as described in ASTM D6392. Peel tests on double-tracked fusion welds shall be performed on both inside and outside tracks of the weld. Seam break classifications for extrusion and fusion welds are shown on Figures III3F-1 and III3F-2, respectively.

At a minimum, a destructive test must be done for each welding machine used for seaming or repairs. A sufficient amount of the seam must be removed to conduct field testing, independent laboratory testing, and archiving of enough material to retest the seam when necessary. Destructive seam testing locations shall be cap-stripped and the cap completely seamed by extrusion welding to the geomembrane. Capped sections shall be non-destructively tested. Additional destructive test samples may be taken if deemed necessary by the POR or his/her qualified representative.

Weld Acceptance Criteria: For HDPE seams, the minimum passing criteria for destructive seam testing are described in the Geosynthetic Institute, GRI Test Method GM19. The POR must use the most current version of GM19 when evaluating welded seams.

Seam Failure Delineation: When a sample fails a destructive test, the installer shall trace the welding path to an intermediate location at least 10 feet in each direction, or a distance determined by the POR, from the point of the failed test and take 1-inch wide specimens for an additional set of field tests. If these additional samples pass the tests, then two laboratory destructive samples shall be taken adjacent to the intermediate locations or at locations determined by the POR or his/her representative. If these laboratory samples pass the tests, then the seam shall be repaired between these locations. If either sample fails, then the process shall be repeated to establish a zone where the seam should be repaired. All acceptable repaired seams shall be bounded by two locations from which samples passing laboratory destructive tests have been taken.

Seam Failure Repairs: Any portion of the geomembrane exhibiting a flaw or failing a destructive or non-destructive test shall be repaired. Repair methods may include spot welding (extrusion) for minor flaws and punctures; patches for larger holes and tears; capping for large lengths of failed seams or panel damage; and extrusion welding of outer flap to repair an inadequate fusion seam (less than 100-feet cumulative length) that has an exposed edge.

For any repair method, the following provisions shall be satisfied:

- Surfaces of the geomembrane that are to be repaired using extrusion methods shall be ground no more than one hour prior to the repair.
- All surfaces shall be clean and dry at the time of repair.
- Patches or caps shall extend at least 6 inches beyond the edge of the defect, and all corners of patches shall be rounded with a radius of approximately 3 inches.
- All repairs shall be non-destructively tested, as previously described.
- All seaming equipment, personnel, and operation procedures used in repair work shall meet the same requirements as for new seaming operations.

The POR or his/her qualified representative shall observe all non-destructive testing of repairs and shall record the number of each repair, type, date, and test outcome. Repairs that pass the non-destructive tests shall be taken as an indication of an adequate repair. Repairs more than 150 feet long shall also be required to have a destructive test performed. Repairs that fail the initial retest shall be redone and retested until a passing test results. All work and testing of repairs shall be fully documented in a repair log.

When placing overlying material on the geomembrane, effort must be made to minimize wrinkle development. If possible, cover should be placed during the coolest weather available. Small wrinkles should be isolated and covered as quickly as possible to prevent their growth. In no case shall the geomembrane be allowed to fold over on itself.

4.0 LEACHATE COLLECTION SYSTEM

4.1 Leachate Collection System and Drainage Materials

The leachate collection trenches and sumps shall be constructed in conjunction with liner construction. All GCL and geomembrane testing shall be completed prior to installing the leachate collection system on the area under evaluation. The locations of the trenches and sumps and design details are shown on the Figures III3-2A, III3-2B, III3-6A, III3-6B, and III3-8. The installation of the leachate collection system and protective cover system will have continuous inspection by the POR or his/her qualified representative(s). Quality assurance monitoring shall consist of measuring the dimensions of the excavated trenches and sumps, and documenting that the pipe, geotextile filters, bedding materials and drainage layers have been placed in accordance with the design details. All data and observations regarding construction of the leachate collection system shall be documented in the ~~Geosynthetic~~ Liner Evaluation Report (~~G~~LER).

Materials selected for use in the leachate collection system and drainage layers shall be verified by the POR to comply with this section of the LQCP.

4.1.1 Double-sided Geocomposite Drainage Layer

Geosynthetic drainage material shall conform to the material and performance properties specified in Table III3F-4, Geosynthetic Drainage Layer Specifications. Manufacturers' certificates of material and performance characteristics shall be obtained and documented at the minimum frequency shown on Table III3F-4, Geosynthetic Drainage Layer Specifications, with not less than one per resin lot. Geosynthetic drainage material conformance testing will consist of transmissivity testing on each material type using the test set-up described in Table III3F-4, Geosynthetic Drainage Layer Specifications.

The drainage layer for the leachate collection system will consist of a geosynthetic drainage layer over both the floor and sideslopes of the landfill cells. The geosynthetic drainage layer shall consist of a geonet with a nonwoven geotextile heat-bonded to both sides. The geosynthetic drainage layer shall be anchored in an anchor trench at the crest of the sideslopes.

Geotextile panels placed in the leachate collection system shall be overlapped and either heat-bonded or field sewn. Only low ground pressure rubber-tired support equipment approved by the POR may be allowed on the geotextile. Personnel working on the geotextile shall not smoke, wear damaging shoes, or engage in any activity that damages the geotextile, or underlying geosynthetics.

TABLE III3F-4: Geosynthetic Drainage Layer Specifications~~(1)~~

Test Category	Product	Test[a]	Test Method[b]	Testing Frequency
Manufacturer	Resin (Geonet)	Density	ASTM D792 or D1505	One test per 100,000 ft^2 and every resin lot
		Melt Flow Index	ASTM D1238	
Manufacturer	Geonet	Density	ASTM D792 or D1505	One test per 100,000 ft^2 and every resin lot
		Nass / Area	ASTM D5261	
		Thickness	ASTM D5199	
		Compression	ASTM D1621	
		Transmissivity	ASTM D4716	
Manufacturer	Geotextile	Mass/Area	ASTM D5261	One test per 100,000 ft^2 and every resin lot
		Grab Tensile Strength	AASTM D4632	
		Trapezoidal Tear Strength	ASTM D4533	
		Burst Strength	ASTM D3786	
		Puncture Strength	ASTN D4833	
		Thickness	ASTM D5199	
		Apparent Opening Size	ASTM D4751	
		Permittivity	ASTM D4491	
Independent Laboratory	Geocomposite Product	Transmissivity	ASTM D4716	One test per product type

		Interface Shear or Ply Adhesion	ASTM D5321 OR D413	One test per project

~~**GEOCOMPOSITE**~~					
~~**Property**~~	~~**Qualifier**~~	~~**Unit**~~	~~**Value**~~	~~**Test Method**~~	~~**Frequency**~~
~~Transmissivity~~	~~Min.~~	~~m^2/sec~~	~~See note 1~~	~~ASTM D4716[(2)]~~	~~200,000 sf~~
~~Ply Adhesion~~	~~Min.~~	~~lb/in~~	~~0.5~~	~~ASTM D7005~~	~~200,000 sf~~
~~**GEONET CORE**~~					
~~**Property**~~	~~**Qualifier**~~	~~**Unit**~~	~~**Value**~~	~~**Test Method**~~	~~**Frequency**~~
~~Thickness~~	~~Min.~~	~~mils~~	~~See note 1~~	~~ASTM D5199~~	~~200,000 sf~~
~~Density (black resin)~~	~~Min.~~	~~g/cm^3~~	~~0.940~~	~~ASTM D1505~~	~~200,000 sf~~
~~Carbon Black Content~~	~~Range~~	~~%~~	~~2 to 3~~	~~ASTM D4218~~	~~200,000 sf~~
~~**GEOTEXTILE**~~					
~~**Property**~~	~~**Qualifier**~~	~~**Unit**~~	~~**Value**~~	~~**Test Method**~~	~~**Frequency**~~
~~Mass per Unit Area~~	~~MARV~~	~~oz/yd^2~~	~~6~~	~~ASTM D5261~~	~~200,000 sf~~
~~AOS~~		~~US Sieve (mm)~~	~~70 (0.210)~~	~~ASTM D4751~~	~~540,000 sf~~

~~Notes:~~
~~(1) See Appendix III3D-3D-1 for design calculations for the geocomposite. These calculations shall be referenced to determine the suitability of the alternate materials.~~
~~(2) The transmissivity shall be measured at a minimum gradient of 0.1 under a minimum normal pressure of 10,000 psf with a minimum seating period of 100 hour.~~

[a] Adapted from EPA/600/R-93/182, September 1993, and *Designing with Geosynthetics*, 6th ed.
[b] The POR may propose equivalent or better tests.

4.1.2 Filter Geotextile

The leachate drainage aggregate that is placed in the collection trenches and sumps shall be wrapped in a geotextile filter fabric. The geotextile shall have the minimum properties listed in Table III3F-5, Nonwoven Filter Geotextile Specifications .

Table III3F-5: Nonwoven Filter Geotextile Specifications

Property	**Qualifier**	**Unit**	**Value**	**Test Method**	**Frequency**
Mass per Unit Area	MARV	oz/yd^2	7.5	ASTM D5261	100,000 sf
AOS		US Sieve (mm)	80 (0.15)	ASTM D4751	550,000 sf
Puncture Resistance		lb	550	ASTM D6241	550,000 sf
Grab Tensile Strength		lb	205	ASTM D4632	100,000 sf

4.1.3 Leachate Pipe

The leachate piping includes perforated collection trench pipes and solid sideslope riser pipes. The leachate piping shall conform to ASTM D3350 with a minimum cell classification value of 345464C. The pipe shall have the minimum SDR rating and perforation schedule shown on the plans and specifications.

4.1.4 Drainage Material

Granular drainage materials, to be used in the underdrains, along the leachate collection lines, and in the sumps. At least one set of pre-construction tests shall be conducted for each drainage medium from each proposed source and a minimum of one per each 3000 cy. Pre-construction tests shall include a complete grain-size analysis, including minus No. 200 Sieve (ASTM D422) and calcium carbonate content (ASTM D3042 modified to use hydrochloric acid with a pH of 5 or the J&L method). The grain-size analysis will be used to determine if the material is compatible with the perforations in the leachate collection pipes and if the material is expected to achieve a minimum permeability of 1×10^{-2} cm/sec. The measured calcium carbonate content must not exceed 15 percent.

Granular drainage materials selected for use shall be tested at regular intervals for conformance during construction. Minimum testing frequency shall include one grain-size analysis for every 3,000 cubic yards, or portion thereof, for each material being used.

4.2 Protective Cover Material

Protective cover materials shall be free of deleterious materials that could puncture the synthetic lining system. The protective cover material shall be selected and placed so as not to harm the geomembrane or other geosynthetic layers. The installation of the leachate collection system and protective cover system will have continuous inspection by the POR or his/her qualified representative(s).

Visual observations shall be made to verify that no deleterious materials are present in the protective cover that could damage the lining and leachate collection systems or impede their performance as designed.

Alternate protective cover material, such as shredded tire chips, may only be used when overlying a protective layer of sufficient puncture resistance to prevent penetration of steel belting fragments or other deleterious materials through the geosynthetic drainage layers or geomembrane. Prior to use of an alternate protective cover material, written approval will be obtained from the TCEQ.

Protective cover does not require compaction control; however, it should be stable for construction and disposal traffic. Care shall be exercised in placement so as not to shift, wrinkle, or damage the underlying geosynthetic layers, and the placement methods shall be documented. Protective cover placement should be conducted at the coolest part of the day to minimize the development of wrinkles in the geosynthetic materials.

The protective cover shall be placed such that the top surface, while spreading, is at least 2 feet above the geosynthetic layers at all times unless low ground pressure dozers are used (i.e., track pressure less than 5 psi). A greater thickness shall be maintained to support loaded hauling trucks and trailers and for turning

5.4 Alternative Liner Stability During Construction

30 TAC §330.337(f)(1)

The dewatering system will prevent excessive pressure head from developing beneath the alternative liner during construction because the double-sided geocomposite and toe drains have been designed to accommodate the maximum anticipated inflow of groundwater as presented in Appendix III3E-2, Dewatering System Calculations. During construction activities, the POR shall evaluate the groundwater level and confirm the underdrain design.

The POR shall observe the liner subgrade, liner, and leachate collection system materials for the presence of groundwater seepage during construction to verify the subgrade is suitable for liner system construction. The entire subgrade shall be observed during excavation, and the occurrence of the following shall be noted:

- Groundwater seepage within the subgrade.
- Softening of the subgrade surface resulting from groundwater seepage.
- Softness or sheen in the secondary features resulting from groundwater seepage.

In each GLER, observations and subgrade evaluations performed by the POR will be presented to verify that the subgrade soils are suitable for liner system construction.

5.5 Alternative Liner Stability During Filling and Operation

30 TAC §330.337(c)

After the waste management unit is constructed and approved to receive waste, landfill operators shall ensure the stability of the alternative liner by maintaining continuous operation of the dewatering system. The underdrain will be in operation until sufficient ballast is in place to offset hydrostatic uplift.

6.0 BALLAST REQUIREMENTS

To offset hydrostatic uplift, the weight of the alternative liner and the waste placed above it will provide the ballast (weight) to protect the liner system from uplift forces from groundwater. The ballast counteracting the hydrostatic forces include the soil materials from the leachate collection system components, the protective cover, waste above the liner and leachate collection system, and the soil materials from the final cover. The weight of the geosynthetic components of the leachate collection system and any geosynthetic components of the final cover is considered negligible.

6.1 Seasonal High Groundwater Table

30 TAC §330.337(i)

To evaluate the ballast required to offset hydrostatic uplift, groundwater levels within the waste management unit must be assessed. Groundwater level data are presented in Appendix III3F-2. Using groundwater level data provided in III4E, Historic Groundwater Levels. Figures III3F-3A and III3F-3B present the seasonal high groundwater contours elevations.

For each new increment of liner construction, the POR shall reevaluate the seasonal high groundwater table for the construction area as part of the Geosynthetic Liner Evaluation Report (GLER) submittal. The seasonal high water table shall be adjusted upward, if necessary, as additional groundwater elevation data become available.

6.2 Ballast Thickness Calculations

The required ballast thickness will be calculated using the following procedures:

1. Determine the hydrostatic uplift pressure, *P*, acting on the alternative liner from the assumed seasonal high groundwater table, and the resistance provided by the ballast:

   Determine the maximum hydrostatic uplift pressure, *P*, acting on the geomembrane component of the alternative liner using the unit weight of water, γ_w, times the vertical distance from the base of the alternative liner to the seasonal high water table, H_{wt}.

   $$P = \gamma_w H_{wt}$$

   The resisting pressure, R_N, provided by the ballast is equal to the normal component of the sum of the unit weights of each ballast component, γ_i, times their respective vertical thickness, T_i, as shown in the following equation:

   $$R_N = \Sigma(\gamma_i T_i)\cos^2 \beta$$

   Where β is the angle between the slope of alternative liner and horizontal.

2. The equations for *R* and *P* are solved for equilibrium to find the thickness of ballast required to counteract the calculated water pressure.

   The safety factors indicated in the regulations, either 1.2 or 1.5 depending on the type and configuration of ballast used, are incorporated into the above referenced equations by multiplying by the appropriate factor. If only soil ballast is used, a factor of 1.2 is used in the equation, and if some combination of soil layers and waste is used as ballast, a factor of 1.5 is used.

   $$1.2P = R \qquad or \qquad 1.5P = R$$

   When the equations for *R* and *P* are input, the required waste thickness, and/or required ballast thickness, is then determined. The equations can be solved for any location within or near an excavation where the piezometric profile is known or can be estimated.

The example ballast calculation are presented in Appendix III3E-1, Sufficient Ballast Calculations.

In each GLER, waste for ballast calculations will be provided to determine the minimum amount of waste needed, if any, to offset the hydrostatic uplift from the seasonal high water table.

6.3 Ballast Verification

30 TAC §330.337(f)(2)

When the operator determines that adequate ballast is in place, the amount of ballast must be verified to be sufficient to offset hydrostatic uplift on the alternative liner by a factor of 1.5 per Appendix III3E-1, ~~Example~~ Sufficient Ballast Calculations. The measures and tests used to verify that any ballast including waste are sufficient to meet the established ballast criteria include surveyed elevations to determine component thickness and density to determine component weight. In addition, the seasonal high water table shall be adjusted upward, if necessary, as additional groundwater elevation data become available.

7.0 MARKING AND IDENTIFYING EVALUATED AREAS

In accordance with 30 TAC §330.143(b)(1) and (6), markers shall be placed so that all areas for which the GLER have been submitted and approved by the TCEQ are readily identifiable. Such markers are to provide site workers with immediate knowledge of the extent of approved disposal areas and shall be placed in accordance with the Site Operating Plan.

Markers shall be metal, wooden, or recycled posts and shall extend at least 6 feet above ground level. Markers shall not be obscured by vegetation and shall be placed so that they are not destroyed during operations. Sufficient intermediate markers shall be installed to show the required boundary. Lost markers shall be promptly replaced. Limits of the evaluated area shall be referenced to the site grid system. Markers shall not be placed inside the evaluated area. Markers shall be color coded in accordance with 30 TAC §330.143(b)(1). GLER markers shall be red in color.

8.0 DOCUMENTATION AND REPORTING

~~8.0~~ The use of applicable TCEQ forms is required. Forms for liners and leachate collection systems and forms for excavation dewatering and liner ballast is posted on the TCEQ website.

8.1 Geosythentic Liner Evaluation Report

30 TAC §330.341

A Geosynthetic Liner Evaluation Report (GLER) includes documentation of cell construction including geosynthetic clay liner installation, geomembrane installation, and leachate collection system installation including protective cover soil. Prior to the disposal of solid waste in any cell, or on any area, excavation, or unprotected surface, a GLER shall be submitted to the TCEQ.

Each GLER shall be submitted in triplicate (including all attachments) to the executive director and shall be prepared in accordance with the methods and procedures contained in this LQCP. If the executive director provides no response, either written or verbal, within 14 days of receipt, the owner or operator may continue facility construction or operation.

If the executive director determines that a report is incomplete or that the test data provided are insufficient to support the evaluation conclusions, additional test data or other information may be required, and use of the cell or disposal area will not be allowed until such additional data are received, reviewed, and accepted. Each report must be signed and, where applicable, sealed by the POR performing the evaluation and counter-signed by the facility operator or an authorized representative.

The construction documentation provided in the GLER will contain a narrative describing the work conducted and testing programs required by the LQCP, "as-built" or record drawings, and appendices of field and laboratory data. The GLER will contain or discuss the information included in Table III3F-~~7~~6, GLER Content at a minimum.

Table III3F-~~7~~6: GLER Content

Geosynthetic Clay Liner	Roll shipment and receipt information
	Manufacturer's quality control certificates and results
	Storage and handling information
	Conformance test sampling and test results
	Subgrade acceptance
	Anchor trench preparation and backfilling
	Panel deployment, identification, and placement
	Equipment placed or operated on GCL
	100 percent visual inspection for defects, damage, etc.
	Seaming methods
	Repairs, including patch size and shape
Geomembrane Liner	Roll shipment and receipt information
	Manufacturer's quality control certificates and results
	Storage and handling information
	Conformance test sampling and test results
	Seamer's names and resumes of experience and qualifications
	Subgrade acceptance
	Anchor trench preparation and backfilling
	Panel deployment, identification, and placement
	Seam preparation, orientation, and identification
	Equipment placed or operated on geomembrane
	100 percent visual inspection for defects, damage, etc.
	Trial seam tests for each combination of seaming equipment and personnel

PERMIT AMENDMENT APPLICATION

Part III, Attachment 4

GEOLOGY REPORT

Edinburg Regional Disposal Facility

Edinburg, Hidalgo County, Texas

TCEQ Permit MSW-956C

Submitted To: City of Edinburg
Department of Solid Waste Management
8601 North Jasman Road
Edinburg, Texas 78542 USA

Submitted By: Golder Associates Inc.
500 Century Plaza Drive, Suite 190
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July 2017
Revised: November 2017

Project No. 1401491

1.0 REGIONAL GEOLOGY

The Gulf of Mexico (GOM) is a semi-enclosed ocean basin surrounded by continental shelves and coastal plains. The GOM's depositional system is a three-dimensional body of sediment deposited in a contiguous suite of process-related sedimentary environments and each sedimentary environment produces specific c facies / rock types. The stratigraphy along the GOM is composed of fluvial depositional systems created by regionally cyclic episodes of focused deposition and progradation of the shoreline followed by non-deposition and transgression of the coastal plain. The timing and cyclicity of progradational and transgressive events depends upon the interplay of sediment supply, subsidence, and sea-level change caused by both tectonic development and continental glaciation (Young, 2010).

In the Lower Rio Grande Valley (LRGV) the depositional stratigraphy described as the Gulf Coast Aquifer (GCA) are Quaternary and Neogene period sediments consisting primarily of fine to medium-grained materials deposited by fluvial and eolian processes. The outcrop of each progressively older, underlying unit is found to the west of the younger, overlying unit. Because of differential subsidence, units typically thicken and dip toward the coastline of the GOM.

1.1 Geologic Map

30 TAC §330.63(e)(1)(A)

Figure III4-1, Geologic Map presents the McAllen-Brownsville Sheet, Geologic Atlas of Texas prepared by the Bureau of Economic Geology. This map presents geologic units and structural features within the vicinity of the facility with text describing the stratigraphy and lithology of the map units. The facility is located on Neogene sediment overlain by Quaternary (Holocene) windblown (eolian) sediment.

1.2 Generalized Stratigraphic Column

30 TAC §330.63(e)(1)(B)

The generalized stratigraphic column of the area beneath the facility is presented to a depth of approximately 1,600 ft-bgs, which is the base of the Evangeline Aquifer. Based on Figure III4-1, Geologic Map and Figure III4-2, Regional Stratigraphic Cross-Section, the Goliad Formation outcrops in the vicinity and is overlain by a veneer of Holocene eolian deposits. A description of the stratigraphy, including geologic age, lithology including variations, thickness, depth, geometry, hydraulic conductivity, and depositional setting of each geologic unit, as available through current geologic information, is included in Table III4-1, Stratigraphic Units Underlying Facility.

Deposits include successions of clay, marl, and caliche. Base elevations and thicknesses for the upper and lower Goliad Formation are presented on Figures III4-3 and III4-4 respectively.

The Upper Goliad's depositional facies is fluvial / meander belt. Fluvial channel-fill facies are composed mainly of medium- to coarse-grained sand and gravel, displaying large-scale cross-bedding. Inter-channel facies include sandy crevasse splays, and muddy floodplain and playa lake facies formed where flood waters breached channel levees and deposited broad aprons of sandy sediment on the floodplain. These facies surround channel-fill and crevasse-splay facies and were deposited across inter-channel areas during floods. Mottled red clays dominate floodplain successions, and secondary calichification and pedogenesis are pervasive. The Lower Goliad's depositional facies is lower coastal plain fluvial / coastal which includes small deltaic and barrier-lagoon depositional systems. Channel belt composition is sandy sediment whereas interchannel composition is calcareous mudstone (Young, 2010).

1.2.2.2 Lagarto Formation

The Lagarto Formation underlies the Goliad Formation and is divided into upper, middle, and lower units. Base elevations and thicknesses for the upper and middle Lagarto Formation are presented on Figures III4-5 and III4-6 respectively. The depositional facies underlying the facility is lower coastal plain fluvial / coastal which includes small deltaic and barrier-lagoon depositional systems. The Lagarto Formation represents a fluvial-deltaic depositional episode in which the upper Lagarto forms the upper progradational part, and the middle and lower Lagarto forms the lower retrogradational part. Therefore, the upper part is generally sand-rich, whereas the middle and lower parts are relatively more mud-rich. The mud-rich parts of the Lagarto are referred to as the Burkeville Aquitard which underlies the Evangeline Aquifer.

2.0 ACTIVE GEOLOGIC PROCESSES

30 TAC §330.63(e)(2)

A description of active geologic processes in the vicinity of the facility including identification of any faults and subsidence in the area of the facility is discussed in the following sections.

2.1 Erosion

Erosion potential caused by surface water processes such as overland flow, channeling, gullying, and wind has been evaluated.

2.1.1 Soils

Figure III4-7, Soils Map presents the distribution of six soil series, predominantly loamy, located across the facility according to the Soil Survey of Hidalgo County, Texas (Jacobs, 1981). These soil series include: the Brennan, Hebbronville (#22, #23, and #24), Hidalgo, Racombs, and Willacy Series. Table III4-2, Soil

Types lists sixteen soil types within the facility boundary, percentage of area covered, and potential for water and wind erosion.

Table III4-2: Soil Types

Soil	Unit Name	Area Covered[1] (%)	Water Erosion Hazard	Wind Blowing Hazard
3	Brennan fine sandy loam, 0 to 1 percent slopes	7.8	Slight	Moderate
9	Delfina loamy fine sand, warm, 0 to 2 percent slopes	4.2	Moderate	Severe
16	Hargill fine sandy loam, 0 to 1 percent slopes	9.5	Slight	Moderate
17	Hargill fine sandy loam, 1 to 3 percent slopes	6.6	Moderate	Moderate
22	Hebbronville sandy loam, 0 to 1 percent slopes	7.7	Slight	Moderate
23	Hebbronville sandy loam, 1 to 3 percent slopes	11.7	Moderate	Moderate
24	Hebbronville sandy loam, 3 to 5 percent slopes	8.9	Severe	Moderate
25	Hidalgo fine sandy loam, 0 to 1 percent slopes	9.1	Slight	Moderate
48	Racombes sandy clay loam	5.1	Slight	Slight
60	Rio clay loam	1.2	Moderate	Slight
70	Willacy fine sandy loam, 0 to 1 percent slopes	19.1	Slight	Moderate
71	Willacy fine sandy loam, 1 to 3 percent slopes	4.0	Moderate	Moderate

Notes:
1. The percentages do not add up to 100% due to part of the area being occupied by the landfill and ponds that are not accounted for in the data. The data is obtained from the NRCS Web Soil Survey Tool: http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

2.1.2 Surface Water Erosion

Surface water erosion will not adversely affect the operation of the facility. Gullying and channeling are uncommon in the area because of high infiltration rates and little relief. Soils in the area are well drained and have slopes of less than or equal to 5.2% (Jacobs et al., 1981). Sheet flow only occurs during very heavy rainfall as evident by lack of natural drainage features on or near the facility.

The soil types located in the facility are either slightly or moderately erodible by surface water with an exception of Hebbronville #24. This soil, located in the middle of the facility, exhibits severe water erosion potential and covers approximately nine percent of the facility. Most of this soil will be removed as development of the facility progresses.

An erosion and sedimentation control plan is included in Part III2, Surface Water Drainage Report of this application was developed to mitigate erosion potential along landfill embankments and sedimentation in surface water drainage features. Erosion and sediment controls will be implemented during the construction and operational periods of the facility.

2.1.3 Wind Erosion

Wind erosion will not adversely affect the operation of the facility. Prevailing winds can erode surface sediments in the area (Barnes, 1976). The soil types located in the facility are either slightly or moderately erodible by wind with an exception of Delfina #9. This soil, located in the south east corner of the facility, exhibits severe wind erosion potential and covers approximately four percent of the facility. This soil will be removed as development of the facility progresses for construction of a future perimeter berm, access road, and storm water pond.

2.2 Active Geological Faulting Assessment

30 TAC §330.555(b)

A location restriction criterion requires that new municipal solid waste landfill units and lateral expansions shall not be located within 200 feet of a fault that has had displacement in Holocene time (representing the most recent 10,000 years), referred to herein as an active fault. Sites located within areas that may be subject to differential subsidence or active geological faulting must include detailed fault studies. When an active fault is known to exist within 1/2 mile of the site, the site must be investigated for unknown faults. There is no evidence of active geological faulting or differential subsidence that would impair the integrity of any landfill component.

Salt domes cause much of the recent fault activity in the Gulf Coastal Plains. In Hidalgo County, salt domes are rare because the Jurassic salt layer, found throughout the Gulf Coast, is thin (Worral & Snelson, 1989). This occurrence has reduced recent fault activity to a minimum in Hidalgo County. The Geologic Atlas of Texas (McAllen-Brownsville Sheet) presented in Figure III4-1, Geology Map and Texas Water Development Board (TWDB) Reports (Young et al. 2010 and Mace et al. 2006) showing faults, were reviewed to determine the presence of faults within the vicinity. Based on the review of the maps and published literature, there are no faults or surface expression of Holocene faults indicated within a one-half-mile radius of the facility. As depicted on Figure III4-1, Geologic Map there are no mapped surface expressions of active or inactive faults located within at least a five-mile-radius of the facility.

2.3 Seismic Impact Zone Assessment

30 TAC §330.557

A location restriction criterion requires new municipal solid waste landfill units and lateral expansions shall not be located in seismic impact zones. A seismic impact zone is defined as an area with a 10-percent or greater probability that the maximum horizontal acceleration in lithified earth material, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10 g in 250 years.

the Jasper (Chowdhury and Mace 2007). Figure III4-9, ~~Extent of~~ Gulf Coast Aquifers in Lower Rio Grande Valley shows the outcrop areas of the different aquifers in the region.

Underlying the facility is the Evangeline Aquifer which overlies the Burkeville Confining Unit; their association with geologic units is presented in Table III4-3, Hydrogeologic Units Underlying the Facility.

Table III4-3: Hydrogeologic Units Underlying the Facility

System	Series	Stratigraphic Units	Lithology	Approx. Thickness (ft)	Approx. Depth (ft-bgs)	Hydro-stratigraphy	Water Bearing Properties
Quaternary	Holocene	Stabilized Sand Dune Deposits	Sand; Silt	0-30	10	Evangeline Aquifer	Moderate to very high permeability, low to moderate water-holding capacity.
Neogene	Miocene	Upper Goliad	Clay or Mud; Sandstone; Mudstone, Carbonate, Limestone, Conglomerate	400	400		Moderate permeability, moderate water-holding capacity. Provides water for domestic and irrigation uses.
		Lower Goliad		550	950		
		Upper Lagarto	Sandstone	650	1600		
		Middle Lagarto	Clay or Mud	700	2300	Burkeville Confining Unit	Regional aquitard, low permeability.

(Table compiled after Baker, 1979; Chowdhury and Mace, 2007; and Young et al., 2010)

3.1 Composition

30 TAC §330.63(e)(3)(B)

The Evangeline Aquifer is composed primarily of the Goliad Sand, but may also contain sections of sand and clay from the Upper Lagarto Formation. It is approximately 1,600 feet thick under the facility and dips towards the coast approaching thicknesses greater than 2,300 ft. Sand fractions in the Evangeline are observed to range from less than 0.4 to greater than 0.6 (Young et al., 2010).

3.2 Hydraulic Properties

30 TAC §330.63(e)(3)(C)

Transmissivity values are observed to range from 3,000 to 15,000 ft^2/day (Chowdhury and Mace, 2007). Average horizontal and vertical hydraulic conductivities are 80 feet/day and 1×10^{-3} feet/day, for horizontal and vertical, respectively (Ryder, 1988). The storativity of the Evangeline Aquifer ranges from 0.001 to 0.01 in the unconfined areas and 0.0004 to 0.001 in the confined areas (Chowdhury and Mace, 2007).

3.3 Under Water Table or Artesian Conditions

30 TAC §330.63(e)(3)(D)

The Evangeline Aquifer generally ~~exhibits~~ exists under water table conditions, however successions of clay may cause portions to behave as a semi-confined aquifer.

3.4 Hydraulic Connectivity

30 TAC §330.63(e)(3)(E)

The Evangeline Aquifer is hydraulically bounded by the underlying Burkeville Confining Unit, located at a depth of approximately 1600 ft, which separates it from the underlying Jasper Aquifer. Within the Goliad's sand-dominated fluvial systems, sand bodies are highly interconnected (Young, 2010).

3.5 Regional Water-Table Potentiometric Surface Maps

30 TAC §330.63(e)(3)(F)

Figure III4-10, Evangeline Aquifer Potentiometric Surface and Hydraulic Conductivity presents a regional potentiometric surface map which demonstrates the regional groundwater flow direction to the east/southeast.

3.6 Rate of Groundwater Flow

30 TAC §330.63(e)(3)(G)

The aquifers of the GCA dip towards the coast and groundwater flow is towards the Gulf of Mexico. The estimated average rate of horizontal groundwater flow for the Evangeline Aquifer is 80 ft/day (Ryder, 1988).

3.7 Total Dissolved Solids

30 TAC §330.63(e)(3)(H)

Typical range of values for total dissolved solids content of groundwater, mineral constituents dissolved from rocks and soils within the Evangeline Aquifer is 632 – 8,774 mg/L with a 0.0 to 0.2 fraction of aquifer thickness that is fresh water (Young, 2010). A general classification of water based on dissolved solids content is as follows; waters containing less than 1,000 mg/L of dissolved solids are considered fresh; 1,000 to 3,000 mg/L, slightly saline; 3,000 to 10,000 mg/L, moderately saline; 10,000 to 35,000 mg/L, very saline, and more than 35,000 mg/L, brine (Winslow and Kister, 1956, p.5)

3.8 Areas of Recharge

30 TAC §330.63(e)(3)(I)

The source of the water which recharges the associated hydrostratigraphic units of the GCA is from precipitation directly onto outcrops, discharging surface water in the Rio Grande and Arroyo Colorado Rivers, and irrigation return flow. According to Figure III4-9, ~~Extent of~~ Gulf Coast Aquifers in Lower Rio Grande Valley, the facility is located in a recharge area for the Chicot Aquifer. Figure III4-1, Geologic Map demonstrates Holocene-age eolian deposits overlying the Goliad Formation of the Evangeline Aquifer and the Lissie Formation of the Chicot Aquifer within a five-mile radius of the facility. Therefore, areas within a five-mile radius recharge both the Chicot and Evangeline Aquifers.

3.9 Local Groundwater Use

30 TAC §330.63(e)(3)(J)

The Rio Grande River is the primary source of domestic water in the Lower Rio Grande Valley. When groundwater is used, it generally comes from the thin layer of the Chicot aquifer, if present, or upper portions of the Evangeline aquifer. Groundwater wells within a one-mile-radius of the facility were located based on a water well database search of located wells from the Texas Water Development Board (TWDB) and on information supplied by the Red Sands Groundwater Conservation District (RSGCD). Figure III4-11, Water Well Location Map depicts approximate water well locations.

The TWDB database search identified six located water wells within a one-mile-radius of the facility summarized in Table III4-4A, Water Well Locations within One-Mile-Radius Provided by TWDB. From available screened depth information, total depths of these water wells range from 74 ft to 1250 ft and extend into the upper parts of the Evangeline Aquifer. In addition to the TWDB database search, RSGCD provided approximate locations for six additional water wells within a one-mile-radius of the facility summarized in Table III4-4B, Water Well Locations within One-Mile-Radius Provided by RSGCD. The locations of these additional wells or records could not be verified.

Table III4-4A: Water Well Locations within One-Mile-Radius Provided by TWDB

State Well Number	Map ID[1]	Latitude	Longitude	Surface Elev. (ft)	Total Depth (ft)	Screen Interval (ft)	Approx. Distance from site[2] (ft)	Water Use[3]
8739901	WW-1	26°24’06”N	98°08’16”W	86	258	NA	1,440	Domestic (P) Stock (S)
8739902	WW-2	26°23’41”N	98°08’29”W	84	240	160-240	2,230	Domestic (P) Stock (S)
8739903	WW-3	26°23’36”N	98°08’31”W	83	1125	NA	2,340	Irrigation

State Well Number	Map ID[1]	Latitude	Longitude	Surface Elev. (ft)	Total Depth (ft)	Screen Interval (ft)	Approx. Distance from site[2] (ft)	Water Use[3]
8740701	WW-4	26°24'48"N	98°06'25"W	87	223	124-155	4,740	Stock
8740702	WW-5	26°24'17"N	98°06'29"W	89	74	185-216	2,200	Stock
8740703	WW-6	26°24'59"N	98°06'59"W	101	1250	NA	5,150	Irrigation

1. Map ID as shown on Figure III4-7, Water Wells
2. Distances are estimated to nearest facility property boundary
3. (P) – primary water use; (S) – secondary water use (obtained from well logs)
~~3.~~4. NA – Information not available

Table III4-4B: Water Well Locations within One-Mile-Radius Provided by RSGCD

Well Reference/Owner Name	Map ID[1]	Latitude[2]	Longitude[2]	Approx. Distance from site[3] (ft)
E.B. Guerra Elementary School	WW-7	26°24'07"N	98°08'57"W	5,110
Garza Well	WW-8	26°24'04"N	98°08'50"W	4,480
Chandler Well	WW-9	26°24'07"N	98°08'26"W	2,390
Labus Water Well	WW-10	26°24'01"N	98°08'27"W	2,350
Gin Well	WW-11	26°24'29"N	98°08'14"W	3,200
Neal Well	WW-12	26°24'45"N	98°08'10"W	4,530

1. Map ID as shown on Figure III4-7, Water Wells
2. Well locations are approximately estimated based on hand-marked map provided by RSGCD, dated March 18, 2016
3. Distances are estimated to nearest facility property boundary.
~~3.~~4. Screened interval information of water wells from RSGCD are not available.

The facility's engineered design and operational groundwater monitoring mitigate potential impacts on groundwater use within the vicinity. The facility's waste disposal units are constructed with a low-permeability geosynthetic lining system to prevent potential contaminant transport into the groundwater. In an unlikely event contaminants are released, the facility's groundwater monitoring system will detect the release and corrective measures will be implemented. In addition, the closest water well has over 1,400 ft of separation from the facility property boundary; therefore, any contaminants will be attenuated or remediated prior to potential impacts on groundwater use.

4.0 SUBSURFACE INVESTIGATION

30 TAC §330.63(e)(4)

The subsurface investigation at the facility includes a description of all borings drilled on site to test soils and characterize groundwater. Geologic strata have been characterized to depths of up to 100 feet below ground surface from the current and previous subsurface investigations.

4.1 Soil Boring Plan

30 TAC §330.63(e)(4)

Presented in Appendix III4A, Soil Boring Plan (SBP) including locations and depths of all proposed borings for the expansion area was submitted to the TCEQ and approved prior to initiation of the subsurface investigation.

4.1.1 Number of Borings

30 TAC §330.63(e)(4)(A)

The SBP proposed 35 borings, a sufficient number of borings to establish subsurface stratigraphy and to determine geotechnical properties of the soils beneath the facility. The number of borings were determined based on general characteristics of the facility and on the heterogeneity of subsurface materials analyzed from previously performed subsurface investigations.

4.1.2 Depth of Borings

30 TAC §330.63(e)(4)(B)

The approved SBP proposed borings that are sufficiently deep enough to allow identification of the uppermost aquifer and underlying hydraulically interconnected aquifers. They penetrate the uppermost aquifer and are deep enough to identify the aquiclude at the lower boundary. All the borings are at least five feet deeper than the elevation of the deepest excavation, 70 ft-msl, and 18 of the 35 borings are at least thirty feet below the deepest excavation.

4.1.3 Established Field Exploration Methods

30 TAC §330.63(e)(4)(C)

All borings were conducted in accordance with established field exploration methods detailed in the approved SBP. The subsurface investigation, borings, and plugging and abandonment were conducted in accordance with applicable rules in 16 TAC §76 – Water Well Drillers and Water Well Pump Installers including the preparation and submittal of well installation and plugging reports. The drilling and sampling program of the SBP includes drilling methods, sampling plan, and boring log documentation.

4.2 Soil Boring Logs

30 TAC §330.63(e)(4)

Appendix III4B, Soil Boring Logs include a boring logs from the current and previous subsurface investigations. Boring logs from the current investigation outlined in the SBP include detailed description of materials encountered including any discontinuities such as fractures, fissures, slickensides, lenses, or

- 2003 – CCI EnviroDrilling, Inc. plugged and re-installed monitoring wells MW-1 through MW-4. The wells were renamed MW-1R through MW-4R. Golder provided oversight.
- 2004 – EnviroCore, Inc. replaced the damaged MW-3R to installed MW-3RA. Golder provided oversight.
- 2005 – EnviroCore, Inc. installed MW-15 through MW-18 under Golder's oversight.
- 2009 – Lewis Environmental drilled three new wells – MW-22, MW-23, and MW-24. Several old wells were redrilled/replaced including MW-3A, MW-4A, MW-7R through MW-10R, MW-15R, MW-16R, and MW-18R. Golder provided oversight.
- 2013 – EnviroCore drilled two monitoring wells MWD-6 and MWD-7. Golder provided oversight.

Table III4-5A: Coordinates and Elevations of Previously Advanced Borings (ft)

Boring	Northing[2] (ft)	Easting[2] (ft)	Ground Elevation (ft-msl)	Depth (ft-bgs)	Bottom Elevation (ft-msl)
Langley-Pitman Testing Lab, 1976 (Soil Borings)					
No.1	16,668,336.87	1,105,717.33	91	40	51
No.2	16,669,135.55	1,105,455.21	86	40	46
No.3	16,669,867.66	1,105,398.98	87	40	47
No.4	16,670,296.17	1,104,238.29	86	40	46
No.5	16,668,738.00	1,104,072.69	91	40	51
No.6	16,668,807.16	1,105,020.81	91	40	51
Professional Services Industries, 1993 (Soil Borings and Monitoring Wells)					
B-1	16,670,435.62	1,104,102.38	85	50	35
B-2	16,668,479.69	1,103,794.80	85	50	35
B-3	16,668,153.82	1,105,849.69	91	50	41
B-4	16,670,034.21	1,106,143.67	88	50	38
B-5	16,669,351.49	1,105,106.22	90	100	-10
MW-1	16,670,435.62	1,104,102.38	85	27	58
MW-2	16,668,479.69	1,103,794.80	86	27	59
MW-3	16,668,153.82	1,105,849.69	90	30	60
MW-4	16,670,034.21	1,106,143.67	88	27	61
Rust Environment & Infrastructure, March 1996 (Soil Borings)					
SB-01	16,669,568.08	1,106,617.13	87	40	47
SB-02	16,668,575.32	1,106,460.78	83	40	43
SB-03	16,668,404.19	1,107,547.38	87	40	47
SB-04	16,669,396.95	1,107,703.73	91	40	51
SB-05	16,669,045.31	1,107,108.28	88	100	-12
Raba-Kistner-Brytest Consultants, December 1996 (Monitoring Wells)					

Boring	Northing[2] (ft)	Easting[2] (ft)	Ground Elevation (ft-msl)	Depth (ft-bgs)	Bottom Elevation (ft-msl)
MW-5	16,668,819.18	1,105,953.07	87	35	52
MW-6	16,669,467.10	1,106,057.05	84	35	49
MW-7	16,670,228.55	1,105,449.97	84	35	49
MW-8	16,670,327.25	1,104,791.54	84	35	49
Golder Associates/ PSI, 1999 (Soil Borings and Piezometers)					
G-1	16,670,047.99	1,106,483.70	87	50	37
G-2	16,669,792.20	1,107,218.82	88	50	38
G-3	16,669,634.68	1,108,135.47	96	58	38
G-4	16,669,719.89	1,108,864.82	100	62.5	38
G-5	16,669,445.90	1,107,174.40	88	25	63
G-6	16,669,189.68	1,108,692.02	106	68.5	38
G-7	16,669,169.33	1,106,288.59	83	45	38
G-8 (P-1)	16,668,919.88	1,107,855.10	87	50	37
G-9 (P-2)	16,668,473.27	1,107,013.57	83	45	38
G-10	16,668,500.43	1,108,575.37	98	60	38
G-11	16,668,298.65	1,108,146.76	86	48.5	38
G-12	16,668,075.59	1,106,168.70	88	50	38
G-13	16,668,028.30	1,107,311.54	84	46.5	38
G-14	16,667,706.94	1,108,555.69	87	50	37
Southern Ecology Management/ PSI, 2000 (Monitoring Wells)					
MW-9	16,669,138.78	1,103,896.60	88	37.7	50
MW-10	16,669,758.36	1,104,000.04	89	37.7	51
MW-11	16,670,047.99	1,106,483.70	88	37	51
MW-12	16,668,075.59	1,106,168.70	90	39.2	51
MW-14	16,669,719.89	1,108,864.82	100	55	46
Golder Associates/ CCI EnviroDrilling, Inc., 2003 (Monitoring Wells)					
MW-1R	16,670,499.43	1,104,230.98	85	29.5	55
MW-2R	16,668,462.15	1,103,807.64	87	31.5	55
MW-3R	N/A	N/A	NA	37	NA
MW-4R	16,670,139.26	1,106,060.54	89	37.5	51
Golder Associates/ EnviroCore, Inc., 2004 (Monitoring Well)					
MW-3RA	16,629,881.403	1,093,651.047	92	38	54
Golder Associates/ EnviroCore, Inc., 2005 (Monitoring Wells)					
MW-15	16,669,968.26	1,107,279.30	91	45	46

Boring	Northing[2] (ft)	Easting[2] (ft)	Ground Elevation (ft-msl)	Depth (ft-bgs)	Bottom Elevation (ft-msl)
MW-18	16,667,905.72	1,107,198.44	88	36.5	52
Golder Associates/ Lewis Environmental, April 2009 (Monitoring Wells)					
MW-3A	16,668,160.24	1,105,577.78	96	42.5	53
MW-4A	16,670,154.21	1,105,936.63	88	38	49
MW-7R	16,670,243.18	1,105,343.73	86	37	49
MW-8R	16,670,342.18	1,104,749.81	85	37	48
MW-9R	16,669,020.21	1,103,870.99	87	38	50
MW-10R	16,669,614.74	1,103,959.80	88	39	49
MW-15R	16,670,029.73	1,107,082.63	88	37.5	51
MW-16	16,669,910.05	1,107,645.48	86	34	53
MW-18R	16,667,889.53	1,107,351.67	85	33	52
MW-22	16,668,246.95	1,104,990.12	93	39	54
MW-23	16,668,348.50	1,104,397.05	88	28	60
MW-24	16,670,205.18	1,104,058.59	87	37	51
Golder Associates (2013) (Monitoring Wells)					
MWD-6	16,667,942.38	1,106,762.85	91	45	46
MWD-7	16,667,796.19	1,107,944.36	85	31	54

Notes: 1. N/A – Information not available
2. Boring coordinates provided in Texas State Plane South Zone NAD83

4.2.2 Current Subsurface Investigation

The current subsurface investigation was performed in accordance with the approved SBP. A total of 35 borings were advanced in expansion area where all the borings are at least five feet deeper than the elevation of the deepest excavation, 70 ft-msl, and 18 of the 35 borings are at least thirty feet below the deepest excavation. Twelve borings were completed as piezometers to provide groundwater elevation data. The boreholes are identified as 101 through 135 with a prefix of 'B-' for the boreholes and 'PZ-' for the piezometers.

Table III4-5B: Coordinates and Elevations of Borings Advanced in the Expansion Area (ft)

Boring	Northing[1] (ft)	Easting[1] (ft)	Ground Elevation (ft-msl)	Depth (ft-bgs)	Bottom Elevation (ft-msl)
PZ-101	16,672,192.55	1,106,495.22	97.8	60	37.8
B-102	16,672,066.31	1,107,318.56	95.3	35	60.3
B-103	16,671,938.34	1,108,124.57	94.4	55	39.4
PZ-104	16,671,821.46	1,108,965.02	95.5	35	60.5

Boring	Northing[1] (ft)	Easting[1] (ft)	Ground Elevation (ft-msl)	Depth (ft-bgs)	Bottom Elevation (ft-msl)
B-105	16,671,681.02	1,109,781.78	88.7	50	38.7
PZ-106	16,671,555.69	1,110,594.81	84.8	30	54.8
B-107	16,671,516.22	1,106,392.87	87.9	25	62.9
B-108	16,671,377.05	1,107,210.46	98.3	60	38.3
B-109	16,671,251.10	1,108,033.90	87.9	25	62.9
B-110	16,671,136.94	1,108,850.76	92.1	55	37.1
B-111	16,671,002.92	1,109,671.86	89.1	30	59.1
B-112	16,670,874.68	1,110,498.71	86.8	50	36.8
PZ-113	16,670,843.25	1,106,277.71	85.8	50	35.8
B-114	16,670,703.98	1,107,109.34	91.6	30	61.6
B-115	16,670,592.78	1,107,899.67	99.3	62	37.3
PZ-116	16,670,444.83	1,108,755.73	93.2	30	63.2
B-117	16,670,335.07	1,109,568.12	91.8	55	36.8
PZ-118	16,670,193.76	1,110,392.83	89.4	35	54.4
B-119	16,669,643.34	1,109,465.29	84.3	25	59.3
B-120	16,669,515.09	1,110,285.15	92.8	55	37.8
B-121	16,669,413.56	1,111,072.66	94.5	32	62.5
PZ-122	16,669,091.56	1,111,975.25	92.2	55	37.2
B-123	16,668,982.12	1,109,304.96	83	45	38
PZ-124	16,668,836.59	1,110,178.48	97.6	40	57.6
B-125	16,668,708.21	1,111,001.47	94.9	60	34.9
B-126	16,668,443.85	1,111,760.57	93.3	30	63.3
B-127	16,668,290.12	1,109,248.44	94.3	45	49.3
B-128	16,668,168.26	1,110,069.45	98.2	60	38.2
B-129	16,668,024.21	1,110,893.17	100	35.3	64.7
PZ-130	16,667,916.49	1,111,609.19	100.5	65	35.5
PZ-131	16,667,606.90	1,109,142.73	96.3	60	36.3
B-132	16,667,493.43	1,109,964.91	94.9	35	59.9
PZ-133	16,667,399.31	1,110,759.32	98.2	60	38.2
PZ-134	16,670,873.39	1,104,174.27	82.4	45	37.4
B-135	16,670,700.05	1,105,208.90	83.1	22	61.1

Note: 1. Boring coordinates provided in Texas State Plane South Zone NAD83

4.2.3 Boring Installation, Abandonment, and Plugging

30 TAC §330.63(e)(4)(D)

Twelve borings were completed as piezometers in accordance with applicable rules in 16 TAC §76 – Water Well Drillers and Water Well Pump Installers to provide groundwater elevation data. The remaining borings were plugged with a cement-bentonite grout.

4.3 Interpretive Geologic Cross-Sections

30 TAC §330.63(e)(4)(G)

Interpretive geologic cross-sections are presented on Figures III4-12B through III4-12H and include a key map of the cross-section locations depicted on Figure III4-12A, Soil Boring ~~Plan~~Map. These cross-sections utilized boring information gathered from the current and previous subsurface investigations to show boring profiles relative to existing ground and interpretive soil stratum boundaries. The boring profiles include corresponding soil classifications, any static and initial water levels, and well screen locations for any piezometers and monitoring wells.

4.4 Subsurface Stratigraphy

30 TAC §330.63(e)(4)(H)

The results of the subsurface investigation is consistent with previous studies at the facility. The facility is underlain by three distinct strata, identified below in order from ground surface down:

- Stratum I: sandy clays or clayey sands, with layers of silty clay, silty sand, or clayey silt.
- Stratum II: sands/silty sands, fine, poorly graded, and is the uppermost water-bearing unit (uppermost aquifer).
- Stratum III: predominantly clay, with some amounts of sandy clay or silty clay, high plasticity, hard, brown, and dry, and is the confining unit underlying the uppermost water-bearing unit (lower confining unit).

5.0 GEOTECHNICAL PROPERTIES

30 TAC §330.63(e)(5)

5.1 Laboratory Testing

30 TAC §330.63(e)(5)(A)&(B)

Multiple samples were collected in accordance with the approved SBP including both Shelby tube and split-spoon samples. All soil samples were observed to determine the stratigraphy; a total of 81 soil samples were used for laboratory testing. Laboratory testing was performed on the selected samples in accordance with commonly accepted methods and practices of American Society for Testing and Materials (ASTM).

Falling head permeability tests were performed according to ASTM D5084, Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter, on undisturbed soil samples using tap water as the permeant. Five undisturbed samples that represent the sidewall of cell excavation were tested for the coefficient of permeability on the sample's in-situ horizontal axis; all others were tested on the in-situ vertical axis. Calculations for the final coefficient of permeability test results for each sample tested indicate the type of test used and the orientation of each tested sample.

Sieve analysis were performed using ASTM D422 and D1140; Atterberg limits per ASTM D4318; moisture content per ASTM D2216; the unit weight per ASTM D7263; and specific gravity per ASTM D854. Shear strength testing consisted of unconsolidated-undrained (UU) triaxial compression tests per ASTM D2850 and consolidation testing was performed per ASTM D2435.

Appendix III4C, Soil Laboratory Testing Data includes the aforementioned testing for the selected samples. A summary of the soil samples and their corresponding tests is provided in Table III4-6, Soil Sample Laboratory Testing Summary. Collectively, 61 samples from Stratum I, 10 samples from Stratum II, and 10 samples from Stratum III were tested. These strata collectively represent the bottom and side of the proposed excavation, as well as the 30 feet below the lowest elevation of excavation. Laboratory testing data from previous investigations are included in Appendix III4D, Previous Geotechnical Testing Data.

Table III4-6: Soil Sample Laboratory Testing Summary

Boring	Sample Depth (ft-bgs)	Stratum	ASTM Test Method							
			D 2216	D 4318	D 1140	D 7263	D 854	D 2850	D 2435	D 5084
			Water Content	Atterberg Limits	Sieve Analysis	Unit Weight	Specific Gravity	Triaxial U/U	Consolidation (ILC)	Permeability
B-102	3-5	I	✓	✓		✓				
B-102	15-17	I	✓							
B-102	23-25	I	✓	✓	✓			✓		
B-103	0-2	I	✓							
B-103	10-12	I	✓							
B-103	18-20	I	✓							
B-103	40-42	II	✓							
B-105	0-2	I	✓							
B-105	38-40	II			✓					
B-107	5-7	I	✓							
B-107	8-10	I	✓	✓	✓					
B-108	13-15	I	✓	✓	✓					

Part III3, Waste Management Unit Design Report includes detailed engineering evaluations and analyses using the geotechnical properties of on-site soils. The analyses indicate that the soils at the facility are suitable for the intended purpose.

6.0 GROUNDWATER INVESTIGATION

6.1 Local Hydrogeology

The second stratigraphic layer, Stratum II, which is composed of sands/silty sands, is the upper water bearing unit at the site (uppermost aquifer). As mentioned in §5.2.2, the thickness of Stratum II varies from 5 to 30 feet, except in portions of the northwest corner of the proposed expansion area where it was not encountered. The extent of this stratum can be seen in Figures III4-12B through III4-12H, which depicts the monitoring wells, borings and sub-surface profiles obtained from the soil investigations at the site. Groundwater occurs primarily within Stratum II, separated from lower aquifers by underlying Stratum III, which acts as an aquiclude. The groundwater within Stratum II is also locally, partially confined by the clayey soils encountered in Stratum I. In other areas, recharge could occur through vertical flows through overlying sandy soils. Recharge areas for the Gulf Coast Aquifers are shown in Figure III4-9, Gulf Coast Aquifers in Lower Rio Grande Valley. A detailed discussion of the groundwater conditions in the site area is presented in Part III5, Groundwater Characterization Report.

6.2 Groundwater Investigation

30 TAC §330.63(e)(5)(C)

Numerous subsurface investigations have been carried out at the facility for purposes related to geological and hydrogeological characterization, groundwater monitoring, and gas monitoring, as detailed in §4.2.1, Previous Subsurface Investigations. Initial and static water level data for these borings are compiled in Table III4-8.

Table III4-8: Summary of Initial and Static Water Level Data

Boring	Groundwater Elevation (ft-msl)		Boring	Groundwater Elevation (ft-msl)		Boring	Groundwater Elevation (ft-msl)		Boring	Groundwater Elevation (ft-msl)	
	Initial	Static		Initial	Static		Initial	Static		Initial	Static
No.1	18	NR	G-4	37.0	NR	GP-27	NR	NR	GP-46	NR	NR
No.2	21	NR	G-5	20.0	20.5	MW-3A	26.0	24.5	GP-47	NR	NR
No.3	21	NR	G-6	43.0	43.0	MW-4A	20.0	17.7	PZ-113	17.5	15.4
No.4	19.5	NR	G-7	20.0	19.7	MW-7R	26.0	19.3	B-114	23.0	NR
No.5	17	NR	G-8	18.0	23.5	MW-8R	6.0	4.1	B-115	35.0	NR
No.6	19	NR	G-9	20.5	20.0	MW-9R	13.0	16.6	PZ-116	25.0	23.5
B-1	18	NR	G-10	36.0	39.5	MW-10R	14.0	15.8	B-117	30.0	NR

Groundwater flow rates were estimated for Stratum II, uppermost water-bearing unit (uppermost aquifer), using estimated hydraulic gradients, estimated hydraulic conductivities, and effective porosity for silty sand using the following formula: $V = (ki)/n_e$.

Where: V = velocity
k = horizontal permeability
i = gradient
n_e = effective porosity

Table III4-9: Groundwater Flow Rates

Area of Evaluation	Hydraulic Conductivity (k) (cm/s)	Hydraulic Gradient (i) (ft/ft)*	Effective Porosity (n_e)**	Groundwater flow rate (V) (ft/yr)
Currently Permitted Area (TCEQ Permit MSW-956B)	1.80×10^{-3}	0.0013	0.33	7.4
Expansion Area (Included in TCEQ Permit MSW-956C)	1.65×10^{-4}	0.0040	0.33	2.0

* Gradient estimated from monthly potentiometric maps from February 2015 to December 2016.
** Assumed for fine sands with some silt based on Freeze and Cherry (1979).

7.0 REFERENCES

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TABLE III4E1
HISTORICAL GROUNDWATER ELEVATIONS (FT MSL)
MONITORING WELLS

Top of Casing Elevations, 10/26/00, (ft msl)	87.58	87.54	89.41	89.36	92.73	94.57	98.38	90.46	91.34	89.99	90.04	87.49	93.49	89.19	89.22	87.73	86.74	88.33	90.10	89.81	91.48	90.99	91.07	92.33	93.20	91.32	88.38	91.35	88.06	95.15	90.72	90.35	
Date	**MW -1**	**MW-1R**	**MW-2**	**MW-2R**	**MW-3**	**MW-3RA**	**MW-3A**	**MW-4**	**MW-4R**	**MW-4A**	**MW-5**	**MW-6**	**MWD-6**	**MW-7**	**MW-7R**	**MWD-7**	**MW-8**	**MW-8R**	**MW-9**	**MW-9R**	**MW-10**	**MW-10R**	**MW-11**	**MW-12**	**MW-15**	**MW-15R**	**MW-16**	**MW-18**	**MW-18R**	**MW-22**	**MW-23**	**MW-24**	**Sampled By**
04/28/93	64.91	--	65.64	--	65.48	--	--	64.51	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	RUST
04/30/93	64.90	--	65.69	--	65.47	--	--	64.49	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	RUST
05/13/93	64.86	--	65.64	--	65.40	--	--	64.59	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	RUST
06/23/93	65.80	--	65.46	--	65.39	--	--	64.41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	RUST
07/15/93	65.33	--	66.82	--	66.18	--	--	65.06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	RUST
08/12/93	65.13	--	66.69	--	66.38	--	--	65.04	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	RUST
10/16/97	63.48	--	64.21	--	64.93	--	--	66.56	--	--	65.14	67.99	--	65.39	--	--	66.04	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	ANALABS
02/11/98	63.93	--	64.76	--	65.68	--	--	64.96	--	--	65.46	65.30	--	64.75	--	--	64.09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	SEM
02/16/98	64.01	--	64.75	--	65.72	--	--	64.84	--	--	65.62	65.49	--	65.03	--	--	64.72	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	SEM
05/07/98	63.18	--	63.91	--	66.23	--	--	65.06	--	--	65.94	65.59	--	64.69	--	--	63.24	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	ANALABS
06/16/98	62.80	--	63.25	--	65.92	--	--	64.66	--	--	65.57	65.25	--	64.22	--	--	62.80	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	SEM
06/25/98	62.77	--	63.13	--	65.82	--	--	64.60	--	--	65.48	65.17	--	64.22	--	--	62.44	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	SEM
12/04/98	63.67	--	63.48	--	66.90	--	--	65.63	--	--	66.55	66.21	--	65.76	--	--	66.71	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	SEM
01/13/99	63.68	--	63.49	--	66.75	--	--	65.54	--	--	66.40	66.09	--	65.50	--	--	65.60	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	SEM
03/22/99	63.91	--	63.55	--	66.33	--	--	65.31	--	--	66.06	65.80	--	65.14	--	--	64.74	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	SEM
07/21/99	63.74	--	63.83	--	66.08	--	--	65.13	--	--	65.76	65.52	--	65.00	--	--	64.34	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	SEM
10/26/99	63.70	--	64.21	--	65.93	--	--	64.76	--	--	65.56	65.24	--	65.10	--	--	64.89	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	SEM
01/27/00	63.66	--	64.49	--	65.52	--	--	64.60	--	--	65.16	64.96	--	65.54	--	--	64.89	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	SEM
05/02/00	63.68	--	64.46	--	65.15	--	--	64.36	--	--	64.77	64.60	--	64.39	--	--	64.79	--	63.67	--	63.99	--	--	--	--	--	--	--	--	--	--	--	SEM
06/30/00	63.88	--	64.49	--	65.32	--	--	64.31	--	--	64.65	64.46	--	64.38	--	--	65.48	--	64.19	--	65.17	--	--	--	--	--	--	--	--	--	--	--	SEM
09/06/00	63.46	--	64.12	--	64.18	--	--	63.88	--	--	63.79	63.69	--	63.93	--	--	64.31	--	63.92	--	66.19	--	--	--	--	--	--	--	--	--	--	--	SEM
10/25/00	63.35	--	63.65	--	63.99	--	--	63.64	--	--	63.68	63.55	--	63.87	--	--	64.12	--	63.56	--	63.87	--	--	--	--	--	--	--	--	--	--	--	SEM
01/15/01	63.17	--	63.31	--	63.88	--	--	63.45	--	--	63.62	63.56	--	63.36	--	--	63.54	--	63.27	--	63.39	--	--	--	--	--	--	--	--	--	--	--	SEM
07/17/01	64.73	--	63.67	--	64.43	--	--	63.42	--	--	64.11	63.84	--	63.82	--	--	67.79	--	64.05	--	66.47	--	--	--	--	--	--	--	--	--	--	--	SEM
08/20/01	64.35	--	63.32	--	--	--	--	63.23	--	--	--	63.50	--	63.63	--	--	66.23	--	63.72	--	65.31	--	--	--	--	--	--	--	--	--	--	--	SEM
10/29/01	64.02	--	63.06	--	63.64	--	--	63.11	--	--	63.40	63.29	--	63.29	--	--	65.38	--	63.40	--	65.15	--	--	--	--	--	--	--	--	--	--	--	SEM
12/18/01	64.71	--	63.24	--	64.01	--	--	--	--	--	--	--	--	--	--	--	66.35	--	63.49	--	65.82	--	--	--	--	--	--	--	--	--	--	--	SEM
01/24/02	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	63.56	--	65.03	--	--	--	--	--	--	--	--	--	--	--	SEM
03/15/02	64.18	--	63.44	--	63.96	--	--	63.22	--	--	63.77	63.49	--	63.51	--	--	65.68	--	63.53	--	64.59	--	--	--	--	--	--	--	--	--	--	--	SEM
04/23/02	63.89	--	63.36	--	63.74	--	--	63.16	--	--	63.51	63.39	--	63.34	--	--	65.34	--	63.32	--	64.36	--	--	--	--	--	--	--	--	--	--	--	SEM
10/14-15/02	64.49	--	62.92	--	64.27	--	--	63.43	--	--	64.12	63.71	--	63.59	--	--	69.69	--	63.40	--	64.13	--	--	--	--	--	--	--	--	--	--	--	SEM
04/16-17/03	65.51	--	64.38	--	65.92	--	--	--	64.01	--	65.50	65.31	--	65.37	--	--	68.77	--	64.22	--	64.08	--	--	--	--	--	--	--	--	--	--	--	SEM
10/29-30/03	--	71.13	--	66.41	--	66.96	--	--	64.23	--	66.99	66.30	--	66.71	--	--	78.83	--	66.65	--	66.61	--	65.29	66.88	--	--	--	--	--	--	--	--	GAI
01/14/04	--	69.23	--	68.16	--	68.20	--	--	65.91	--	--	--	--	67.65	--	--	74.55	--	66.79	--	67.25	--	66.20	68.13	--	--	--	--	--	--	--	--	GAI
01/21/04	--	68.97	--	68.03	--	68.13	--	--	65.81	--	--	--	--	67.44	--	--	73.98	--	66.75	--	67.20	--	66.26	68.16	--	--	--	--	--	--	--	--	GAI
5/19-20/04	--	69.16	--	69.46	--	69.02	--	--	66.25	--	--	--	--	68.30	--	--	72.33	--	68.14	--	67.44	--	66.75	68.99	--	--	--	--	--	--	--	--	GAI
7/14-15/2004	--	70.56	--	70.30	--	69.59	--	--	68.12	--	--	--	--	68.83	--	--	73.10	--	69.30	--	67.86	--	67.18	69.58	--	--	--	--	--	--	--	--	GAI
11/11-12/2004	--	69.79	--	71.44	--	70.59	--	--	69.64	--	--	--	--	70.54	--	--	74.10	--	70.15	--	68.92	--	69.05	70.18	--	--	--	--	--	--	--	--	GAI
2/15-16/2005	--	69.92	--	70.49		70.40	--		69.19	--			--	62.62	--	--	72.56	--	69.85	--	69.46	--	68.77	70.11	--	--	--	--	--	--	--	--	GAI
5/17-18/2005	--	69.92	--	70.46	--	70.21	--	--	68.87	--	--	--	--	69.42	--	--	72.84	--	69.96	--	69.72	--	68.73	69.99	--	--	--	--	--	--	--	--	GAI
9/13-15/2005	--	67.93	--	68.58	--	69.49	--	--	67.44	--	--	--	--	--	--	--	--	--	--	--	--	--	68.15	70.53	--	--	--	--	--	--	--	--	GAI
11/30/05	--	67.69	--	67.46	--	68.16	--	--	67.97	--	--	--	--	68.00	--	--	70.11	--	67.51	--	67.87	--	67.53	68.21	--	--	--	--	--	--	--	--	GAI
5/30-31/2006	--	67.21	--	66.68	--	66.78	--	--	66.48	--	--	--	--	66.72	--	--	68.95	--	66.90	--	66.82	--	66.37	66.82	67.57	--	--	67.71	--	--	--	--	GAI
09/29/06	--	75.28	--	70.18	--	70.43	--	--	70.35	--	--	--	--	71.04	--	--	78.09	--	70.12	--	70.03	--	71.55	70.39	71.13	--	--	69.90	--	--	--	--	GAI
10/30-31/2006	--	75.94	--	73.34	--	71.92	--	--	72.98	--	--	--	--	73.35	--	--	79.02	--	73.31	--	71.31	--	73.09	72.14	73.15	--	--	72.56	--	--	--	--	GAI
12/18-19/2006	--	73.32	--	72.41	--	72.27	--	--	72.59	--	--	--	--	72.87	--	--	75.30	--	71.87	--	71.93	--	72.40	72.33	72.45	--	--	72.71	--	--	--	--	GAI
3/21-22/2007	--	73.92	--	72.68	--	72.36	--	--	71.56	--	--	--	--	72.89	--	--	75.79	--	71.06	--	71.15	--	71.42	72.31	72.42	--	--	73.20	--	--	--	--	GAI
5/22-23/2007	--	72.61	--	72.56	--	71.94	--	--	72.53	--	--	--	--	71.91	--	--	73.18	--	72.53	--	72.79	--	71.02	71.74	72.03	--	--	72.04	--	--	--	--	GAI
08/02/07	--	--	--	73.68	--	72.38	--	--	72.72	--	--	--	--	72.53	--	--	77.33	--	--	--	--	--	73.42	72.64	--	--	--	--	--	--	--	--	GAI
09/05/07	--	74.14	--	75.87	--	74.96	--	--	74.88	--	--	--	--	75.03	--	--	76.17	--	75.16	--	75.23	--	74.17	74.83	--	--	--	--	--	--	--	--	GAI
12/18-19/2007	--	74.45	--	73.54	--	72.67	--	--	72.36	--	--	--	--	72.85	--	--	75.63	--	73.62	--	73.84	--	71.87	71.87	--	--	--	--	--	--	--	--	GAI
2/6-7/2008	--	73.72	--	72.91	--	72.08	--	--	71.95	--	--	--	--	72.28	--	--	74.63	--	73.05	--	73.32	--	71.49	71.98	--	--	--	--	--	--	--	--	GAI
6/18-19/2008	--	71.29	--	71.01	--	70.84	--	--	70.78	--	--	--	--	70.82	--	--	72.41	--	71.19	--	71.51	--	70.40	70.60	--	--	--	--	--	--	--	--	GAI
08/15/08	--	--	--	77.56	--	74.35	--	--	74.42	--	--	--	--	--	--	--	78.96	--	--	--	--	--	74.59	74.08	--	--	--	--	--	--	--	--	GAI
5/12-13/2009	--	74.23	--	74.79	--	74.09	--	--	73.35	--	--	--	--	74.37	--	--	--	--	74.95	--	75.27	--	73.98	73.66	75.18	--	--	74.52	--	--	--	--	GAI
06/4-06/5/2009	--	75.52	--	74.49	--	--	74.02	--	--	74.05	--	--	72.99	--	74.44	--	--	75.61	--	74.66	--	75.12	73.82	73.53	--	74.04	74.07	--	73.20	74.12	74.35	75.42	GAI
09/14-09/15/2009	--	74.69	--	74.03	--	--	72.91	--	--	73.28	--	--	72.16	--	74.02	--	--	75.08	--	73.84	--	74.11	72.90	72.62	--	73.07	73.10	--	72.27	73.02	73.31	74.75	GAI
09/30/09	--	--	--	73.82	--	72.87	--	--	--	--	--	--	--	73.59	--	--	75.23	--	74.16	--	--	--	73.04	72.75	--	--	--	--	--	--	--	--	GAI
12/14/09-12/15/09	--	74.60	--	73.76	--	--	73.20	--	--	73.42	--	--	73.19	--	73.65	--	--	75.62	--	74.04	--	74.43	73.09	73.03	--	73.83	74.20	--	73.31	73.15	73.37	74.87	GAI

Submitted: July 2017
Revised: November 2017

TABLE III4E1
HISTORICAL GROUNDWATER ELEVATIONS (FT MSL)
MONITORING WELLS

Top of Casing Elevations, 10/26/00, (ft msl)	87.58	87.54	89.41	89.36	92.73	94.57	98.38	90.46	91.34	89.99	90.04	87.49	93.49	89.19	89.22
Date	**MW -1**	**MW-1R**	**MW-2**	**MW-2R**	**MW-3**	**MW-3RA**	**MW-3A**	**MW-4**	**MW-4R**	**MW-4A**	**MW-5**	**MW-6**	**MWD-6**	**MW-7**	**MW-7R**
02/23/10-02/24/10	--	76.89	--	75.61	--	74.37	--	--	74.57	--	--	--	--	75.08	--
4/6-4/7/2010	--	76.19	--	75.41	--	74.52	74.76	--	74.64	74.87	--	--	74.49	--	75.57
7/20-7/21/2010	--	79.79	--	77.91	--	--	75.88	--	--	76.37	--	--	75.54	--	78.32
11/9-11/11/2010	--	79.19	--	78.33	--	76.90	77.18	--	77.74	77.89	--	--	75.44	77.99	78.52
12/13/10	--	--	--	78.11	--	76.52	--	--	77.19	--	--	--	--	77.45	--
2/22-2/24/2011	--	77.58	--	76.74	--	--	76.33	--	--	76.93	--	--	75.46	--	77.30
6/21-6/22/2011	--	73.51	--	73.38	--	--	74.86	--	--	74.68	--	--	73.32	--	74.64
12/12-12/13/2011	--	71.34	--	69.88	--	--	72.06	--	--	72.80	--	--	71.79	--	72.78
01/19/12	--	--	--	69.62	--	--	--	--	72.78	72.38	--	--	71.71	--	--
6/27-6/28/2012	--	69.86	--	68.57	--	--	70.41	--	--	70.48	--	--	69.69	--	70.15
07/25/12	--	69.08	--	--	--	--	--	--	69.93	69.15	--	--	--	--	--
12/10-12/11/2012	--	67.78	--	66.43	--	--	68.23	--	--	68.59	--	--	68.94	--	68.45
01/07/13	--	67.42	--	66.28	--	--	68.30	--	68.50	71.71	--	--	68.65	--	--
03/27/13	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
06/12 - 06/13/13	--	66.68	--	65.49	--	--	72.70	--	--	66.88	--	--	67.40	--	67.13
07/19/13	--	--	--	66.46	--	--	67.33	--	--	66.90	--	--	71.71	--	--
09/25/13	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
12/13 - 12/14/13	--	71.07	--	67.79	--	--	69.25	--	--	69.64	--	--	70.33	--	71.68
02/04/14	--	71.63	--	68.40	--	--	69.43	--	--	70.12	--	--	70.53	--	--
03/21/14	--	71.82	--	68.77	--	--	69.49	--	--	70.43	--	--	70.49	--	72.18
6/21 - 6/22/14	--	69.65	--	67.97	--	--	69.39	--	--	69.34	--	--	69.98	--	69.59
07/25/14	--	68.95	--	65.68	--	--	--	--	--	66.82	--	--	69.78	--	--
09/05/14	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
12/10 - 12/11/14	--	71.80	--	69.17	--	--	70.43	--	--	70.20	--	--	71.16	--	72.15
01/13/15	--	73.22	--	69.96	--	--	--	--	--	--	--	--	71.63	--	73.39
2/24 - 2/25/15	--	72.95	--	70.26	--	--	71.10	--	--	71.77	--	--	71.86	--	73.12
03/25/15	--	73.14	--	70.41	--	--	71.38	--	--	72.09	--	--	75.99	--	73.72
04/20 - 4/21/15	--	79.24	--	72.69	--	--	72.00	--	--	73.82	--	--	72.28	--	75.59
05/28/15	--	81.73	--	74.63	--	--	73.84	--	--	76.34	--	--	73.34	--	78.27
06/22 - 06/26/15	--	82.62	--	76.01	--	--	74.91	--	--	76.66	--	--	74.26	--	79.47
7/27- 7/30/2015	--	78.97	--	75.06	--	--	76.03	--	--	77.21	--	--	75.54	--	78.02
8/20-21/2015	--	77.49	--	74.66	--	--	75.75	--	--	76.51	--	--	75.63	--	76.78
9/28-29/2015	--	76.65	--	74.51	--	--	75.64	--	--	76.02	--	--	75.95	--	76.15
10/19/15	--	76.43	--	74.41	--	--	75.51	--	--	75.85	--	--	75.99	--	76.02
11/16/15	--	77.64	--	75.63	--	--	76.34	--	--	76.84	--	--	76.39	--	77.30
12/7-10/2015	--	77.17	--	75.40	--	--	76.11	--	--	76.69	--	--	76.02	--	76.95
1/25-26/2016	--	76.73	--	75.12	--	--	75.93	--	--	76.47	--	--	75.78	--	76.70
02/15/16	--	76.55	--	74.96	--	--	75.87	--	--	76.31	--	--	75.70	--	76.49
03/28/16	--	76.08	--	74.61	--	--	75.47	--	--	75.86	--	--	75.29	--	76.01
6/27-29/2016	--	74.86	--	73.32	--	--	75.49	--	--	75.61	--	--	75.54	--	76.12
9/7-8/2016	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
11/30 - 12/1 2016	--	73.10	--	70.23	--	--	73.31	--	--	74.11	--	--	73.34	--	74.16
HISTORIC HIGH	65.80	82.62	66.82	78.33	66.90	76.90	77.18	66.56	77.74	77.89	66.99	67.99	76.39	77.99	79.47
HISTORIC LOW	62.77	66.68	62.92	65.49	63.64	66.78	67.33	63.11	64.01	66.82	63.40	63.29	67.40	62.62	67.13

Top of Casing Elevations, 10/26/00, (ft msl)	87.73	86.74	88.33	90.10	89.81	91.48	90.99	91.07	92.33	93.20	91.32	88.38	91.35	88.06	95.15	90.72	90.35	
Date	**MWD-7**	**MW-8**	**MW-8R**	**MW-9**	**MW-9R**	**MW-10**	**MW-10R**	**MW-11**	**MW-12**	**MW-15**	**MW-15R**	**MW-16**	**MW-18**	**MW-18R**	**MW-22**	**MW-23**	**MW-24**	**Sampled By**
02/23/10-02/24/10	--	77.62	--	75.26	--	75.26	--	74.40	74.30	75.86	--	--	76.17	--	--	--	--	GAI
4/6-4/7/2010	--	--	77.02	--	75.50	--	76.12	74.02	74.69	--	74.27	74.17	76.25	75.47	74.75	75.05	76.39	GAI
7/20-7/21/2010	--	--	80.11	--	78.26	--	76.84	--	75.93	--	76.52	76.73	--	77.16	75.85	76.52	77.70	GAI
11/9-11/11/2010	--	79.05	79.18	77.83	78.36	77.58	78.64	77.12	77.18	77.85	76.87	76.58	78.40	77.81	77.20	77.72	79.16	GAI
12/13/10	--	--	--	--	--	--	--	--	76.50	--	--	--	--	--	--	--	--	GAI
2/22-2/24/2011	--	--	77.99	--	76.94	--	77.38	76.54	76.01	--	76.07	75.46	--	76.38	76.26	76.40	77.71	GAI
6/21-6/22/2011	--	--	74.20	--	73.73	--	73.97	75.49	74.24	--	74.53	73.78	--	72.76	74.63	74.00	74.01	GAI
12/12-12/13/2011	--	--	72.54	--	70.73	--	71.00	73.05	72.29	--	73.07	72.53	--	71.20	71.67	70.94	71.33	GAI
01/19/12	--	--	--	--	70.22	--	--	--	--	--	--	--	--	70.65	71.51	70.51		GAI
6/27-6/28/2012	--	--	71.03	--	68.05	--	69.44	71.40	70.69	--	71.98	72.18	--	70.55	69.83	69.09	69.87	GAI
07/25/12	--	--	--	--	68.55	--	--	--	--	--	--	--	--	--	--	--	69.19	GAI
12/10-12/11/2012	--	--	68.74	--	66.90	--	67.46	68.87	68.59	--	69.73	70.06	--	69.65	67.69	67.01	67.70	GAI
01/07/13	--	--	--	--	--	--	--	--	--	--	--	69.11	--	--	--	--	67.53	GAI
03/27/13	68.22	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	GAI
06/12 - 06/13/13	67.82	--	67.33	--	65.86	--	66.35	67.27	67.26	--	67.32	67.60	--	67.55	66.21	65.70	66.60	GAI
07/19/13	--	--	--	--	66.29	--	--	--	--	--	--	70.65	--	68.42	--	--	67.24	GAI
09/25/13	70.60	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	GAI
12/13 - 12/14/13	70.73	--	72.13	--	68.09	--	68.99	69.72	69.92	--	69.88	70.14	--	70.86	68.49	67.97	70.97	GAI
02/04/14	--	--	--	--	68.60	--	--	--	70.02	--	--	70.43	--	--	--	--	71.21	GAI
03/21/14	70.95	--	73.24	--	69.10	--	69.93	70.26	69.94	--	70.52	70.84	--	70.82	69.04	68.69	71.61	GAI
6/21 - 6/22/14	69.72	--	70.70	--	68.48	--	69.28	69.95	69.78	--	70.34	70.31	--	70.09	68.87	68.35	69.94	GAI
07/25/14	--	--	69.23	--	68.02	--	67.31	--	68.21	--	--	71.04	--	--	--	--	67.92	GAI
09/05/14	69.10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	GAI
12/10 - 12/11/14	71.96	--	72.95	--	69.31	--	69.77	70.63	70.72	--	74.19	72.51	--	71.64	69.91	69.15	71.29	GAI
01/13/15	--	--	--	--	69.79	--	70.50	--	--	--	--	74.45	--	72.33	--	--	72.84	GAI
2/24 - 2/25/15	72.02	--	75.23	--	70.52	--	71.31	71.88	71.61	--	72.98	73.42	--	72.21	70.71	70.33	72.67	GAI
03/25/15	72.03	--	75.23	--	70.71	--	71.59	72.37	71.68	--	73.42	73.88	--	72.21	71.05	70.52	72.90	GAI
04/20 - 4/21/15	73.41	--	79.07	--	72.74	--	72.57	73.33	72.21	--	74.01	73.89	--	73.73	71.81	71.97	75.58	GAI
05/28/15	75.27	--	81.65	--	75.89	--	79.16	75.25	73.55	--	74.97	75.27	--	73.60	74.27	74.07	79.36	GAI
06/22 - 06/26/15	76.90	--	82.51	--	76.19	--	76.02	77.19	75.46	--	77.62	76.81	--	74.57	74.91	75.04	83.89	GAI
7/27- 7/30/2015	76.09	--	79.63	--	75.26	--	76.13	77.39	75.99	--	77.20	77.17	--	75.66	75.71	75.10	77.45	GAI
8/20-21/2015	75.31	--	77.94	--	74.96	--	75.72	76.88	75.76	--	76.75	77.07	--	75.61	75.36	74.62	77.32	GAI
9/28-29/2015	75.24	--	77.00	--	74.77	--	75.50	76.45	75.86	--	76.74	77.05	--	75.95	75.18	74.56	77.32	GAI
10/19/15	75.13	--	76.80	--	74.66	--	75.40	76.30	75.77	--	76.59	77.03	--	76.07	75.06	74.46	76.36	GAI
11/16/15	75.97	--	78.41	--	75.77	--	76.55	77.05	76.50	--	77.30	76.81	--	76.54	75.72	75.22	77.64	GAI
12/7-10/2015	75.70	--	77.81	--	75.65	--	76.41	76.82	76.19	--	77.10	77.08	--	76.17	75.70	75.29	77.19	GAI
1/25-26/2016	75.25	--	77.28	--	75.30	--	75.96	77.73	76.02	--	76.97	77.05	--	75.79	75.58	75.11	75.68	GAI
02/15/16	75.13	--	77.02	--	75.31	--	75.92	76.59	75.89	--	76.91	76.98	--	75.73	75.51	74.09	76.57	GAI
03/28/16	74.50	--	76.46	--	74.92	--	75.51	76.16	75.40	--	76.48	76.51	--	75.28	75.16	74.69	76.08	GAI
6/27-29/2016	74.50	--	77.47	--	73.70	--	73.90	75.99	74.78	--	76.29	76.64	--	75.54	74.93	73.97	74.91	GAI
9/7-8/2016	73.14	--	--	--	72.48	--	72.67	75.07	--	--	75.20	75.46	--	73.82	--	--	74.44	GAI
11/30 - 12/1 2016	71.45	--	74.56	--	71.73	--	72.25	74.47	73.40	--	74.79	74.94	--	72.56	72.80	71.73	72.94	GAI
HISTORIC HIGH	76.90	79.05	82.51	77.83	78.36	77.58	79.16	77.73	77.18	77.85	77.62	77.17	78.40	77.81	77.20	77.72	83.89	
HISTORIC LOW	67.82	62.44	67.33	63.27	65.86	63.39	66.35	65.29	66.82	67.57	67.32	67.60	67.71	67.55	66.21	65.70	66.60	

Top of casing elevations were surveyed by J.E. Saenz & Associates, Inc. 12-22-97.
Locations were surveyed and top of casing verified by Govind Engineers & Consultants 10/26/00.
Some groundwater elevation data has been corrected based on surveyed and verified top of casing elevations.
-- Water level not measured

All water level data are in feet relative to mean sea level (msl).

Submitted: July 2017
Revised: November 2017

TABLE III4E2
HISTORICAL GROUNDWATER ELEVATIONS (FT-MSL)
PIEZOMETERS

		Date																	
		Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16	Jun-16	Dec-16
Piezometer	**Top of Casing Elevation (ft-msl)**	**Groundwater Elevation (ft-msl)**																	
PZ-101	101.73	68.61	69.79	70.58	71.23	71.77	-	74.13	74.65	74.39	74.24	74.07	74.49	74.63	74.74	74.75	74.63	73.78	72.52
PZ-104	99.02	66.98	67.36	67.95	68.42	69.63	-	74.18	75.41	75.13	74.56	74.14	74.34	74.27	74.08	73.97	73.75	73.20	71.97
PZ-106	88.17	58.98	59.24	59.55	59.77	60.30	-	68.00	65.75	64.25	63.39	63.05	64.17	63.90	63.79	63.75	63.40	62.97	61.47
PZ-113	89.79	70.37	71.03	72.15	72.49	75.49	78.4	80.79	78.07	76.71	75.96	75.75	76.75	76.74	76.70	76.61	76.25	75.49	74.22
PZ-116	96.56	69.7	70.22	70.80	71.21	72.45	-	76.20	76.98	76.84	76.36	76.03	76.27	76.28	76.07	75.94	75.57	75.06	73.65
PZ-118	93.22	62.03	62.24	62.59	62.82	63.51	76.54	66.59	66.68	66.52	68.34	66.04	66.40	66.47	66.71	66.71	66.54	66.17	64.89
PZ-122	96.14	-	56.26	56.55	56.44	57.01	-	-	57.34	-	56.68	56.64	57.19	57.50	57.87	57.96	58.10	58.04	57.14
PZ-124	101.67	67.41	67.68	67.72	67.77	68.11	-	70.60	71.54	71.28	71.45	71.16	71.88	71.73	71.76	71.63	71.36	71.44	70.13
PZ-130	104.39	-	66.36	66.74	67.09	67.29	-	68.44	68.74	68.65	69.16	69.11	69.84	69.84	70.30	70.39	70.14	70.03	69.26
PZ-131	100.09	70.4	68.2	71.44	71.49	72.34	86.47	75.59	76.48	75.77	75.36	75.10	75.70	75.51	75.41	75.31	74.81	74.49	72.92
PZ-133	101.96	78.34	68.8	68.91	69.06	69.44	-	71.54	72.36	72.54	72.74	72.71	73.10	73.10	73.28	73.28	73.18	73.08	72.31
PZ-134	86.11	71.98	72.49	73.02	73.11	80.68	82.66	83.04	78.96	77.31	76.66	76.45	77.39	76.91	76.58	76.40	75.98	74.36	73.06

CITY OF EDINBURG SOLID WASTE MANAGEMENT

PERMIT AMENDMENT APPLICATION

Part III, Attachment 5

GROUNDWATER CHARACTERIZATION AND MONITORING REPORT

Edinburg Regional Disposal Facility

Edinburg, Hidalgo County, Texas

TCEQ Permit MSW-956C

Submitted To: City of Edinburg
Department of Solid Waste Management
8601 North Jasman Road
Edinburg, Texas 78542 USA

Submitted By: Golder Associates Inc.
500 Century Plaza Drive, Suite 190
Houston, TX 77073 USA

July 2017
Revised: November 2017

Project No. 1401491

Golder Associates

1.4.2 Local Groundwater Quality

Groundwater quality data from the facility's monitoring wells and piezometers indicate that total dissolved solids content ranges from 690-25,500 mg/L. Therefore, the facility's groundwater quality is considered fresh to saline.

1.4.3 Groundwater Monitoring Data

A tabulation of all relevant groundwater monitoring data from wells on site is presented in Part III4F, Historic Groundwater Quality Testing Data. The groundwater monitoring data includes results of all semi-annual and applicable quarterly groundwater monitoring events since 2005.

2.0 GROUNDWATER MONITORING

30 TAC §330.401(d)-(f)

To ensure both a conservative approach to groundwater monitoring at the facility and ensure the detection of any contaminants that may potentially be released to the uppermost aquifer, the facility currently monitors the groundwater present in Stratum II at the point of compliance with a well spacing of approximately 600 feet. Once established at a solid waste management unit, groundwater monitoring must be conducted throughout the active life and any required post-closure care period of that solid waste management unit as specified in 30 TAC §330.463.

Groundwater monitoring requirements under 30 TAC §§330.403, 330.405, 330.407, and 330.409 may be suspended by the TCEQ for a solid waste management unit if the City can demonstrate that there is no potential for migration of hazardous constituents from that solid waste management unit to the uppermost aquifer during the active life and the closure and post-closure care period of the unit. This demonstration shall be certified by a qualified groundwater scientist and approved by the TCEQ, and must be based upon:

- site-specific field-collected measurements, sampling, and analysis of physical, chemical, and biological processes affecting contaminant fate and transport; and
- contaminant fate and transport predictions that maximize contaminant migration and consider impacts on human health and the environment.

2.2.2.1 Previously Permitted Groundwater Monitoring Well Network

The monitoring well network of TCEQ Permit MSW-956B included 14 wells (MW-1 through MW-14) screened in the upper water-bearing unit. MW-1 through MW-4 were installed in 1993 and MW-5 through MW-8 in 1996. MW-9 through MW-12 and MW-14 were installed in 2000. In 2003, replacement wells MW-1R through MW-4R were installed, followed by further reinstallation of well MW-3RA. In 2005, MW-15 and MW-18 were added to the existing monitoring well system. In 2009, the following wells were replaced/relocated – MW-3A, MW-4A, MW-7R, MW-8R, MW-9R, MW-10R, MW-15R, and MW-18R. In addition, MW-16 and MW-22 through MW-24 were installed in 2009. The Edinburg Sanitary Landfill TCEQ Permit MSW-956B and Type IV Landfill TCEQ Permit MSW-2302 share a common permit boundary along the southwestern portion of the facility. In 2013, wells MWD-6 and MWD-7 were installed along this southern boundary to monitor the same groundwater unit as the Type IV Landfill. These wells are located 30 feet of the southern permit boundary of the Type I landfill. Apart from the wells which were relocated or replaced, wells MW-5, MW-6, and MW-14 were plugged in 2004, 2008, and 2000 respectively. MW-13, MW-14R, MW-17, MW-19, MW-20, and MW-21 are part of the current monitoring well network that are permitted for future installation.

Table III5-1 lists the monitoring wells that are part of the monitoring well network of TCEQ Permit MSW-956B. Appendix III5A, Existing Monitoring Well Information presents the available well installation records for the current and historic monitoring wells.

Table III5-1: Previously Permitted Groundwater Monitoring Well Network

Well ID	Northing (ft)[1]	Easting (ft)[1]	Ground Elevation	Top of Casing	Depth of Screened Interval		Elevation of Screened Interval	
			ft-msl	ft-msl	ft-bgs		ft-msl	
					Top	Bottom	Top	Bottom
MW-1R	16,670,451.01	1,104,162.79	84.7	87.5	20	25	64.7	59.7
MW-2R	16,668,465.10	1,103,816.69	86.5	89.4	25	30	61.5	56.5
MW-3A	16,668,167.98	1,105,587.63	95.7	98.4	31	41	64.7	54.7
MW-4A	16,670,162.92	1,105,941.09	87.3	90.0	27	37	60.3	50.3
MWD-6	16,667,949.81	1,106,763.82	90.6	93.5	35	45	55.6	45.6
MWD-7	16,670,250.28	1,105,347.96	85.0	87.7	21	31	65.0	55.0
MW-7R	16,667,810.34	1,107,955.19	86.4	89.2	26	36	60.4	50.4
MW-8R	16,670,347.68	1,104,753.77	85.1	88.3	26	36	59.1	49.1
MW-9R	16,669,023.33	1,103,878.53	86.8	89.8	27	37	59.8	49.8
MW-10R	16,669,618.10	1,103,965.73	88.2	91.0	26	36	62.2	52.2
MW-11	16,670,058.17	1,106,488.44	88.4	91.1	27	37	61.4	51.4
MW-12	16,668,084.93	1,106,178.78	89.8	92.3	30.1	40.1	59.8	49.8
MW-13*	16,667,722.74	1,108,566.75	90.4	-	-	-	-	-

Well ID	Northing (ft)[1]	Easting (ft)[1]	Ground Elevation	Top of Casing	Depth of Screened Interval		Elevation of Screened Interval	
			ft-msl	ft-msl	ft-bgs		ft-msl	
					Top	Bottom	Top	Bottom
MW-14R*	16,669,889.35	1,108,856.78	96.9	-	-	-	-	-
MW-15R	16,670,041.53	1,107,087.42	88.3	91.3	26.5	36.5	61.8	51.8
MW-16	16,669,923.37	1,107,650.60	85.8	88.4	22	32	63.8	53.8
MW-17*	16,668,909.26	1,108,747.81	83.1	-	-	-	-	-
MW-18R	16,667,902.08	1,107,362.25	85.3	88.1	22	32	63.3	53.3
MW-19*	16,669,975.70	1,108,263.02	102.6	-	-	-	-	-
MW-20*	16,669,502.20	1,108,839.55	84.1	-	-	-	-	-
MW-21*	16,668,316.32	1,108,656.07	94.0	-	-	-	-	-
MW-22	16,668,253.10	1,104,999.75	93.0	95.2	28	38	65.0	55.0
MW-23	16,668,353.05	1,104,406.40	87.9	90.7	17	27	70.9	60.9
MW-24	16,670,208.81	1,104,062.92	87.2	90.4	25	35	62.2	52.2

Note: *These wells are part of the groundwater monitoring well network approved under TCEQ Permit MSW-956B, but haven't been installed as of the date of this report.

1. Coordinates provided in Texas State Plane South Zone NAD83

2.2.2.2 Groundwater Monitoring Well Network

The groundwater monitoring system will consist of a total of 38 groundwater monitoring wells requiring modifications to the approved network of monitoring well of TCEQ Permit MSW-956B; retain 12 wells, plug and abandon 12 wells, and install 26 additional wells as depicted on Figure III5-1, Proposed Groundwater Monitoring System. The twelve existing monitoring wells to be properly plugged and abandoned are MW-1R, MW-4A, MW-7R, MW-8R, MW-11, MW-14R, MW-15R, MW-16, MW-17, MW-19, MW-20, and MW-21. The additional 26 monitoring wells to be installed are MW-101 through MW-115 along the northern permit boundary, MW-116 through MW-122 along the eastern permit boundary; and MW-123 through MW-126 along the southern permit boundary. The removal of existing monitoring wells and installation of the additional wells will be sequenced to coincide with the schedule of site development outlined in Part II, Facility Layout. Wells will be installed prior to waste placement in the adjacent disposal unit.

Table III5-2: Groundwater Monitoring Well Network

Well ID	Northing (ft)[1]	Easting (ft)[1]	Ground Elevation	Top of Casing	Depth of Screened Interval		Elevation of Screened Interval	
			ft-msl	ft-msl	ft-bgs		ft-msl	
					Top	Bottom	Top	Bottom
Monitoring Wells to Remain								
MW-2R	16,668,465.10	1,103,816.69	86.5	89.4	25	30	61.5	56.5

Well ID	Northing (ft)[1]	Easting (ft)[1]	Ground Elevation	Top of Casing	Depth of Screened Interval		Elevation of Screened Interval	
			ft-msl	ft-msl	ft-bgs		ft-msl	
					Top	Bottom	Top	Bottom
MW-3A	16,668,167.98	1,105,587.63	95.7	98.4	31	41	64.7	54.7
MWD-6	16,667,949.81	1,106,763.82	90.6	93.5	35	45	55.6	45.6
MWD-7	16,670,250.28	1,105,347.96	85.0	87.7	21	31	65.0	55.0
MW-9R	16,669,023.33	1,103,878.53	86.8	89.8	27	37	59.8	49.8
MW-10R	16,669,618.10	1,103,965.73	88.2	91.0	26	36	62.2	52.2
MW-12	16,668,084.93	1,106,178.78	89.8	92.3	30.1	40.1	59.8	49.8
MW-13*	16,667,722.74	1,108,566.75	90.4	-	-	-	-	-
MW-18R	16,667,902.08	1,107,362.25	85.3	88.1	22	32	63.3	53.3
MW-22	16,668,253.10	1,104,999.75	93.0	95.2	28	38	65.0	55.0
MW-23	16,668,353.05	1,104,406.40	87.9	90.7	17	27	70.9	60.9
MW-24	16,670,208.81	1,104,062.92	87.2	90.4	25	35	62.2	52.2
Additional Monitoring Wells to be Installed								
MW-101	16,670,791.71	1,104,169.10	83.4	-	20	30	63.4	53.4
MW-102	16,670,787.29	1,104,623.01	83.6	-	20	30	63.6	53.6
MW-103	16,670,705.22	1,105,156.73	84.0	-	20	30	64.0	54.0
MW-104	16,670,622.82	1,105,690.41	85.3	-	18	28	67.3	57.3
MW-105	16,670,540.42	1,106,224.08	86.9	-	18	28	68.9	58.9
MW-106	16,670,458.17	1,106,757.78	87.5	-	18	28	69.5	59.5
MW-107	16,670,385.39	1,107,290.48	92.2	-	20	30	72.2	62.2
MW-108	16,670,836.34	1,107,371.57	98.7	-	25	35	73.7	63.7
MW-109	16,671,423.26	1,107,462.38	93.5	-	30	40	63.5	53.5
MW-110	16,671,972.46	1,107,598.57	95.9	-	25	35	70.9	60.9
MW-111	16,671,885.23	1,108,177.04	92.1	-	25	35	67.1	57.1
MW-112	16,671,798.19	1,108,752.57	90.6	-	34	44	56.6	46.6
MW-113	16,671,708.81	1,109,334.62	95.3	-	33	43	62.3	52.3
MW-114	16,671,620.14	1,109,912.86	85.8	-	28	38	57.8	47.8
MW-115	16,671,531.11	1,110,492.95	82.2	-	25	35	57.2	47.2
MW-116	16,670,961.59	1,110,572.09	88.4	-	25	35	63.4	53.4
MW-117	16,670,387.13	1,110,597.01	87.6	-	30	40	57.6	47.6
MW-118	16,669,812.67	1,110,621.93	88.7	-	20	30	68.7	58.7
MW-119	16,669,402.58	1,110,842.39	92.6	-	35	45	57.6	47.6
MW-120	16,668,987.79	1,111,045.55	93.8	-	40	50	53.8	43.8
MW-121	16,668,413.22	1,111,067.56	96.3	-	40	50	56.3	46.3
MW-122	16,667,838.65	1,111,089.58	99.4	-	40	50	59.4	49.4
MW-123	16,667,379.28	1,110,767.39	98.7	-	43	53	55.7	45.7
MW-124	16,667,461.31	1,110,228.55	97.6	-	43	53	54.6	44.6

Well ID	Northing (ft)[1]	Easting (ft)[1]	Ground Elevation	Top of Casing	Depth of Screened Interval		Elevation of Screened Interval	
			ft-msl	ft-msl	ft-bgs		ft-msl	
					Top	Bottom	Top	Bottom
MW-125	16,667,549.21	1,109,660.31	93.7	-	43	53	50.7	40.7
MW-126	16,667,637.14	1,109,092.08	96.8	-	45	55	51.8	41.8

Note:
*These wells are part of the groundwater monitoring well network approved under TCEQ Permit MSW-956B, but haven't been installed as of the date of this report.
- Anticipated construction details are provided for additional monitoring wells to be installed and are estimates inferred from cross-sections presented in Part III4, Geology Report. Actual screen depths need to be determined based on field observations during borehole drilling.
1. Coordinates provided in Texas State Plane South Zone NAD83

2.2.3 Monitoring Well Construction

30 TAC §330.421(a)

Monitoring well construction shall provide for maintenance of the integrity of the bore hole, collection of representative groundwater samples from the water-bearing zone of concern, and prevention of migration of groundwater and surface water within the bore hole. The following specifications must be used for the installation of groundwater monitoring wells at municipal solid waste landfills. Equivalent alternatives to these specifications may be used if prior written approval is obtained in advance from the TCEQ. Figure III5-2, Proposed Monitoring Well Construction Details present the required specifications for installation of a monitoring well.

Damaged monitoring wells that are no longer usable will be reported to the TCEQ Executive Director for a determination whether to replace or repair the well. In accordance with 30 TAC §305.70(j), if a compromised well requires replacement, a permit modification request will be submitted within 45 days of the discovery. Plugging and abandoning of monitoring wells will be performed in accordance with 16 TAC §76.104. No abandonment will be performed without prior written authorization from the TCEQ.

2.2.3.1 Drilling

30 TAC §330.421(a)(1)(A)-(D)

Monitoring wells must be drilled by a Texas-licensed driller who is qualified to drill and install monitoring wells. The installation and development shall be supervised by a licensed professional geoscientist or engineer who is familiar with the geology of the area and a log of the boring shall be completed, sealed, signed, and dated by the licensed professional.

recommended to provide maximum inflow area. Field-cut slots are not permitted for well screen. Filter cloth shall not be used. A blank-pipe sediment trap, typically one to two feet, should be installed below the screen. A bottom cap will be placed on the bottom of the sediment trap. The sediment trap shall not extend through the lower confining layer of the water-bearing zone being monitored. Screen sterilization methods are the same as those for casing. Selection of the size of the screen opening should be done by a person experienced with such work and shall include consideration of the distribution of particle sizes both in the water-bearing zone and in the filter pack surrounding the screen. The screen opening shall not be larger than the smallest fraction of the filter pack.

2.2.3.2.3 Filter Pack

30 TAC §330.421(a)(2)(C)

The filter pack, placed between the screen and the well bore, shall consist of prepackaged, inert, clean silica sand or glass beads; it shall extend from one to four feet above the top of the screen. Open stockpile sources of sand or gravel are not permitted. The filter pack usually has a 30% finer grain size that is about four to ten times larger than the 30% finer grain size of the water-bearing zone; the filter pack should have a uniformity coefficient less than 2.5.

2.2.3.2.4 Annular Seal

30 TAC §330.421(a)(2)(D)

The annular seal shall be placed on top of the filter pack and shall be at least two feet thick. It should be placed in the zone of saturation to maintain hydration. The seal should be composed of coarse-grain sodium bentonite, coarse-grit sodium bentonite, or bentonite grout. Special care should be taken to ensure that fine material or grout does not plug the underlying filter pack. Placement of one foot~~a few inches~~ of prepackaged clean fine sand on top of the filter pack will help to prevent migration of the annular seal material into the filter pack. The bentonite shall be hydrated with clean water prior to any further activities on the well and left to stand until hydration is complete (eight to 12 hours, depending on the grain size of the bentonite). If a bentonite-grout (without cement) casing seal is used in the well bore, then it may replace the annular seal described in this paragraph.

2.2.3.2.5 Casing Seal

30 TAC §330.421(a)(2)(E)

A casing seal shall be placed on top of the annular seal to prevent fluids and contaminants from entering the borehole from the surface. The casing seal shall consist of a commercial bentonite grout or a cement-bentonite mixture. Drilling spoil, cuttings, or other native materials are not permitted for use as

CITY OF EDINBURG SOLID WASTE MANAGEMENT

PERMIT AMENDMENT APPLICATION

Part III, Attachment 5, Appendix B

GROUNDWATER SAMPLING AND ANALYSIS PLAN (GWSAP)

Edinburg Regional Disposal Facility

Edinburg, Hidalgo County, Texas

TCEQ Permit MSW-956C

Submitted To: City of Edinburg
Department of Solid Waste Management
8601 North Jasman Road
Edinburg, Texas 78542 USA

Submitted By: Golder Associates Inc.
500 Century Plaza Drive, Suite 190
Houston, TX 77073 USA

July 2017
Revised: November 2017

Project No. 1401491

Golder Associates

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1.0 GROUNDWATER SAMPLING AND ANALYSIS PROCEDURES

30 TAC §§330.63(f)(6)(E), 330.405(a), 330.405(b)(1), 330.405(b)(3), and 330.405(b)(3)(A)

Consistent analysis procedures are designed to ensure monitoring results that provide an accurate representation of groundwater quality at the groundwater monitor wells. These sampling and analytical methods are appropriate for groundwater sampling and that accurately measure hazardous constituents and other monitoring parameters in groundwater samples. Provided within this section of the GWSAP are procedures and techniques for sample collection, sample preservation and shipment, analytical procedures, chain of custody controls, and quality assurance and quality control. The City shall collect an appropriate number of samples necessary to establish groundwater quality data consistent with the appropriate statistical procedures for detection, assessment, and corrective measures.

1.1 Groundwater Sampling Procedures

1.1.1 Well Inspection

Prior to performing any purging or sampling, each monitoring well will be inspected to assess its integrity. The visual inspection will include the well lock, static water level measuring mark, protective steel casing, concrete pad, and monitor well casing for signs of damage by vandalism, animals, heavy equipment, or other causes. The objective of the visual inspection is to confirm that no outside constituents or other conditions exist that may affect the quality of the sampling. All necessary repairs or maintenance that can be accomplished without a TCEQ modification request will be conducted immediately by the City and documented on the Field Sampling Data Sheet for that well. If it is determined that the integrity of the well has been, or may have been, compromised the necessary information will be documented and the Executive Director of the TCEQ notified. No additional actions will be taken without the approval of the TCEQ.

1.1.2 Sample Collection

1.1.2.1 Equipment Decontamination

All equipment used for water-level measurement, purging, and/or the collection of groundwater samples will be decontaminated prior to use at each well location, unless the equipment is dedicated to a specific well. Appropriate decontamination procedures consists of scrubbing all equipment with a solution of Alconox® or equivalent laboratory grade detergent and deionized, tap, or distilled water, then triple rinsing with deionized or distilled water. Separate containers for each rinsate will be individually set up at each monitor well. At the conclusion of the sampling, all the rinsate will be properly disposed with the water generated during purging.

- install at least one additional monitoring well between the monitoring well with the statistically significant level and the next adjacent wells along the point of compliance before the next sampling event and sample these wells;
- notify in writing all persons that own or occupy the land that directly overlies any part of the plume of contamination if contaminants have migrated off-site as indicated by sampling of wells; and
- initiate Assessment of Corrective Measures Program all within 90 days of the notice to the TCEQ.

3.6.2 Alternate Source Demonstration

30 TAC §330.409(g)(2)-(3)

The City may demonstrate that a source other than the monitored solid waste management unit caused the contamination or that the SSL resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. In making an alternative source demonstration (ASD), the City must:

- notify the TCEQ in writing within 14 days of determining a SSL above the GWPS at the point of compliance that the City intends to make an ASD;
- within 90 days of determining a SSL above the GWPS, submit a report to the TCEQ that demonstrates that a source other than the monitored solid waste management unit caused the contamination or that the SSL resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. The report shall be prepared and certified by a qualified groundwater scientist;
- not filter the groundwater samples for constituents addressed by the demonstration prior to laboratory analysis. The TCEQ may also require the City to provide analysis of landfill leachate to support the demonstration; and
- continue to monitor in accordance with the Assessment Monitoring Program.

If a successful ASD is made, the City shall continue monitoring in accordance with the Assessment Monitoring Program and may return to detection monitoring after two consecutive sampling events if the Assessment Monitoring Constituents are at or below established background concentrations. Until a successful demonstration is made, the City shall comply with the requirements of this section including initiating an assessment of corrective measures.

3.7 Assessment of Corrective Measures

30 TAC §330.63(f)(7)

If hazardous constituents have been measured in the groundwater that exceed the concentration limits of the established GWPS, the City shall submit sufficient information, supporting data, and analyses to establish a corrective action program that meets the requirements of 30 TAC §330.411 and §330.413 relating to Assessment of Corrective Measures and Selection of Remedy, respectively. To demonstrate compliance with of 30 TAC §330.411, the City shall address, at a minimum, the following:

- a characterization of the contaminated groundwater, including concentrations of assessment constituents as defined in §330.409 of this title;
- the concentration limit for each constituent found in the groundwater;
- detailed plans and an engineering report describing the corrective action to be taken;
- a description of how the groundwater monitoring program will demonstrate the adequacy of the corrective action; and
- a schedule for submittal of the aforementioned information required provided the City obtains written authorization from the TCEQ prior to submittal of the complete permit application.

Implementation of the Corrective Action Program will be conducted in accordance with 30 TAC § 330.415.

3.8 Annual Assessment Monitoring Report

30 TAC §§330.63(f)(6)(A), 330.409(k), & 330.409(k)(1)-(6)

The City shall submit an annual assessment monitoring report within 60 days after the facility's second semiannual groundwater monitoring event that includes the following information determined since the previously submitted report:

- a statement whether an statistically significant level above the established groundwater protection standard has occurred in any groundwater monitor well during the previous calendar year period and the status of any statistically significant level events;
- the results of all groundwater monitoring, testing, and analytical work obtained or prepared in accordance with the requirements of this GWSAP, including a summary of background groundwater quality values, groundwater monitoring analyses, statistical calculations, graphs, and drawings;
- the groundwater flow rate and direction in the uppermost aquifer. The groundwater flow rate and direction of groundwater flow shall be established using the data collected during the preceding calendar year's sampling events from the monitoring wells of the Assessment Monitoring Program. The City shall also include in the report all documentation used to determine the groundwater flow rate and direction of groundwater flow;
- a contour map of piezometric water levels in the uppermost aquifer based, at a minimum, upon concurrent measurement in all groundwater monitor wells. All data or documentation used to establish the contour map should be included in the report;
- recommendation for any changes; and
- any other items requested by the TCEQ such as a description of any special wastes previously handled at the facility.

In addition, the City will submit a laboratory case narrative and a laboratory checklist with all analysis submitted to the TCEQ. An example laboratory review checklist and exception report is included in Appendix D. In place of the laboratory checklist, the facility may submit a copy of the laboratory QA/QC and analytical data. The facility may explain any problems encountered in the laboratory analysis, either by adding additional explanations to the checklist or by extending the laboratory case narrative. Any

PERMIT AMENDMENT APPLICATION
Part III, Attachment 6

LANDFILL GAS MANAGEMENT PLAN

EDINBURG REGIONAL DISPOSAL FACILITY

Edinburg, Hidalgo County, Texas

TCEQ Permit MSW-956C

Submitted To: City of Edinburg
Department of Solid Waste Management
8601 North Jasman Road
Edinburg, Texas 78542 USA

Submitted By: Golder Associates Inc.
500 Century Plaza Drive, Suite 190
Houston, TX 77073 USA

STATE OF TEXAS
11/7/17
CHAD E. IRELAND
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LICENSED
PROFESSIONAL ENGINEER

GOLDER ASSOCIATES INC.
Professional Engineering Firm
Registration Number F-2578

INTENDED FOR PERMITTING PURPOSES ONLY

July 2017
Revised: November 2017

Project No. 1401491

Gas Probe ID	Site Grid Northing[1]	Site Grid Easting[1]	Seasonal Low Groundwater Elevation[2] (ft-msl)	Comments
GP-108	3,272	3,180	68.4	Proposed to be Installed
GP-109	3,824	3,180	68.1	Proposed to be Installed
GP-110	4,076	3,524	67.7	Proposed to be Installed
GP-111	4,076	4,105	67.4	Proposed to be Installed
GP-112	4,078	4,694	66.7	Proposed to be Installed
GP-113	4,079	5,279	63.9	Proposed to be Installed
GP-114	4,080	5,864	61.0	Proposed to be Installed
GP-115	3,800	6,284	59.6	Proposed to be Installed
GP-116	3,302	6,379	60.3	Proposed to be Installed
GP-117	2,695	6,497	61.2	Proposed to be Installed
GP-118	2,130	6,607	62.6	Proposed to be Installed
GP-119	1,955	7,028	61.2	Proposed to be Installed
GP-120	1,396	7,132	63.7	Proposed to be Installed
GP-121	814	7,239	66.4	Proposed to be Installed
GP-122	224	7,350	67.9	Proposed to be Installed
GP-123	18	6,841	68.7	Proposed to be Installed
GP-124	18	6,261	68.4	Proposed to be Installed
GP-125	18	5,676	68.2	Proposed to be Installed
GP-126	18	5,091	68.6	Proposed to be Installed
GP-32	2050	486	67.7	Existing to be Abandoned
GP-33	2050	882	67.6	Existing to be Abandoned
GP-18	2048	1408	67.3	Existing to be Abandoned
GP-19R	2038	2045	66.5	Existing to be Abandoned
GP-36	2059	2612	66.1	Existing to be Abandoned
GP-37	2057	3153	67.4	Existing to be Abandoned
GP-38	2057	3692	67.8	Existing to be Abandoned

Notes:
1. Locations provided are approximate.
2. Seasonal low groundwater elevations determined from groundwater level data collected in Part III4E, Historical Groundwater Elevations.

2.1.1.1 Monitoring Probe Installation

Borings for monitoring probes will be performed by drillers registered in the State of Texas, drilled with a hollow-stem auger and sampled with a split-tube sampler, logged, and supervised by either a qualified professional geologist or a registered professional engineer.

These monitoring probes, fabricated of 1- to 2-inch diameter polyvinyl chloride (PVC) material, will be constructed with a solid riser pipe that extends from approximately 3 feet above ground level to approximately 5 feet below ground level and a screened section extending to the final depth. The annular space will be filled with sand or pea gravel approximately 6 inches above the screened section, topped with

Although this pipeline does not cross the facility boundary, utility trench gas vents will be installed at the west and east corners of southern facility boundary for monitoring, GV-8 and GV-9, respectively.

2.1.3 Enclosed Facility Structures

30 TAC §330.371(i)

No enclosed on-site facility structures are located within the facility's property boundary that have a potential for LFG migration to accumulate – the closest enclosed structure to the facility is a maintenance building located approximately 1,050 ft south of the permit boundary. Any existing on-site mobile structures are elevated above the existing ground and adequately vented below; therefore, eliminating the potential for LFG migration to accumulate.

2.2 Monitoring Frequency

30 TAC §§330.371(b)(2), 330.371(d), 330.371(j), 330.371(k)(1) & 330.371(k)(2)

The minimum frequency of methane monitoring shall be quarterly for the operating life of the landfill and the post-closure care period, unless directed otherwise by the executive director of the Texas Commission on Environmental Quality (TCEQ). All monitoring probes and any on-site enclosed structures shall be sampled for methane during the monitoring period. Sampling for specified trace gases may be required by the TCEQ when there is a possibility of acute or chronic exposure due to carcinogenic or toxic compounds. The TCEQ may require more frequent monitoring upon notification and may establish alternative schedules for demonstrating compliance with 30 TAC §330.371(b). The City of Edinburg (City) shall monitor more frequently those locations where monitoring results indicate that landfill gas migration is occurring or is accumulating in structures.

2.3 Sampling Methods

2.3.1 Monitoring Probes and Utility Trench Gas Vents

Methane monitoring during landfill operations will be performed using portable equipment. A hand-held Landtec GA-90 Infra-Red Gas Analyzer, a Landtec Gem 2000, or a similar instrument, which is capable of measuring methane gas concentrations in an oxygen deficient environment, may be used to measure methane gas concentrations at the site. Prior to sampling, calibration of the methane monitoring equipment will be verified using standard calibration gas. The type of gas monitoring equipment utilized at the facility will vary over the operational life and post-closure periods; therefore, manufacturers' specifications are not included with this plan. Monitoring data collected will be recorded on the typical form provided in ~~Part~~ Appendix III6A, Example Gas Monitoring Data Form.

2.3.2 Enclosed Facility Structures

As discussed in §2.1.3, there are no enclosed on-site facility structures located within the facility's property boundary. However if any enclosed facility structures are constructed having a potential for LFG migration to accumulate; they will be monitored with either a portable equipment or a stationary continuous combustible gas monitor, which activates an audible alarm when preset combustible gas concentrations are exceeded. If the alarms are used, they will be calibrated to detect methane concentrations below 1.25 percent by volume and will be maintained and tested in accordance with the manufacturer's recommendations.

2.4 Contingency Plan

30 TAC §330.371(c)-(1)

If confirmed methane gas detection levels exceeding 1.25 percent by volume in facility structures (excluding gas control or recovery system components); and/or 5 percent by volume in monitoring points, probes, subsurface soils, or other matrices at the facility boundary; the City shall immediately take all necessary steps to ensure protection of human health and notify the TCEQ, local and county officials, emergency officials, and the public.

2.4.1 Action for Enclosed Facility Structures

If methane gas levels exceeding 1.25 percent by volume has been detected in enclosed facility structures (excluding gas control or recovery system components), the structure will be immediately evacuated and the Site Manager (SM), or other appropriate personnel, will be notified. Personnel (except for monitoring personnel) will not be allowed to re-enter the affected enclosed structure until a determination of the structure's safety is completed.

2.4.2 Action for Perimeter Monitoring at the Facility Boundary

If methane gas levels exceeding 5 percent by volume has been detected at the perimeter points, probes, subsurface soils, or other matrices at the facility boundary as defined in §3.1.1, Monitoring Probes of this LFGMP, the SM, or other appropriate personnel, will be notified immediately. The immediate emergency response measure will be for the SM, or other appropriate personnel, to determine if nearby enclosed structures are at risk and if evacuation of the enclosed structures is necessary.

2.4.3 Notification Procedures

Upon detection of methane gas exceedance, the executive director of the TCEQ, the TCEQ Region 15 office, local and county officials, emergency officials, and the public shall be notified by phone call, voicemail, email, or facsimile.

2.4.5 Recording

30 TAC §330.371(c)(2)

Within seven days of detection, the City will place in the site operating record the concentration of methane gas levels detected and a description of the steps taken to protect human health. If the source of methane gas detection is determined to be other than LFG migration, the City shall submit to the TCEQ a detailed evaluation identifying the source and corrective measures.

2.4.6 Landfill Gas Remediation Plan

30 TAC §330.371(c)(3) & §330.371(d)

If the source of methane gas releases determined to be LFG migration, the City shall implement ~~Part~~ Appendix III6B, Landfill Gas Remediation Plan (LFGRP) within 60 days of detection, place a copy of the plan in the site operating record, provide a copy to the TCEQ, and notify the TCEQ that the plan has been implemented. The notification shall describe the nature and extent of the problem and the proposed remedy. After review, the executive director may require additional remedial measures and may establish alternative schedules for demonstrating compliance with 30 TAC §330.371(c).

If modifications to the LFGRP are required for effective remediation, a revised LFGRP shall be submitted to the TCEQ as a permit modification pursuant to 30 TAC §305.70. The modification may propose a variety of changes to the site operations, and depending on the nature of the remedial action, different provisions of the §305.70 modification rule may apply. The City shall implement the modified LFGRP for methane gas releases within 60 days of detection and should not wait until the permit modification is issued.

3.0 LANDFILL GAS MANAGEMENT AND CONTROL PLAN

30 TAC §330.371(g)-(1)

The potential for LFG migration is affected by pressure gradients caused by LFG generation and existing site conditions discussed in §1.1, Site Conditions of this LFGMP. Porous soils such as sand and gravel allow greater lateral gas migration than finer grained soils such as clay. Waste disposal units are engineered with a lining and cover system and a gas collection and control system (GCCS) that mitigate the potential for LFG migration.

The facility has constructed an approved GCCS, depicted in Figure III6-3, Existing Landfill Gas Collection and Control System designed to actively extract LFG from within the waste for control of odor and LFG migration and for compliance with federal and state air quality regulations. The GCCS consists of vertical and horizontal gas extraction wells installed within waste over constructed disposal areas. Each gas extraction well is connected to lateral piping that convey gas flow to larger header piping around the

CITY OF EDINBURG SOLID WASTE MANAGEMENT

PERMIT AMENDMENT APPLICATION

Part III, Attachment 7

CLOSURE PLAN

Edinburg Regional Disposal Facility

Edinburg, Hidalgo County, Texas

TCEQ Permit MSW-956C

Submitted To: City of Edinburg
Department of Solid Waste Management
8601 North Jasman Road
Edinburg, Texas 78542 USA

Submitted By: Golder Associates Inc.
500 Century Plaza Drive, Suite 190
Houston, TX 77073 USA

July 2017
Revised: November 2017

Project No. 1401491

Golder Associates

The erosion layer shall be composed of no less than two feet of soil where the first 18 inches shall be of clayey soil and the uppermost 6 inches shall be of suitable topsoil that is capable of sustaining native plant growth and shall be seeded or sodded immediately following the application of the final cover in order to minimize erosion.

Double-sided geocomposite (geotextile/geonet/geotextile) drainage layer shall be installed top of the geomembrane to prevent the buildup of excess pore water pressure at the on the geomembrane interface. Calculations are provided in Part III, Waste Management Unit Design Report.

A 40-mil linear low-density polyethylene (LLDPE) textured geomembrane that has a permeability less than or equal to the permeability of any bottom liner system shall be installed on top of an 18-inch thick compacted clay rich earthen material with a hydraulic conductivity of $1x10^{-5}$ cm/sec or less. The thickness of the 40-mil LLDPE textured geomembrane is of adequate thickness to ensure proper seaming.

1.2.2 Alternative Composite System

30 TAC §330.457(d)

The alternative composite final cover varies from the conventional composite system by substituting a ~~geocomposite~~ geosynthetic clay liner for the 18-inch thick compacted clay rich earthen material and will consist of the following from top to bottom:

- Erosion layer consisting of 24 inches of protective soil cover, of which the uppermost 6 inches will be capable of supporting native vegetation.
- Double-sided geocomposite (geotextile/geonet/geotextile) drainage layer.
- 40-mil linear low-density polyethylene (LLDPE) textured geomembrane that has a permeability less than or equal to the permeability of the bottom liner system.
- Geosynthetic Clay Liner.

Figure III7-3B, Alternative Composite Final Cover Details includes final cover and drainage feature installation details.

Appendix III7A, Alternative Composite Final Cover Demonstration shows that use of geosynthetic clay liner achieves a greater or equal to reduction in infiltration in comparison to 18-inch thick compacted clay rich earthen material.

1.2.3 Alternative Synthetic Grass System

30 TAC §330.457(d)

The alternative synthetic grass final cover will consist of the following from top to bottom:

- HDPE synthetic grass

- Sand infill
- Woven geotextile filter backing
- 50-mil linear low density polyethylene (LLDPE) Super Gripnet® geomembrane with integrated drainage layer

Figure III7-3C, Alternative Synthetic Grass Final Cover Details includes final cover and drainage feature installation details.

Appendix III7B, Alternative Synthetic Grass Final Cover Demonstration shows that ClosureTurf® provides a level of infiltration reduction and wind and water protection that is greater than or equal to the level of protection provided by the standard composite final cover system. In addition, the ClosureTurf® offers other advantages over the standard composite final cover system.

2.0 CLOSURE

Waste disposal areas designated as units in this application do not have discrete individual final cover systems but share one final cover; therefore, for the purposes of closure, they will be collectively referred to as the MSW landfill unit. Final cover installation will be done in installments as ~~each~~ areas of ~~a~~ the MSW landfill unit ~~or units~~ attain permitted elevation. Part II, Facility Layout of this application describes the anticipated schedule of development for the facility ~~where landfill units may be incrementally constructed wholly or partially in any sequence for operational feasibility~~. Figures II-20 – II-25, Operational Sequence I – VI show areas of final cover placement as waste is filled to permitted elevation.

2.1 Maximum Closure Area

30 TAC §330.457(e)(2)

Based on the Figure II-20A, Operational Fill Sequence I of site development discussed in Part II, Facility Layout of this application, the maximum closure area or estimate of the largest area of the MSW landfill ~~facility~~ unit ever requiring final cover at any time during the active life is approximately 159.1 acres. Figure III7-4, Maximum Closure Area includes the active face and areas with daily or intermediate cover in place.

2.2 Maximum Inventory of Wastes

30 TAC §330.457(e)(3)

The maximum inventory of waste ever on-site over the active life of the facility is both the capacity of ~~the of the facility's waste disposal units~~MSW landfill unit and storage or processing ~~units~~areas. Waste in storage or processing ~~units~~ areas at final facility closure will either be disposed in the landfill or transported to an authorized facility, therefore the maximum inventory of waste is the capacity of the ~~combined waste disposal units~~MSW landfill unit.

2.2.1 Facility ~~Units~~

The maximum inventory of waste ever on-site over the active life of the facility is 87,301,156 cubic yards as demonstrated~~included~~ in Part III3A-1, Volume Calculations of this application. The volume represents the total volume available for in-place solid waste and daily and intermediate cover soils. Wastes accepted for disposal in accordance with Part II, Waste Acceptance Plan are typically compacted in place at the working face as they are received.

2.2.2 Storage or Processing ~~Units~~Areas

Waste in storage or processing ~~units~~ areas at final facility closure will either be disposed in the landfill or transported to an authorized facility. Closure for the storage and processing ~~units~~ areas at the site is addressed as follows:

- Mulch area: Brush will be mulched used for erosion control applications.
- Liquid waste stabilization area: Upon closure, the waste remaining in the stabilization basin will be properly stabilized and disposed of in the landfill. The stabilization basin will be disposed of within the landfill.
- Whole tire staging area: At time of closure, tires in the staging area will be processed by grinding or other means to reduce size to quartered or split and disposed of in the landfill or another authorized facility.
- Large Item/White Goods Storage Area: Large items/white goods stored on-site at time of closure will be either transported offsite for recycling or disposed of at an authorized facility.
- Reusable materials staging area: Reusable materials will transported off-site for to reusable material end user locations.

2.3 MSW Landfill Unit Closure Implementation

30 TAC §330.457(e)(4)

A schedule for completing all activities necessary to satisfy the closure criteria for the MSW landfill unit ~~a waste disposal unit~~ is as follows in accordance with 30 TAC §330.457(f). The closure process will follow the procedures listed in Appendix III7C, TCEQ Closure Plan Form.

2.3.1 Closure Plan Placed in Operating Record by Initial Receipt of Waste

30 TAC §330.457(f)(1)

Because waste is currently received by the facility under TCEQ Permit MSW-956B, the City shall place a copy of this closure plan in the operating record upon issuance of TCEQ Permit MSW-956C.

2.3.2 Closure Notice to TCEQ

30 TAC §330.457(f)(2)

No later than 45 days prior to the initiation of closure activities for the~~an~~ MSW landfill unit, the City shall provide written notification to the TCEQ of the intent to close the unit and place this notice of intent in the operating record.

2.3.3 Begin Closure Activities

30 TAC §330.457(f)(3)

The City shall begin closure activities for ~~each~~ the MSW landfill unit no later than 30 days after the date on which the unit receives the known final receipt of wastes or, if the unit has remaining capacity and there is a reasonable likelihood that the unit will receive additional wastes, no later than one year after the most recent receipt of wastes. A request for an extension beyond the one-year deadline for the initiation of closure may be submitted to the TCEQ for review and approval and shall include all applicable documentation necessary to demonstrate that the unit has the capacity to receive additional waste and that the City has taken and will continue to take all steps necessary to prevent threats to human health and the environment from the MSW landfill unit.

2.3.4 Complete Closure Activities

30 TAC §330.457(f)(4)

The City shall complete closure activities for the MSW landfill unit within 180 days following the initiation of closure activities. These activities include placing all the final cover components to design grades and elevations over the waste mass utilizing methods, procedures, and specifications described in the Final Cover Quality Control Plan and installation of any outstanding or replacement of any damaged post-closure monitoring devices such as monitoring wells, gas probes, and the gas collection system. A request for an extension for the completion of closure activities may be submitted to the TCEQ for review and approval and shall include all applicable documentation necessary to demonstrate that closure will, of necessity, take longer than 180 days and all steps have been taken and will continue to be taken to prevent threats to human health and the environment from the unclosed MSW landfill unit.

2.3.5 Following Completion of Closure Activities

30 TAC §330.457(f)(5)

Following completion of all closure activities for the MSW landfill unit, the City shall comply with the post-closure care requirements specified in Part III8, Post-Closure Plan. The City shall submit to the TCEQ by registered mail for review and approval a certification, signed by an independent licensed professional engineer, verifying that closure has been completed in accordance with this closure plan. The submittal to the executive director shall include all applicable documentation necessary for certification of closure. Once approved, this certification shall be placed in the operating record.

facility of the date of closing for the entire facility and the prohibition against further receipt of waste materials after the stated date.

2.4.4 Access Barriers

30 TAC §330.461(b)

Upon written notification to the TCEQ, suitable barriers shall be installed at all gates or access points to adequately prevent the unauthorized dumping of solid waste at the closed facility.

2.4.5 Deed Recordation

30 TAC §330.457(g) & §330.461(c)(1)

Within ten days after closure of ~~all~~ the MSW landfill unit~~s~~, the City shall submit to the TCEQ by registered mail a certified copy of an "affidavit to the public" in accordance with the requirements of 30 TAC §330.19, Deed Recordation and place a copy of the affidavit in the operating record. In addition, the City shall record a certified notation of the deed to the facility property, or on some other instrument that is normally examined during title search, that will in perpetuity notify any potential purchaser of the property that the land has been used as a landfill facility and use of the land is restricted according to the provisions specified in 30 TAC §330.465 Certification of Post-Closure Care. The City shall submit a certified copy of the modified deed to the TCEQ and place a copy of the modified deed in the operating record.

2.4.6 Certification

30 TAC §330.461(c)(2)

Within ten days after completion of final closure activities, a certification, signed by an independent licensed professional engineer, verifying that final facility closure has been completed in accordance with this closure plan. The submittal to the TCEQ shall include all applicable documentation necessary for certification of final facility closure. Once approved, the certification will be placed in the site's operating record.

Following receipt of the required final closure documents and an inspection report from the TCEQ's regional office verifying proper closure of the facility according to this closure plan, the TCEQ may acknowledge the termination of operation and closure of the facility and deem it properly closed. Post-closure care maintenance will begin immediately upon the date of final closure as approved by the TCEQ. All post-closure land use will comply with 30 TAC §330.463, as indicated in the Post-Closure

Plan. Appendix III7C, TCEQ Closure Plan Form, provides guidance to detail the plan for closure of a landfill unit, closure of associated storage or processing ~~units~~areas, and final closure of the facility to meet the requirements in 30 TAC Chapter 330, §330.63(h) and 30 TAC Chapter 330 Subchapter K for a MSW Type I facility.

3.0 FINAL COVER QUALITY CONTROL PLAN

30 TAC §330.457(c)

Appendix III7D, Final Cover Quality Control Plan (FCQCP) describes the final cover system design, construction, and evaluation protocol and processes, including the personnel, materials, methods, sampling and testing standards, procedures, and practices to be used in procuring, handling, installing, and evaluating all elements of the final cover system. It establishes the material requirements; personnel qualifications and roles; installation requirements; quality control and quality assurance monitoring, testing, documentation, and reporting programs to be used during construction of each component of the final cover system to assure and to verify that the final cover system is constructed as designed and in accordance with applicable rules and technical standards. The alternative synthetic grass final cover differs considerably from the conventional composite final cover and the alternative composite final cover, therefore a separate FCQCP has been prepared.

- Appendix III7D-1 – Conventional Composite and Alternative Composite Final Cover Systems.
- Appendix III7D-2 – Alternative Synthetic Grass Final Cover System.

APPENDIX III7A

ALTERNATIVE COMPOSITE FINAL COVER DEMONSTRATION

CITY OF EDINBURG SOLID WASTE MANAGEMENT

PERMIT AMENDMENT APPLICATION

Part III, Attachment 7, Appendix A

PART III, ATTACHMENT 7, APPENDIX A

ALTERNATE COMPOSITE FINAL COVER DESIGN DEMONSTRATION

Edinburg Regional Disposal Facility

Edinburg, Hidalgo County, Texas

TCEQ Permit MSW-956C

Submitted To: City of Edinburg
Department of Solid Waste Management
8601 North Jasman Road
Edinburg, Texas 78542 USA

Submitted By: Golder Associates Inc.
500 Century Plaza Drive, Suite 190
Houston, TX 77073 USA

July 2017
Revised: November 2017

Project No. 1401491

Golder Associates

1.0 INTRODUCTION

This alternative composite final cover design demonstration will demonstrate that the use of geosynthetic clay liner (GCL) will provide equivalent infiltration and protection from wind and water erosion as the conventional composite final cover defined in 30 TAC §330.457(a).

1.1 Alternative Composite Liner System

The alternative composite final cover system is summarized in below.

GCL ~~Alternate~~ Alternative Final Cover System
~~**Sideslopes**~~
24-inch thick erosion layer
Double-sided geocomposite drainage layer
40-mil LLDPE textured geomembrane
GCL

GCLs are geocomposite materials of low hydraulic conductivity used frequently in liner systems. Several manufacturers produce GCLs with varying characteristics. In general, GCLs are manufactured by placing powdered or granulated bentonite on a geotextile or geomembrane substrate. The bentonite layer is typically 7 to 10 mm thick (following hydration) and is placed at a unit weight of approximately 0.8 pounds per square feet (lb/ft^2). The GCLs with a geotextile substrate also have a covering geotextile, which is often needle-punched, connecting the underlying geotextile to increase the structural integrity. Non-woven and woven geotextiles of various weights are used.

Typically, the permeability of the bentonite component of GCLs ranges from less than 1×10^{-9} to 5×10^{-9} cm/sec.

2.0 EQUIVALENCY

2.1 Leakage Rate Estimates

The leakage through composite liners can be estimated using the "Giroud equation", presented in Giroud et al, 1997. The method requires several assumptions regarding the characteristics of the composite liner. First, it is assumed that permeation through the full area of the geomembrane is insignificant in comparison to rapid leakage through isolated defects or holes. It is also necessary to make assumptions regarding the extent to which intimate contact has been achieved. A composite liner that possesses intimate contact has been constructed such that the geomembrane lies flush with the surface of the underlying clay component, with few or no gaps between the two liners. When intimate contact has been achieved, the effective area of leakage is very small, and the total liner system leakage is minimized. This phenomenon is referred to as "composite action."

The equation used in the analysis is derived both from theoretical models of fluid flow and from empirical analyses of actual composite liner systems. Flow through a circular defect in a composite liner is calculated as:

$$Q = C[1+0.1(h/t_s)^{0.95}]a^{0.1}h^{0.9}k_s^{0.74}$$

where:

Q = rate of leakage through a defect (m^3/sec)
C = Dimensionless constant related to the quality of the intimate contact between the geomembrane and the underlying soil component
h = hydraulic head on the geomembrane (m)
t_s = thickness of the low-permeability soil component (i.e., the CCL or GCL) (m)
a = area of geomembrane defect (m^2)
k_s = permeability of soil component (i.e., CCL or GCL) (m/s)

Using the above equation, the conventional composite final cover system was compared to the alternative composite final cover system for both "good" and "poor" intimate contact and for circular holes with an area of 0.1 and 1.0 cm^2.

As shown on the calculations in Appendix III7AA, Infiltration Rate Comparison – GCL Alternate Final Cover~~Infiltration Rate Comparison – Alternative Composite Final Cover~~ for each condition, the alternative composite final cover had calculated leakage rates approximately 1/250th that of the geomembrane/compacted clay liner system.

2.2 Wind And Water Erosion

The alternative composite final cover surface will be seeded or sodded.

3.0 SUMMARY

Based on this analysis, it is apparent that substituting a GCL for an 18-inch thick compacted clay rich earthen material with a hydraulic conductivity of $1x10^{-5}$ cm/sec provides a level of infiltration reduction and wind and water protection that is greater than or equal to the level of protection provided by the conventional composite final cover system.

APPENDIX III7AA

INFILTRATION RATE COMPARISON – GCL ALTERNATE FINAL COVER

INFILTRATION RATE COMPARISON - GCL ALTERNATE FINAL COVER

Made By: JBF
Checked by: CEI
Reviewed by: MX

OBJECTIVE

Compare the infiltration rate through a conventional composite final cover system with the infiltration rate through the alternative composite final cover system.

GIVEN

The conventional composite final cover system consists of a 40-mil geomembrane overlying a 18-inch thick compacted clay rich material with a maximum hydraulic conductivity of 1 x 10-5 cm/s. In the alternative composite final cover system, the compacted clay rich (the infiltration layer) material will be replaced with a geosynthetic clay liner (GCL). Both final covers include a geocomposite drainage layer above the geomembrane.

Infiltration Layer Properties

k =	1.00E-05	cm/s
t =	1.5	ft
h =	0.2	inches

sized to prevent head > 0.2 inches when cover soil saturated)

GCL Properties

k =	5.00E-09	cm/s
t =	7	mm
h =	0.2	inches

(geocomposite drainage layer sized to prevent head > 0.2 inches when cover soil saturated)

METHOD

Estimate the infiltration rate through each final cover system using the Giroud Equation (Ref. 1). Compare the infiltration rate through composite final cover systems consisting of a geomembrane/clay rich material and a geomembrane/GCL.

Infiltration through composite geomembrane/GCL liner.

$$Q = C[1+0.1(h/t_s)^{0.95}]a^{0.1}h^{0.9}k_s^{0.74}$$ Ref 1

where:

C = 0.21 for good contact
1.15 for poor contact
h = head (m)
t_s = thickness of low permeability soil component (i.e. CCL or GCL) (m)
a = area of hole (m^2)
k_s = hydraulic conductivity of CCL or GCL (m/s)

RESULTS

Leakage Rate Per Defect

Intimate Contact		Good		Poor	
Composite Cover System		GM/Clay	GM/GCL	GM/Clay	GM/GCL
Leakage (m^3/sec)	0.1 cm^2 hole	3.79E-09	1.46E-11	2.07E-08	8.02E-11
	1 cm^2 hole	4.77E-09	1.84E-11	2.61E-08	1.01E-10

Comparison

Intimate Contact	$Q_{GM/Clay}/Q_{GM/GCL}$	
	0.1 cm^2 hole	1 cm^2 hole
Good	259	259
Poor	259	259

CONCLUSION

Based on this analysis, the infiltration rate through an alternative composite final cover system with a GCL will be approximately 1/250th that of the conventional composite final system with a clay rich infiltration layer.

REFERENCE

1) Giroud, J.P., “Equations for Calculating the Rate of Liquid Migration Through Composite Liners Due to Geomembrane Defects”, Geosynthetics International, Vol. 4, Nos. 3-4, pp. 335-348, 1997.

APPENDIX III7C

TCEQ CLOSURE PLAN FORM

Texas Commission on Environmental Quality

Closure Plan for Municipal Solid Waste Type I Landfill Units and Final Facility Closure

This form is for use by applicants or site operators of Municipal Solid Waste (MSW) Type I landfills to detail the plan for closure of a landfill unit, closure of associated storage or processing units, and final closure of the facility to meet the requirements in 30 TAC Chapter 330, §330.63(h) and 30 TAC Chapter 330 Subchapter K for a MSW Type I facility.

If you need assistance in completing this form, please contact the MSW Permits Section in the Waste Permits Division at (512) 239-2335.

I. General Information

Facility Name: Edinburg Regional Disposal Facility

MSW Permit No.: MSW-956C

Site Operator/Permittee Name: City of Edinburg

II. Landfill and Other Waste Management Units and Operations Requiring Closure at the Facility

A. Facility Units

Table 1. Description of the Landfill Unit~~s~~. (Note the contiguous waste disposal areas designated as units in this application collectively share one final cover system and comprise a single landfill unit)

Name or Descriptor of Unit	Operating Status of Unit	Type of Liner System Under Unit	Above Grade Class 1 Disposal Cells in this Unit	Below Grade Class 1 Disposal Cells in this Unit	Other Class 1 Disposal Cells in this Unit (describe)	Size of Unit's Waste Footprint (acres)	Maximum Inventory of Waste Ever in Unit (cubic yards)	Other Necessary Information that Pertains to the Unit
Pre-Subtitle D Units 1 - 4	Inactive	None Few cells have GM	☐	☐	☐	29.2	1,027,858	Final cover soil in place. Certification not found.
Unit 5	Active	Alternative liner	☐	☐	☐	52.9	3,723,273	
Unit 6	Active	Alternative liner	☐	☐	☐	110.8	11,983,781	
Unit 7 and Unit 8 / Overliner	Construction following permit issuance	Alternative liner	☐	☐	☐	213.1	70,566,243	Unit 8 or Overliner option to be constructed
Totals						406.0	87,301,156	

Table 2. Description of Waste Storage or Processing ~~Units~~ Areas or Operations Associated with this Permit.

Type of Storage or Processing Unit or Operation (individual units may be closed at any time prior to or during the final facility closure as described in this plan)	Operational Status of Unit	Size of the Area Used for the Storage or Processing Unit or Operation (Acres)	Maximum Inventory of Waste Ever in Storage or Processing Unit or Operation (indicate cubic yards or tons)	Other Information (enter other necessary information that pertains to the unit)
Mulching	Active	1.0	4,000 - Assumed ☒cubic yards ☐tons	*Waste in storage or processing ~~units~~ areas will either be disposed in the landfill or transported to an authorized facility. Therefore inventory of waste in storage or processing ~~units~~ areas or operations is included in capacity of the landfill unit~~s~~.*
Liquid Stabilization	Operational following permit issuance	0.04	400 - Assumed ☒cubic yards ☐tons	
Reusable Materials	Active	0.02	200 - Assumed ☒cubic yards ☐tons	
Whole Tire Staging	Active	0.004	40 - Assumed ☒cubic yards ☐tons	
Totals		1.064	4,640	

B. Waste Inventory Summary

Table 3. Maximum Inventory of Wastes Ever On Site.

Item	Quantity (indicate cubic yards or tons)
Maximum inventory of waste in landfill units (total from Table 1)	87,301,156 ☒cubic yards or ☐tons
Maximum inventory of waste in storage or processing ~~units~~ areas or operations (total from Table 2)	0 ☒cubic yards or ☐tons *Waste in storage or processing units will either be disposed in the landfill or transported to an authorized facility.*
Total Maximum Inventory of Wastes ever on site over the active life of the MSW facility (sum of totals from Tables 1 and 2)	87,301,156 ☒cubic yards or ☐tons

C. Drawings Showing Details of the Waste Management Units at Closure

Table 4. Location of the Drawings showing Details of the Waste Management Units at Closure (outlines, dimensions, maximum elevations of waste and final cover of landfill units, and waste storage or processing ~~units~~ areas or operations at closure of the facility).

Drawing Location in the SDP	Drawing Figure Number	Drawing Title	Waste Management Units Details Shown
Part III, Attachment 3	III3-1	Facility Layout Plan	e.g., outline, waste footprint, and dimensions of the landfill unit~~e.g., outlines , waste footprints, and dimensions of the landfill unit(s)~~
Part III, Attachment 7	III7-1	Final Contour Map	e.g., maximum elevations of waste and final cover of the landfill unit~~e.g., maximum elevations of waste and final cover of the landfill unit(s)~~
Part III, Attachment 1	III1-2	Schematic View of Various Waste Disposal, Processing, and Storage Areas	e.g., outlines and dimensions of the storage and processing area(s)~~e.g., outlines and dimensions of the storage and processing unit(s)~~

III. Description of the Final Cover System Design

A. Types and Descriptions of the Final Cover Systems

Table 5. Types and Descriptions of the Final Cover Systems Permitted or Proposed for Closure of the Landfill Units.

Landfill Unit Name or Descriptor	Type of Final Cover System	Final Cover System Components Description	Other Information (Enter other information as applicable)
~~All Units~~ ~~No certified final cover.~~	Conventional Composite	24-inch erosion layer with upper 6 inches capable of supporting vegetation, double-side geocomposite, 40-mil LLDPE, 18-inch compacted clay $1x10^{-5}$ cm/s	*Three final cover system options are provided for closure ~~for~~*
	Alternative Composite	24-inch erosion layer with upper 6 inches capable of supporting vegetation, double-side geocomposite, 40-mil LLDPE, geosynthetic clay liner	

Landfill Unit Name or Descriptor	Type of Final Cover System	Final Cover System Components Description	Other Information (Enter other information as applicable)
	Alternative Synthetic Grass	HDPE synthetic grass, sand infill, geotextile, 50-mil LLDPE Super Gripnet® geomembrane	~~*areas in all units*~~.

B. Design Details

Table 6. Design Details of the Final Cover Top and Side Slopes for the Landfill Units.

Landfill Unit Name or Descriptor	Maximum Final Elevation of Waste (feet above mean sea level [ft-msl])	Maximum Elevation of Top of Final Cover (ft-msl)	Minimum Grade of the Final Cover Top Slope (%)	Maximum Grade of the Final Cover Side Slope (%)	Other Information (enter other information as applicable, e.g. above-grade Class 1 Cell Dikes)
~~All Units~~ Conventional Composite Option	394.5	398.0	5	25	*Three final cover system options are provided for closure ~~for all units~~. Final cover grades are not to exceed those in Figure IIII7-1, Final Contour Map*
~~All Units~~ Alternative Composite Option	396.0	398.0	5	25	
~~All Units~~ Alternative Synthetic Grass Option	398.0	398.0	5	25	

C. Final Cover Drainage Features

Storm water drainage and erosion and sediment control features incorporated on the final cover of the landfill units to protect the integrity and effectiveness of the final cover system include *(please list and describe the drainage features to be installed on the final cover at or prior to closure for each landfill unit, or list the drainage features and provide cross references on the location(s) of the descriptive and details (drawing) information in other parts of the SDP)*:

Part III2, Surface Water Drainage Report contains details on drainage features to be installed on the final cover prior to closure for each landfill unit which includes add-on berms and downchutes.

Figure III2-2 Post-Development Drainage Plan

Figure III2-3 Drainage Control Details I – Channels and Berms

Figure III2-4 Drainage Control Details II – Stormwater Downchute Details and Crossings

D. Final Cover Vegetation or Other Ground Cover Material

The final cover will be seeded and/or sodded with native plants immediately following the application of the final cover in order to minimize erosion. Other materials, including **mulch and geosynthetic erosion control products,** may be incorporated over the final cover soil surface to ensure sufficient coverage of the ground surface to minimize erosion. The estimated percent ground cover to minimize soil loss and maintain long-term erosional stability of the final cover top and side slopes is: ~~**5% and**~~ ~~25~~90 **%**. The minimum material specifications for other ground cover materials are summarized in the table below.

For a landfill with water balance final cover design, the percentage vegetation cover (excluding other ground cover types) will not be less than that assumed in the water balance final cover model.

Table 7. Minimum Specification for Ground Cover Materials Other Than Vegetation, if Applicable.

Other Ground Cover Material	Maximum Particle Size (inches)	Minimum Particle Size (inches)	Material Placement Method	Thickness of Layer (inches)	Percentage Coverage (%)	Other (specify)
Mulch	Varies	Varies	Spread	Varies	Varies	
Geosynthetic Erosion Control Products	NA	NA	Install	Varies	Varies	

E. Final Contour Map

Figure **III7-1**, a facility final contour map is attached. The map shows the final contours of the landfill units and the entire facility at closure.

Figures **III7-3A** and **III7-3E** showing the cross–sections of the landfill units at closure are also provided.

The facility final contour and cross-section maps/drawings depict the following information:

(1) Final constructed contours of the landfill at closure.

(2) Top slopes and side slopes of the landfill units.

(3) Surface drainage features.

(4) 100-year floodplain, as applicable.

(5) Constructed features providing protection of/from the 100-year floodplain.

(6) Other (specify):
N/A

IV. Description of the Final Cover System Installation Procedure

A. Mode of Installation

Table 8. Mode of Final Cover Installation on the Landfill Units.

Landfill Unit Name or Descriptor	Largest Area of Unit Ever Requiring Final Cover (Acres)	Check this Column if Final Cover will be Placed in Installments as Permitted Elevation is Reached	Check this Column if Final Cover will be Placed when Entire Unit Area Reaches Permitted Elevation	Final Cover Installation Status
~~All Units~~	~~253.5~~159.1	☒	☐	Yet to be installed
		☐	☐	
		☐	☐	
		☐	☐	

B. Installation Drawings for Final Cover and Drainage Features

The following attached plan and cross-section drawings show the final cover design details, the largest area requiring final cover, details of the sequence of installation of the final cover system, and all drainage features.

Table 9. List of Attached Installation Drawings for Final Cover and Drainage Features.

Drawing No.	Drawing Title	Description of Information Contained in Drawing
III7-1	Final Contour Map	Plan drawing of final fill and drainage features
III7-2	Fill Cross-Sections	Fill Cross Section Location Map including profiles
III7-3	Final Cover Details	Details of final cover components and drainage features
III7-4	Maximum Closure Area	Area of maximum closure from sequence of site development in Part II

C. Final Cover Quality Control Plan

A final cover quality control plan (FCQCP), Attachment **III7D**, is attached. The FCQCP describes the final cover system design, construction, and evaluation protocol and processes, including the personnel, materials, methods, sampling and testing standards, procedures, and practices to be used in procuring, handling, installing, and evaluating all elements of the final cover system. It establishes the material requirements; personnel qualifications and roles; installation requirements; quality control and quality assurance monitoring, testing, documentation, and reporting programs to be used during construction of each component of the final cover system to assure and to verify that the final cover system is constructed as designed and in accordance with applicable rules and technical standards.

D. Documentation and Reporting of Final Cover System Construction and Testing

The professional of record will document all aspects and stages of the final cover installation, including materials used, equipment and construction methods, and the type and rate of sampling and quality control testing performed. Following completion of construction of the final cover, the site operator/permittee will submit to the TCEQ executive director, a Final Cover System Evaluation Report (FCSER) for each landfill unit.

V. Closure Activities and Completion Schedules for Each Landfill Unit and for the Final Facility Closure

A. Closure of a Landfill Unit

The following activities will be conducted to satisfy the closure criteria for a landfill unit:

(1) Closure Notification to the TCEQ Executive Director:

The site operator will inform the executive director of the TCEQ, in writing, of the intent to close the unit no later than 45 days prior to the initiation of closure activities and place this notice of intent in the operating record.

(2) Stoppage of Waste Acceptance and Commencement of Other Closure Activities for the Unit:

The site operator will stop accepting waste upon receiving the known final receipt of waste. The site operator will ensure that the permitted top elevations of the in-place waste, as depicted in/derived from the unit's final contour map approved by the TCEQ executive director, are not exceeded at any section or part of the landfill unit. The site operator will begin closure activities for the unit no later than:

- Thirty days after the date on which the unit receives the known final receipt of wastes; or

- One year after the most recent receipt of wastes if the unit has remaining capacity and there is a reasonable likelihood that the unit will receive additional wastes.

(3) Request for Extension Beyond the 1-Year Deadline for Commencing Closure Activities for a Unit:

The site operator may submit a written request to the executive director of the TCEQ for review and approval for an extension beyond the one-year deadline for the initiation of closure. The request will include the following:

(a) All applicable documentation necessary to demonstrate that the unit has the capacity to receive additional waste; and

(b) All documentation necessary to demonstrate that the site operator has taken and will continue to take all steps necessary to prevent threats to human health and the environment from the MSW landfill unit.

(4) Construction of Final Cover:

The site operator will construct the permitted final cover over the waste mass utilizing methods, procedures, and specifications described in the FCQCP. The final constructed contours, elevations, and slopes of the installed final cover will match the permitted final cover contours, elevations, and slopes shown in closure drawings contained in this closure plan.

(5) Construction of Drainage Features:

The site operator will construct the drainage structures shown in drawings referenced or contained in this closure plan or in the facility surface water drainage report.

(6) Completion of Outstanding or Replacement of Damaged Groundwater or Landfill Gas Monitoring Components:

The site operator will complete installation of any outstanding or replacement of any damaged groundwater or landfill gas monitoring system components and landfill gas control systems as needed to maintain current and effective groundwater or landfill gas monitoring and control systems.

(7) Submittal of Final Cover System Evaluation Report (FCSER) to the TCEQ Executive Director:

Following completion of construction of the final cover for the subject landfill unit, the site operator will submit to the TCEQ executive director for review and acceptance, a FCSER for the unit.

(8) Completion of Closure Activities for the Landfill Unit:

The site operator will complete closure activities for the unit within 180 days following the start of closure activities, unless the executive director of the TCEQ grants an extension as described in Item V.A.8(a) below.

(a) Request for Extension of the Completion of Closure Activities for the Landfill Unit:

The site operator may submit a written request for an extension for the completion of closure activities to the TCEQ for review and approval. The extension request will include:

- All applicable documentation necessary to demonstrate that closure will, of necessity, take longer than 180 days; and
- All applicable documentation necessary to document that all steps have been taken and will continue to be taken to prevent threats to human health and the environment from the unclosed MSW landfill unit.

(9) Submittal of Engineer's Certification of Closure to the TCEQ Executive Director and Request of Closure Inspection to TCEQ Regional Office:

Following completion of all closure activities for the landfill unit, the site operator will submit:

(a) Closure Inspection

A written request to the local TCEQ regional office for a closure inspection of the unit.

(b) Closure Certification

A certification, signed by an independent licensed professional engineer, to the executive director of the TCEQ for review and approval verifying that closure has been completed in accordance with this closure plan. The site operator will submit the certification via registered mail, and the submittal will contain all applicable documentation necessary for certification of closure of the unit, including:

- A final cover system evaluation report (FCSER) documenting the installation of the final cover. The FCSER may be submitted as a separate document for review and approval following the completion of the final cover installation. In that case, the certification of closure will be submitted subsequently;
- A final contour map as described under Section III.E that includes the relevant unit; and
- Copy of the letter to the TCEQ regional office requesting a closure inspection of the relevant unit.

(10) TCEQ's Acknowledgement of Termination of Operation and Closure of a Unit:

Upon receipt, the TCEQ executive director will review the closure documents for completeness and accuracy; and following receipt of the closure inspection report from the agency's regional office verifying proper closure of the MSW landfill unit according to this closure plan, the executive director will, in writing, acknowledge the termination of operation and closure of the unit and deem it properly closed. Thereafter, the site operator will comply with the post-closure care requirements described in the post-closure care plan for the unit.

(11) Deed Recordation for Disposed Regulated Asbestos Containing Materials (RACM):

Upon closure of the unit that accepted RACM, the site operator will place a specific notation that the unit accepted RACM in the deed records for the facility with a diagram identifying the RACM disposal areas. Concurrently, the site operator will submit to the TCEQ executive director, a notice of the deed recordation and a copy of the diagram identifying the asbestos disposal areas.

(12) Placement of all Closure Documentation in the Site Operating Record:

Once approved, the closure certification and all other documentation of closure will be placed in the site operating record.

(13) Closure Schedule for the Landfill Unit:

A closure schedule *for Unit Closure Implementation is provided in Closure Plan Report Text*. The schedule shows all the closure activities listed within Section V.A and the timelines for commencing and completing each activity. Also, the schedule shows that closure activities for the landfill unit will be completed within 180 days following the initiation of closure activities as required, unless an extension is granted by the TCEQ executive director.

(14) Other: (enter as applicable).

B. Closure of the Waste Storage or Processing Units or Operations

Closure of the waste storage or processing units or operations authorized under this permit will include removal of all waste, waste residues, and any recovered materials. The facility units and operations will either be dismantled and removed off-site or decontaminated. The site operator will dispose at the landfill or evacuate all materials (including feedstock, in process, and processed) to an authorized facility and disinfect all leachate handling units, tipping areas, processing areas, and post-processing areas. If there is evidence of a release from a unit or operation, the site operator will conduct an investigation, as approved by the TCEQ executive director, into the nature and extent of the release and an assessment of measures necessary to correct an impact to groundwater.

C. Final Closure of the Facility

In addition to the closure activities listed in Section V.A above for closing a landfill unit, the site operator will conduct the following activities for the closure of the entire facility:

(1) Publish Final Closure Notice and Place the closure Plan in a Public Place:

No later than 90 days prior to the initiation of the final facility closure, the site operator will:

(a) Publication of Notice:

The site operator will publish notice in the newspaper(s) of largest circulation in the vicinity of the facility to inform the public of the final closure of the facility. This notice will include:

- The name of the facility;
- The address, and physical location of the facility;
- The facility’s permit number; and
- The last date of intended receipt of waste.

(b) Place Copies of the Closure Plan in a Public Place:

The site operator will also make available an adequate number of copies of the approved final closure and post-closure plans for public access and review at the Edinburg City Hall, 415 West University Drive, Edinburg, Texas 78539 (state public place within the area, including address, where the plan will be available for public access and review).

(2) Submit Written Notice of “Intent to Close the Facility” to the TCEQ Executive Director:

The site operator will provide written notification to the TCEQ executive director of the intent to close the facility. This notice will be provided to the executive director no later than 90 days prior to the initiation of the final facility closure, and thereafter be placed in the site operating record.

(3) Post Signs and Install Barriers:

Upon notifying the executive director of the intent to close the facility and no later than 90 days prior to the initiation of final facility closure, the site operator will:

(a) Post Final Closure Signs:

The site operator will post a minimum of one sign at the main entrance and all other frequently used points of access for the facility notifying all persons who may utilize the facility of the date of closing for the entire facility and the prohibition against further receipt of waste materials after the stated date.

(b) Install Barriers:

Also, the site/operator will install suitable barriers at all gates or access points to adequately prevent the unauthorized dumping of solid waste at the closed facility.

(4) Filling of "Affidavit to the Public" and Performance of the Final Deed Recording:

Upon closure of all the landfill units or upon final closure of the facility, the site operator will:

(a) File Affidavit

File with the county deed records an "Affidavit to the Public" in a form provided by the TCEQ executive director that includes an updated metes and bounds description of the extent of the disposal areas at the facility and the restrictions to future use of the land in accordance with applicable provisions under 30 TAC Chapter 330, Subchapter T.

(b) Record a Notation on the Deed

Record a certified notation on the deed to the facility property, or on some other instrument that is normally examined during title search, that will in perpetuity notify any potential purchaser of the property that the land has been used as a landfill facility and use of the land is restricted according to the provisions under 30 TAC Chapter 330, Subchapter T.

(c) Place Documents in the Operating Record

Place a copy of the "Affidavit to the Public" and a copy of the modified deed in the site operating record.

(5) Submittal of a Copy of the "Affidavit to the Public" and the "Modified Deed" to the TCEQ Executive Director:

Within ten days after completion of final closure activities of the facility, the site operator will submit the following to the TCEQ executive director by registered mail:

(a) A certified copy of the "Affidavit to the Public";

(b) A certified copy of the modified deed to the facility property; and

(c) A certification, signed by an independent licensed professional engineer, verifying that final facility closure has been completed in accordance with the approved closure plan. The submittal will contain all applicable documentation necessary for certification of final facility closure, including:

- Final Cover System Evaluation Report (FCSER) documenting the installation of the final cover. The FCSER may be submitted earlier as a separate document for review and approval following the completion of the final cover installation. In that case, the certification of closure will be submitted subsequently;
- A final contour map as described under Item III.G above;
- Copy of a letter to the TCEQ regional office requesting a final closure inspection of the facility; and
- Copies of documents verifying newspaper publication of the notice of the final facility closure.

(6) Other

Additional items relating to the schedule for final facility closure, and additional closure activities specific to the final closure of this facility include:

(7) TCEQ's Acceptance of Termination of Operation and Closure of a Landfill Facility:

Following the TCEQ executive director's receipt and completion of the review of the professional engineer's certification of the completion of facility closure and the final closure documents, and receipt of the inspection report from the agency's regional office verifying proper closure of the facility according to this closure plan, the executive director will, in writing, accept the termination of operation and closure of the facility and deem it properly closed. Thereafter, the site operator will comply with the post closure care requirements described in the post closure plan for the facility.

(8) Final Closure Schedule for the Facility:

The attached Closure Plan, Final Closure Schedule, provides the closure schedule for the final facility closure. It incorporates the schedule for closure of a unit as discussed in Section V.A and also shows the commencement and completion timelines for the final closure activities listed within this Section.

VI. Summary of Attachments

A. Drawings and Maps

The following Drawings and Maps are attached as part of this plan.

- Figure III7-1, Final Contour Map.
- Figures III7-2, Cross-Section Drawings of the Landfill Units at Closure.
- Figures III7-3, Final Cover Details.
- Other Drawings/Maps: Figure III7-4 Maximum Closure Area

B. Documents

- Attachment III7A, Alternative Composite Final Cover Demonstration.
- Attachment III7B, Alternative Synthetic Grass Final Cover Demonstration.
- Attachment III7C, Form TCEQ-20720
- Attachment III7D, Final Cover Quality Control Plan (FCQCP).

C. Additional Items Attached (enter as applicable)

VII. Professional Engineer's Statement, Seal, and Signature

Name: Chad E. Ireland Title: Senior Project Geological Engineer

Date: November 7, 2017

Company Name: Golder Associated Inc. Firm Registration Number: F-2578

Professional Engineer's Seal

____
Signature

APPENDIX III7D-1

CONVENTIONAL COMPOSITE AND ALTERNATE COMPOSITE FINAL COVER SYSTEMS

PERMIT AMENDMENT APPLICATION

Part III, Attachment 7, Appendix D-1

FINAL COVER QUALITY CONTROL PLAN

CONVENTIONAL COMPOSITE AND ALTERNATIVE COMPOSITE FINAL COVER

Edinburg Regional Disposal Facility

Edinburg, Hidalgo County, Texas

TCEQ Permit MSW-956C

Submitted To: City of Edinburg
Department of Solid Waste Management
8601 North Jasman Road
Edinburg, Texas 78542 USA

Submitted By: Golder Associates Inc.
500 Century Plaza Drive, Suite 190
Houston, TX 77073 USA

July 2017
Revised: November 2017

Project No. 1401491

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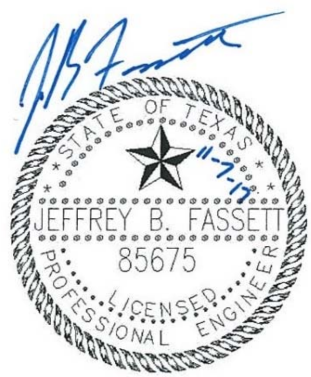

GOLDER ASSOCIATES INC.
Professional Engineering Firm
Registration Number F-2578

INTENDED FOR PERMITTING PURPOSES ONLY

The alternative composite final cover will consist of (from top to bottom):

- Erosion layer consisting of 24 inches of protective soil cover, of which the uppermost 6 inches will be capable of supporting native vegetation.
- Double-sided geocomposite (geotextile/geonet/geotextile) drainage layer.
- 40-mil LLDPE textured geomembrane that has a permeability less than or equal to the permeability of the bottom liner system.
- Reinforced GCL (infiltration layer).

The construction and testing requirements for the conventional composite final cover system infiltration layer are described in §2.0, Final Cover System Components of this FCQCP. The construction and testing requirements of the GCL infiltration layer in the alternative composite final cover system is described in §3.0, Cohesive Soil Cover of this FCQCP.

3.0 COHESIVE SOIL COVER (INFILTRATION LAYER)

This section outlines generally acceptable construction practices and specifications and the minimum quality control testing requirements for cohesive soil covers, serving as the infiltration layer in the final cover system.

3.1 Pre-construction Material Evaluation

The first step in constructing a cohesive soil cover is to pre-qualify the soil materials that are selected for final cover construction. Cohesive soil cover material may be obtained from in situ soil strata that will be excavated as the final cover is constructed or from a select borrow source. Representative samples from either source shall be subject to the minimum pre-construction testing program shown in Table III7D-1-1, Cohesive Soil Cover Materials Pre-construction Testing Schedule. Each soil type shall undergo the series of tests listed in Table III7D-1-1.

Table III7D-1-1: Cohesive Soil Cover Materials Pre-construction Testing Schedule

TEST	METHOD USED	FREQUENCY(1)
Soil Classification	ASTM D2487	1 per soil type
Particle-Size Analysis	ASTM D422 or D1140	1 per soil type
Atterberg Limits	ASTM D4318	1 per soil type
Hydraulic Conductivity(2)	ASTM D5084(3)	1 per soil type
Conventional Proctor Test	ASTM D698	1 per soil type
Moisture Content	ASTM D2216	1 per soil type

NOTES:

(1) If either the liquid limit (LL) or plastic limit (PI) varies by more than 10 points from other samples, the soil is considered a different soil type.

(2) Conduct this test on a remolded sample that is compacted at or less than 95% of the maximum dry density and at the optimum moisture content as determined from the conventional Proctor test or compacted at or less than 90% for modified Proctor test at one percent dry of the optimum. If pre-construction samples are compacted at higher

or lower densities and/or respective moisture contents, then these values will govern for field control. Pre-construction tests should represent the "worst-case" condition in the field concerning hydraulic conductivity results.

(3) Testing procedures in Appendix VII of the US Army Corps of Engineers Manual EM 1110-2-1906, November 30, 1970, Laboratory Soils Testing, may be used as an alternative method. Permeability tests will be conducted using tap water or 0.05N calcium sulfate solution as the permeant fluid. Distilled or deionized water is not acceptable.

Where soil types vary substantially and are not segregated, representative blends of those soil types anticipated to be utilized for cohesive soil cover construction should also be sampled and tested. The material tested shall comply with the following minimum material specifications:

- Plasticity Index ≥ 15
- Liquid Limit ≥ 30
- Percent Passing No. 200 Sieve ≥ 30
- Particle Size ≤ 1 inch
- Hydraulic Conductivity ≤ 1 x 10^{-5} cm/sec

The Proctor moisture-density curves shall be developed for each type of soil determined suitable as cohesive soil cover material and shall be used during the construction phase as a performance reference for compaction and moisture control. ~~Rocks and stones in soil for liner construction shall be limited to no more than 1 inch in diameter and no more than 10% by weight.~~

The POR should consider the potential adverse effects on and/or inconsistencies of results due to laboratory drying procedures, as some materials may exhibit variation in results for Proctor and Atterberg limits tests. Samples should not be oven-dried nor dried back more than 2 to 3 percent below the lowest anticipated moisture content needed to develop the Proctor moisture-density relationship. The zero air voids line shall be computed and included along with the Proctor curves, indicating the specific gravity value used.

Pre-construction samples to be run for hydraulic conductivity testing shall be molded at or less than the optimum moisture content and at or less than 95 percent of the maximum dry density according to the conventional Proctor test (ASTM D698). These points should represent reasonable worst-case conditions for hydraulic conductivity results on appropriately compacted soils. If higher moisture contents or dry densities are used for the hydraulic conductivity tests, then the higher values will be used for field control during placement. However, if lower moisture or density values are used and confirmed to achieve acceptable hydraulic conductivities, field control will still be based on the minimum compaction requirements in §3.2.4, Minimum Compaction Requirements of this FCQCP. .

~~As a general rule, a~~A minimum of one series of pre-construction tests ~~should~~ will be performed on each soil type and, a general rule for every 15,000 to 20,000 cubic yards (CY) of soil to be used in cohesive soil cover construction, unless soil types are limited and easily distinguished. As soil is usually made available subsequent to excavation during final cover construction, additional pre-construction samples should be taken and tests performed when soils vary or as soon as the initial pre-construction test results appear inappropriate or questionable. If and when the same borrow source is utilized for the soil supply of more than one final cover area, and the soil type is the same, results from previous tests may be used to supplement the pre-construction data.

3.2 Soil Cover Construction Specifications and Practices

The cohesive soil cover shall be constructed in accordance with the requirements included in this section. Also, certain construction practices shall be utilized as described herein when appropriate.

3.2.1 Working Surface Preparation

Subgrade preparation prior to receiving final cover will include compacting the near surface waste or intermediate cover to prepare the working surface. Depressions in the surface where ponded water is observed will be prepared by removing the water and filling the depression with additional intermediate cover to maintain an adequate slope.

Stability of the working surface prior to placement of the final cover shall be determined by the POR by visual inspection to confirm that deflection and pumping characteristics are minimized and the strength of the surface material is adequate. The lines and grades shall be determined by survey methods prior to subsequent final cohesive soil cover construction.

The prepared subgrade shall be tied into the first cohesive soil cover lift in a manner deemed suitable by the POR such that the integrity of the first lift will be maintained.

3.2.2 Work Area Selection and Sizing

Work areas for cohesive soil cover construction should be selected, sized, and sequenced so that work on each lift can begin and be completed in the same day. The area worked at any one time should be of such size that placement, processing, and compaction will be uniform, with minimal variation caused by weather conditions. It is critical that completed lifts be tested and covered with the next loose lift before that completed lift dries out in the sun or becomes damaged by heavy precipitation. Furthermore, the selection of size and shape of work areas shall be consistent, so that uniform construction techniques and equipment can be selected. Adequate numbers of quality control personnel will be provided to suit the pace of construction so proper monitoring and documentation is performed.

3.2.3 Lift Placement and Processing

Reduction of soil clods, uniform moisture distribution, and consistent placement thickness are key elements to achieving uniform compaction of cohesive soil covers. Cohesive soil cover material shall be placed in loose lifts, generally not exceeding 8 inches after spreading and leveling and/or processing, with the

Visual observation shall include, but not be limited to, the following:

- Moisture content and distribution, particle size, and other physical properties of the soil during processing, placement, and compaction.
- Type and level of compaction effort, including roller type and weight, drum size, foot length and face area, and number of passes.
- Action of compaction equipment on soil surface (i.e., foot penetration, rolling, pumping, or shearing).
- Maximum clod size and breakdown of soil structure.
- Method of bonding lifts together and making cohesive soil cover tie-ins.
- Stones or other inclusions, which may damage overlying geosynthetic components or adversely affect compaction, lift bonding, and in-place testing/sampling.
- Areas where damage due to excess moisture, insufficient moisture, or freezing may have occurred.

3.3.2 Construction Testing

30 TAC §330.457(c)

During cohesive soil cover construction, the minimum testing and sampling program presented in Table III7D-1-2, Cohesive Soil Cover Construction Testing Schedule shall be conducted to determine that adequate compaction and material conformance are being achieved.

Table III7D-1-2: Cohesive Soil Cover Construction Testing Schedule

TEST	METHOD	MINIMUM FREQUENCY(2)(3)
Field Moisture/Density Test	ASTM D6938, D2937, or D1556	1 per 8,000 ft^2, per 6-inch lift
Percent Finer Than No. 200 Sieve	ASTM D1140 or D422	1 per 100,000 ft^2, per 6-inch lift
Atterberg Limits	ASTM D4318	1 per 100,000 ft^2, per 6-inch lift
Hydraulic Conductivity(1)	ASTM D5084	1 per acre (evenly distributed through all lifts), per 6-inch lift

NOTES:
(1) Testing shall be conducted on undisturbed samples. Testing procedures in Appendix VII of the US Army Corps of Engineers Manual EM 1110-2-1906, November 30, 1970, Laboratory Soils Testing, may be used as an alternative.
(2) A voluntary increase in the number of any tests performed does not in turn require a commensurate increase in the other testing requirements to meet the above program.
(3) A minimum of one of each of the designated tests must be conducted for each lift of cohesive soil cover regardless of surface area.

Typically, field moisture-density tests will be performed using a nuclear density gage (ASTM D6938). Other acceptable test methods include the Sand Cone Method (ASTM D1556) or Drive Cylinder Test (ASTM D2937). Questions concerning the accuracy of any single field moisture-density test shall be addressed by retesting in the same general location. Periodic checks using the various test methods may be performed to verify the field moisture-density test results. Alternatively, field moisture-density checks may be performed using laboratory measurements of tube samples obtained adjacent to the field test locations.

Hydraulic conductivity tests will be performed on samples obtained with a thin-walled tube sampler. The percent finer than No. 200 sieve and~~,~~ Atterberg limits~~, and hydraulic conductivity tests~~ will be performed on ~~grab samples generally obtained with a~~the thin-walled tube sample~~r~~ or on a grab sample obtained adjacent to the thin-walled tube. ~~If more material is needed, the extra material can be obtained from cuttings at the same location.~~ These construction test samples will be obtained from the recently completed lift, taken one lift at a time, so that sample penetrations only go through one lift and do not penetrate from one lift into the next. ~~Undisturbed~~ Hydraulic conductivity samples will ~~generally~~ be sent to the geotechnical laboratory in the sampling tube, which will be properly sealed to preserve the moisture content and integrity of the sample.

3.3.3 Failure Repairs

3.3.3.1 Field Density Testing

Sections of cohesive soil~~s~~ cover~~s~~ that do not pass either the density or moisture requirements in the field shall be reworked and retested until the section in question does pass. All field density results shall be reported in the Final Cover System Evaluation Report (FCSER), whether they indicate passing or failing values.

In the event of a failed moisture-density test, additional tests will be performed between the failed test and the nearest adjacent passing test locations. If those additional tests pass, then the area between the failed test and the additional passing tests will be reworked and retested until passing. If the additional tests fail, then additional tests will be performed halfway between the initial additional tests and the adjacent passing tests to further define the failing area. This procedure will be repeated until the failing area is defined, reworked, and retested with passing results.

3.3.3.2 Laboratory Testing

Sections of cohesive soil cover that do not pass hydraulic conductivity testing shall be reworked and retested until the section in question does pass. All hydraulic conductivity testing results shall be reported in the Final Cover System Evaluation Report (FCSER), whether they indicate passing or failing values.

In the event of a failed hydraulic conductivity test, additional tests will be performed between the failed test and the nearest adjacent passing test locations. If those additional tests pass, then the area between the failed test and the additional passing tests will be reworked and retested until passing. If the additional tests fail, then additional tests will be performed halfway between the initial additional tests and the adjacent passing tests to further define the failing area. This procedure will be repeated until the failing area is defined, reworked, and retested with passing results.

3.3.4 Cohesive Soil Cover Perforations

When taking field densities and undisturbed samples, all holes dug or created in the cohesive soil cover for density probes or samples must be backfilled with bentonite or a bentonite-rich soil material. This backfill will be tamped in the hole to remove pockets of air or loose soil, and to assure a tight compact seal.

3.3.5 Cover Thickness Verification

Cohesive soil cover thickness verification shall be determined by survey methods. The verification points for record purposes shall be on a grid not exceeding 10,000 square feet per grid. If the area under evaluation is less than 10,000 square feet, a minimum of two grid points is required for verification. The selected grid shall be the same for both beginning and finished elevations of the cohesive soil cover, so that minimum thicknesses can be calculated and verified.

3.3.6 Post-Construction Care of Cohesive Soil Cover

The integrity of the cohesive soil cover shall be maintained by moistening to prevent the material from desiccating. Conversely, the cohesive soil cover shall be kept free of standing water. Damage caused by rain shall be repaired, and if the lift must be reworked, as determined by the POR, then appropriate retesting (including field moisture-density and permeability tests) shall be performed.

4.0 GEOSYNTHETIC CLAY LINER

This section presents general procedures, quality control testing requirements, and installation procedures for the geosynthetic clay liner (GCL) used in the alternative composite final cover to replace the cohesive soil (infiltration) layer. The GCL approved for use at the site consists of sodium bentonite encapsulated between two geotextile layers, needle-punched or stitched-bonded together.

4.1 Pre-Installation Material Evaluation

4.1.1 Manufacturer's Quality Control Certificates

Prior to the installation of the GCL, the manufacturer or installer shall provide the POR with quality control certificates signed by a responsible party employed by the manufacturer. The manufacturer must provide documentation certifying the material was continuously inspected for broken needles, and is needle free. Each quality control certificate shall include roll identification numbers, testing procedures, and results of quality control tests. The quality control tests shall be performed in accordance with project-specific testing methods and subject to the minimum testing frequency shown in Table III7D-1-3, GCL OC Submittal Frequency & Material Specifications. The owner may require more frequent testing at his discretion.

The quality control testing may be performed in the manufacturing plant. The POR shall review the test results prior to accepting the GCL to ensure that the certified minimum properties meet the values presented in Table III7D-1-3, GCL OC Submittal Frequency & Material Specifications.

4.1.2 Conformance Testing

In addition to the manufacturer's quality control certificates, samples of rolls of GCL will be obtained for conformance testing. The samples shall be tested by an independent third party laboratory in accordance with Table III7D-1-4, GCL Conformance Test Schedule. The POR shall review the test results to ensure that they meet the values presented in Table III7D-1-3, GCL QC Submittal Frequency & Material Specifications.

The POR shall compare measured shear strength values to those used in the stability analyses included in Part III3B-2E, Final Cover System Stability. If the measured interface shear strength is less than the values used in the analyses, the stability of the final cover system shall be reassessed and revised calculations shall be included in the Final Cover System Evaluation Report (FCSER).

4.1.3 Shipping and Unloading

In order to prevent premature hydration, the GCL rolls shall be shipped in plastic wrapping that shall remain intact until material installation. Rolls shall be labeled with the manufacturers name, product identification, roll and lot number, roll dimensions, weight and any other information to trace the quality assurance documentation. Upon delivery of the GCL, storage and handling procedures shall be documented. The rolls will be stacked, stored above ground, covered, and handled in accordance with ASTM D5888 or manufacturer's recommendations. If any rolls is damaged during shipping, unloading or storage or if the outer portion becomes partially hydrated, the damaged portion shall be removed before the roll is deployed.

Table III7D-1-3: GCL QC Submittal Frequency & Material Specifications

Bentonite					
Property	**Qualifier**	**Unit**	**Value**	**Test Method(1)**	**Frequency**
Fluid Loss	max.	ml	18	ASTM D5891	1 per 50 tons or every truck or railcar
Free Swell	min.	ml	24	ASTM D5890	
Geotextile					
Property	**Qualifier**	**Unit**	**Value**	**Test Method(1)**	**Frequency**
Mass per Unit Area	—	g/cc	—	ASTM D5261	1 per 200,000 ft^2
Tensile Properties:	—	lb	—	ASTM D4632	
GCL Product					
Property	**Qualifier**	**Unit**	**Value**	**Test Method(1)**	**Frequency**
Bentonite Mass	min.	lb/ft^2	0.8	ASTM D5993	1 per 40,000 ft^2

Bentonite Moisture Content	—	%	—	ASTM D5993	
Grab Tensile Strength	—	lb	—	ASTM D6768	1 per 200,000 ft^2
Hydraulic Flux	max.	m^3/m^2-s	1×10^{-8}	ASTM D5887	1 per week for each production line[2]
Lap Joint Permeability	Max	cm/sec	1 x 10-8	Flow Box or other suitable device	1 per material and lap type

Notes:
1. Updated methods may be implemented based on a review by the POR.
2. Report last 20 test values, ending on production date of supplied GCL.
3. For those properties that do not indicate a value, the GCL material must meet the manufacturer's minimum specification.

Table III7~~3~~D-1-4: GCL Conformance Test Schedule

TEST	METHOD[1]	FREQUENCY
Bentonite Mass/Unit Area	ASTM D5993	Not less than 1 test per 100,000 ft^2
Hydraulic Flux	ASTM D5887	
Direct Shear	ASTM D6243	1 test per GM/adjoining materials

Notes:
1. Updated methods may be implemented based on a review by the POR.

4.2 Installation Procedures

4.2.1 GCL Subgrade Preparation

Surfaces to be lined should be smooth and free of all rocks greater than 0.75-inch diameter (or as recommended by the manufacturer, if less than 0.75 inches), sharp/angular objects, sticks, roots, or debris of any kind. The surface should provide a firm, unyielding foundation for the GCL with no sudden, sharp, or abrupt changes or break in grade. The subgrade surface shall be prepared by rolling with a smooth-drum roller to minimize the roughness and press down protruding soil or rock particles prior to GCL deployment. Loose rocks and/or dry soil particles that could damage the GCL shall be removed. Excessive voids or dimples shall be filled with soil.

The GCL subgrade should be moisture conditioned prior to placing the GCL in final covers. Research has shown that the subgrades with water contents above 10%, or greater than the optimum water content, promotes hydration and osmotic swell in GCLs. These conditions result in GCLs that maintain their low hydraulic conductivities regardless of the amount cation exchange that occurs (Scalia and Benson 2011).

Although the subgrade shall be moist, standing water will not be allowed.

4.2.2 GCL Deployment

Equipment used to deploy GCL must not cause excessive rutting of the subgrade. Deployed GCL panels should contain no folds or excessive slack. Installation personnel must not smoke or wear damaging shoes on GCL. GCL should not be placed during excessive winds. Sand bags should be used to anchor deployed GCL when necessary. In general, only low ground pressure rubber-tired support equipment approved by the POR may be allowed on the GCL. If the POR or CQA monitor observes any potential damage done to the liner by the support equipment, use of the equipment will cease and the damage will be repaired. Generators, gasoline or solvent cans, tools, or supplies must not be stored directly on the GCL. GCL must be rolled into position, not drug across the subgrade. Deployed GCL must not be used as a work area without adequate protection such as a rub sheet.

Panels should be overlapped and seamed, as recommended by the manufacturer. End-to-end seams on sideslopes are not allowed. Care must be taken to assure the GCL is installed with the proper side up. ~~should be kept to a minimum. If end-to-end seams are necessary (i.e., if the GCL roll lengths are insufficient to cover the entire slope length), a minimum overlap of 5 feet will be required. Alternatively, seams may be glued, as recommended by the manufacturer. In addition, end-to-end seams may be placed only in the lower half of the slope and must be staggered.~~

GCL deployment shall be limited to the amount that can be covered with the overlying geomembrane liner the same day. GCL deployment shall not be undertaken during precipitation or when there is an impending threat of precipitation. GCL deployed on 5H:IV or steeper slopes shall be rolled down the slopes, not cross slope.

Following deployment, the CQA monitor shall visually examine the entire surface of the GCL for even bentonite distribution, thin spots, or other panel defects. All defects will be recorded and repaired in accordance with this FCQCP. The QA/QC representative shall also verify the following:

- Adequately moist subgrade
- Proper overlap during deployment
- Seams between GCL panels are constructed per manufacturer's recommendations
- Defects are patched and overlapped properly
- The bentonite has not become excessively hydrated
- No stones, tools, cutting blades or other objects that could damage the GCL are present on the GCL.

Excessively hydrated GCL shall be removed and replaced. Geomembrane shall not be placed on excessively hydrated GCL.

GCL panels shall be given an identification code, mapped, and logged to record relevant installation information.

4.2.3 GCL Repairs

Torn or otherwise damaged geosynthetic facing must be patched with the same type of geosynthetic. The geosynthetic patch must extend at least 12 inches beyond the damaged area and must be heat bonded, or otherwise attached to the main GCL to avoid shifting during placement of overlying geosynthetics. If the GCL damage includes loss of bentonite, the patch must consist of full GCL extending at least 12 inches beyond the damaged area. Lapping procedures must be the same as specified for original laps of GCL panels.

4.2.4 GCL Protection

The overlying geosynthetics and soil layers shall be deployed in such a manner as to ensure that the GCL is not damaged. Textured geomembranes shall not be dragged across previously installed GCL. A smooth rubsheet shall be placed between the GCL and textured geomembrane to prevent damage. The rubsheet will be removed when the geomembrane is in position. Other methods may be employed at the POR's discretion.

To avoid local bentonite displacement, and the possible impact on the hydraulic performance of a GCL, the soil cover material should be placed over the geomembrane and geocomposite overlying the GCL as soon as practicable following completion of the geomembrane and drainage system construction.

5.0 GEOMEMBRANE LINER

This section presents general procedures, quality control testing requirements, and construction specifications for geomembrane liner construction. Both the conventional composite final cover system and the alternative composite final cover system will include the following components:

- 40-mil, textured LLDPE geomembrane~~ with the option to install smooth LLDPE on the upper portion of the final cover, which is sloped at 5%~~;
- A geocomposite drainage layer composed of a geonet and filter geotextiles heat-bonded to both sides; and
- 18-inch protective cover soil. The upper 6 inches is an erosion control layer and must be capable of sustaining native plant growth.

5.1 Pre-installation Material Evaluation

5.1.1 Manufacturer's Quality Control Certificates

Prior to installing any geomembrane, the manufacturer or installer shall provide the POR with quality control certificates signed by a responsible party employed by the manufacturer. Each quality control certificate shall include roll identification numbers, testing procedures, and results of quality control tests. The quality control tests shall be performed in the manufacturing plant using the test methods and frequencies listed in the most recent version of the Geosynthetic Research Institute (GRI) test method GM17, "Test Methods, Test Properties and Testing Frequency for Linear Low Density Polyethylene (LLDPE) Smooth and Textured Geomembranes," included in Attachment 1. The owner may require more frequent testing at his/her discretion.

The POR shall review the test results prior to accepting the geomembrane to assure that the certified minimum properties meet the minimum values for geomembranes, as determined by the most recent GRI test method GM17.

The rolls delivered to the site shall be inventoried, recording the manufacturer's name and product identification, and the roll thickness, number and dimensions. Manufacturer's certificates should be cross-referenced to rolls delivered on-site.

Resumes of the installer's supervisor(s) or Master Seamer(s) shall be obtained to verify that adequate seaming experience will be utilized on the project. The installer's supervisor or Master Seamer shall have had experience totaling a minimum of 2,000,000 square feet of geomembrane installation.

Upon delivery of geosynthetic materials, storage and handling procedures shall also be documented. Rolls of geosynthetic materials shall be handled and stored in such a way as not to damage the material. As a general rule, rolls of geosynthetic materials should not be stacked more than four rolls high.

5.1.2 Conformance Testing

In addition to the manufacturer's quality control certificates, samples of the delivered rolls of geomembrane will be obtained either at the manufacturing facility or upon delivery to the site for conformance testing. The test samples shall be ~~obtained for~~ conformance tested~~ing~~ by a third party laboratory in accordance with the testing schedule shown in Table III7D-1-5, Geomembrane Conformance Test Schedule.

Table III7D-1-5: Geomembrane Conformance Test Schedule

TEST	METHOD(1)	FREQUENCY
Thickness (laboratory measurement)	~~ASTM D5199 (Smooth) or~~ ASTM D5994 (Textured)	Not less than 1 test per 100,000 ft^2 with not less than 1 per resin lot
Density	ASTM D1505 or D792	
Carbon black content(5)	ASTM D4218	
Carbon black dispersion	ASTM D5596	
Tensile properties	ASTM D6693, Type IV	
Direct Shear(2)(3)(4)	ASTM D6243	1 test per GM/adjoining materials

Notes:

1. Updated ASTM or GRI methods may be implemented based on a review by the POR.
2. Direct shear testing shall be performed on the soil or GCL/geomembrane/geocomposite sandwich. Soak interface and apply normal stresses of 100, 200 and 400 psf for at least 1 hour prior to shearing at a displacement rate of 0.04 in/min.
3. The testing results shall be compared to the values used in the final cover system stability analyses included in the Appendix III3B-2E. If the measured interface shear strength is less than the values used in the analyses, the stability of the final cover system shall be reassessed and revised calculations shall be included in the FCSER.
4. Test results from materials used during one construction event may be used in subsequent events provided the materials used are the same and approved by the POR.
5. Other methods such as D1603 (tube furnace) or D6370 (TGA) are acceptable if an appropriate correlation to D4218 (muffle furnace) can be established.

5.2 Installation Procedures

5.2.1 Geomembrane Deployment

The geomembrane shall be installed in direct and uniform contact with the cohesive soil coder or GCL. The geomembrane shall not be placed during inclement weather such as high winds or rain.

Geomembrane seaming should generally not take place when ambient temperatures are below 32 degrees Fahrenheit (°F), unless preheating is used. For extrusion welding, preheating will be required if the temperature is below 32°F. For fusion welding, preheating may be waived if the installer demonstrates that quality welds may be obtained without preheating. Seaming shall not be permitted at ambient temperatures above 104°F, unless the installer can demonstrate that seam quality is not compromised.

In general, only low ground pressure rubber-tired support equipment approved by the POR may be allowed on the geomembrane. If the POR observes any potential damage done to the liner by the support equipment, use of the equipment will cease and the damage will be repaired. Personnel working on the geomembrane shall not smoke, wear damaging shoes, or engage in any other activity likely to damage the geomembrane. Only those sections that are to be placed and seamed in one day should be unrolled. Panels left unseamed should be anchored with sandbags or other suitable weights. In general, seams should be oriented parallel to the line of maximum slope (i.e., oriented up and down, not across the slope). In corners and odd-shaped geometric locations, the number of field seams should be minimized.

Panels should be overlapped as recommended by the manufacturer as appropriate for the type of seam welding to be performed; however, overlapping shall be no less than 2 inches. Field seaming shall only be performed by the method(s) approved by the manufacturer, either by extrusion welding or double-tracked fusion welding. No seaming shall take place without the installer's supervisor or Master Seamer and CQA monitor being present. Fishmouths or wrinkles at the seam overlap shall be cut along the ridge of the wrinkle to achieve a flat overlap. The cut shall be seamed and/or patched. Seams shall extend to the outside edge of panels placed in the anchor trench.

5.3.3 Destructive Seam Testing

Destructive samples shall be taken at a minimum frequency of one test location, selected randomly, within each 500 linear feet of seam length, inclusive of both primary longitudinal and cross seams, cap strips, and repairs 20 square feet in total area or larger. Each test sample should be of sufficient length and 12 inches wide with the seam located in the middle. Test specimens, approximately 1 inch wide, shall be cut from both ends of the sample for field testing (peel and shear). The remaining sample should be cut into three parts (one for quality assurance laboratory testing, one for installer quality control laboratory testing, and one for archive storage to be maintained at a location selected by the owner).

The field tests shall be conducted on a certified calibrated tensiometer capable of maintaining a constant extension rate of 2 inches per minute. If one of the field test specimens from the ends of the destructive sample fails, then the seam will be considered to have failed, and repairs shall be initiated, as described below. If both specimens pass, then a sample for laboratory testing will be sent to the quality assurance laboratory for testing in both peel and shear. Seam strengths for LLDPE geomembranes shall meet the minimum values specified in the most current version of the Geosynthetic Institute, GRI Test Method GM19, "Seam Strength and Related Properties of Thermally Bonded Polyolefin Geomembranes."

Destructive test results for both field and laboratory tests shall include qualitative data, including the location of the failure and locus-of-break code as described in ASTM D6392. Peel tests on double-tracked fusion welds shall be performed on both inside and outside tracks of the weld. Seam break classifications for extrusion and fusion welds are shown on Figures III7A-1 and III7A-2, respectively.

At a minimum, a destructive test must be done for each welding machine used for seaming or repairs. A sufficient amount of the seam must be removed to conduct field testing, independent laboratory testing, and archiving of enough material to retest the seam when necessary. Destructive seam testing locations shall be cap-stripped and the cap completely seamed by extrusion welding to the geomembrane. Capped sections shall be non-destructively tested. Additional destructive test samples may be taken if deemed necessary by the POR or his/her qualified representative.

> Weld Acceptance Criteria: For LLDPE seams ~~(both smooth and textured)~~, the minimum passing criteria for destructive seam testing are described in the Geosynthetic Institute, GRI Test Method GM19. The POR must use the most current version of GM19 when evaluating welded seams.
>
> Seam Failure Delineation: When a sample fails a destructive test, the installer shall trace the welding path to an intermediate location at least 10 feet in each direction, or a distance determined by the POR, from the point of the failed test in each direction and take 1-inch wide specimens for an additional set of field tests. If these additional samples pass the tests, then two laboratory destructive samples shall be taken adjacent to the intermediate locations or at locations determined by the POR or his/her representative. If these laboratory samples pass the tests, then the seam shall be repaired between these locations. If either sample fails, then

the process shall be repeated to establish a zone where the seam should be repaired. All acceptable repaired seams shall be bounded by two locations from which samples passing laboratory destructive tests have been taken.

Seam Failure Repairs: Any portion of the geomembrane exhibiting a flaw or failing a destructive or non-destructive test shall be repaired. Repair methods may include spot welding (extrusion) for minor flaws and punctures; patches for larger holes and tears; capping for large lengths of failed seams or panel damage; and extrusion welding of outer flap to repair of an inadequate fusion seam (less than 100-foot cumulative length) that has an exposed edge.

For any repair method, the following provision shall be satisfied:

- Surfaces of the geomembrane that are to be repaired using extrusion methods shall be ground no more than one hour prior to the repair;
- All surfaces shall be clean and dry at the time of repair;
- Patches or caps shall extend at least 6 inches beyond the edge of the defect, and all corners of patches shall be rounded with a radius of approximately 3 inches;
- All repairs shall be non-destructively tested, as previously described; and
- All seaming equipment, personnel, and operation procedures used in repair work shall meet the same requirements as for new seaming operations.

The POR or his/her qualified representative shall observe all non-destructive testing of repairs and shall record the number of each repair, type, date, and test outcome. Repairs that pass the non-destructive tests shall be taken as an indication of an adequate repair. Repairs more than 150 feet long shall also be required to have a destructive test performed. Repairs that fail the initial retest shall be redone and retested until a passing test results. All work and testing of repairs shall be fully documented in a repair log.

When placing overlying material on the geomembrane, effort must be made to minimize wrinkle development. If possible, cover should be placed during the coolest weather available. Small wrinkles should be isolated and covered as quickly as possible to prevent their growth. In no case shall the geomembrane be allowed to fold over on itself.

6.0 DRAINAGE LAYER

The geocomposite drainage layer shall conform to the material and performance properties specified in Table III7D-1-6, Geocomposite Drainage Layer Specifications. Manufacturers' certificates of material and performance characteristics shall be obtained and documented at the minimum frequency shown on Table III7D-1-6, Geocomposite Drainage Layer Specifications, with not less than 1 per resin lot. Geosynthetic drainage material conformance testing will consist of transmissivity testing on each material type using the test set-up described in Table III7D-1-6, Geocomposite Drainage Layer Specifications.

The drainage layer is a double-sided geocomposite that consists of a geonet with a non-woven geotextile heat-bonded on both sides deployed over the final cover area. The double-sided geocomposite shall be anchored in an anchor trench at the perimeter of the final cover area or as shown on Figures III7-2A and III7-2B. The geonet core of the geocomposite will be tied together using plastic ties placed at a frequency of one per 5 feet along the length of the panel and every 6 inches along the ends of the panels. The upper geotextile panels will be secured by either overlapping and heat bonding or field sewn.

Only low ground pressure rubber-tired support equipment approved by the POR may be allowed on the geotextile. Personnel working on the geotextile shall not smoke, wear damaging shoes, or engage in any activity that damages the geotextile or underlying geosynthetics.

Table III7D-1-6: Geocomposite Drainage Layer Specifications~~(1)~~

Test Category	**Product**	**Test[a]**	**Test Method[b]**	**Testing Frequency**
Manufacturer	Resin (Geonet)	Density	ASTM D792 or D1505	One test per 100,000 ft^2 and every resin lot
		Melt Flow Index	ASTM D1238	
Manufacturer	Geonet	Density	ASTM D792 or D1505	One test per 100,000 ft^2 and every resin lot
		Nass / Area	ASTM D5261	
		Thickness	ASTM D5199	
		Compression	ASTM D1621	
		Transmissivity	ASTM D4716	
Manufacturer	Geotextile	Mass/Area	ASTM D5261	One test per 100,000 ft^2 and every resin lot
		Grab Tensile Strength	AASTM D4632	
		Trapezoidal Tear Strength	ASTM D4533	
		Burst Strength	ASTM D3786	
		Puncture Strength	ASTM~~N~~ D4833	
		Thickness	ASTM D5199	
		Apparent Opening Size	ASTM D4751	
		Permittivity	ASTM D4491	
Independent Laboratory	Geocomposite Product	Transmissivity	ASTM D4716	One test per product type
		Interface Shear or Ply Adhesion	ASTM D5321 OR D413	One test per project

[a] Adapted from EPA/600/R-93/182, September 1993, and *Designing with Geosynthetics*, 6th ed.
[b] The POR may propose equivalent or better tests.

~~**GEOCOMPOSITE**~~					
~~**Property**~~	~~**Qualifier**~~	~~**Unit**~~	~~**Value**~~	~~**Test Method**~~	~~**Frequency**~~
~~Transmissivity~~	~~Min.~~	~~m^2/sec~~	~~2.6 x 10^{-4}~~	~~ASTM D4716(2)~~	~~200,000 ft^2~~
~~Ply Adhesion~~	~~Min.~~	~~lb/in~~	~~0.5~~	~~ASTM D7005~~	~~200,000 ft^2~~
~~**GEONET CORE**~~					

~~Property~~	~~Qualifier~~	~~Unit~~	~~Value~~	~~Test Method~~	~~Frequency~~
~~Thickness~~	~~Min.~~	~~mils~~	~~200~~	~~ASTM D5199~~	~~200,000 ft^2~~
~~Density (black resin)~~	~~Min.~~	~~g/cm^3~~	~~0.940~~	~~ASTM D1505~~	~~200,000 ft^2~~
~~Carbon Black Content~~	~~Range~~	~~%~~	~~2 to 3~~	~~ASTM D4218~~	~~200,000 ft^2~~
~~**GEOTEXTILE**~~					
~~**Property**~~	~~**Qualifier**~~	~~**Unit**~~	~~**Value**~~	~~**Test Method**~~	~~**Frequency**~~
~~Mass per Unit Area~~	~~MARV~~	~~oz/yd^2~~	~~6~~	~~ASTM D5261~~	~~200,000 ft^2~~
~~AOS~~		~~US Sieve (mm)~~	~~70 (0.210)~~	~~ASTM D4751~~	~~540,000 ft^2~~
~~Puncture Resistance~~		~~lb~~	~~435~~	~~ASTM D6241~~	~~540,000 ft^2~~
~~Grab Tensile Strength~~		~~lb~~	~~160~~	~~ASTM D4632~~	~~540,000 ft^2~~

~~Notes:~~

~~(1) Appendix III3B-2E shall be referenced to determine the suitability of the alternate materials.~~

~~(2) The transmissivity shall be measured at a minimum gradient of 0.25 under a minimum normal pressure of 1,000 psf with a minimum seating period of 1 hour. If the measured transmissivity is less than this value, the geocomposite must be daylighted at certain intervals. See Appendix III3-B-2E-2 for details.~~

7.0 EROSION LAYER

The soil cover layer will consist of an 24-inch thick single protective/erosion layer. See Section 2.0 of this plan for a detailed description of the final cover system.

Soil cover does not require compaction control; however, it should be stable for construction traffic. Care shall be exercised in placement so as not to shift, wrinkle, or damage any underlying geosynthetic layers, and the placement methods shall be documented. Soil cover placement shall be monitored by the POR or his/her representative on a full-time basis.

Only the geocomposite should be placed in direct contact with the geomembrane. Light equipment, such as low ground pressure dozers (less than 5 psi contact pressure), shall be used to place the soil cover and a minimum of 12-inches of material shall be maintained between the dozer and the underlying geosynthetics. If possible, cover should be placed during the coolest weather available. Soil cover material shall be deployed in “fingers” along the geosynthetics to control the amount of slack and minimize wrinkles and prevent folds. Soil cover shall generally be placed in an upslope direction on sideslopes.

The final thickness of the soil cover layer shall be a minimum of 24-inches directly above the geocomposite drainage layer. The required thickness of the layer shall be verified by survey techniques on an established grid system with not less than one verification point per 10,000 square feet of surface area. A minimum of two verification points is required.

The soil used as the soil cover layer will be capable of sustaining native plant growth and must be seeded or sodded immediately after completion of the final cover (weather permitting). Temporary or permanent erosion control materials (i.e., mulches, containment meshes, geomatting systems, etc.) may be used to minimize erosion and aid establishment of vegetation. An alternative erosion layer may also be constructed (subject to the approval of TCEQ) consisting of cobbles, riprap, or other hard armor systems for areas where establishing vegetative cover has proven difficult.

Other quality assurance for the soil cover layer should consist of continuous observation by the POR or his/her representative during construction; inspection of any manufacturer's or supplier's material test data and certification; and performing any additional test believed necessary by the POR to verify that the layer has been constructed in accordance with the closure plan.

8.0 FINAL COVER SYSTEM EVALUATION REPORT

Upon completion of all required final cover construction and evaluation, the POR shall prepare and submit in triplicate the FCSER, prepared in accordance with this plan, to the TCEQ for review and approval.

Each FCSER will include a discussion of the construction of the final cover elements and a cover placement map, which not only shows the covered area being submitted for approval, but also the areas covered by all previous FCSER submittals with the dates of acceptance by the TCEQ. The map should depict the site grid system, graphic scale, and north arrow. It may be a print from a master drawing that is annotated and updated with each new submittal. The FCSER shall be signed and/or sealed by the POR performing the evaluation and counter-signed by the site operator or his/her authorized representative.

The construction documentation will contain a narrative describing the conduct of work and testing programs required by the FCQCP, "as-built" or record drawings, and appendices of field and laboratory testing. Constructed cover details ("as-builts"), where applicable, will be depicted and will show slopes, widths, and thickness for compaction lifts as determined from the field documentation. The construction documentation report will contain or discuss the following information at a minimum.

Table III3D-1-7: FCSER Content

Cohesive Soil Cover	Pre-construction soil test results
	Summary of construction material conformance tests results
	Summary of field moisture-density control test methods and results
	Summary of hydraulic conductivity test results
	Cohesive soil cover construction practices
	Placement and processing methods
	Observations of soil conditions prior to and after compaction, including soil structure, clod size, and presence of inclusions
	Compaction methods, equipment type, compactor weight and foot length, and number of passes
	Lift tie-in and bonding observations
	Repair of failed and damaged lifts

PERMIT AMENDMENT APPLICATION

Part III, Attachment 8

POST CLOSURE CARE PLAN

Edinburg Regional Disposal Facility

Edinburg, Hidalgo County, Texas

TCEQ Permit MSW-956C

STATE OF TEXAS
11/7/17
CHAD E. IRELAND
99293
LICENSED
PROFESSIONAL ENGINEER

GOLDER ASSOCIATES INC.
Professional Engineering Firm
Registration Number F-2578

INTENDED FOR PERMITTING PURPOSES ONLY

Prepared for: City of Edinburg
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July 2017
Revised: November 2017

Project No. 1401491

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GOLDER ASSOCIATES INC.
Professional Engineering Firm
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INTENDED FOR PERMITTING PURPOSES ONLY

EXECUTIVE SUMMARY

30 TAC §330.63(i) & §330.463(b)(3)(B)

This post-closure plan is prepared in accordance with 30 TAC Chapter 330 Subchapter K and the City shall place a copy of this plan in the operating record upon issuance of this permit. The post-closure plan includes a description of the monitoring and maintenance activities required and the frequency at which these activities will be performed. The City is the responsible for overseeing and conducting post-closure care activities.

City of Edinburg
Department of Solid Waste Management
8601 North Jasman Road
Edinburg, TX. 78541
(956) 381-5635

Also included in this post-closure plan is a description of the planned uses of any portion of the closed unit during the post-closure period in accordance with 30 TAC §330.465. A detailed written estimate, in current dollars, of the cost of post-closure care maintenance and any corrective action as described in this post-closure care plan or required by the TCEQ is included in Part III9B, TCEQ Post-Closure Cost Estimate Form.

1.0 POST-CLOSURE CARE REQUIREMENTS

30 TAC §330.463(b)(3)(A)

Monitoring and maintenance activities are required in post-closure care period. Post-closure care activities will follow the measures and conditions specified in Appendix III8A, TCEQ Post Closure Care Plan Form. A description of these activities and the frequency at which these activities will be performed are included in the following sections.

1.1 Post-Closure Care Period

30 TAC §§330.463 ~~(a)(1), §330.463~~(b)(1)~~,~~ & §330.463(b)(2)

After professional engineer certification of the completion of closure requirements for a municipal solid waste management unit as accepted by the TCEQ, the City shall conduct post-closure care for the unit for 30 years, unless revised by the TCEQ. The post-closure care period may be decreased by the TCEQ if the City submits to the TCEQ for review and approval a documented certification, signed by a licensed professional engineer and including all applicable documentation necessary to support the certification, which demonstrates that the reduced period is sufficient to protect human health and the environment. The TCEQ may also reduce the post-closure period for the unit if all wastes and waste residues have been removed during closure. The post-closure period care period may be increased by the TCEQ if it is determined that the lengthened period is necessary to protect human health and the environment. If there is evidence of a release from a municipal solid waste unit, the TCEQ may require an investigation into the nature and extent of the release and an assessment of measures necessary to correct an impact to groundwater.

1.2 Inspection Activities and Correction of Problems

30 TAC §330.463 (b)(1)(A)

~~30 TAC §330.463(a)(1)~~

The site operator will conduct periodic inspection of the closed units to identify and document deficiency conditions and conduct maintenance and corrective action to maintain compliance. Tables III8-1 through III8-6 provide information on the inspection items and deficiency conditions that the site operator will look for during inspection of the major components of the landfill and the site during the post-closure care period. The City shall correct, as needed, erosion of cover material, lack of vegetative growth, leachate or methane migration, and subsidence or ponding of water on the unit. If any of these problems occur after the end of the five-year post-closure period or persist for longer than the first five years of post-closure care, the City shall be responsible for their correction until the TCEQ determines that all problems have been adequately resolved. Other inspection and maintenance provisions that apply during the post-closure care period as specified in the facility's site operating plan, site development plan, or applicable rules will remain in effect.

The City shall retain the right of entry to and maintain all rights-of-way of a closed municipal solid waste management unit in order to conduct periodic inspections of the closed unit, conduct maintenance and/or remediation activities, as needed, in order to maintain the integrity and effectiveness of all final cover, facility vegetation, and drainage control system, to correct any effects of settlement, subsidence, ponded water, erosion, or other events or failures detrimental to the integrity of the closed unit and to prevent any surface run-on and run-off from eroding or otherwise damaging the final cover system.

1.2.1 Right of Entry and Rights-of-way

~~30 TAC §330.463(a)(1) & (b)(1)(A)~~

~~The City shall retain the right of entry to and maintain all rights-of-way of a closed municipal solid waste management unit in order to conduct periodic inspections of the closed unit, conduct maintenance and/or remediation activities, as needed, in order to maintain the integrity and effectiveness of all final cover, facility vegetation, and drainage control system, to correct any effects of settlement, subsidence, ponded water, erosion, or other events or failures detrimental to the integrity of the closed unit and to prevent any surface run-on and run-off from eroding or otherwise damaging the final cover system.~~

During the post-closure monitoring and maintenance period of the site, the facility access and Rights-of-way will be inspected quarterly. At a minimum, maintenance will be performed as needed prior to the next scheduled inspection.

Table III8-1: Access and Right-of-way Inspection Items

Inspection Item	Types of Deficiency Conditions
Gates, Gate Locks and Barriers	Damaged, gates unlocked/locks missing, signs of site entry detected
Fence and other Access Control Barriers	Damaged, broken, signs of entry detected
Vegetation Control in Areas of the Facility other than the Final Cover	Vegetative stress, overgrowth, vegetation other than what was designated in that area

1.2.2 Final Cover

During the post-closure monitoring and maintenance period of the site, the final cover will be inspected quarterly. Monitoring and maintenance activities will be performed to maintain the integrity and effectiveness of the final cover system. Items included in the quarterly assessment will include inspection

1.2.4 Leachate Collection and Removal System

30 TAC §330.463(b)(1)(B)

The City shall maintain and operate the leachate collection and removal system throughout the post-closure care period in accordance with the requirements of 30 TAC §330.331 and §330.333 and Part III3, Waste Management Unit Design Report. The components of the leachate collection and removal system will be routinely inspected to maintain its integrity and effectiveness. The need for maintenance will be assessed based on performance during routine monitoring. At a minimum, maintenance will be performed as needed prior to the next scheduled inspection. The TCEQ may allow the City to stop managing leachate if the City demonstrates to the approval of the TCEQ that leachate no longer poses a threat to human health and the environment.

Table III8-4: Leachate Collection and Removal System Inspection Items

Inspection Item	Types of Deficiency Conditions
Leachate Pumps	Visible damage to pumps, abnormal flow rates or odors.
Leachate Forcemain	Visible damage to forcemains, abnormal flow rates or odors.
Leachate Collection Lines	Abnormal flow rates or odors. Leachate collection lines may need periodic cleaning or flushing to dislodge biological mass or fines than may have clogged the pipe ~~performations~~perforations.

1.2.5 Landfill Gas Management System

The City shall maintain and operate the landfill gas management system throughout the post-closure care period in accordance with the requirements of Part III6, Landfill Gas Management Plan. The components of the landfill gas management system will be routinely inspected to maintain its integrity and effectiveness. The need for maintenance will be assessed based on performance during routine monitoring. At a minimum, maintenance will be performed as needed prior to the next scheduled inspection.

Table III8-5: Landfill Gas Management System Inspection Items

Inspection Item	Types of Deficiency Conditions
Gas Wells	Visible damage and landfill gas extraction performance.
Lateral and header piping	Cracks, bends, breakage or blockage of landfill gas flow
Condensate Sumps	Visible damage and performance.
Flare Station	Visible damage and performance. May need calibration.

1.2.6 Groundwater and Gas Monitoring Systems

During the post-closure monitoring and maintenance period of the site, the groundwater and gas monitoring systems will be routinely inspected to maintain their integrity and effectiveness. Particular attention will be paid to ensure that monitoring equipment is calibrated according to the manufacturers' recommendations. Maintenance of the groundwater and gas monitoring systems will be performed prior to or during the next scheduled sampling or monitoring event, depending on the extent of the repairs or maintenance required.

Table III8-~~6~~5: Groundwater and Gas Monitoring Inspection Items

Inspection Item	Types of Deficiency Conditions
Groundwater Monitoring Wells	Visible damage to protective casing, well locks, or concrete pads.
Landfill Gas Monitoring Probes	Visible damage to protective casing, well locks, or concrete pads.

1.3 Continuation of Monitoring Programs

~~30 TAC §330.463(a)(2)&(3)~~

Groundwater and gas monitoring programs in effect during the life of the unit shall be continued during the post-closure care period. If there is evidence of a release from a municipal solid waste unit, the TCEQ may require an investigation into the nature and extent of the release and an assessment of measures necessary to correct an impact to groundwater.

1.3.1 Groundwater Monitoring System

30 TAC §330.463(b)(1)(C)

Groundwater monitoring activities will continue throughout the post-closure care period in accordance the requirements of 30 TAC Chapter 330 Subchapter J and Part III5B, Groundwater Sampling and Analysis Plan (GWSAP). All groundwater monitoring wells including in the groundwater monitoring network will be monitored semi-annually unless otherwise approved by the TCEQ. If there is evidence of a confirmed statistically significant increase over constituent background values, the City shall implement an assessment monitoring plan outlined in Part III5B, GWSAP.

1.3.2 Gas Monitoring System

30 TAC §330.463(b)(1)(D)

Landfill gas monitoring activities will continue throughout the post-closure care period, in accordance with the requirements of 30 TAC Chapter 330 Subchapter I and Part III 6, Landfill Gas Management Plan, as conducted during the active facility operations. All structures and permanent gas monitoring probes will be sampled quarterly unless otherwise approved by the TCEQ. If there is evidence of confirmed landfill gas migration from the waste management units at the facility, the City shall implement the contingency plan in Part III6, Landfill Gas Management Plan.

1.4 Documentation and Record Keeping

30 TAC §330.463(b)(3)

The City will document and maintain detailed records of all inspection results and schedules, maintenance, monitoring results and schedules, or remediation activities of any other actions to be taken to maintain compliance in the site operating record.

The City shall place a copy of the post-closure care plan in the operating record by the initial receipt of waste. The post-closure care plan shall include, at a minimum, the following information:

1.4.1 Description of Monitoring and Maintenance Activities

30 TAC §330.463(b)(3)(A)

The post-closure care plan shall include a description of the monitoring and maintenance activities required in 30 TAC §330.463(b)(1) for each unit, and the frequency at which these activities will be performed. Monitoring and maintenance activities required and the frequency at which these activities will be performed are included in §1.0, Post-Closure Care Requirements and Appendix III8A, TCEQ Post Closure Care Plan.

1.4.2 Post-Closure Care Responsibility

30 TAC §330.463(b)(3)(B)

The post-closure care plan shall include the name, address, and telephone number of the office or person responsible for overseeing and/or conducting the post-closure care activities at the closed unit or facility during the post-closure period. The City is ~~the~~ responsible for overseeing and conducting post-closure care activities.

City of Edinburg
Department of Solid Waste Management
8601 North Jasman Road
Edinburg, TX. 78541
(956) 381-5635

1.4.3 Post-Closure Planned Uses

30 TAC §330.463(b)(3)(C)

The post-closure care plan shall include a description of the planned uses of any portion of the closed unit during the post-closure period in accordance with 30 TAC §330.465, Certification of Completion of Post-

Closure Care. Currently, post-closure land use is anticipated to be open space, and will be in accordance with requirements for development over a closed MSW landfill in post-closure care in 30 TAC §330.954(c).

1.4.4 Post-Closure Care Cost Estimate

30 TAC §330.463(b)(3)(D)

The post-closure care plan shall include a detailed written estimate, in current dollars, of the cost of post-closure care maintenance and any corrective action as described in the post-closure care plan or required by the executive director or the commission and which satisfies the requirements specified in 30 TAC §330, Subchapter L. A detailed post-closure care cost ~~written~~ estimate, in current dollars, ~~of the cost of post-closure care maintenance and any corrective action as described in this post-closure care plan or required by the TCEQ~~ is included in Part III9B, TCEQ Post-Closure Care Cost Estimate Form.

~~1.4 DOCUMENTATION AND RECORD KEEPING~~

~~2.0 THE CITY WILL DOCUMENT AND MAINTAIN DETAILED RECORDS OF ALL INSPECTION RESULTS AND SCHEDULES, MAINTENANCE, MONITORING RESULTS AND SCHEDULES, OR REMEDIATION ACTIVITIES OF ANY OTHER ACTIONS TO BE TAKEN TO MAINTAIN COMPLIANCE IN THE SITE OPERATING RECORD.~~

~~3.0 POST-CLOSURE LAND USE~~

~~4.0 30 TAC §330.463(B)(3)(C)~~

2.0 ~~CURRENTLY, POST-CLOSURE LAND USE IS ANTICIPATED TO BE OPEN SPACE, AND WILL BE IN ACCORDANCE WITH 30 TAC §330, SUBCHAPTER T, RELATED TO USE OF LAND OVER CLOSED MUNICIPAL SOLID WASTE LANDFILLS.~~ COMPLETION OF POST-CLOSURE CARE

~~5.0~~ Completion of post-closure care will follow the conditions specified in Appendix III8A, TCEQ Post Closure Care Plan Form.

~~5.1~~2.1 Certification of Post-Closure Care Completion

30 TAC §330.465(a)

Following completion of the post-closure care maintenance period for each municipal solid waste landfill unit, the City shall submit to the TCEQ for review and approval a certification, signed by an independent licensed professional engineer, verifying that post-closure care has been completed in accordance with this post-closure plan. The submittal to the TCEQ shall include all applicable documentation necessary for the certification of completion of post-closure care. Once approved, the certification and all applicable documentation will be included in the site's operating record.

~~5.2~~2.2 Voluntary Revocation

30 TAC §330.465(b)

Upon completion of the post-closure care period for the final unit at a facility, the City shall also submit to the TCEQ a request for voluntary revocation of the facility permit. Once approved, the voluntary revocation and will be included in the site's operating record.

APPENDIX III8A

TCEQ POST CLOSURE CARE PLAN FORM

PERMIT AMENDMENT APPLICATION

Part III, Attachment 9

CLOSURE AND POST-CLOSURE COST ESTIMATES

Edinburg Regional Disposal Facility

Edinburg, Hidalgo County, Texas

TCEQ Permit MSW-956C

Submitted To: City of Edinburg
Department of Solid Waste Management
8601 North Jasman Road
Edinburg, Texas 78542 USA

Submitted By: Golder Associates Inc.
500 Century Plaza Drive, Suite 190
Houston, TX 77073 USA

July 2017
Revised: November 2017

Project No. 1401491

EXECUTIVE SUMMARY

30 TAC §§330.63(j) & 305.70(j)(30)

The City has included a cost estimate for closure and post-closure care in accordance with 30 TAC §330 Subchapter L and documentation required to demonstrate financial assurance as specified in 30 TAC §37 Subchapter R. The City may request as permit modification that does not require notice in accordance with~~to~~ 30 TAC §330.305(j)(30), for changes to a closure or post-closure care cost estimate required under 30 TAC §§330.503 or 330.507 that result in an increase/decrease in the amount of financial assurance required if the increase/decrease in the cost estimate is due to an increase/decrease in the maximum area requiring closure.

~~1.0~~

~~2.0~~1.0 CLOSURE COST ESTIMATE E.I.2

30 TAC §330.503(a)

The detailed written cost estimate, in current dollars, showing the cost of hiring a third party to close the largest waste fill area that could potentially be open in the year to follow and those areas that have not received final cover in accordance with Part III7, Closure Plan is included in Appendix III9A, TCEQ Closure Care Cost Estimate Form. ~~This means the completion of the final closure requirements for active and inactive fill areas as depicted on Figure III9-1, Maximum Closure Area.~~

~~2.1~~1.1 Annual Review

30 TAC §330.503(a)(1)

The City shall review the facility's permit conditions on an annual basis and verify that the current active areas match the areas on which closure cost estimates are based.

~~2.1.1~~1.1.1 Closure Cost Increase

30 TAC §330.503(a)(2)

An increase in the closure cost estimate and the amount of financial assurance shall be made if changes to the final closure plan or the landfill conditions increase the maximum cost of closure at any time during the remaining active life of the unit.

~~2.1.2~~1.1.2 Closure Cost Reduction

30 TAC §330.503(a)(3)

A reduction in the closure cost estimate and the amount of financial assurance may be approved if the cost estimate exceeds the maximum cost of closure at any time during the remaining life of the unit and the City has provided written notice to the TCEQ of the situation that includes a detailed justification for the reduction of the closure cost estimate and the amount of financial assurance. The City may request a reduction in the cost estimate and the financial assurance as a permit modification in accordance with 30 TAC §330.305(j)(30).

~~2.2~~1.2 Financial Assurance

30 TAC §330.503(b)

The City has established financial assurance for closure of the municipal solid waste units in accordance with 30 TAC §37, Subchapter R. Continuous financial assurance coverage for closure shall be provided until the facility is officially placed under the post-closure maintenance period and all requirements of Part III7, Closure Plan have been approved as evidenced in writing by the TCEQ.

In accordance with 30 TAC §37.131, during the active life of the facility, the current cost estimate will be adjusted annually for inflation within 60 days prior to the anniversary of the establishment of the financial instrument(s) used. The evidence of any additional financial assurance will be provided to the TCEQ within 30 days after the anniversary date of the first establishment of the financial assurance mechanism.

The adjustment for inflation may be made by recalculating the maximum cost of closure in current dollars, or by using an inflation factor derived from the most recent Implicit Price Deflator for Gross National Product published by the US Department of Commerce in the Survey of Current Business. The inflation factor is the result of dividing the latest published annual Deflator by the Deflator for the previous year. Multiplying the closure cost estimate by the inflation factor makes the first adjustment. The result is the adjusted closure cost estimate. Multiplying the latest adjusted closure cost estimate by the latest inflation factor makes subsequent adjustments. If the TCEQ approves a revised closure cost estimate prior to the annual inflation update, an additional update for inflation only is not required. The regular annual inflation update will resume the following year.

In accordance with 30 TAC §330.63(j), a copy of the financial assurance documentation for closure of the facility is included in Appendix III9C, Current Evidence of Financial Assurance.

~~3.0~~2.0 POST-CLOSURE CARE COST ESTIMATE

30 TAC §330.507(a)

The City has provided in Appendix III9B, TCEQ Post-Closure Care Cost Estimate Form a detailed written cost estimate, in current dollars, of the cost of hiring a third party to conduct post-closure care activities for the municipal solid waste units, in accordance with the post-closure care plan. The post-closure care cost estimate used to demonstrate financial assurance in 30 TAC §330.507(b) shall account for the total costs of conducting post-closure care for the largest area that could possibly require post-closure care in the year to follow, including annual and periodic costs as described in the post-closure care plan over the entire post-closure care period.

~~3.1~~2.1 Annual Review

~~3.1.1~~2.1.1 Increase in Post-Closure Care Cost Estimate

30 TAC §330.507(a)(1)

An increase in the post-closure care cost estimate and the amount of financial assurance provided under 30 TAC §330.507(b) shall be made if changes in the post-closure care plan or the unit conditions increase the maximum costs of post-closure care.

~~3.1.2~~2.1.2 Reduction in Post-Closure Care Cost Estimate

30 TAC §330.507(a)(2)

A reduction in the post-closure care cost estimate and the amount of financial assurance provided under 30 TAC §330.507(b) may be allowed if the cost estimate exceeds the maximum costs of post-closure care remaining over the post-closure care period and the City has provided written notice to the TCEQ of the detailed justification for the reduction of the post-closure cost estimate and the amount of financial assurance. The City may request a reduction in the cost estimate and the financial assurance as a permit modification in accordance with 30 TAC §330.305(j)(30).

~~3.2~~2.2 Financial Assurance

30 TAC §330.507(b)

The City has established financial assurance for the costs of post-closure care of the unit in accordance with 30 TAC §37, Subchapter R. Continuous financial assurance coverage for post-closure care shall be provided until the facility is officially released in writing by the TCEQ from the post-closure care period in accordance with all requirements of the Part III8, Post-Closure Care Plan.

In accordance with 30 TAC §37.131, during the active life of the facility, the current cost estimate will be adjusted annually for inflation within 60 days prior to the anniversary of the establishment of the financial instrument(s) used. The evidence of any additional financial assurance will be provided to the TCEQ within 30 days after the anniversary date of the first establishment of the financial assurance mechanism.

The inflation adjustment may be made by recalculating the maximum cost of closure in current dollars, or by using an inflation factor derived from the most recent Implicit Price Deflator for Gross National Product published by the US Department of Commerce in the Survey of Current Business. The inflation factor is the result of dividing the latest published annual Deflator by the Deflator for the previous year. Multiplying the closure cost estimate by the inflation factor makes the first adjustment. The result is the adjusted closure cost estimate. Multiplying the latest adjusted closure cost estimate by the latest inflation factor makes subsequent adjustments. If the TCEQ approves a revised post-closure cost estimate prior to the annual inflation update, an additional update for inflation only is not required. The regular annual inflation update will resume the following year.

In accordance with 30 TAC §330.63(j), a copy of the financial assurance documentation for post closure care of the existing facility is included in Appendix III9C, Current Evidence of Financial Assurance.

PERMIT AMENDMENT APPLICATION

Part IV

SITE OPERATING PLAN

Edinburg Regional Disposal Facility

Edinburg, Hidalgo County, Texas

TCEQ Permit MSW-956C

Submitted To: City of Edinburg
Department of Solid Waste Management
8601 North Jasman Road
Edinburg, Texas 78542 USA

Submitted By: Golder Associates Inc.
500 Century Plaza Drive, Suite 190
Houston, TX 77073 USA

July 2017
Revised: November 2017

Project No. 1401491

1.0 RECORDKEEPING REQUIREMENTS

The following sections outline the facility's recordkeeping and records retention requirements.

1.1 Records

1.1.1 Permit and Plans

30 TAC §330.125(a)

Upon permit issuance, a copy of the permit, this SOP and the approved site development plan, the final closure plan, the post-closure maintenance plan, the landfill gas management plan, and any other required plans or related documents shall be maintained ~~at the facility~~ in the SOR. The SOR will be properly stored at the Jasman Road Complex, the landfill facilities serving both Type I and Type IV landfills as depicted on Figure II-16, Facility Entrance Plan.

1.1.2 Records Management

30 TAC §330.125(b) – (g) & (d)

Documents will be added to SOR within 7 working days of completion of the item or receipt of analytical data. It shall be the responsibility of the landfill manager to retain all required records, either paper copy or electronic format, and maintain the SOR in an organized format that allows the information to be easily located and retrieved. All information contained in the SOR shall be furnished upon request to the TCEQ and must be made available for inspection by the TCEQ. The different plans required for the facility and all information contained within the SOR, will be retained for the life of the facility, including the post-closure care period. In addition, the TCEQ may set an alternate recordkeeping and notification schedule.

Recordkeeping requirements and recommendations are further summarized on the table below:

Table IV-1: Recordkeeping Requirements and Recommendations

Records Needed	Frequency	30 TAC Rule Citation or SOP Section
Approved SOP, SDP, Closure Plan, Post-closure Maintenance Plan, Landfill Gas Management Plan, and Other Required Plan(s) and Related Documents	Permit Issuance	§330.125(a)
Location Restriction Demonstrations	Permit Issuance	§330.125(b)(1)
Prohibited Waste Inspection Records, Training and Receipt Notification Procedures	Per Occurrence	§330.125(b)(2)
Gas Monitoring Results	Quarterly	§330.125(b)(3); §330.159
Remediation Plans for Explosive and Other Gases	Per Occurrence	§330.125(b)(3)
Unit Design Documentation for Leachate or Gas Condensate Placement	As Required	§330.125(b)(4)
Groundwater Monitoring and Corrective Action Demonstration, Certification, Monitoring, Testing, & Analytical Data	Per Occurrence	§330.125(b)(5)

4.0 GENERAL INSTRUCTIONS

30 TAC §330.127(3)

Operations will be conducted in a professional manner by qualified and trained personnel. Operational objectives will consist of placing the maximum permissible amount of waste in a specified area, properly compacting, covering and managing the waste, and operating the site in compliance with the TCEQ regulations, the site permit, and the SOP. The following Table IV-4, Facility Operations, Inspection, and Maintenance List includes general instructions that the operating personnel will follow concerning the operational requirements of the facility.

Table IV-4: Facility Operations, Inspection, and Maintenance List

Description of Activity	Task	Frequency	Inspector	Inspection Documentation
Entrance Gate and Perimeter Fences	Conduct inspection of gate and perimeter fences to ensure that no breach has occurred. If breach occurs, notify TCEQ, as specified in §4.5.2 Notification of this SOP	Weekly	Director of Solid Waste Management, Site Manager, or Designee	Note status and maintain in SOR
Cover Application Record	Record date of cover, how it was accomplished, and the last area covered, according to 330.165.	Daily	Director of Solid Waste Management, Site Manager, or Designee~~Site Manager or Designee~~	Document daily, intermediate, and final cover application, sign form, and place in SOR
Perimeter Drainage Channel and Pond Maintenance	Inspect channels for litter and debris, establish flowline, as required. Inspect detention ponds for damage.	Inspect weekly Maintain as needed	Director of Solid Waste Management, Site Manager, or Designee~~Site Manager or Designee~~	Document weekly, place in SOR
Random Load Inspection	Conduct inspection of selected vehicle to ensure that no unauthorized wastes are in the load.	Weekly, as specified in §4.2.2.4 Random Inspections of this SOP	Director of Solid Waste Management, Site Manager, or Designee~~Site Manager or Designee~~	Place completed Load Inspection Report in SOR
Unauthorized Material Removal	Document removal of unauthorized materials from the landfill.	Per Occurrence	Director of Solid Waste Management, Site Manager, or	Complete Unauthorized Material Removal form and place in SOR

Description of Activity	Task	Frequency	Inspector	Inspection Documentation
			Designee~~Site Manager or Designee~~	
Final Cover Inspection	Inspect final cover for erosion and damage to drainage structures.	As indicated in the SWPPP or weekly at a minimum	Director of Solid Waste Management, Site Manager, or Designee~~Site Manager or Designee~~	Complete documentation and place in SOR
On-site Litter Collection	Inspect site for litter. Collect litter on a daily basis and return to the working face for proper disposal.	Daily	Director of Solid Waste Management, Site Manager, or Designee~~Site Manager or Designee~~	Complete documentation and place in SOR
Mud and Debris Cleaned from Public Roads	Inspect public roads for evidence of mud and debris tracked from the site.	Daily during periods of inclement weather	Director of Solid Waste Management, Site Manager, or Designee~~Site Manager or Designee~~	Complete documentation and place in SOR
Fire Extinguishers/ Firefighting Equipment	Inspect all fire extinguishers and/or firefighting equipment, promptly repair or replace defective equipment.	Annually	Director of Solid Waste Management, Site Manager, or Designee~~Site Manager or Designee~~	Properly mark tags on fire extinguishers, document results of equipment inspections, place in SOR
Markers and Benchmarks	Inspect markers and benchmarks for damage. Replace markers that are removed or destroyed within 15 days of removal or destruction.	Monthly	Director of Solid Waste Management, Site Manager, or Designee~~Site Manager or Designee~~	Complete documentation and place in SOR
Roadway Regrading	Inspect on-site access roadways to ensure a clean and safe condition.	As needed or Quarterly	Director of Solid Waste Management, Site Manager, or Designee~~Site Manager or Designee~~	Complete documentation and place in SOR

Description of Activity	Task	Frequency	Inspector	Inspection Documentation
Site Signs	Inspect all site signs for damage, general location, and accuracy of posted information.	Weekly	Director of Solid Waste Management, Site Manager, or Designee~~Site Manager or Designee~~	Complete documentation and place in SOR
Ponded Water	Inspect site for potential ponding and ponded water. Fill and grade low areas as soon as practical.	Weekly	Director of Solid Waste Management, Site Manager, or Designee~~Site Manager or Designee~~	Complete documentation and place in SOR

Notes:

SWPPP = Storm Water Pollution Prevention Plan

4.1 Personnel Training

30 TAC §§330.127(4), 335.586(a), & 335.586 (c)

Facility personnel must successfully complete a program of classroom instruction or on-the-job training that teaches them to perform their duties in a way that ensures the facility's compliance with the applicable requirements of 30 TAC §335.586. The City must ensure that this program includes all the elements described in the description of the type and amount of both introductory and continuing training that will be given to each personnel position.

This program must be directed by a person trained in waste management procedures, and must include instruction that teaches facility personnel waste management procedures (including contingency plan implementation) relevant to the positions in which they are employed. At a minimum, the training program must be designed to ensure that facility personnel are able to respond effectively to emergencies by familiarizing them with emergency procedures, emergency equipment, and emergency systems, including, where applicable:

- procedures for using, inspecting, repairing, and replacing facility emergency and monitoring equipment;
- communications or alarm systems;
- response to fires or explosions;
- response to groundwater contamination incidents; and
- shutdown of operations.

More detailed written descriptions of the type and amount of introductory and continued training provided to each employee as well as documentation of training will be maintained in the SOR. Facility personnel must take part in an annual review of the initial training required. The site manager, equipment operators, gate attendants, and laborers are trained in the contents of this SOP and other topics, as described in the following ~~table~~Table IV-5, Personnel Training:

Table IV-5: Personnel Training

Position	Job Description	Site Orientation	Site Operations	Endangered Species	Prohibited Waste Identification	Safety (job specific)	Fire Prevention	Load Inspection	Prohibited Wastes	Spill Prevention Control	Emergency Response	Litter Control	Random Inspection	Stormwater Pollution Prevention	Leachate System Maintenance
Site Manager	Responsible for all activities, ensure adequate staffing, inspections	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Gate Attendant	Take receipts, screen and some load inspection, direct vehicles to unloading area	X			X	X	X	X	X		X		X		
Equipment Operator	Compact waste, visual inspection of loads, unauthorized waste identification, apply daily cover	X		X	X	X	X	X	X	X	X		X		As Assigned
Laborer	As assigned	X		X		X	X				X	X			

4.2 Prohibited Waste Detection and Prevention

30 TAC §330.127(5

The facility has and will continue to implement procedures for the detection and prevention of the disposal of prohibited wastes, including regulated hazardous waste as defined in 40 Code of Federal Regulations (CFR) Part 261, and of polychlorinated biphenyls (PCB) wastes as defined in accordance with 40 CFR Part 761 unless authorized by the United States Environmental Protection Agency. Prohibited wastes that shall not be accepted are identified in Part II, Waste Acceptance Plan.

4.2.1 Training for Inspecting Loads

30 TAC §330.127(5)(C)

Facility personnel will be trained to inspect vehicles and identify regulated hazardous waste, PCB waste, and any prohibited waste described above. At a minimum, the gate attendant and equipment operators at the working face will be trained in screening and inspection procedures for prohibited waste and trained to recognize potential sources of prohibited waste, such as microelectronics manufacturers, electronic companies, metal plating industry, automotive and vehicle repair service companies, and dry cleaning establishments. The personnel will receive on-the-job training from the site manager or designated alternate. Records of employee training on prohibited waste control procedures will be maintained in the facility SOR.

4.2.2 Procedures to Control the Receipt of Prohibited Wastes

30 TAC §330.127(5)(A)

Procedures to control the receipt of prohibited wastes are designed to minimize the potential that the facility will receive hazardous or otherwise unacceptable waste for disposal. The following sections discuss the methods and procedures that will be used to control prohibited wastes at the facility.

4.2.2.1 Access Control

A means to control the disposal of prohibited waste at the landfill is by the control of access into the facility by unauthorized vehicles. This issue is addressed in §4.5, Access Control of this SOP.

4.2.2.2 Special/Industrial Waste Screening

Pre-screening customers bringing special waste and industrial waste to the facility is an additional means of controlling the receipt of prohibited waste. A detailed description of the special waste screening process is provided in the Appendix IVH, Special Waste Acceptance Plan (SWAP). This plan has been and will continue to be an essential element to preventing the acceptance or disposal of prohibited wastes.

4.2.2.3 Gatehouse Waste Screening

During hours of operation, the gatehouse will be staffed with at least one gate attendant. The attendant, trained for inspecting loads, will screen incoming loads and customers to help ensure that no prohibited wastes are being brought to the landfill. In addition, the facility will provide a sign in a conspicuous location that will list wastes that are prohibited for acceptance at the ~~l~~facility.

If the attendant suspects prohibited waste is present in an incoming load, then that load will be directed to an area out of the flow of traffic, and trained personnel will further assess the load. Appendix IVA, Waste

Discrepancy Report Form will be used to document the inspection and includes the date, time, name of the inspector(s), type of inspection/screening (i.e., suspected prohibited waste), transporter/generator information, and waste information. The inspection report shall be placed in the SOR within 7 working days of the inspection.

4.2.2.4 Random Inspections

The gate attendant, or other designated landfill personnel, will randomly select one half of one percent of the incoming loads per week (no less that on load per day) ~~a minimum of two vehicles per week (including compactor vehicles)~~ for inspection, notify the equipment operator, and direct the selected load to the working face. Once the selected load arrives at the working face, the equipment operator will direct the vehicle to a separate but adjacent location on the working face out of the flow of normal disposal traffic. The driver will be instructed to discharge the load onto the ground. The equipment operator will then visually inspect the contents of the load and document the presence of any prohibited waste.

Appendix IVB, Random Load Inspection Form will be used to document results of the random load inspection and includes information such as the date and time of inspection, name and signature of inspector(s), type of inspection/screening (i.e., random screening, suspected unauthorized waste, etc.), transporter/generator information (including hauling company name and license plate number), source of waste, contents of load as reported by driver, contents of load as observed by inspector, and approval or disapproval of the load. The inspection report will be placed in the SOR within 7 days of the inspection.

Loads that are excluded from random inspections are:

- Waste from transfer stations, providing that the transfer station is permitted or registered by the TCEQ and conducts random screening (waste received from transfer stations is already subject to visual inspections and random screening prior to arrival at the facility).
- Liquid waste.
- Asbestos waste.

4.2.2.5 Waste Disposal Observation

Equipment operators, trained for inspecting loads, will observe waste being disposed of at the active working face. If an equipment operator suspects the presence of any prohibited waste, the trained personnel will further assess the load. Appendix IVA, Waste Discrepancy Report Form will be used to document the inspection. The inspection report shall be placed in the SOR within 7 working days of the inspection. If the waste is determined to be prohibited, then the prohibited waste remediation plan will be implemented as §4.2.4.1, Prohibited Waste Remediation Plan of this SOP.

4.2.3 Records of All Inspections

30 TAC §330.127(5)(B)

earthen material to cover any waste not already covered with six inches of earthen material within one hour of detecting a fire.

4.4.1.1 Adequacy of Earthen Material

During site operations, the site manager shall perform daily monitoring of the working face size. A sufficient volume of earthen material will be maintained on the site within 1,000 feet of the working face at all times to cover a potential fire area equivalent to the size of the working face with 6 inches of earthen material within 1 hour. This source of earthen material may be on-site soil stockpiles, working face diversion and/or containment berms, areas of future excavation, or some combination thereof. Examples of required earthen material volumes are included in the following Table IV-6, Examples of Earthen Material Required for Various Working Face Dimensions~~table~~.

Table IV-6: Examples of Earthen Material Required for Various Working Face Dimensions

Length of Working Face (feet)	**Width of Working Face** (feet)	**Volume Needed to Cover Working Face** (cubic yards)
100	50	111
200	50	222
100	100	222
200	100	444
300	100	667
400	200	1,778

4.4.1.2 Sufficient On-Site Equipment

A bulldozer, earthmoving equipment, and a water truck will immediately mobilize to place earthen material to smother any fire that may occur. A calculation showing the adequacy of the site equipment to place the 6 inches of soil in 1 hour is included in Appendix IVC, Fire Protection Equipment Capacity Calculation

. If the working face size varies or the number of working faces is greater than 1, the landfill manager will evaluate the adequacy of site equipment to place the 6 inches of soil in 1 hour in a manner consistent with the calculations.

4.4.2 Fire Protection Standards and Training Procedures

The TCEQ may approve alternative methods of fire protection. To reduce the possibility of fire and improve the operation of the site and pursuant to 30 TAC §330.133, a minimum of 6 inches of “daily” cover soil, or approved equivalent, shall be placed and compacted over exposed waste at the end of each working day or at least once every 24 hours, in accordance with §4.22.1, Daily Cover of this SOP. Fire protection standards to be used at the facility and how personnel are trained are discussed in the following sections.

- Equipment/Vehicle Fires – If a fire occurs on a vehicle or piece of equipment, the equipment operator should bring the vehicle or equipment to a safe stop. If safety of personnel will allow, the vehicle must be parked away from fuel supplies, uncovered solid wastes, and other vehicles. The engine should be shut off and the brake engaged to prevent movement of the vehicle or piece of equipment. A fire extinguisher will then be used to extinguish the fire.
- Hot Loads – Burning waste will not be unloaded in the active area of the landfill. After the gate attendant, equipment operator, or other site personnel have identified signs of a possible load of burning waste, or a hot load, the truck will be directed to a portion of the disposal area away from the working face, fuel areas, and other combustion sources where the load can be unloaded without danger of spreading fire. The water truck will water down the waste. The bulldozer will then spread the waste to apply additional water. The bulldozer may smother the fire with soil. The waste will be inspected for signs of fire or hot spots. When the fire has been extinguished and the waste has cooled, the waste will be landfilled.
- Working Face – In the event that a fire is detected at the working face, the burning area should be isolated and pushed away from the working face quickly, or fire breaks should be cut around the fire before it can spread. Efforts to cover the burning area with earthen material must be initiated immediately to smother the fire. Sufficient earthen material will be available to cover the entire working face, if necessary. All vehicles and equipment not involved in smothering the fire will be immediately moved away from the fire. Incoming waste will be temporarily rerouted to another portion of the disposal area and a working face may be established there or work may be halted all together until the fire is extinguished. A bulldozer, earthmoving equipment, and a water truck will immediately mobilize to place earthen material to smother any fire that may occur.

If additional fire protection/fighting measures are deemed warranted by the site manager or designated alternate, emergency assistance may be requested from the City of Edinburg by dialing 911. City emergency response personnel will assess the nature of the emergency and dispatch the appropriate emergency crews. Law enforcement assistance may respond from the City of Edinburg Police Department, or the Hidalgo County Sheriff's Department, depending on availability. Fire, ambulance, and hazardous materials emergencies may be handled by either the City of Edinburg or Hidalgo County, depending on availability.

4.4.4 Notification Requirements

If a fire occurs that is not extinguished within ten minutes of detection, TCEQ Region 15 office in Harlingen, Texas must be contacted immediately, but no later than four hours by telephone, and in writing within 14 days with a description of the fire and the resulting response.

TCEQ Region 15
1804 W Jefferson Ave
Harlingen TX 78550-5247
Tel: (956) 425-6010
Fax: (956) 412-5059

4.5 Access Control

30 TAC §§330.131 & 330.223(a) & (c)

A perimeter fence, a composite of either a four-foot barbed wire fence or a six-foot steel-link mesh fence, is currently installed around contiguous properties owned by the City. The perimeter fence encompasses the facility permit boundary as well as the Type IV Landfill TCEQ Permit MSW-2302 and landfill facilities to the south and additional City owned properties to the east as depicted on Figure II-16, Facility Entrance Plan.~~Currently, fencing has been installed along the southern boundary of Type IV Landfill TCEQ Permit MSW-2302 and facility entrance, along the west side of the facility entrance, along the southern facility boundary from the site entrance to the west facility boundary, and along the west facility boundary as shown on Figure II-16, Facility Entrance Plan. The northern and eastern portions of the facility boundary are adjacent to City owned property where the land use is primarily agricultural and the southern portion is adjacent to Type IV Landfill, TCEQ Permit MSW-2302, and hence providing adequate control to public access. However, fencing will be incrementally installed along the northern facility boundary and east of the facility on City owned property to provide an additional barrier to control public access.~~

Public access to the facility is controlled by a gate at the facility entrance on Jasman Road. Another maintenance gate is located on the west side of the facility on Encinitos Road. The gate at the facility entrance is locked by site personnel at the end of the day's operations while the gate on Encinitos Road remains locked unless access is needed by site personnel.

The entrance gate is designed to provide complete access restriction when the site is not open, yet allow plenty of room for vehicles to maneuver through the entrance when the facility is open. All landfill users shall be required to stop at the gatehouse, satisfy applicable waste acceptance criteria, and conduct appropriate business transactions prior to proceeding to the disposal area(s). Since the facility shares the same entrance as the Edinburg Type IV Landfill TCEQ Permit MSW-2302, vehicles containing construction and demolition waste will receive a yellow placard and be directed to the active Type IV Landfill and all other acceptable loads will receive a blue placard and will be directed to the Type I Landfill. Unauthorized vehicles and loads identified as containing prohibited waste shall not be allowed to proceed past the gatehouse.

4.5.1 Inspection and Maintenance Schedule

The fence shall be inspected on a weekly basis, with repairs made as necessary. The gates will be inspected periodically for damage or problems. Appendix IVD, Perimeter Fence and Gate Inspection and Repair Record will be used to document results of the fence and gate inspection. The inspection report will be placed in the SOR within 7 days of the inspection. The fence, gate, and associated signs shall be repaired, maintained, or replaced on an as needed basis to ensure continued site security.

4.5.2 Notification

If access control is breached, the TCEQ's regional office, and any local pollution agency with jurisdiction that has requested notification, will be notified within 24 hours of detection of the breach, including an estimate of when the breach will be permanently repaired. The breach will be temporarily repaired within 24 hours of detection and will be permanently repaired by the time specified to the TCEQ's regional office when it is reported. The TCEQ's regional office will be notified when the permanent repair is complete. If a permanent repair can be made within 8 hours of detection, no notice is required. A copy of these notices will be place in the SOR.

4.6 Unloading of Waste

4.6.1 Unloading Areas

30 TAC §330.133(a)

The various types of unloading areas and their maximum sizes at the facility include the following Table IV-7, Unloading Areas and Maximum Size:

Table IV-7: Unloading Areas and Maximum Size

Unloading Area	Description	Maximum Size
Active Working Face	Municipal solid waste will be unloaded at the active working face(s). More than one working face maybe established to provide for separation of residential and commercial trucks, etc., as described in 4.6.1.1 below.	2 - 80,000 sqft
RACM Disposal Areas	RACM is to be placed in a disposal area separate from (but possibly immediately adjacent to~~)~~ the active working face.	20,000 sqft
Liquid Stabilization Processing Area	Liquid waste will be unloaded at the liquid stabilization processing area located within Subtitle D cells.	40,000 sqft
Brush Area	Brush will be unload in designated area for mulching, currently over Pre-Subtitle D Units 1 – 4.	80,000 sqft
Citizen's Collection Station	Private citizen and other small loads may be delivered to the citizen's collection station.	40,000 sqft
Reusable Material Storage Area	Designated reusable materials storage area will remain free of putrescibles and household wastes with the exception of incidental amounts	40,000 sqft
Large Item Salvage Area	Large item salvage will be unloaded in designated area	40,000 sqft
Tire Area	Incidental tires will be stored in the tire area prior to processing. Periodically, tires will be processed by grinding or other means to reduce size to less than quartered or split, or sent off-site for processing/disposal.	40,000 sqft

4.6.1.1 Active Working Face

The unloading of municipal solid waste (MSW) at the active working face shall be confined to as small an area as practical. Landfill personnel will limit the size of each active working face to a maximum of 80,000 sqft (e.g., 400 feet by 200 feet). The size of each working face will be directly impacted by the amount of wastes being received and may vary accordingly.

In general, there will only be one active MSW working face to reduce odors and windblown waste and to control vector populations. There may be more than one active MSW working face open at any given time, however. Examples of when more than one MSW working face may be open at one time includes the separation of residential and commercial customers, wet weather operation, when wastes are being deposited in a new cell that must receive only select wastes to cover the bottom of the new cell, during a transition from a wet weather area to another MSW working face, during disposal of RACM, or when there may be a "hot load" delivered to the MSW working face and another working face is established until the fire is controlled.

4.6.1.2 RACM

The maximum size of the unloading area for RACM will be 20,000 sqft (e.g., 100 feet by 200 feet). RACM is to be placed in a disposal area separate from (but possibly immediately adjacent to) the active working face. A separate cell is not required. The procedures for managing RACM are provided in Appendix IVG~~E~~, Regulated Asbestos Containing Material Handling Plan.

4.6.1.3 Liquid Stabilization Processing

Liquid waste will be unloaded at the liquid stabilization processing area located within Subtitle D cells. The maximum size of the unloading area for liquid waste will be 40,000 sqft (e.g., 200 feet by 200 feet).

4.6.1.4 Brush Area

Brush will be unloaded in designated area currently located over Pre-Subtitle D Units 1 – 4. The maximum size of the unloading area for brush will be 40,000 sqft. (e.g., 200 feet by 200 feet).

4.6.1.5 Citizens Collection Station

~~4.6.1.5~~ 30 TAC §330.213

The citizens collection station will be used for small loads. The gate attendant will direct vehicles to this area as appropriate. Roll-off boxes will be provided to unload waste. The boxes will be emptied at the working face as needed. The maximum size will be 40,000 sqft. (e.g., 200 feet by 200 feet).

The type and quantity of containers provided will correspond to anticipated waste receipt volumes. Containers will be delivered to an active disposal area daily or tarped overnight. The City will supervise the area designated for citizen's collection routinely in order to maintain it in a sanitary condition. Rules for waste disposal and prohibited waste will be prominently displayed on signs at the site entrance. Citizen's collection may accept sharps from single-family or multi-family dwellings, hotels, motels, or other establishments that provide lodging and related services for the public. The sharps will not be considered medical waste, as defined in 30 TAC §330.3.

4.6.1.6 Reusable Materials Storage

30 TAC §330.209(a)

~~4.6.1.6~~

~~Recyclable or r~~Reusable materials may be received and staged at the facility. The designated reusable materials storage area will remain free of putrescibles and household wastes with the exception of incidental amounts. Reusable materials shall be stored in such a manner that it does not constitute a fire, safety, or health hazard or provide food or harborage for animals and vectors, and shall be contained or bundled so as not to result in litter. The maximum size of the reusable storage area will be 40,000 sqft. (e.g., 200 feet by 200 feet).

~~Recyclable or reusable materials may be received and staged at the facility.~~ The size of the stockpiles may vary depending on the amount of reusable ~~or recyclable~~ materials received at any given time. The reusable materials staging area may receive approximately 300 tons of material per day and have a maximum amount of 3,000 tons of material stored at one time. Materials at the staging area will be either used onsite for applications such as roadbase, erosion control, etc., or transported offsite to end users. The average time for the materials to be stored onsite is 90 days; the maximum time for the materials to be stored onsite is 180 days.

4.6.1.7 Large Item Salvage

Large item salvage will be unloaded in a designated area with a maximum size of 40,000 sqft. (e.g., 200 feet by 200 feet). The large item salvage and staging area (only non-chlorinated fluorocarbon [non-CFC] containing white goods are accepted for disposal) may receive approximately one ton of large items and white goods per day and have a maximum amount of 180 tons of materials stored at one time. These materials can be stored for a maximum of 180 days and 90 days on average.

4.6.1.8 Tire Area

Whole tires or tire pieces may be stored or processed on-site in an unused portion of the property with a maximum size of 40,000 sqft. (e.g., 200 feet by 200 feet) in accordance with 30 TAC §328.54(c). Storage shall be above ground in controlled storage piles or in enclosed and lockable containers, pursuant to 30

TAC §328.61. The site will not store tires or tire pieces in excess of 500 used or scrap tires (or weight equivalent tire pieces or combination thereof) on the ground or 2,000 used or scrap tires (or weight equivalent tire pieces or combination thereof) in enclosed and lockable containers. The area used for tire storage and processing will be dedicated to tires only.

Tire piles consisting of scrap tires or tire pieces will be no greater than 15 feet in height and the pile will have a maximum footprint of 8,000 square feet. Indoor storage piles or bins shall not exceed 12,000 cubic feet with a 10-foot aisle space between piles or bins. Scrap tires or tire pieces may be stored in trailers provided the trailer is totally enclosed and lockable for volumes greater than 500 tires.

Tire storage will be located within the permit boundary and in an area that will allow all-weather access for emergency vehicles. Fire lanes will be provided with minimum separation of 40 feet between outdoor piles of scrap tires or tire pieces. Outdoor piles consisting of scrap tires or tire pieces and entire buildings used to store scrap tires or tire pieces shall not be within 40 feet of the property line or within an easement.

The tire storage area will not be located within a designated 100-year floodplain area, and suitable drainage structures or features will be provided to divert the flow of rainfall run-off or other uncontaminated surface water within the scrap tire storage site to a location off-site.

Tires will be split, quartered, shredded, and otherwise processed to ensure current approved limits for MSW landfills are not exceeded. (i.e., 500 tires on the ground or 2,000 tires in enclosed and lockable container[s]). Scrap tires shall be split, quartered, or shredded within 180 days from the date of delivery to the scrap tire storage site. The average length of time tires will be stored is 90 days. Off-the-road tires that are used on heavy machinery, including earthmovers, loader/dozers, graders, agricultural machinery, and mining equipment are exempt from this requirement. Truck tires shall not be classified as off-the-road tires and thus are not exempt from this requirement. Appropriate vector controls shall be used at a frequency based upon type and size of piles, weather conditions, and other applicable local ordinances. The tire storage area will remain free of putrescibles and household wastes. The tire storage and processing activity shall not be conducted in a manner that will adversely affect operations of the MSW disposal site, or otherwise endanger human health or the environment.

Quartered, shredded, or otherwise processed tires may be beneficially reused or disposed of within the landfill. In the event that tires are not processed on-site they will be transported to an appropriately authorized facility.

~~Tires will be split, quartered, shredded, and otherwise processed to ensure current approved limits for MSW landfills are not exceeded, i.e., 500 tires on the ground or 2,000 tires in enclosed and lockable containers. Scrap tires shall be split, quartered, or shredded within 180 days from the date of delivery of the scrap tire. The average length of time tires will be stored is 90 days.~~

4.6.2 Trained Staff to Monitor Incoming Loads

30 TAC §330.133(a)

A trained employee shall be present at the gatehouse at all times during regular waste acceptance hours to monitor all incoming loads of waste, and shall direct traffic to the appropriate unloading area. Trained personnel will also be on duty during regular waste acceptance hours at the working face to direct and observe unloading of solid waste. The City is not required to accept any solid waste that the City determines will cause or may cause problems in maintaining full and continuous compliance.

4.6.3 Unloading Waste in Unauthorized Areas

30 TAC §330.133(b)

The unloading of waste in unauthorized areas is prohibited. Any waste deposited in an unauthorized area must be removed immediately and disposed of properly. Trained staff shall observe each load that is disposed at the landfill.

4.6.3.1 Pre-Operation Notice

30 TAC §330.123

The City shall provide written notice in the form of a geomembrane liner evaluation report (GLER) as described in 30 TAC §330.341 of the final construction and lining of a new disposal cell to the TCEQ for review 14 days prior to the placement of waste. The TCEQ has 14 days to provide a verbal or written response. If by the end of the 14th day following the TCEQ's receipt of the report no comments are received, the City may begin placing waste.

4.6.4 Unauthorized Loads

30 TAC §330.133(b)

The site manager or designated alternate has the authority and responsibility to reject unauthorized loads, have unauthorized material removed by the transporter, and/or assess appropriate surcharges and have the unauthorized material removed by on-site personnel or otherwise properly managed by the facility. The employees will be trained to recognize prohibited waste and their transportation and disposal requirements. A record of unauthorized material removal will be maintained in the SOR.

Litter fences or other comparable controls (e.g., portable panels) will be utilized in the immediate vicinity of the working face to help aid in controlling windblown material. The Site Manager or designated alternate shall be responsible for determining the need, type, and placement of litter fences. Litter fences shall either be portable, free-standing fences that can be readily moved, as necessary, with equipment, or they may be temporary fences that consist of poles driven into the waste/soil cover with fencing between them. Typically, the litter fences shall be placed downwind and extend the full width of the working face and shall extend above the working face. Windblown waste and litter at the working face will be collected and properly managed to control unhealthy, unsafe, or unsightly conditions. The collected waste will be returned to the active disposal area(s).

4.9.2 Scattered Litter

30 TAC §330.139(2)

Litter scattered throughout the site, along fences and access roads, and at the gate will be picked up once a day on the days the facility is in operation. Litter will be collected and properly managed to control unhealthy, unsafe, or unsightly conditions and the collected waste will be returned to the active disposal area(s).

4.10 Easements and Buffer Zones

4.10.1 Easement Protection

30 TAC §330.141(a) & §330.543(a)

No solid waste unloading, storage, disposal, or processing operations will occur within any easement, buffer zone, or right-of-way (ROW) that crosses the site. There are currently two pipeline easements depicted on Figure IA1, Land Ownership Record Map and no ROWs within the permit boundary. Additionally, no solid waste disposal will occur within 25 feet of the center line of any utility line or pipeline easement unless otherwise authorized by the TCEQ.

4.10.2 Easement Marking

30 TAC §330.141(a) & §330.543(a)

All pipeline and utility easements will be clearly marked with green posts that extend at least six feet above ground level, spaced at intervals no greater than 300 feet.

4.10.3 Buffer Zones

30 TAC §330.141(b) & §330.543(b)

A minimum separating distance will be maintained between solid waste processing and disposal activities within and adjacent to the facility boundary on property owned or controlled by the City as determined by the requirements of 30 TAC §330.543(b). Such buffer zones are detailed in Part II, Facility Layout Plan. The buffer zones will provide for safe passage for fire-fighting and other emergency vehicles.

4.11 Landfill Markers and Benchmarks

30 TAC §330.143

4.11.1 Inspection and Maintenance

30 TAC §330.143(a)

All required landfill markers and benchmarks will be maintained so that they are visible during operating hours. Markers that are removed, destroyed, or determined not to meet regulatory requirements shall be replaced or repaired within 15 days thereafter. All markers will be repainted as necessary to retain visibility. It is the responsibility of the SM to ensure that landfill markers and benchmarks are inspected for regulatory compliance on a monthly basis. Records of all inspections will be maintained in the SOR.

4.11.2 Landfill Marker Installation and Color-Coding

30 TAC §330.143(b)(1)

Landfill markers will be installed to clearly mark significant features. In the event a marker location falls in a roadway, waterway, or other area incapable of sustaining an above ground marker, an alternate marker may be placed with the offset from its true location noted on the marker. The TCEQ may modify specific marker requirements to accommodate unique site-specific conditions. All markers will be durable posts, steel or wooden, extending at least six feet above ground level and will not be obscured by vegetation. Sufficient intermediate markers will be installed to show the required boundary and because the size of the site, all markers will be incrementally installed such that the markers are in place prior to cell construction or operations. Markers will be installed at the following locations and color coded as follows:

Table IV-9: Marker Color-Coding

Marker	Color
Facility Boundary	Black
Buffer Zone	Yellow
Easements and Rights-of-Way	Green

Landfill Grid System	White
Geosynthetic Liner Area / GLER	Red
100-yr Flood Protection	Blue

4.11.3 Boundary Markers

30 TAC §330.143(b)(2)

Site boundary markers (color-coded black) will be placed at each corner of the facility and along each boundary line at intervals no greater than 300 feet. Fencing with color-coded posts may be used in place of these markers, as appropriate.

4.11.4 Buffer Zone Markers

30 TAC §330.143(b)(3)

Buffer zone markers (color-coded yellow) will be placed along each buffer zone boundary at all corners and between corners at intervals of no greater than 300 feet. Placement of the landfill grid markers may be made along a buffer zone boundary.

4.11.5 Easement and Right-of-Way Markers

30 TAC §330.143(b)(4)

Easement and right-of-way markers (color-coded green) will be placed along the centerline of an easement and along the boundary of a right-of-way at intervals of 300 feet and at each corner within the facility and at the intersection of the facility boundary.

4.11.6 Landfill Grid System Markers

30 TAC §330.143(b)(5)

A landfill grid system (color-coded white) will be installed at the facility. The grid system will encompass at least the area expected to be filled within the next three-year period. Although grid markers must be maintained during the active life of the facility, post-closure maintenance of the grid system is recommended, but not required. An alphanumeric grid system will be used, consisting of lettered markers along two opposite sides, and numbered markers along the other two sides. Markers will be spaced no greater than 100 feet apart measured along perpendicular lines. Where markers cannot be seen from opposite boundaries, additional markers will be installed, where feasible.

4.11.7 GLER Area Markers

30 TAC §330.143(b)(6)

GLER area markers (color-coded red) will be placed so that all areas for which a GLER has been submitted and approved by the TCEQ are readily determinable. Such markers are to provide site workers immediate knowledge of the extent of approved disposal areas. These markers will be located so that they are not destroyed during operations until operations extend into the next GLER. The location of these markers will be tied into the landfill grid system and will be reported on each GLER submitted. GLER markers will not be placed inside the approved disposal areas.

4.11.8 Flood Protection Markers

30 TAC §330.143(b)(7)

Flood protection markers (color-coded blue) will be installed for any area within the 100-yr floodplain that is subject to flooding prior to the construction of a flood protection levee. The area subject to flooding will be clearly marked by means of permanent posts spaced not more than 300 feet apart or closer, if necessary, to retain visual continuity.

4.11.9 Permanent Benchmark

30 TAC §330.143(b)(8)

A permanent benchmark has been established at the site in an area that is readily accessible and will not be used for disposal. The benchmark monument is a bronze survey marker set in concrete with the benchmark elevation and survey date stamped on it. The monument elevation was surveyed from a known United States Coast and Geodetic Survey benchmark. The ~~reference~~ benchmark monument location is provided in Part I, Figure I-1, Facility Location Map.

4.12 Materials Along Route to Site

30 TAC §330.145

The City will encourage persons hauling waste to the site to enclose their vehicles or utilize a tarpaulin, net, or other means to effectively secure the load to prevent the escape of any part of the load by blowing or spilling. These efforts will include, as necessary, signs posted at the landfill entrance requiring the loads to be enclosed or covered, verbal or written admonitions to drivers or customers, the possibility of reporting offenders to the City of Edinburg Police Department, adding litter control surcharges, or other actions to encourage compliance.

At least once on a daily basis and during daylight hours when the facility is in operation, public access roads serving the facility will be inspected and cleaned of spilled materials and windblown waste for a distance of 2 miles in either direction from any entrances used to deliver waste to the site. As necessary, litter found along Jasman Road, ~~and~~ FM 2812, and US Hwy 281 will be picked up by landfill personnel or other persons acting in coordination with the landfill operator. The landfill's pickup truck and personnel will be utilized to gather the litter, secure it on the vehicle, and transport it back to the landfill for proper disposal. Litter control outside the site will not be conducted during night hours. It shall be the responsibility of the SM or designated alternate to ensure that litter control outside the facility is conducted in a safe and timely manner using appropriate personnel and equipment. The SM or designated alternate shall make proper arrangements to gather items that are too large to be picked up by conventional means. The SM or designated alternate will record daily cleanup efforts on a log that will be maintained in the SOR.

The SM will be responsible for consulting with officials of TxDOT, who has maintenance authority over FM 2812 and US Hwy 281, concerning cleanup when necessary. The City's litter abatement efforts along FM 2812 and US Hwy 281 will be subject to any limitations or requirements imposed by TxDOT.

4.13 Disposal of Large Items

30 TAC §330.147

Items that can be classified as large, heavy, or bulky can include, but are not limited to, white goods (household appliances), air conditioner units, metal tanks, large metal pieces, and automobiles. Large, heavy, or bulky items that cannot be incorporated in the regular spreading, compaction, and covering operations at the landfill will be recycled. Items identified as being too large for proper disposal shall be refused, broken into smaller pieces, or crushed by compactor equipment to prevent bridging and localized subsidence.

Large items to be salvaged will be placed in a designated area away from the general flow of traffic, so as not to interfere with prompt sanitary disposal of solid waste, but readily assessable to all users. Large items will be removed from the site frequently to prevent them from becoming a nuisance and to preclude the discharge of any pollutants.

White goods may be recycled. No items containing CFCs will be knowingly accepted. Refrigerators, freezers, air conditioners, and any other items containing CFCs must be handled in accordance with 40 water for this process include the on-site municipal water supply, on-site ditches and detention ponds, borrow areas, and/or other outside sources. The SM or his authorized delegate will deploy site personnel with appropriate on-site materials, tools and equipment.

4.16.4 Roadway Maintenance

30 TAC §330.153(c)

All on-site and other access roadways will be maintained in a clean and safe condition. Interior access roadways will be re-graded on a periodic basis by grading and placing additional road materials to minimize depressions, ruts, and potholes, and provide uninterrupted access to the unloading area(s). Additional re-grading or maintenance will be implemented by the SM or his authorized delegate as needed by deploying site personnel with appropriate on-site materials, tools and equipment.

4.16.5 Litter and Debris

30 TAC §330.153(c)

All on-site and other access roads including ditches shall be cleaned of litter and debris. Litter and any other debris must be picked up at least daily and taken to the working face in accordance to §4.9.2, Scattered Litter. Litter and any other debris on Jasman Road, the public access road to the facility, will be removed daily in accordance to §4.12, Materials along Route to Site.

4.17 Salvaging and Scavenging

30 TAC §330.155

Salvaging is the controlled removal of waste materials for utilization, recycling, or sale. Salvaging or recycling of materials, such as metals, cardboard, brush, and white goods, will be allowed with specific authorization from the SM or designated alternate if the activity is conducted by and/or supervised by landfill personnel. However, salvaging will not be allowed to interfere with the prompt sanitary disposal of solid waste or create a public health nuisance. Such items shall be removed on an as-needed basis to prevent the creation of nuisance conditions, to preclude the discharge of any pollutants from the area, and to prevent an excessive accumulation of the material at the facility. Other special wastes received at the facility will not be salvaged. Pesticide, fungicide, rodenticide, and herbicide containers will not be salvaged unless being salvaged through a state-supported recycling program.

Scavenging is the uncontrolled and unauthorized removal of materials at any point in the solid waste management system. Scavenging is prohibited and shall be strictly enforced through site access controls and monitoring by facility personnel, including both human and animal scavenging activities.

4.18 Endangered Species Protection

30 TAC §330.157

Included in Part IIE, Endangered or Threatened Species is an assessment, recommendations provided by Texas Parks and Wildlife Department (TPWD), and agreement with US Fish and Wildlife Service (USFWS). The facility and the operation of the facility will not result in the destruction or adverse modification of the critical habitat of endangered or threatened species, or cause or contribute to the taking of any endangered or threatened species. The facility will be operated in conformance with TPWD's identified best management practices (BMPs) to minimize potential negative impacts to federally-listed and state-listed species. The referenced BMPs are incorporated by reference into this SOP, contain operational criteria for protecting such species, and will be included in the personnel training discussed in §4.1 Personnel Training of this SOP.

Part IIIE2-3, TPWD Response to Recommendations includes the following operational practices:

- The City will employ best management practices (BMPs) to minimize potential negative impacts to federally-listed and state-listed wildlife to include a "no kill" policy.
- Any state-listed reptile discovered will be permitted to leave the area on its own or relocated by persons permitted through the TPWD Wildlife Permit Program.
- Any boreholes resulting from drilling activities and any shallow trenches with vertical walls left open overnight will be inspected the following morning.
- Prior to initial clearing and construction activities involving grading or bulldozing in the disposal facility expansion area, operators will be made aware of the potential for state-listed reptiles to occur and implement BMPs if discovered.

4.19 Landfill Gas

30 TAC §330.159

All landfill gases will be monitored in accordance with Part III6, Landfill Gas Management Plan (LFGMP) and 30 TAC §330.371 (Subchapter I) to help ensure that the concentration of methane gas generated by the facility does not exceed 1.25% by volume in facility structures (excluding gas control/recovery system components) and does not exceed 5% by volume in monitoring points, probes, subsurface soils, or other matrices at the facility boundary. The LFGMP, required reports, and other submittals must be included in the SOR of the facility and submitted to the TCEQ.

4.20 Oil, Gas, and Water Wells

30 TAC §330.161

As described in Part II, Existing Conditions Summary there is one producing gas well, two plugged gas wells, and no existing or abandoned water wells situated within the facility.

4.20.1 Discovery of Water Wells, Oil Wells, Natural Gas Wells, or Other Wells

30 TAC §330.161(a)-(b)

The City will provide written notification within 30 days to the TCEQ of the location of any and all existing or abandoned water wells, on-site crude oil or natural gas wells, or other mineral recovery wells under the jurisdiction of the Railroad Commission of Texas that are discovered within the facility during the course of facility development.

4.20.1.1 Water Wells

30 TAC §330.161(a)

The City will, within 30 days of such a discovery, also provide the TCEQ with written certification that such water wells have been capped, plugged, and closed in accordance with all applicable rules and regulations of the TCEQ or other state agency. The facility does not require supply from a water well for landfill operations.

4.20.1.2 On-site Crude Oil or Natural Gas Wells, or Other Mineral Recovery Wells

30 TAC §330.161(b)

The City will, within 30 days after the plugging of any such crude oil, natural gas or other mineral recovery well, provide the TCEQ with written certification that such wells have been properly capped, plugged, and closed in accordance with all applicable rules and regulations of the Railroad Commission of Texas. Producing crude oil or natural gas wells that do not affect or hamper landfill operations may be operated within the facility boundary, if identified in the permit for the facility or in a written notification to the TCEQ. Currently there is one producing natural gas well, owned by Faulconer, located within the facility boundary as shown on Figure II-8, Water Well and Oil & Gas Well Location Map that will not affect or hamper landfill operations.

4.20.2 Well Plugging Report

30 TAC §330.161(c)

Any water or other type of wells under the jurisdiction of the TCEQ will be plugged in accordance with all applicable state requirements or additional requirements imposed by the TCEQ. A copy of the well plugging report required to be submitted to the appropriate state agency will also be submitted to the TCEQ within 30 days after the well has been plugged.

4.20.3 Liner Installation Modifications

30 TAC §330.161(d)

The City will submit for TCEQ approval a permit modification application identifying any proposed changes to the liner installation plan as a result of any well abandonment.

4.21 Waste Compaction

30 TAC §330.163

Solid waste will be spread and compacted by repeated passages of compaction equipment such that each layer of solid waste is thoroughly compacted. The first 5 feet of waste placed over the liner system shall be free of brush and large bulky items that would damage the underlying parts of the liner system or that cannot be compacted to the required density. On subsequent waste lifts, a wheeled trash compactor having a minimum weight of 40,000 pounds, or similar equipment, shall be properly utilized to reach a compaction density of at least 1,200 pounds per cubic yard. Effective waste compaction is achieved by spreading solid waste in no less than 1 ft to no more than 2.5 ft lifts and compacting with no less than 4 to no more than 6 passes of a wheeled trash compactor. Typical daily lifts may range from 8 ft to 20 ft thick, depending on size of active working face and daily waste gate rates.

4.22 Landfill Cover

30 TAC §330.165

4.22.1 Daily Cover

30 TAC §330.165(a)

To control disease vectors, fires, odors, windblown litter or waste, and scavenging, the facility will apply six inches of well-compacted earthen material (not previously mixed with garbage, rubbish, or other solid waste), or an approved alternative daily cover (ADC), to the working face or active disposal area at least once every 24 hours. Runoff from areas that have intact daily cover is not considered as having come into contact with the working face or leachate.

To ensure that the daily cover will be adequate, the following procedures will be followed:

- The daily cover will be sloped to drain.

4.22.3.1 Required ADCOP Information

30 TAC §330.165(d)(1)(A)-(E)

The evaluation of the effectiveness of the different alternate material daily cover (ADC) will generally be based on comparisons with soil cover. The ADCOP includes the following:

- a description and minimum thickness of the alternative material to be used
- its effect on vectors, fires, odors, and windblown litter and waste
- the application and operational methods to be utilized at the site when using this alternative material
- chemical analysis of the material and/or the Material Safety Data Sheet(s) for the alternative material
- any other pertinent characteristic, feature, or other factors related to the use of this alternative material

4.22.3.2 Status Reports

30 TAC §330.165(d)(2)

A status report on the ADC will be submitted on a two-month basis to the TCEQ during the temporary authorization period describing the effectiveness of the alternative material, any problems that may have occurred, and corrective actions required as a result of such problems. If no unresolved problems have occurred within the temporary authorization period, status reports may no longer be required.

4.22.3.3 Length of Time

30 TAC §330.165(d)(3)

ADC will not be allowed when the landfill is closed for a period greater than 24 hours, unless the TCEQ approves an alternative length of time.

4.22.3.4 Contaminated Soil

30 TAC §330.165(d)(4)

For any contaminated soil to be used as ADC, the constituents of concern will not exceed the maximum leachable concentrations listed in 30 TAC §335.521(a)(1). The contaminated soil will meet the restrictions under 30 TAC §§330.165(d)(4)(A) and 330.165(d)(4)(B), as discussed in the following two sections.

4.22.3.4.1 Polychlorinated Biphenyl Wastes

30 TAC §330.165(d)(4)(A)

Additionally, the contaminated soil must not contain polychlorinated biphenyl wastes that are subject to the disposal requirements of 40 Code of Federal Regulations Part 761.

4.22.3.4.2 Total Petroleum Hydrocarbons

30 TAC §330.165(d)(4)(B)

Additionally, the contaminated soil will not contain total petroleum hydrocarbons (TPH) in concentrations greater than 1,500 milligrams per kilogram (mg/kg). The City may submit a demonstration for TCEQ approval that material exceeding 1,500 mg/kg TPH can be a suitable ADC. The demonstration shall include information regarding the risk to human health and the environment and the information required in §4.22.3.1, Required ADCOP Information. If approved, the TCEQ may impose additional permit requirements regarding the use of this material.

4.22.3.5 Constituent Limitations

30 TAC §330.165(d)(5)

ADC must not exceed constituent limitations imposed on waste authorized to be disposed at the facility.

4.22.3.6 Runoff

30 TAC §330.165(d)(6)

The TCEQ may require the City to test runoff from areas that have ADC for compliance with Texas Pollutant Discharge Elimination System (TPDES) storm water discharge limits or manage the runoff as contaminated water.

4.22.4 Temporary Waiver

30 TAC §330.165(e)

The TCEQ may grant a temporary waiver from the requirements of 30 TAC §330.165(a) - (d) if the City demonstrates that there are extreme seasonal climatic conditions that make meeting such requirements impractical.

4.22.5 Final Cover

30 TAC §330.165(f)

be certified by the signature of the on-site supervisor that the work was accomplished as stated in the record. A cover inspection record will be maintained that documents inspections of daily, intermediate, and final cover, the findings, and corrective action taken when necessary.

4.23 Ponded Water

30 TAC §330.167

The ponding of water over waste on the landfill, regardless of its origin, must be prevented. Ponded water that occurs in the active portion of the landfill or on a closed portion of the landfill will be eliminated and the area in which the ponding occurred will be filled in and regraded within seven days of the occurrence.

4.23.1 Ponding Prevention Plan

The potential for ponding of water over waste areas will be minimized by achieving adequate compaction during the placement of the wastes and by constructing and maintaining proper cover and slope on all areas so that stormwater will not pond and will drain properly, either to the site drainage system (for intermediate or final covered areas) or to run-off control structures (for active disposal areas). Installation of upgradient diversion berms to minimize the amount of water entering the disposal area and proper construction of the working face slopes will minimize ponding of water over waste in the disposal areas.

Active waste disposal areas of the landfill, including final covered areas not in post-closure care, intermediate cover areas, and daily cover areas, will be inspected at least weekly for signs of ponded water or depressions that could potentially pond water. Additional inspections may be conducted after rainfall events in excess of 0.5 inches or more rain in a 24-hour period. However, during periods of extended or heavy rainfall, portions of the site may not be readily accessible to vehicles for inspection. During these periods it may be necessary to allow for drying prior to accessing the remote sections of the site for inspection. During the post-closure period of closed portions of the landfill, the final cover will be inspected and maintained in accordance with Part III8, Post-Closure Plan.

Ponded water that occurs in the active portion of a landfill or on a closed landfill will be eliminated and the area in which the ponding occurred will be filled and regarded within seven days of the occurrence. Ponded water areas may be corrected by implementing one or more of the following procedures~~ within seven days of the occurrence~~:

- Pumping water out of the depression.
- Regrading and allowing the water to flow off.
- Adding cover soils to fill the depression and forcing the water onto areas of the landfill that allow the water to dissipate or flow off the landfill.

Water that has been in contact with waste is considered contaminated and in general will be contained in the working face area behind a containment berm. Contaminated water shall be managed in accordance with §4.29, Contaminated Water Management of this SOP. ~~This contaminated water will either be allowed to flow into the leachate collection system for removal or pumped directly into the leachate force main.~~ Contaminated water may not be recirculated.

4.24 Disposal of Special Waste

Special waste is any solid waste or combination of solid wastes that because of its quantity, concentration, physical or chemical characteristics, or biological properties requires special handling and disposal to protect the human health or the environment. If improperly handled, transported, stored, processed, or disposed of or otherwise managed, it may pose a present or potential danger to the human health or the environment. Appendix IVH, Special Waste Acceptance Plan outlines the process that will be used to review, evaluate, and determine acceptance of all TCEQ-defined special wastes for the facility.

The acceptance and/or disposal of a special waste, as defined in 30 TAC §330.3(148) (relating to Definitions), is described in Appendix IVG, Regulated Asbestos Containing Material Handling Plan (RACM), and Appendix IVH, Special Waste Acceptance Plan (SWAP). The RACM / SWAP are incorporated by reference into this SOP and will be included in the personnel training discussed in §4.1, Personnel Training of this SOP.

4.25 Disposal of Industrial Waste

Industrial non-hazardous waste is defined by 30 TAC §330.3(66) as solid waste resulting from or incidental to any process of industry or manufacturing, or mining or agricultural operations, and is classified as follows:

- Class 1 Industrial Solid Waste – any industrial solid waste or mixture of industrial solid wastes that because of its concentration, or physical or chemical characteristics is toxic, corrosive, flammable, a strong sensitizer or irritant, a generator of sudden pressure by decomposition, heat, or other means, or may pose a substantial present or potential danger to human health or the environment when improperly processed, stored, transported, or disposed of or otherwise managed, as further defined in 30 TAC §335.505
- Class 2 Industrial Solid Waste – any individual solid waste or combination of industrial solid wastes that cannot be described as Class 1 or Class 3, as defined in 30 TAC §335.506.
- Class 3 Industrial Solid Waste – any inert and essentially insoluble industrial solid waste, including materials such as rock, brick, glass, dirt, and certain plastics and rubber, etc. that are not readily decomposable as defined in 30 TAC §335.507.

4.25.1 Class 1 Industrial Solid Waste

30 TAC §330.173(c)

This facility will not accept Class 1 industrial solid waste, with the exception of wastes that are Class 1 only because of asbestos content. Waste classified as Class 1 only because of asbestos content may be accepted by the facility for disposal and will be managed in accordance with 30 TAC §330.171(C)(3)(I) and Appendix IVG, RACM Handling Plan. All Class 1 industrial asbestos wastes will be manifested and the City will submit monthly reports to the TCEQ in compliance with 30 TAC §330.173(g) – (h).

4.25.2 Class 2 Industrial Solid Waste

30 TAC §330.173(i)

Class 2 industrial solid waste, except special wastes as defined in 30 TAC §330.3, may be accepted provided the acceptance of this waste does not interfere with facility operation.

4.25.3 Class 3 Industrial Solid Waste

30 TAC §330.173(j)

Class 3 industrial solid waste may be disposed provided the acceptance of this waste does not interfere with facility operation.

4.26 Liquid Waste Stabilization ~~Area~~

Approved liquid wastes that are received at the facility, and wastes that do not pass the paint filter liquids test, will be managed in accordance Appendix IVI, Liquid Waste Solidification Plan.

The facility may receive approximately 25 tons of liquid waste on average, and a maximum of 50 tons of liquid waste per day. A maximum of 50 tons of materials may be stored at one time. These materials can be stored for a maximum of 72 hours and 24 hours on average. ~~The liquid waste stabilization basin will have a cover for odor control.~~ [IC1]

~~**To process/stabilize approved liquid wastes that are received at the facility, and wastes that do not pass the paint filter liquids test, the facility will utilize a metal basin placed within a disposal cell with an approved TCEQ liner system. The basin will be secured with landfill material and soil. The soil will be graded around the liquid waste stabilization basin (basin) to ensure that stormwater run-off is directed away from the basin. The basin will be placed to ensure a minimum of 1 foot of the basin extends above the surrounding soil. Using an excavator or similar mixing equipment, the liquid wastes will be mixed promptly upon receipt with a stabilizing material (see Appendix IVH, Special Waste Handling Acceptance Plan) or soil within the basin and will be removed from the basin for disposal by the same equipment. The mixing equipment will scrape any residual materials from the basin sides to prevent any cumulative build-up of material that could contribute to odors or vectors. The bottom of the basin will be at least 10 feet above the top of the protective cover soil composite of the lining system and founded in the waste. Various sizes of metal basins may be used**~~

~~**throughout the life of the site. Once stabilized, the waste will be removed from the basin promptly and landfilled at the facility. If necessary, the batch of solidified/stabilized material will be tested for free liquids in accordance with the Method 9095B (Paint Filter Liquids Test), as described in "Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods" (EPA Publication Number SW-846), as amended. Upon verification of the solidified/stabilized material passing the paint filter liquids test, or other approved test, the mixture will be removed from the basin and deposited in the active face for landfilling.**~~

4.27 Screening of Deposited Waste

30 TAC §330.175

As discussed in Part II, Existing Conditions Summary, some visual screening currently exists along the southern portion of the facility boundaries. Additional visual screening of deposited waste materials is not necessary because the nearest high traffic roadway is located approximately 1,900 feet to the west and surrounding land use is primarily agricultural. The City will provide supplemental visual screening of deposited waste materials in the future if the TCEQ determines additional screening has become necessary.

4.28 Facility Generated Wastes

30 TAC §330.205(b)-(c)

Waste generated by the facility's operations, including any solid waste storage and processing units, will be disposed at the facility unless waste generated is unauthorized for acceptance by the facility. Any such waste will be disposed at an authorized solid waste management facility. Wastewaters generated by a facility or all liquids resulting from the operation of the facility shall be managed in accordance with §4.29, Contaminated Water Management of this SOP. Wastewaters include~~, but limited to,~~ the following:

- Contaminated Water - water that has come in contact with solid waste or leachate
- Leachate - a liquid that has passed through or emerged from solid waste and contains soluble, suspended, or miscible materials removed from such waste
- Gas Condensate - a liquid generated as a result of any gas recovery process at a municipal solid waste facility.
- Cleaning and washing of equipment

4.29 Contaminated Water Management

30 TAC §330.207

All liquids resulting from the operation of the facility will be disposed of in a manner that will not cause surface water or groundwater pollution.~~,~~ Off-site discharge of contaminated waters shall be made only after approval under the Texas Pollutant Discharge Elimination System authority.~~and the City will not discharge contaminated water without specific written authorization.~~ The facility will ensure that wastewater discharged to a treatment facility permitted under Chapter 26 of the Texas Water Code will not interfere with or pass-through the treatment facility processes or operations, including its sludge processes, use or disposal, or otherwise be inconsistent with prohibited discharge standards including 40 CFR Part 403 (Pretreatment Regulations).

4.29.1 Contaminated Water

As discussed in Part III2, Surface Water Drainage Report, run-on and runoff controls for active disposal areas will be utilized to minimize the potential for stormwater contamination. The working face of the active disposal area will be encompassed by a run-on berm (top berm) and a runoff berm (toe berm) for the purpose of segregating potentially contaminated water, water that has come in contact with solid waste or leachate, and non-contact stormwater. The contaminated water storage area, located within a constructed waste disposal unit constructed in accordance with 30 TAC §330.331(b), will have a containment berm designed to ensure an adequate capacity for a 25-year, 24-hour rainfall event with one foot of freeboard. Contaminated water will either be allowed to flow into the leachate collection and removal system or any ponded contaminated water will be pumped within seven days of occurrence directly into the leachate force main connected to a public sewer system in accordance with Part III3, Waste Management Unit Design.

4.29.2 Leachate

Leachate, a liquid that has passed through or emerged from solid waste and contains soluble, suspended, or miscible materials removed from such waste, will be pumped from the leachate collection and removal system into a force main connected to a public sewer system in accordance with Part III3, Waste Management Unit Design ~~.~~

Gas Condensate~~.~~

Gas condensate, a liquid generated as a result of any gas recovery process at a municipal solid waste facility, will either be allowed to flow into the leachate collection and removal system or pumped directly into the leachate force main connected to a public sewer system in accordance with Part III3, Waste Management Unit Design.

4.29.3 Cleaning and Washing of Equipment

~~The facility will ensure that wastewater discharged to a treatment facility permitted under Chapter 26 of the Texas Water Code will not interfere with or pass-through the treatment facility processes or operations, including its sludge processes, use or disposal, or otherwise be inconsistent with prohibited discharge~~

~~standards including 40 CFR Part 403 (Pretreatment Regulations).~~ Wastewater generated from the cleaning and washing of equipment, to be performed only within a constructed waste disposal unit constructed in accordance with 30 TAC §330.331(b), will either be allowed to flow into the leachate collection and removal system or any ponded wastewater will be pumped within seven days of occurrence directly into the leachate force main connected to a public sewer system in accordance with Part III3, Waste Management Unit Design.

4.30 Citizen's Collection

30 TAC §330.213

Waste accepted from citizens and other small loads may be delivered to an area designated for citizen's collection where waste shall be unloaded in to roll-off containers whereas the quantity of containers provided will correspond to anticipated waste receipt volumes. Roll-off containers shall be leak-proof to maintain sanitary conditions per 30 TAC §330.211. Containers will be delivered to active disposal area daily or tarped overnight. The City will supervise the area designated for citizen's collection routinely in order to maintain it in a sanitary condition. Rules for waste disposal and prohibited waste will be prominently displayed on signs at the site entrance. Citizen's collection may accept sharps from single-family or multi-family dwellings, hotels, motels, or other establishments that provide lodging and related services for the public. The sharps will not be considered medical waste, as defined in 30 TAC §330.3.

4.31 Waste Relocation

The relocation of waste from Pre-Subtitle D Units 1 – 4 into Subtitle D Units for the construction of Unit ~~*~~ 8 needs be performed in manner to safeguard health and to protect the environment. Additional operational requirements for waste relocation are:

- Waste relocation activities shall be conducted in such a manner that they do not disrupt landfill operations.
- Side slopes of excavations into buried waste shall be no steeper than 34 degrees.
- Leachate found while uncovering buried waste shall be properly disposed in accordance to §4.29, Contaminated Water Management.
- The lining system of the Pre-Subtitle D cell must not be removed and must remain operational until all waste within the cell is relocated and leachate properly disposed.
- Use of any additional personal protection equipment required to safeguard health.

APPENDIX IVG

REGULATED ASBESTOS CONTAINING MATERIAL HANDLING PLAN

PERMIT AMENDMENT APPLICATION

Part IV, Appendix G

REGULATED ASBESTOS CONTAINING MATERIAL HANDLING PLAN

Edinburg Regional Disposal Facility

Edinburg, Hidalgo County, Texas

TCEQ Permit MSW-956C

Submitted To: City of Edinburg
Department of Solid Waste Management
8601 North Jasman Road
Edinburg, Texas 78542 USA

Submitted By: Golder Associates Inc.
500 Century Plaza Drive, Suite 190
Houston, TX 77073 USA

July 2017
Revised: November 2017

Project No. 1401491

~~1.0 INTRODUCTION~~EXECUTIVE SUMMARY

Breathing asbestos fibers into the lungs has the potential to cause disabling lung diseases and cancer. The primary health objective in handling asbestos waste is the prevention of the release of asbestos fibers during demolition, renovation, transportation, and disposal operations. Proper management practices can prevent exposure to asbestos fibers, eliminating the potential for serious health consequences.

This plan has been prepared to ensure proper handling practices of regulated asbestos-containing material (RACM) during disposal operations at the ~~Edinburg Regional Disposal Facility~~facility, in accordance with applicable federal, state, and local requirements, including Code of Federal Regulations Title 40, Part 61; Title 29, Parts 1910.1001 and 1926.58; Title 49, Parts 171 - 173; and Texas Administrative Code, Title 30, Chapter 330, §330.171(c)(3).

1.0 AUTHORIZATION

30 TAC §§330.171(c)(3), 330.171(c)(3)(A), 330.171(c)(3)(B) & 330.171(c)(3)(I)

Regulated asbestos-containing material (RACM) that has been designated as a Class 1 industrial waste as defined in 40 Code of Federal Regulations Part 61 may be accepted at the facility provided the RACM is handled in accordance with 30 TAC §330.171(c) and the City complies with the provisions of 30 TAC §330.173(g) – (i). The facility is currently authorized to accept RACM under TCEQ Permit MSW-956B and by means of this application is providing written notification to the TCEQ of the intent to accept RACM under TCEQ Permit MSW-956C.

Because of the movement of active disposal areas, a dedicated specific area or areas of the landfill to receive RACM cannot be effectively be defined. Therefore, the City by means of this application is providing written notification to the TCEQ that the entire permitted fillable area of the landfill will be considered as potential RACM disposal areas. An on-site map identifying areas for RACM disposal will be maintained at the facility and will be revised as needed to include additional constructed areas as potential disposal areas for RACM. RACM disposal locations will either be surveyed or located by the site grid location.

~~2.0 NOTIFICATION~~

~~The landfill manager should be notified by the transporter at least 24 hours in advance of the delivery. Less than 24 hour notice is acceptable provided the landfill manager determines that the load can be properly handled and covered.~~

~~3.0~~2.0 LANDFILL DISPOSAL

2.1 Notification of Delivery and Load Receipt

30 TAC §330.171(c)(3)(D)

The Director of Solid Waste Management (DSWM) or the Site Manager (SM) should be notified by the transporter at least 24 hours in advance of the delivery. Less than 24 hour notice is acceptable provided the DSWM or SM determines that the load can be properly handled and covered.

When a load of RACM arrives at the gate house, the gate attendant shall notify the ~~landfill manager~~DSWM, SM, or ~~his designated representative~~designee~~,~~ who will oversee the disposal operations. The gate attendant shall check the accompanying manifest (required for RACM) to ensure that all necessary information is properly recorded. If the manifest is properly completed, the gate attendant will direct the driver to the proper disposal location, and record the receipt in an Asbestos or Special Waste Receipt Log.

~~3.1~~2.2 ~~Initial~~ Load Inspection

When the load of RACM arrives at the disposal area, prior to unloading, the RACM shall be visually inspected by landfill personnel to determine if the waste has been properly wetted and bagged. A load of RACM determined to be improperly wetted or bagged will be rejected for disposal at this time, and TCEQ will be notified within one working day, in accordance with 40 CFR 61.154(e)(1)(iv).

2.3 Disposal Location

30 TAC §330.171(c)(3)(F)

~~Due to the movement of the active disposal area at the Edinburg, a specific or separate cell or disposal area cannot effectively be defined. However, the entire permitted fillable area of the landfill will be considered as potential RACM disposal area. An on-site map identifying the RACM area will be maintained at the Landfill and will be revised as needed to include additional constructed areas as disposal areas for RACM. RACM disposal locations will either be surveyed or located by the site grid location.~~

RACM is to be placed in a disposal area separate from (but possibly immediately adjacent to) the active working face. A separate cell is not required. A minor depression (i.e., three to five feet deep) shall be made with a dozer or compactor prior to unloading. As an alternative, a dozer or compactor may make a cut into the refuse working face, which is deep enough to contain the volume of RACM anticipated (this does not necessarily mean going below grade).

The bags or containers holding the RACM must be placed below natural grade level or, where placement below natural grade is not possible or practical, provisions must be made to ensure that the waste will not be subject to future exposure through erosion or weathering of the intermediate and/or final cover. RACM that is placed above natural grade must be located in the landfill unit such that it is, at closure of the landfill unit, not less than 20 feet from any final side slope of the unit and must be at least ten feet below the final surface of the unit.

A 3-D grid system will be utilized to identify where the waste will be disposed. The site grid system (i.e., 100 foot markers) and site elevation benchmark and will be used in identifying the disposal locations in a log book. The date of disposal, the approximate elevation and grid coordinates, and the volume of waste will be recorded.

~~3.2~~2.4 ~~Methods of~~ Unloading Methods

30 TAC §§330.171(c)(3)(E) & 330.171(c)(3)(G)

Transporters shall use the method as described below to unload RACM at the landfill.

- RACM must only be accepted at the facility in tightly closed and unruptured containers or bags or must be wrapped with at least six-mil polyethylene.
- Bags or containers holding RACM must be carefully unloaded and placed in their disposal location rather than thrown to the ground. Unloading will be conducted by employees of the generator or transporter.
- Direct discharge of roll-off containers is permitted when performed in accordance with the following procedures:
  - A liner is used with a minimum 6-mil thickness to facilitate sliding of bags from the roll off container without damage by tearing of the bags. A sheet of 6-mil plastic (or equivalent) is placed in the open roll-offs and used to wrap the wetted asbestos in a “burrito wrap” method to prevent airborne particulates. The truck and roll-off box are positioned to unload at the hole excavated in advance for disposal of the waste.
  - With the opened roll-off box tailgate above the edge of the excavation, the bed of the truck and the roll-off box are gradually elevated until the entire envelope slowly slides out of the roll-off box and into the excavation.

~~3.3~~2.5 Cover Placement~~ing the Asbestos Waste~~

30 TAC §330.171(c)(3)(G)

~~Asbestos waste~~RACM will not be compacted directly. Immediately after unloading, the asbestos waste should be covered with a minimum of 3 feet of asbestos-free solid waste or 1 foot of soil. Care should be exercised in the application of the cover to ensure that the bags or containers will not be ruptured.

~~3.4 Grid System Control~~

~~A 3-D grid system will be utilized to identify where the waste will be disposed. The site grid system (i.e., 100 foot markers) and site elevation benchmark and will be used in identifying the disposal locations in a log book. The date of disposal, the approximate elevation and grid coordinates, and the volume of waste will be recorded.~~

~~4.0~~3.0 RECORD KEEPING

Record keeping for RACM disposal is in the form of manifests and disposal location log. The disposal location log indicating RACM disposal locations is maintained by the landfill manager or designated alternate. A Monthly Waste Receipt Summary form will be completed using STEERS for all loads of industrial RACM which were disposed of during the preceding calendar month.

~~4.1~~3.1 Manifests

All shipments of RACM must be accompanied by a Texas Uniform Hazardous Waste Manifest which includes:

- ~~a)~~ Name, address, and telephone number of the generator.
- ~~b)~~ Name, address, and telephone number of any transporter.
- ~~c)~~ Description and quantity of RACM (including Class III Designation).
- ~~d)~~ Date of receipt and signature of disposal facility representative.

A copy of each manifest must be retained on-site for at least 3 years.

~~4.2~~3.2 Log or Site Map

30 TAC §330.171(c)(3)(B)

A RACM disposal log for the landfill must be maintained. The following information should be recorded for each load of RACM accepted:

- ~~a)~~ The horizontal location of disposal (using the existing site grid system).
- ~~b)~~ The elevation of disposal.
- ~~c)~~ The volume of waste.
- ~~d)~~ The date of disposal.

~~4.3~~3.3 Monthly Waste Receipt Summary

Monthly Reporting of RACM from industrial sources will be submitted through the State of Texas Environmental Electronic Reporting System (STEERS).

~~4.4~~3.4 Deed Recordation

30 TAC §330.171(c)(3)(C)

Upon closure of the landfill, a specific notification that the landfill accepted RACM will be placed in the deed of records of the property which will include a site diagram or other information identifying the disposal locations of RACM. In addition, a notice of deed recordation and copies of the site diagram or other information identifying the RACM disposal locations will be submitted to the TCEQ executive director.

~~5.0~~4.0 PERSONAL PROTECTIVE EQUIPMENT

Respirators and protective clothing prevents exposure of asbestos contamination. Requirements for respirators and protective clothing for spill cleanup are listed below. (Note: If on-site personnel do not meet these requirements, a qualified asbestos cleanup contractor will be contacted. The area will be sealed off until qualified personnel arrive).

~~5.1~~4.1 Respirators

- ~~a)~~ Must be NIOSH approved.
- ~~b)~~ Must be fit-tested to each individual.
- ~~c)~~ Must be clean and properly maintained.

~~5.2~~4.2 Personal Protective Equipment

- ~~a)~~ Disposable Tyvek or similar coveralls.
- ~~b)~~ Gloves (when necessary).
- ~~c)~~ Foot coverings (when necessary).

The respirator and disposable coveralls should be worn by all personnel in immediate proximity to the RACM cleanup should a spill occur during the disposal operation, workers involved in the cleanup should wear their respirator, disposable coveralls, gloves, and foot coverings.

~~6.0~~5.0 EMPLOYEE TRAINING

All employees involved in the receipt and disposal of RACM are given training annually on the proper procedures of managing RACM. This training includes:

- ~~a)~~ Asbestos and its health effects.
- ~~b)~~ Regulations on transportation, disposal and worker protection.
- ~~c)~~ Paperwork, manifesting and notification requirements.
- ~~d)~~ Personal protection and protective equipment (including respirator fit tests).
- ~~e)~~ Transportation requirements.
- ~~f)~~ RACM receipt procedures.

- ~~g)~~ RACM disposal procedures.
- ~~h)~~ Location logging and record keeping.
- ~~i)~~ Spill response actions.

All employee training will be completely documented and maintained on-site.

Contractors and others working around the RACM disposal areas are informed of the RACM disposal practices at the site. Should any excavation work be necessary in areas of previous RACM disposal, a written notification to the TCEQ or EPA Administrator will be made 45 days prior to excavating or otherwise disturbing any RACM. The disposal location will be identified and all personnel working in that vicinity will wear the appropriate protective clothing. Any excavated or exposed RACM will be handled in the same manner as if the waste had just been brought in for disposal.

~~7.0~~6.0 CONTINGENCY PLAN

30 TAC §330.171(c)(3)(H)

This contingency plan has been developed in the event that a spill of RACM occurs during unloading operations. Personnel involved in the response are to be kept to a minimum to reduce the risk to employees. The ~~Landfill~~DSWM, SM ~~Manager~~, or ~~his designated representative~~designee, shall be in charge of the ~~Landfill~~facility's spill response for RACM. The following procedures will be followed in the event of a spill of RACM at or near the landfill:

~~7.1~~6.1 Personal Protection

- ~~a)~~ Get upwind of the RACM
- ~~b)~~ Employees involved in cleanup should make use of the following PPE, including:
  - ~~i.~~ Respirator
  - ~~ii.~~ Disposable coveralls
  - ~~iii.~~ Shoe covers
  - ~~iv.~~ Gloves
  - ~~v.~~ Safety glasses or goggles
- ~~c)~~ Keep others away until cleanup is complete.

~~7.2~~6.2 Notification

- ~~a)~~ Notify the ~~landfill office~~DSWM of SM~~/landfill manager~~.

- ~~b)~~ If the spill of RACM involves a reportable quantity (one pound or more), the National Response Center (NRC) must be notified by the landfill manager, or his designated representative.

~~7.3~~6.3 Emergency Cleanup Actions

- ~~a)~~ Summon water truck, wet down waste with a misting spray of water.
- ~~b)~~ Scoop the waste and put it into a properly labeled bag or a closed container and dispose of it with the other RACM.
- ~~c)~~ Wash any contaminated equipment or machinery.
- ~~d)~~ Dispose of gloves, coveralls, and shoe covers in a tightly sealed 6-~~-~~mil plastic bag.
- ~~e)~~ Wash all other personal protective equipment with soap and water.
- ~~f)~~ Check respirator, refit with new filter cartridges, and place into a resealable, air-tight container for future use.

~~7.4~~6.4 Spill Response Equipment

- ~~1.~~ An OSHA approved respirator with the proper pre-filters.
- ~~2.~~ A disposable, Tyvek or similar coverall suit.
- ~~3.~~ Disposable gloves.
- ~~4.~~ Rubber boots.
- ~~5.~~ 6-~~-~~mil plastic bags with asbestos warning.
- ~~6.~~ Water spray tank.
- ~~7.~~ Roll of duct tape.
- ~~8.~~ Broom and shovel.

APPENDIX IVH

SPECIAL WASTE ~~HANDLING~~ ACCEPTANCE PLAN

APPENDIX IVH-3

TCEQ GUIDANCE DOCUMENTS~~'S RG-022, GUIDELINES FOR THE CLASSIFICATION AND CODING OF INDUSTRIAL AND HAZARDOUS WASTES~~

RG-003

DISPOSAL OF SPECIAL WASTES ASSOCIATED WITH THE DEVELOPMENT OF OIL, GAS, AND GEOTHERMAL RESOURCES

Waste Permits Division
RG-003 • September 2006

Disposal of Special Wastes Associated with the Development of Oil, Gas, and Geothermal Resources

This document provides recommendations for the management of special wastes associated with the exploration, development, or production of oil, gas, or geothermal resources that are regulated by the Railroad Commission of Texas (RRCT) and that are being disposed of in landfills permitted by the Municipal Solid Waste (MSW) Permits Section of the Texas Commission on Environmental Quality (TCEQ) in accordance with Title 16, Texas Administrative Code, Section 3.30, and 30 TAC 330.3(148)(P). Some of the special wastes listed below require written authorization for disposal. Column 5 details the requirements for special waste disposal.

Description of Waste Items	RCRA Exempt per 40 CFR Part 261.4(b)(5) (see Note 1)	RRCT Authority Required for Disposal in TCEQ Landfill?	Treatment or Testing Recommended (see Note 2)	TCEQ Approval Required Prior to Disposal / Other Options
Asbestos-containing material	No Subject to specific regulations	Yes	Comply with Federal & State regulations for removal & disposal	No per §330.171(c)
Bags (empty), paper	No	No	None	No
Brush & vegetation from clearing land, uncontaminated	No	No	None	No / Disposal in Type IV landfill, compost facility
Buckets, detergent (empty)	No	No	None	No / Recycle
Buckets, grease (empty)	No	No	None	No / Recycle
Concrete, contaminated from compressor stations, oil, or gas facilities	No	Yes	Test for COCs on a case-by-case basis	Yes
Concrete, uncontaminated	No	No	None	No / Disposal in Type IV landfill
Containers (empty)	No	No	None	No / Recycle
Drill cuttings	Yes	Yes	Test for COCs on a case-by-case basis	Yes
Barrels, drums, 5-gallon buckets (empty)	No	No	None	No / Recycle
Fiberglass tanks & pipe (empty)	No	No	Clean, cut or shred	No
Filters—amine, dehydration, glycol	Yes	Yes	Drain, air dry for 48 hrs., test for TPH & benzene	Yes
Filters—cooling tower	Yes (No, if generated in transportation)	Yes	Drain, air dry for 48 hrs., test for chromium	Yes
Filters—saltwater	Yes	Yes	Drain, air dry for 48 hrs., test for pH, TPH, & chlorides	Yes
Filters— waste oil (1) entire unit is inside	No	Yes	Separate parts, recycle oil & metal parts	Yes

Description of Waste Items	RCRA Exempt per 40 CFR Part 261.4(b)(5) (see Note 1)	RRCT Authority Required for Disposal in TCEQ Landfill?	Treatment or Testing Recommended (see Note 2)	TCEQ Approval Required Prior to Disposal / Other Options
metal container				
(2) replaceable fiber or paper filter inside unit	No	Yes	Drain for at least 24 hrs., recycle, waste-to-energy, test for lead & benzene	Yes
Iron sponge	Yes	Yes	Allow to oxidize completely to prevent combustion	Yes
Office trash, routine	No	No	None	No / Recycle
Metal plates, pipes, cable	No	No	None	No / Recycle
Molecular sieves	Yes	Yes	Cool in non-hydrocarbon, inert atmosphere; hydrate in ambient air for 24 hrs., test for TPH & benzene	Yes
Muds—drilling	Yes	Yes	Test for barium, TPH, & BTEX; treatment to reduce hydrocarbons may be required	Yes
Muds—sacks of unused drilling mud	No	Yes	Return to vendor, use at other sites	Yes
Muds—unused additives	No	Yes	MSDS, test for barium	Yes
“Pigging waste” from gathering lines in primary field operations	Yes	Yes	MSDS for corrosion inhibitors, test for TPH, benzene, RCRA metals, & NORM	Yes
“Pigging waste” from transmission lines	No	Yes	MSDS for corrosion inhibitors, TPH, benzene, & arsenic	Yes
Pipe scale & other deposits removed from piping & equipment	Yes (No, if generated in transportation)	Yes	Test for TPH, RCRA metals, & NORM	Yes
Pipe dope, unused	No	Yes	MSDS (may contain lead), re-use if possible	Yes
Plastic pit liners	Yes	Yes	Decontaminate	No
Pumps, valves, etc.	No	No	Test for NORM	No / Recycle
Rags & gloves, soiled	No	No	None	No
Sand—produced during exploration	Yes	Yes	Test for TPH, benzene, & NORM	Yes
Soil—containing crude oil hydrocarbon	Yes (No, if generated in transportation)	Yes	Test for TPH & benzene	Yes
Soil—containing lube oil hydrocarbons	No	Yes	Test for cadmium, chromium, lead, TPH, benzene, PCBs	Yes
Sulfur—ferrous elemental sulfur & soil contaminated with sulfur	No	Yes	Recover sulfur	Yes
Sorbent pads—crude oil & other exempt wastes	Yes	Yes	Test for TPH & benzene	Yes
Sorbent pads—lube oil & other nonexempt wastes	No	Yes	Test for TPH & benzene	Yes
Tank seals—rubber	No	Yes	Allow to drain	Yes / Recycle

Description of Waste Items	RCRA Exempt per 40 CFR Part 261.4(b)(5) (see Note 1)	RRCT Authority Required for Disposal in TCEQ Landfill?	Treatment or Testing Recommended (see Note 2)	TCEQ Approval Required Prior to Disposal / Other Options
Tower packing	No	Yes	Test for chromium	Yes / Recycle
Water-treatment backwash solids	Yes	Yes	Test for RCRA metals & NORM	Yes
Wooden pallets, uncontaminated	No	No	None	No / Disposal in Type IV landfill

1. The scope of the RCRA exemption for oil and gas wastes is limited to drilling fluid and cuttings, produced water, and other waste unique or intrinsic to exploration and production in "primary field operations." Guidance for determining whether an oil and gas waste is exempt or nonexempt, including the definition of "primary field operations," is available in the Railroad Commission's manual, *Interim Guidance for Statewide Rule 98* (available online at <www.rrc.state.tx.us/divisions/og/swr98/index.html>). Oil and gas waste is always nonexempt when generated in transportation operations (i.e., downstream of primary field operations).
2. A less expensive alternative to the toxicity characteristic leaching procedure (TCLP) analysis is a total constituent analysis. If a total (i.e., total lead, total benzene, etc.) exceeds the example limits listed below or exceeds 20 times the TCLP limit for a Class 2-like waste, then the TCLP must be performed and the TCLP results must not exceed the stated limits for disposal in a standard MSW Type I landfill unit. For TCLP results that exceed the example limits listed below but do not exceed a hazardous limit, the waste may be authorized for disposal into an MSW Type I landfill with a Class 1 industrial waste unit. More TCLP limits can be found on Table 1, Appendix 1 of 30 TAC 335 Subchapter R:

Constituent	Total Limit (mg/kg)	MSW Type I TCLP Limit (mg/L)	Hazardous Waste TCLP Limit (mg/L)
Benzene	10	0.5	0.5
Arsenic	36	1.8	5.0
Barium	2,000	100	100
Cadmium	10	0.5	1.0
Chromium	100	5.0	5.0
Lead	30	1.5	5.0
Mercury	4	0.2	0.2
Selenium	20	1.0	1.0
Silver	100	5.0	5.0

There are additional constituent analyses that can limit the options for disposal into an MSW Type I landfill unit:

a. TPH < 1,500 mg/kg may be disposed of in a standard MSW Type I landfill unit.

b. TPH ≥ 1,500 mg/kg may be disposed of in an MSW Type I landfill with a Class 1 industrial unit as specified in 30 TAC 330.171(b)(4).

c. PCBs ≥ 50 mg/kg may not be disposed of in an MSW Type I landfill unit, unless authorized by the USEPA as specified in 40 Code of Federal Regulations Part 761.

d. NORM concentrations must be below 30 picocuries per gram for disposal in an MSW Type I landfill unit as specified in 25 TAC 289.259(d)(1)(A).

Explanation of Acronyms:

BTEX benzene, toluene, ethylbenzene, and xylene

COC constituents of concern

MSDS material safety data sheet

MSW municipal solid waste

NORM naturally occurring radioactive materials

PCBs polychlorinated biphenyls

RCRA Resource Conservation and Recovery Act

RRCT Railroad Commission of Texas

TCEQ Texas Commission on Environmental Quality

TCLP Toxicity Characteristic Leaching Procedure

TPH total petroleum hydrocarbons

Regulatory References:

16 TAC 3.30

30 TAC 330.3(148) and 330.171

30 TAC 335.505(1) and 335.521(a)(1)

40 CFR 261.4(b)(5)

RG-022

GUIDELINES FOR THE CLASSIFICATION & CODING OF INDUSTRIAL & HAZARDOUS WASTE

GUIDELINES

FOR THE

CLASSIFICATION

AND

CODING

OF

INDUSTRIAL

AND

HAZARDOUS WASTES

TEXAS COMMISSION ON
ENVIRONMENTAL QUALITY
WASTE PERMITS DIVISION

RG-022 Revised 11/14

GUIDELINES FOR THE CLASSIFICATION AND CODING OF INDUSTRIAL AND HAZARDOUS WASTES

THIS IS A GUIDANCE DOCUMENT AND SHOULD NOT BE INTERPRETED AS A REPLACEMENT TO THE RULES.
The rules for classifying and coding industrial wastes and hazardous wastes may be found in 30 Texas Administrative Code (TAC) Sections (§§) 335.501-.521 (Subchapter R).

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RG-022
Texas Commission on Environmental Quality

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Published and distributed
by the
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, TX 78711-3087

Contents

Appendices, Tables and Figures listed on page iv.

Contents Continued

Chapter 1

Introduction

Who Should Read This Booklet

The main purpose of this guidance document is to help generators of industrial and hazardous waste follow state and federal requirements on

- classifying and coding these wastes,
- keeping proper records, and
- notifying the Texas Commission on Environmental Quality (TCEQ) about the wastes, when required.

Specifically, this document gives guidance on the regulations in Title 30 of the Texas Administrative Code (TAC), Chapter 335, Subchapter R (Waste Classification). The rules in Subchapter R apply both to wastes generated in Texas and to those generated outside the state and sent to Texas for treatment, storage, and/or disposal. Correct and timely compliance with the regulations on industrial and hazardous wastes helps to protect the state's environment and safeguard the health of Texas citizens.

Waste Classes

Figure 1-1 shows the main categories of hazardous and nonhazardous waste. The following paragraphs give brief descriptions of these categories—important terms that will be used throughout this booklet. (For more details, see the classification checklist in Chapter 3 and the definitions in Chapter 8.)

Hazardous Waste

A hazardous waste is one that is listed as such by the U.S. Environmental Protection Agency (EPA) or that exhibits one or more hazardous characteristics (also as specified by the EPA). Hazardous wastes are threatening to human health and the environment.

Listed Hazardous Waste

EPA lists over 400 wastes as hazardous. For more information see Part I-A of the checklist in Chapter 3.

Characteristically Hazardous Waste

Waste that displays one or more of four hazardous characteristics:

- ignitability (easily flammable—for example, solvents);
- reactivity (capable of rapid chemical reaction–for example, peroxides);
- corrosivity (highly acidic or alkaline, able to dissolve metals or burn the skin–for example, hydrochloric acid or sodium hydroxide); and
- toxicity (a waste that can release toxic constituents into the environment—for example, lead-based paint).

For more information on hazardous characteristics, see Part I-B of the checklist in Chapter 3.

Nonhazardous Waste

Any industrial waste that is not listed as hazardous and does not have hazardous characteristics. (Class 1 nonhazardous industrial waste can include certain levels of constituents and specified properties that, at higher levels, might otherwise render the waste hazardous—see Part II of the checklist in Chapter 3.)

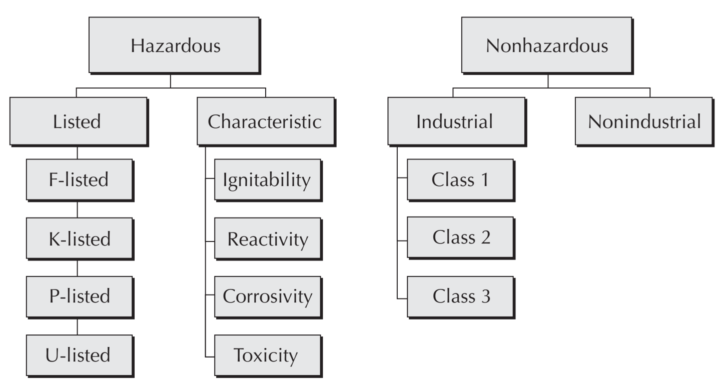
Industrial versus Nonindustrial Wastes

Industrial wastes result from (or are incidental to) operations of industry, manufacturing, mining, or agriculture—for example, wastes from power generation plants, manufacturing facilities, and laboratories serving an industry. *Nonindustrial wastes*, by contrast, come from sources such as schools, hospitals, churches, dry cleaners, most service stations, and laboratories serving the public.

Nonhazardous Industrial Waste

In this grouping, ***Class 1*** waste is considered potentially threatening to human health and the

Figure 1-1. Hazardous and Nonhazardous Wastes



environment if not properly managed, because of the constituents and properties this class can include. Therefore, there are special handling requirements for Class 1 wastes. An example is water contaminated with ethylene glycol.

Examples of ***Class 2*** wastes include waste-activated sludge from biological wastewater treatment. ***Class 3*** includes materials such as demolition debris—for example, bricks—that are insoluble, do not react with other materials, and do not decompose. Class 2 and 3 wastes are often accepted by local landfills. However, a Class 2 or 3 designation does not mean that the waste is incapable of causing harm in every management (or mismanagement) situation.

What This Booklet Explains How to Do

After you have worked through this booklet (and that includes consulting the rules referred to in it), you will be able to accomplish the following tasks:

- **Identify *which wastes* you must classify, code, and notify** the TCEQ about. Chapter 2 introduces a key concept—"waste streams"— that helps you decide these points.
- **Classify your waste.** Chapter 3 gives you a step-by-step approach for putting your waste into one of four categories: either *hazardous* waste or *nonhazardous* industrial waste Classes 1, 2, or 3.
- Know what kind of information (either from **process knowledge** about your facility's operation or from **analytical testing**) that you must **document** and keep on **file** (Chapter 4).
- **Understand the 8-character Texas waste code**. Chapter 5 explains the components of the waste code:
  - 4-character ***sequence number*** (may be a number, letters, or a combination; generally, identifies a particular waste or where it came from);
  - 3-digit ***form*** code; and
  - 1-character classification (from Chapter 3).
- **Know how to notify TCEQ** about your wastes and **which TCEQ form** to use (Chapter 6).

Some Things This Booklet Does NOT Cover

Non**hazardous *Non*industrial Waste.** The rules in 30 TAC Chapter 335, ***do NOT*** apply to **nonhazardous** waste generated by **nonindustrial** facilities.

Selective Coverage of Chapter 335

Also, please be aware that this guidance document only covers 2 subchapters (A and R) of 30 TAC Chapter 335, which contains 18 subchapters in all. This booklet covers only classification and coding, documentation you must create and keep on file, and notifications you must send to TCEQ (and the forms to use for that purpose). This booklet is not a substitute for the complete rules themselves. (You can obtain your own copies of the full, official state rules from the TCEQ's publications unit. Ways to contact this unit are listed under the heading "TCEQ and EPA Forms" in Chapter 6.)

Classification versus Risk Reduction

There is an important distinction between (1) classifying your wastes; and (2) meeting the ***risk reduction standards,*** which are set forth in 30 TAC Chapter 335, Subchapter S. Here are the most common situations where the risk reduction standards apply:

- a facility that handled industrial wastes is being closed;
- a site where unauthorized discharge of wastes occurred is being cleaned up.

If you are involved in a situation like these, you need to inform yourself about the risk reduction standards. The guidance document you are now reading does not cover this topic. (Again, you can obtain a copy of Subchapter S, and other information, from the TCEQ publications unit—see the heading "TCEQ and EPA Forms" in Chapter 6.)

Who Are "You" in This Booklet?

Throughout this guidance document, generators of industrial and/or hazardous wastes will be referred to as "generator," "generators," or—for a more direct way of writing—simply as "you." Also, 30 TAC Chapter 335, Subchapter R, will be referred to as "these rules" or "the rules." Finally, "this booklet," "this document," or "this guidance document" refers to *Guidelines for the Classification and Coding of Industrial and Hazardous Wastes*, TCEQ Publication Number RG-022—the booklet you are now reading.

Chapter 2

"Waste Streams"–A Key Concept

When the preceding chapter mentioned that this booklet will instruct you on how to classify, code and report about wastes, a question that naturally might have come to your mind is "***How*** do I know which wastes must be classified, coded, and reported?" (The general answer is that you must perform these processes on all hazardous wastes and nonhazardous industrial wastes.)

In discussing this point, federal regulators use the term *waste stream,* in both of the following senses: First, it can mean the total flow of all waste from homes, businesses, and industry. Second, within this total flow, smaller "waste streams" can be distinguished—for example, "the residential waste stream," "the recyclable waste stream," and others.

Similarly, within the overall flow of waste from your ordinary operations or processes, a number of particular waste streams can be identified. For example if your process ordinarily produces a hazardous acidic waste, and at some point you neutralize that waste, these are two separately identifiable "waste streams."

Each waste stream—the acidic waste and the neutralized waste, in this example–must be identified by an 8-character Texas waste code, which identifies the waste stream as a separate entity and gives information about its origin, general nature, and hazardous status. (Chapters 3 through 5 go into the details of how this 8-character code is arrived at.)

Table 2-1 gives examples of some situations in which the waste flow from an operation or process can produce more than one waste stream, each of which must be classified and coded; and an example of a situation that does *not* result in more than one waste stream. For specific guidance on specific waste streams, contact the TCEQ.

In general, whenever you have or suspect the existence of an additional, distinct waste stream, you must determine its classification (Chapter 3), arrive at a Texas waste code for it (Chapter 5), and in most cases notify TCEQ about the additional waste stream (Chapter 6—which also gives details about some of the exceptions to the requirements for notification: for example, a slight change or variation in a waste stream's composition may not require notification.)

Table 2-1. An Operation's Overall Waste Flow Can Produce Multiple "Waste Streams"

IF you have WASTES that are …	AND they come from PROCESSES that are …	THEN the wastes are considered …
different	similar	**different** "waste streams"—for example, a sludge removed from an electroplating vat is not the same waste stream as a liquid removed from an electroplating vat.
similar	different	**different** "waste streams"—for example, methylene chloride used in a paint- stripping operation is not the same waste stream as methylene chloride used in laboratory analysis.
similar	similar	**the same** "waste stream"—for example, a site may have several paint booths that perform the same activities with the same materials, and each produces drop cloth waste. These drop cloth wastes, from the various locations at this site, could be considered one waste stream as long as they were all classified the same (for more on classification, see Chapter 3).
altered physically or chemically by treatment	N/A	**different** "waste streams"—for example, if a sludge is dewatered, it may produce two new waste streams, one a solid and the other a liquid.

Chapter 3

Waste Classification Checklist

This chapter provides a checklist to help you classify your hazardous waste and your nonhazardous industrial waste. For an overview of these types of waste, refer back to Figure 1-1 in Chapter 1; for more details, refer to 30 TAC Chapter 335 Subchapter R Sections 335.501–508. (You can obtain your own copy of state rules from the TCEQ publications unit; ways to contact this unit are listed under the heading "TCEQ and EPA Forms" in Chapter 6.)

Process Knowledge vs. Analytical Testing

In determining a waste stream's classification, a generator may use *process knowledge* and/or *analytical testing*. Process knowledge is the owner or operator's knowledge about how the facility operates, how a waste was produced and handled, and other information based on operating experience. Analytical testing is information about a waste from laboratory analysis.

In the checklist, the nonhazardous classification criteria that could involve analytical testing have been marked with an *. This marking **does not** mean that analytical testing is the only way to evaluate these criteria. If sufficient process knowledge is available, little or no analysis may need to be performed. You should evaluate whether you have enough process knowledge about the waste to classify it or whether analytical testing is needed.

Documentation

Regardless of whether you rely on process knowledge or opt for analytical testing, you must fully document the information used in making your waste classification. **A completed checklist does not qualify as full documentation**. Documentation should be in a written and/or electronically stored format that is reasonably accessible and easily reproducible. For details on documentation requirements, see Chapter 4.

Part I. Hazardous Waste Determination

All waste generators should work through Part I of this checklist. In this part you will determine whether your waste is hazardous because (a) it is listed as hazardous by EPA or (b) it displays characteristics that EPA says make it hazardous.

In federal regulatory language, the first step in classifying your waste is called "making a *hazardous waste determination*." The definition of hazardous waste, based upon the Resource Conservation and Recovery Act (RCRA), is found in Title 40 of the Code of Federal Regulations (CFR), Part 261.

This TCEQ guidance document reflects the hazardous waste definition in the *Federal Register* as of July 1, 2004. If that definition changes, the generator is still responsible for making an accurate hazardous waste determination in accordance with the latest regulations—instead of with what is printed in this guidance document.

IF	the answer to any of the questions in Part I is "Yes,"
THEN	the waste is hazardous.

Possible *Exclusions* from Hazardous Classification

Under certain conditions, some types of wastes are excluded from being considered hazardous (40 CFR Sections 261.3–4). Generators may wish to review these exclusions before working through Part I of this checklist.

Part I-A. *Listed* Hazardous Waste Determination

The EPA lists some 400 hazardous wastes.

Information to Help You Make This Determination

Descriptions of listed waste are found in 40 CFR Part 261, Subpart D, Sections 261.31–33. These wastes are often referred to as follows:

- "F" listed waste (waste from nonspecific sources, Section 261.31);
- "K" listed waste (wastes from specific sources, Section 261.32);
- "P" listed waste (unused acutely hazardous off-specification materials as well as container residues and spill residues of these materials, Section 261.33);
- "U" listed waste (unused toxic hazardous off-specification materials as well as container residues and spill residues of these materials, Section 261.33).

QUESTION: Is the waste a listed hazardous waste, or is it mixed with or derived from one? ☐ Yes ☐ No

Part I-B. *Characteristic* Hazardous Waste Determination

Wastes may be hazardous if they display any of four characteristics: ignitability, corrosiveness, reactivity, or toxicity.

Information to Help You Make This Determination

Ignitability

Wastes that are hazardous because they may ignite include the following:

- Liquid wastes (other than those aqueous waste containing less than 24 percent alcohol by volume) that have a flash point less than 60^{O}C (140^{O}F). (The test method is the Pensky-Martens closed cup tester, using the test method specified in ASTM Standard D-93-79 or D-93-80, or a Setaflash closed cup tester, using the test method specified in ASTM Standard D-3278-78.)
- Nonliquid wastes that, under standard temperature and pressure, are capable of causing fire through friction, absorption of moisture, or spontaneous chemical changes and, when ignited, burn so vigorously and persistently that they create a hazard.
- Wastes that meet the definition of an ignitable compressed gas (see 49 CFR Section 173.300).
- Wastes that meet the definition of an oxidizer (see 49 CFR Section 173.151).

QUESTION: Is the waste ignitable according to 40 CFR Section 261.21? ☐ Yes ☐ No

Corrosiveness

Wastes that are hazardous because they are corrosive include the following:

- aqueous wastes with a pH of 2 units or below or of 12.5 units or above;
- liquid wastes that corrode steel at a rate greater than 6.35 mm (0.250 inches) per year.

QUESTION: Is the waste corrosive according to 40 CFR Section 261.22? ☐ Yes ☐ No

Reactivity

A waste is considered reactive if it meets any of the following conditions:

- It is capable of detonation or explosive decomposition or reaction
  - at standard temperature and pressure,
  - if subjected to a strong ignition source, or
  - if heated under confinement.
- When mixed with water, it is
  - potentially explosive,
  - reacts violently, or
  - generates toxic gases or vapors.
- If a cyanide or sulfide-bearing waste is exposed to pH conditions between 2 and 12.5, it can generate enough toxic gases, vapors, or fumes to present a danger to human health or the environment. Generally, if a waste generates **250** ppm or more of reactive cyanides or **500** ppm or more of reactive sulfides, it is considered a reactive waste. (It should be noted that these levels of reactive compounds are just guidance. Each waste must be evaluated for reactivity on a case-by-case basis).
- It is normally unstable and readily undergoes violent change without detonating.
- It is a forbidden explosive (as defined in 49 CFR 173.51, or a Class A explosive as defined in 49 CFR 173.53).
- It is a Class B explosive (see 49 CFR Section 173.88).

QUESTION: Is the waste reactive according to 40 CFR Section 261.23? ☐ Yes ☐ No

Toxicity

A waste is toxic if the toxicity characteristic leaching procedure (TCLP) shows that a representative sample from the waste contains one or more constituents at or above the levels listed in Table 3-1. The TCLP is described in EPA Method 1311 (SW-846).

QUESTION: Is the waste toxic according to 40 CFR Section 261.24? ☐ Yes ☐ No

Table 3-1. TCLP Regulatory Levels

arsenic —5.0 mg/l	1,4-dichlorobenzene — 7.5 mg/l	nitrobenzene — 2.0 mg/l
barium — 100.0 mg/l	1,2-dichloroethane — 0.5 mg/l	pentachlorophenol — 100.0 mg/l
benzene — 0.5 mg/l	1,1-dichloroethylene — 0.7 mg/l	pyridine — 5.0 mg/l
cadmium — 1.0 mg/l	2,4-dinitrotoluene — 0.13 mg/l	selenium — 1.0 mg/l
carbon tetrachloride — 0.5 mg/l	endrin — 0.02 mg/l	silver — 5.0 mg/l
chlordane — 0.03 mg/l	heptachlor (and its epoxide) — 0.008 mg/l	tetrachloroethylene — 0.7 mg/l
chlorobenzene — 100.0 mg/l	hexachlorobenzene — 0.13 mg/l	toxaphene — 0.5 mg/l
chloroform — 6.0 mg/l	hexachlorobutadiene — 0.5 mg/l	trichloroethylene — 0.5 mg/l
chromium — 5.0 mg/l	hexachloroethane — 3.0 mg/l	2,4,5-trichlorophenol — 400.0 mg/l
o-cresol — 200.0 mg/l	lead — 5.0 mg/l	2,4,6-trichlorophenol — 2.0 mg/l
m-cresol — 200.0 mg/l	lindane — 0.4 mg/l	2,4,5-TP (Silvex) — 1.0 mg/l
p-cresol — 200.0 mg/l	mercury — 0.2 mg/l	vinyl chloride — 0.2 mg/l
cresol — 200.0 mg/l	methoxychlor — 10.0 mg/l	
2,4-D — 10.0 mg/l	methyl ethyl ketone — 200.0 mg/l	

Review of Checklist Part I: Hazardous Waste

IF the answer to any of the preceding questions in Part I is "Yes,"
THEN the waste is HAZARDOUS; PROCEED to Chapter 4.

IF the answers are "No" to all the preceding questions,
AND the waste is NONINDUSTRIAL,
THEN STOP here.

IF the answers are "No" to all of the preceding questions,
AND the waste is INDUSTRIAL,
THEN PROCEED to Part II.

Part II: Nonhazardous Industrial Waste Classes 1 & 2

The determination in this part of the checklist applies only to nonhazardous industrial waste—see Figure 1-1 in Chapter 1. (This part of the checklist is based on regulations found in 30 TAC Sections 335.505–06 and 335.508).

IF the answer to any of the **un-numbered** questions in this part of the checklist is "Yes,"
THEN the nonhazardous industrial waste is a Class 1 waste.

IF all the answers to the **un-numbered** questions in this part are "No,"
THEN the industrial waste is a Class 2 waste.

Generator's Self-Classification

QUESTION: Has the generator chosen to classify its nonhazardous waste as Class 1? ☐ Yes ☐ No

Container Waste

IF the waste is a container, greater than 5 gallons in holding capacity, which has held

- a hazardous substance (as defined in 40 CFR Part 302 and listed in Appendix A of this guidance document),
- a hazardous waste (including acutely hazardous wastes),
- a Class 1 waste, and/or
- a material that would be classified as a hazardous or Class 1 waste if disposed of,

THEN answer questions 1 and 2. *(Please note that containers that have held acutely hazardous wastes must be triple-rinsed before they can be classified as empty).*

IF these conditions are not present in your situation,
THEN proceed to the next un-numbered question.

1. Has the container had all its residues removed? ☐ Yes ☐ No
2. Has the container been rendered unusable? ☐ Yes ☐ No

QUESTION: Are ***any*** of the answers to questions (1) or (2) above "NO"? ☐ Yes ☐ No

Regulated Asbestos-Containing Material (RACM)

(See Chapter 8, Definition of Terms, for information on RACM.)

QUESTION: Does the waste contain asbestos material identified as RACM, as defined in 40 CFR Part 61? * ☐ Yes ☐ No

Polychlorinated Biphenyls (PCBs)

QUESTION: Is the waste contaminated by a material that originally contained 50 or more parts per million (ppm) total PCBs? * ☐ Yes ☐ No

QUESTION: Does the waste contain 50 or more ppm PCBs?* ☐ Yes ☐ No

Petroleum Substance Waste

1. Is your waste specifically identified as a *petroleum substance* (see Chapter 8, Definitions of Terms) or contaminated with a material identified as a petroleum substance waste? ☐ Yes ☐ No
2. Does the waste contain more than 1,500 ppm total petroleum hydrocarbons (TPH)? ☐ Yes ☐ No

QUESTION: Are the answers to **both** of the numbered questions above "Yes"? (If one or both of the answers are "No," enter "No" for this question.) ☐ Yes ☐ No

"New Chemical Substance"

See "new chemical substances wastes" in Chapter 8, Definitions and Terms, for a description of how this particular type of waste may be classified as Class 2 or 3.

QUESTION: Is the waste from the production of a "new chemical substance," as defined by the federal Toxic Substances Control Act, 15 U.S.C.A. Section 2602(9)? ☐ Yes ☐ No

Out-of-State Origin

See "wastes generated out-of-state" in Chapter 8, Definitions of Terms, for details on how this particular type of waste may be classified as Class 2 or 3.

QUESTION: Is the waste generated outside Texas? ☐ Yes ☐ No

Constituent Levels and Specified Properties for Nonhazardous Industrial Class 1 Wastes

QUESTION: If the waste is a liquid, does it have a flash point of less than 65.6^{O}C (150^{O}F)? * ☐ Yes ☐ No

QUESTION: Is the waste a solid or semi-solid that—under conditions normally encountered in storage, transportation, and disposal—

- is liable to cause fires through friction or through retained heat from manufacturing or processing; or
- can be ignited readily, and when ignited burns so vigorously and persistently as to create a serious hazard? ☐ Yes ☐ No

Question: Is the waste a semi-solid or solid that, when mixed with an equivalent weight of ASTM Type II laboratory distilled or deionized water, produces a solution with a pH of 2 or less or 12.5 or more? ☐ Yes ☐ No
(***Exception:*** for solidified, stabilized, encapsulated, or otherwise chemically bound wastes, an exception is provided in 30 TAC Section 335.505(3)) *

Question: Does the waste leach Class 1 toxic constituents at or above the levels listed in Table 1, Appendix 1 of 30 TAC Chapter 335 Subchapter R when submitted to the toxicity characteristic leaching procedure (TCLP)? * ☐ Yes ☐ No
(For a copy of Table 1, Appendix 1, see Appendix C of this guidance document.)

(Where matrix interferences of the waste cause the Practical Quantitation Limit (PQL) of the specific analysis to be greater than the Maximum Concentration listed in Table 1, Appendix 1 of 30 TAC Chapter 335 Subchapter R, then the achievable PQL becomes the Maximum Concentration, provided that the generator maintains documentation that satisfactorily demonstrates to the TCEQ that lower levels of quantitation of a sample are not possible.)

A satisfactory demonstration includes the results from the analysis of the waste for that specific constituent by a laboratory using an appropriate method found in *Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods* (EPA SW-846); *Methods or Chemical Analysis of Water and Wastes* (EPA-600 series); *Standard Methods for the Examination of Water and Wastewater*; *American Society for Testing and Materials (ASTM) Standard Methods*; or an equivalent method approved by the TCEQ.

Lack of Class 2 or 3 Information

Question: Is information lacking that demonstrates the waste belongs in Class 2 or 3? ☐ Yes ☐ No

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Review of Checklist Part II: Class 1 or 2 Nonhazardous Industrial Waste

IF	the answer to any of the preceding **un-numbered** questions in Part II is "Yes,"
THEN	the nonhazardous industrial waste is a Class 1 waste.
PROCEED	to Chapter 4.
IF	the answers are "No" to all the preceding **un-numbered** questions in Part II,
THEN	the industrial waste is a Class 2 waste.
PROCEED	to Chapter 4.
IF	the answers are "No" to all of the preceding **un-numbered** questions in Part II,
AND	the industrial generator wishes to evaluate the waste for a possible Class 3 status,
THEN PROCEED	to Part III.

Part III: Nonhazardous Industrial Class 3 Waste

This part of the checklist applies only to nonhazardous, industrial waste that does not meet the definition of a Class 1 waste and is not specifically identified as a Class 2 waste. (The corresponding regulations for this part of the checklist can be found in 30 TAC Sections 335.507 and 335.508.)

Part III-A. Initial Determinations for Class 3 Status

IF the answer to any of the following questions in Part III-A is "Yes,"
THEN the nonhazardous, industrial waste ***cannot*** be considered a Class 3 waste.

Containers

QUESTION: Is the waste an empty container? ☐ Yes ☐ No

Medical Waste

(For a definition, see "medical wastes" in Chapter 8.)

QUESTION: Is the waste a medical waste regulated under 30 TAC Chapter 330, Subchapter Y? ☐ Yes ☐ No

Distilled Water Leaching Test

QUESTION: When subjected to the 7-day distilled water leaching test, does the waste leach constituents at or above the maximum contaminant levels listed in Table 3, Appendix 1 of 30 TAC Chapter 335, Subchapter R? * ☐ Yes ☐ No

(Table 3 is reproduced in Appendix D of this guidance document.)

Toxicity Characteristic Leaching Procedure

QUESTION: When submitted to the toxicity characteristic leaching procedure (TCLP), does the waste leach Class 1 toxic constituents listed in Table 1, Appendix 1 of 30 TAC Chapter 335 Subchapter R at or above their detection levels? * ☐ Yes ☐ No

(The list of Class 1 toxic constituents is reproduced in Appendix E of this guidance document.)

Exclusion: Excluded from this list of Class 1 toxic constituents are those addressed in the previous question (that is, constituents identified in Table 3, Appendix 1 of 30 TAC Chapter 335 Subchapter R).

Petroleum Hydrocarbons

QUESTION: Does the waste contain detectable levels of petroleum hydrocarbons (Method 1005)? * ☐ Yes ☐ No

Polychlorinated Biphenyls (PCBs)

QUESTION: Does the waste contain detectable levels of PCBs? * ☐ Yes ☐ No

Decomposition

QUESTION: Is the waste readily decomposable? ☐ Yes ☐ No

Review of Checklist Part III-A: Class 3 Nonhazardous Industrial Waste

IF the answer to any of the preceding questions in Part III-A is "Yes,"
THEN the nonhazardous, industrial waste ***cannot*** be considered a Class 3 waste.

IF all the answers to the preceding questions in Part III-A are "No,"
THEN proceed to Part III-B to continue the waste's evaluation for possible Class 3 status.

Part III-B: Final Determinations for Class 3 Status

Inertness

QUESTION: Is the waste inert? (Inertness refers to chemical inactivity of an element, a compound, or a waste.) ☐ Yes ☐ No

Insolubility

QUESTION: Is the waste essentially insoluble? ☐ Yes ☐ No
(***Note***: wastes that contain liquids are *NOT* considered insoluble.)

Review of Checklist Part III

IF the answer to any question under Part III-B is "No,"
THEN the nonhazardous, industrial waste ***cannot*** be considered a Class 3 waste.

IF all the answers to the questions in Part III-A are "No,"
AND all the answers to the questions in Part III-B are "YES,"
THEN the nonhazardous industrial waste is a Class 3 waste.

Part IV. Variance from Waste Classification

The TCEQ may determine, on a case-by-case basis, the merits of a variance request for a specific nonhazardous classification. The burden of justifying the need for a variance is on the requestor. The requestor must submit information sufficient to clearly indicate the issues involved, the reason(s) for the request, and both the positive and negative impacts that may result from the granting of the variance. (The regulations corresponding to these types of variance requests can be found in 30 TAC Section 335.514, Variance from Waste Classification Provisions.)

* **As a reminder**, these characteristics need not necessarily be addressed by analytical testing. A generator may be able to address them through process knowledge. For more information on process knowledge, please see Chapter 4 of this guidance document.

Chapter 4

Process Knowledge, Analytical Testing, and Documentation Requirements

Introduction

Now that you know how to classify your wastes, you are ready to compile supporting documentation. Documentation should support the classification and coding of a waste stream. You must properly document each waste stream generated by the facility, and keep that documentation for at least three years after the waste is no longer generated, stored, or recycled or until the site is closed.

The regulations on documentation requirements can be found in 30 TAC Section 335.9 (Record Keeping and Annual Reporting Procedures Applicable to Generators), Section 335.70 (Record Keeping), Section 335.510 (Sampling Documentation), Section 335.511 (Use of Process Knowledge), and Section 335.513 (Documentation Required).

The TCEQ randomly audits a portion of waste stream *notifications* (see Chapter 6) in order to ensure proper classification and coding of waste in Texas. When the TCEQ sends you a request for information for the purpose of an audit, you must send the agency the information that you have gathered to make your hazardous waste determination/waste classification. Please use Chapter 4 as a guide to compiling supporting documentation for each waste stream generated at your facility.

Process Knowledge

If process knowledge is used in classifying a waste, that knowledge must be documented and kept on file for three years. Process knowledge must be in writing or stored in some electronic form. It cannot be stored solely in someone's mind. The process knowledge must support a generator's reasoning about why the waste has been given a particular classification. It must also support the generator's reasoning about why a particular test method was not performed.

The following are some examples of process knowledge that may assist in classifying waste:

- description of the waste;
- date of initial waste generation;
- a detailed description of the process generating the waste (that is, identification of chemicals or other materials in the process that generated the waste stream (including any potential breakdown products);
- manufacturer's literature such as Material Safety Data Sheets—MSDSs (although they were not created for the purpose of determining Texas waste classification, and do not contain information on all constituents found in a product, MSDSs may be helpful);
- full description of activities that generated the waste stream;
- identification of potential contaminants; and
- other documentation generated in conjunction with the particular process.

Analytical Data

If a generator uses analytical data to classify a waste, the data must be supported by documentation of the sampling procedure and the analytical testing. The following lists specify information that must be maintained when analytical data is used for classification purposes.

Sampling Procedures

The following procedures must be documented:

- dates of sample collection;
- description of the site and/or unit from which the sample was taken, including sampling locations;
- the method and equipment used for sampling;
- a description of the sampling techniques, including collection, containerization, and preservation; and
- rationale—that is, supporting reasons—for the sampling plan (why the number, type, and location of samples taken accurately represent the waste stream being characterized).

Analytical Testing

Documentation of analytical testing must include the following:

- Analytical **results** (including quality control data).
- Analytical **methods** (including any preparatory methods).
- The **detection limits** for each analysis.
- **Name of laboratory** performing the analysis.
- **Chain of custody**—documentation tracking the condition of the waste containers. For example, were the waste containers and their seal intact or broken upon arrival at the laboratory? Were the containers full, half-full, or empty? Did all the containers arrive at the laboratory or just a partial shipment?
- Documentation that satisfactorily demonstrates that lower levels of *quantitation* are not possible (this is only necessary when the waste media causes the *Estimated Quantitation Limit* (EQL) of a Class 1 toxic constituent (as listed in Appendix E of this guidance document) to be greater than the concentration listed (*matrix interference*). (Terms in italics are explained in Chapter 8.)

Classification Checklist

Although the checklist in Chapter 3 can be used to help classify industrial and hazardous waste, a generator should support the checklist's "yes" or "no" responses with process knowledge and/or analytical data. A completed checklist by itself is not sufficient documentation to submit to the TCEQ in response to a random audit of classification.

For example, a generator answers "no" to the question "Is the waste ignitable according to 40 CFR Section 261.21?" You can support this response by submitting process knowledge, analytical data, or both. If process knowledge is used, it must be **specific**. A general statement such as "the waste is not ignitable" would not be sufficient.

Instead, you should document specific actions you took and their results, such as (1) reviewed all constituents that may be present in the waste; (2) determined that each constituent present in the waste does not meet the definition of an ignitable waste; and (3) determined that the process generating the waste does not introduce any ignitable characteristics to the waste stream. You should keep copies of your documentation demonstrating that the constituents in the waste stream would not cause the waste to exhibit the characteristic of ignitability.

Rule of Thumb about Documentation

Remember that documentation should demonstrate why a waste has been given a particular classification. Here's a good rule of thumb: if someone else can review your classification documentation, using the published criteria and/or the checklist, and arrive at the same classification you did, then you have probably done a good job of compiling supporting documentation for a waste classification. On the other hand, if someone reviews your classification and still has unanswered questions, then you may want to gather additional documentation (from process knowledge and/or analytical data) to support your classification of that waste stream.

Chapter 5

Texas Waste Code Formula

Chapter 5 describes the 8-digit Texas waste code that identifies each of your waste streams. (Part of the information to complete this waste code comes from the waste determination process (described in Chapter 3) and from the documentation you must compile and keep on hand (described in Chapter 4).)

The formula for the Texas waste code is given in Figure 5-1. The rules corresponding to this formula can be found in 30 TAC Section 335.503 (Waste Classification and Waste Coding Required).

Sequence Number

Although called a sequence "number," this part of the code may contain a mix of numbers and letters—alphanumeric; and sometimes it may consist of letters alone. Various types of 4-digit sequence numbers are used in the Texas waste code.

- An **arbitrary and unique 4-digit number from 0001 to 9999** (no alpha characters), which is assigned by the generator when adding a waste stream to Texas facility's *Notice of Registration* (see Chapter 6, Notification Requirements). Once assigned to a particular waste stream, a sequence number **cannot be reassigned** to another waste stream. Generators need not sequentially assign sequence numbers to a facility's waste streams.
- A **4-digit alphanumeric number** assigned by the TCEQ (under the **one-time shipment program**) to wastes generated by unregistered generators within Texas. (Spill waste not managed under the Emergency Response Program may be handled in this manner.)
- **"SPIL"** to be assigned only by the Emergency Response Team of the Field Operations Division **for spill wastes regulated under the Emergency Response Program.**
- **"OUTS"** to be used for **wastes generated outside of Texas**.
- **"CESQ"** to be used by **municipal hazardous and industrial CESQGs** (Conditionally Exempt Small-Quantity Generators).
- **"TSDF"** (treatment, storage, and disposal facilities), to be used by facilities that (1) receive and consolidate a waste stream with other like waste streams (thus not changing the form or composition of the waste); or (2) store a received waste without treating or changing its form or composition. This sequence number does not apply to wastes that are treated or altered in some other way. The "TSDF" designation is to be used only by **facilities that store and/or accumulate waste** from more than one site for subsequent shipment to a treatment or disposal facility.

Form Code

The second series of numbers found in the Texas waste code is the "form code." The list of form codes as well as flowcharts that depict the choosing of a form code can be found in Appendix G.

Form codes are broken down into 10 major categories. They are Lab Packs, Inorganic Liquids, Organic Liquids, Inorganic Solids, Organic Solids, Inorganic Sludges, Organic Sludges, Inorganic Gases, Organic Gases, and Plant Trash. The various form codes and corresponding descriptions can be found under these categories in Appendix G.

In determining a waste stream's form code, TCEQ recommends that the generator first determine the major category into which the waste stream fits. Then review all the form code descriptions in that category to determine which code or codes best describe your waste stream. From this narrowed-down list, choose a form code for the waste stream.

Classification

The waste stream's classification completes the Texas waste code. As Figure 5-1 showed, this part of the Texas waste code will be "H" or "1", "2", or "3".

Stop! Are You about to Misclassify a Waste?

Table 5-1 provides additional information about using certain combinations of form and class codes.

Figure 5-1. Components of a Texas Waste Code

4-digit Sequence Number	+	3-digit Form Code	+	1-digit Classification Code
(___ ___ ___ ___	+	___ ___ ___	+	___)
Identifies specific waste streams; usually assigned by the generator; under certain conditions, the TCEQ may assign it; see text for details		Indicates general type of waste; see Appendix G, Form Codes		H = Hazardous 1 = Class 1 2 = Class 2 3 = Class 3

Table 5-1. Questions to Ask about Some Combinations of Coding and Classification

IF the waste is …	AND you assigned form codes …	Are you sure about a classification of …
Any Class 3 waste	Any form code	*Class 3?* (You must submit all supporting documentation)
Asbestos solids, debris, slurry, sludge, etc.	311, 515	*Class 2?* (Wastes that contain regulated asbestos-containing material are Class 1)
Oils	205, 206[a]	*Class 2?* (Wastes that contain more than 1,500 ppm total petroleum hydrocarbons are Class 1)
PCB-containing materials	297, 298, 394, 395, 396, 397, 398, 399, 494, 495, 496, 497, 498, 499, 598, 599, 698, 699	*Class 2?* (Wastes that contain 50 ppm or more PCBs are Class 1)
Petroleum-containing materials	205, 206[a], 296, 489, 510, 603, 606, 695, 696	(Petroleum substance wastes that contain more than 1,500 ppm total petroleum hydrocarbons are Class 1)
Plant trash	902 and 999[b]	*Hazardous, Class 1, or Class 3?* (Only wastes that are Class 2 may be given a form code for plant trash)
Spent lead acid batteries	309[c]	Hazardous

[a] If your waste oil is nonhazardous, is managed under 40 CFR 279 and 30 TAC 324, and is recycled 100 percent, then do not add to your Notice of Registration (the central record that the TCEQ compiles from waste notifications you send in—see Chapter 6, Notification Requirements and Forms).

[b] Only form codes 902 and 999 may be used.

[c] If all your lead acid batteries are managed under the “universal waste” rule in 40 CFR Part 273, then do not add to your Notice of Registration.

Chapter 6

Notification Requirements and Forms

This chapter describes forms and supporting documentation you must send to the TCEQ to notify the agency about waste streams that you generate. The regulations on notification can be found in 30 TAC Section 335.6 (Notification Requirements), Section 335.502 (Conversion to New Waste Notification and Classification System), Section 335.508 (Classification of Specific Industrial Solid Wastes), Section 335.509 (Waste Analysis), and Section 335.513 (Documentation Required).

Notifications about Industrial or Hazardous Waste

You must submit information about industrial or hazardous wastes no later than 90 days after the waste's initial generation and before handling, shipment, or disposal; use TCEQ form 00002 or the TCEQ State of Texas Environmental Electronic Reporting System (STEERS) software. (For information on obtaining TCEQ forms and how to access the STEERS information, see this chapter's section "TCEQ and EPA Forms.")

Please Note: All Large-Quantity Generators (LQG) **must** use STEERS to update their Notice of Registration (NOR). This requirement, effective December 15, 1997, is found in 30 TAC Section 335.6(b). Therefore, if you are a LQG and you need to update your NOR to replace inactivated waste code, please do so using STEERS.

The TCEQ uses the information submitted on these forms to create a record called the ***Notice of Registration***, which contains site-specific waste management information about industrial and municipal hazardous waste generators in Texas.

Notifications about New Chemical Substance Waste

For a Class 2 or Class 3 waste generated as the result of the production of a "new chemical substance" (see Chapter 8, Definitions of Terms), you must follow the instructions below:

- Give the TCEQ notice that the waste is from the production of a "new chemical substance."
- Submit all supporting reasons and documentation used in that waste's classification.
- Manage nonhazardous waste from the production of a "new chemical substance" as a Class 1 waste, unless you can provide appropriate analytical data and/or process knowledge demonstrating that the waste meets the definition of a Class 2 or Class 3, and the TCEQ concurs. (For definitions of Class 2 and 3, see Chapter 8 and the classification checklist in Chapter 3.)
- If you have not received concurrence or denial from the TCEQ within 120 days from the date of your request for review, you may manage the waste according to the requested classification, but you must give the TCEQ 10 working days written notice before managing the waste as a Class 2 or a Class 3.

Notifications about Class 2 and Class 3 Out-of-State Waste

If you want to ship a nonhazardous waste into Texas, it is automatically considered a Class 1 waste (and expected to be managed as such) unless

- you request the TCEQ to review your waste classification documentation supporting a lower classification such as Class 2 or 3; and
- the TCEQ concurs with the lower classification.

After concurrence from the TCEQ you must comply with the lower classification's requirements on shipping, record keeping, and disposal of the waste. If, after review of your documentation, the TCEQ disagrees with your waste classification, you must continue managing the nonhazardous waste as Class 1 waste.

Notifications about Other Industrial and Hazardous Wastes from out of State

Please note the following special requirements for the documentation of industrial and hazardous waste that is imported to Texas from foreign countries and other U.S. states.

- If out-of-state generators and importers of record want to bring hazardous waste into Texas, they must have an EPA Identification number. Generators and importers who do not have this ID number must obtain one from the EPA, using EPA Form 8700-12.

- Out-of-state generators or importers of record must fill out a Uniform Hazardous Waste Manifest (TCEQ-00311) and place their EPA ID number in Box 1 of this form.
- In Box B of the Uniform Hazardous Waste Manifest, use one of the generic numbers for identifying the country or state of origin. For example: F0061 for hazardous and or nonhazardous industrial waste imported from Mexico, D0022 for Louisiana (Appendix H gives these codes). For more information about manifesting imported industrial and hazardous waste, see 40 CFR 262.60 and 30 TAC 335.76 (d).
- OUTS must be used as the 4-digit sequence number of the Texas waste code in Box I of the manifest.

Notifications about Alternate Analytical Methods

Generators who propose an alternate analytical method must validate their alternate method by demonstrating that it is equal to or superior in accuracy, precision, and sensitivity to the corresponding EPA-approved methods for analytical testing given in *Standard Methods for the Examination of Water and Wastewater,* SW-846, and EPA-600/4-79/020.

In making this demonstration, the generator must provide the TCEQ, at a minimum, the following documentation:

- a full description of the proposed method (including all equipment and reagents to be used);
- a description of type of waste and *waste matrices* to be analyzed (for definitions of terms in italics, see Chapter 8);
- comparative results of the proposed method and corresponding SW-846 or *ASTM* method;
- a complete assessment of interferences with the proposed method (see, for example, *matrix interference* in Chapter 8);
- a description of quality control procedures; and
- additional information as needed and/or requested by the TCEQ to adequately review the proposed alternate method.

TCEQ and EPA Forms

How to Order

Notification forms can be obtained in several ways:

- Contact the TCEQ regional office near you.
- On the Internet go to <www.tceq.texas.gov> and select the "Forms" link. Access the Forms Database and type in the form number. (The instructions for form TCEQ-00002 are in a separate download file).
- Fax your order to 512-239-4488, or order forms by voice at 512-239-0028, the TCEQ's publications unit. Be sure to give the form ***numbers*** that you want; this information will help the TCEQ get the correct form to you as quickly as possible.

How to Access STEERS

State of Texas Environmental Electronic Reporting System (STEERS) information, including an application package, can be obtained as follows:

- on the Internet, go to <https://www3.tceq.texas.gov/steers>; or
- call the STEERS Help Line at 512-239-6925.

Currently Available Forms

Notification forms available at the time of this printing include the following:

- The hazardous or industrial waste **"Initial Notification Form,"** used for initial notification about a site, and adding a waste stream to your Notice of Registration (see Chapter 6) or when recording a 6-digit waste code into one or more 8-digit waste codes. (form number: **TCEQ-00002**)
- The **"Hazardous or Industrial Waste Management Unit Form,"** used when adding information about a waste management unit to a Notice of Registration. (form number: **TCEQ-00002**)
- The **"Uniform Hazardous Waste Manifest,"** used by generators and transporters of hazardous waste and by owners or operators of hazardous waste treatment, storage, and disposal facilities for both inter- and intrastate transportation. (form number: **TCEQ-00311**–Only order form available on the Web)
- The **"One-Time Shipment Request … for Shipment of Class 1, 2, 3 and EPA Hazardous Waste,"** used by unregistered generators, not by generators that already have a site's Notice of Registration. (form number: **TCEQ-00757**)
- The EPA **"Notification of Regulated Waste Activity"** form, used when notifying EPA of a federally regulated hazardous waste activity—for example, the generation of hazardous waste. (form number: **EPA 8700-12**–Available on the Web as part of TCEQ-00002)

Chapter 7

Management of Mechanical Shredding Wastes

The regulations on mechanical shredding waste can be found in 30 TAC Section 335.508 (Classification of Specific Industrial Solid Wastes).

Wastes generated by the mechanical shredding of automobiles, appliances, or other items of scrap, used, or obsolete metals are handled according to the provisions of the Texas Solid Waste Disposal Act, Health and Safety Code, Section 361.019 (Vernon Pamphlet 1992), until the TCEQ develops specific standards for the classification of this waste and ensures adequate disposal capacity.

These provisions say that you can dispose of mechanical shredding wastes in a municipal landfill facility authorized to accept Class 1 and 2 industrial solid wastes, if the shredding waste:

- contains no free liquids, and
- is not a hazardous waste.

As mentioned earlier, TCEQ may establish other requirements.

Chapter 8

Definitions of Terms

For readers' convenience, this chapter gives the full version of some abbreviations and brief descriptions of some important terms used in this guidance document. Full, official definitions can be found in the sources cited. Nothing in this chapter takes the place of any definitions in laws, rules, or regulations.

Acutely hazardous wastes (40 Code of Federal Regulations (CFRs) Parts 261.31–33 and subject to the exclusion established in 40 CFR Part 261.5: EPA hazardous waste numbers F020, F022, F023, F026, and F027)—A subset of *listed hazardous waste*s that carry the "H" code; they are considered very harmful to human health and the environment.

ASTM—American Society for Testing and Material

CFR—Code of Federal Regulations

Characteristically hazardous waste (40 CFR Part 261 Subpart C)—Any waste that exhibits the characteristics of ignitability, corrosivity, reactivity, and/or toxicity as defined by the EPA in 40 CFR Part 261 Subpart C. These are often referred to as the "D" wastes. (Also see Chapter 3 of this guidance document.)

Class 1 waste [30 TAC Section 335.1(14)]—Any waste or mixture of waste that, because of its concentration or physical or chemical characteristics is toxic; corrosive; flammable; a strong sensitizer or irritant; a generator of sudden pressure by decomposition, heat, or other means; or may pose a substantial present or potential danger to human health or the environment when improperly processed, stored, transported, disposed of, or otherwise managed. (The checklist in Chapter 3 takes you through the process of distinguishing hazardous waste from nonhazardous Class 1 waste.)

Class 2 waste [30 TAC Section 335.1(15)]—Any individual waste or combination of waste that cannot be described as hazardous waste or as nonhazardous Class 1 or Class 3 waste.

Class 3 waste [30 TAC Section 335.1(16)]—Waste that is *inert* and *essentially insoluble* (see definitions of terms in italics), usually including but not limited to materials such as rock, brick, glass, dirt, certain plastics, rubber, and similar materials that are not readily decomposable.

Classification code (30 TAC Section 335.503)—This last digit of the Texas waste code represents the classification of the waste stream. The letter H represents hazardous wastes; and the number 1, 2, or 3 represents nonhazardous industrial waste Class 1, 2, or 3.

Conditionally Exempt Small-Quantity Generator (30 TAC Section 335.78)—Generators of less than 100 kg (220 lbs) per month of hazardous waste, or less than 1 kg (2.2 lbs) per month of *acutely hazardous waste* (see description of term in italics in this chapter).

Essential insolubility (30 TAC Section 335.507)—Is established when using:

- the Seven-Day Distilled Water Leachate Test, and the extract from the sample of waste does not leach greater than the Maximum Contaminant Level listed in Appendix 1, Table 3 of 30 TAC Chapter 335, Subchapter R;
- the test methods described in 40 Code of Federal Regulations Part 261, Appendix II, and the extract from the sample of waste does not exhibit detectable levels of the constituents found in Appendix 1, Table 1 of 30 TAC Chapter 335, Subchapter R;
- an appropriate test method, and a representative sampling of the waste does not exhibit detectable levels of total petroleum hydrocarbon (TPH); ("Petroleum substance wastes" are not subject to 30 TAC's subsection on essential insolubility.)
- an appropriate test method, and a representative sampling of the waste does not exhibit detectable levels of polychlorinated biphenyls (PCBs).

Form code (30 TAC Section 335.503)—This code describes the general type of waste stream. It consists of three numbers, the 5th, 6th, and 7th digits in the Texas waste code (see Figure 5-1 in Chapter 5). More than one form code may apply to a particular waste stream.

Hazardous substance (30 TAC Section 335.508)—Any substance designated as "hazardous" in 40 CFR Part 302 (Table 302.4) including, but not limited to, waste designated as hazardous in the Resource Conservation Recovery Act (RCRA).

Hazardous waste (40 CFR 261.3.)—The EPA defines a waste as hazardous if it exhibits one or more of four hazardous "characteristics," or if it is one of several hundred wastes "listed" as hazardous. For details, see Chapters 1 and 3 of this guidance document.

Hazardous waste determination (30 TAC Section 335.504)—An evaluation of a waste to determine whether it meets the RCRA definition of a hazardous waste.

Inert (30 TAC Section 335.507)—Inertness refers to the chemical inactivity of an element, compound, or waste. Ingredients added to mixtures chiefly for the purposes of bulk and/or weight are normally considered inert.

Listed hazardous wastes (40 CFR Part 261 Subpart D)—Specific wastes that have been identified by the EPA as hazardous. These are often referred to as the "F" wastes (waste from nonspecific sources); "K" wastes (wastes from specific sources); "P" wastes (acutely hazardous off-specification materials, container residues, and spill residues of these materials); and "U" wastes (toxic, hazardous off-specification materials, container residues, and spill residues).

A waste is considered hazardous if

- it is listed in 40 CFR Part 261 Subpart D, or
- is mixed with or derived from a waste listed there, and
- has not been provided a particular exclusion from the definition of hazardous as provided in 40 CFR Sections 261.3–4.

Matrix interference—Interference with the precision of analytical testing for a particular constituent in a waste stream due to other material(s) in the sample (contamination by carryover). See also waste matrices.

Medical wastes (30 TAC Section 335.508)—Nonhazardous medical wastes that are subject to the provisions of 30 TAC Chapter 330 Subchapter Y are designated as Class 2 wastes. An example of such waste would be needle-bearing syringes from plant infirmaries.

"New chemical substance" waste (30 TAC Section 335.508)—If a nonhazardous industrial waste is generated as a result of the commercial production of a "new chemical substance" as defined by the federal Toxic Substances Control Act, *United States Code Annotated* (U.S.C.A.), Title 15, Section 2602(9), the generator must manage that waste as a Class 1 waste, unless the generator can provide appropriate analytical data and/or process knowledge demonstrating that the waste is Class 2 or Class 3, and the TCEQ concurs. If the generator has not received concurrence or denial from the TCEQ within 120 days from the date of the request for review, the generator may manage the waste according to the requested classification, but not before giving 10 working days written notice to the TCEQ.

Notice of Registration (NOR)—TCEQ term for the information it collects in its database on each hazardous or industrial waste handler: generator, receiver, transporter, and recycler. The NOR includes the facility's physical and mailing addresses, information on waste streams that are generated or handled at the site, a list of individual units at the facility where wastes are managed, and other information. It also contains the state facility identification numbers and the EPA facility number, issued by the TCEQ. The NOR serves to verify the information submitted by each handler. When a generator registers with the TCEQ using form TCEQ-00002, the agency sends back a printout of the information in its database about the site and generator. The handler should keep the NOR current and in on-site files and check it periodically to make sure that it accurately reflects the facility's waste streams and waste management units.

Petroleum-hydrocarbon-containing wastes (30 TAC Section 335.508)—Wastes resulting from the cleanup of leaking underground storage tanks (USTs), which are regulated under 30 TAC Chapter 334 Subchapter K (relating to Petroleum Substance Waste), are not subject to classification under 30 TAC Chapter 335 Subchapter R (Waste Classification).

Petroleum substance—A crude oil, or any refined or unrefined fraction or derivative of crude oil, that is a liquid at standard conditions of temperature and pressure. These substances include the following:

- combinations or mixtures of basic petroleum substances, such as crude oils, crude oil fractions, petroleum feedstocks, and petroleum fractions;

- aviation gasolines, aviation jet fuels, distillate fuel oils, residual fuel oils, gas turbine fuel oils, illuminating oils, lubricants, building materials, insulating and waterproofing materials, used oils;
- solvents or a combination or mixture of solvents—except for any listed substance regulated as a hazardous waste under the federal Solid Waste Disposal Act, Subtitle C (*United States Code*, Title 42, Section 6921, et seq.)—that are liquid at standard conditions of temperature (20^{O} centigrade) and pressure (1 atmosphere). Examples include Stoddard solvent, petroleum spirits, mineral spirits, petroleum ether, varnish makers' and painters' naphthas, petroleum extender oils, and commercial hexane.

The following materials are ***not*** considered petroleum substances:

- polymerized materials, such as plastics, synthetic rubber, polystyrene, high- and low- density polyethylene;
- animal, microbial, and vegetable fats;
- food-grade oils;
- hardened asphalt and solid asphaltic materials, such as roofing shingles, roofing felt, hot mix and cold mix; and
- cosmetics.

Practical Quantitation Limits (PQLs)—See quantitation.

Process Knowledge—See examples in Chapter 4 under this subheading.

Quantitation—Generally, measurement of quantity or amounts. The word appears in a number of specialized terms used in waste regulation:

- ***Quantitation Limits*** (QLs) indicate the levels at which measurements can be "trusted."
- ***Practical Quantitation Limits*** (PQLs) and ***Estimated Quantitation Limits*** (EQLs) are levels that are routinely and reliably detected and quantitated in a variety of sample matrices. These are 3 to 5 times the Method Detection Limits (MDLs). (See Chapter 1, SW 846, 1992.)
- ***Method Detection Limits*** (MDLs) take into account the reagents, sample matrix, and preparation steps applied to a sample in specific analytical methods. (See 40 CFR Part 136, Appendix B; Chapter 1, SW 846, July 1992.)

RCRA—Resource Conservation and Recovery Act (amendment to the Solid Waste Disposal Act). Primarily designed to regulate five types of disposal activities: hazardous waste, solid waste, underground storage tanks, oil waste, and medical waste. In this guidance document, any mention of "RCRA" refers to RCRA Subtitle C, which applies to all handlers of hazardous waste, including generators; transporters; and operators of treatment, storage, and disposal (TSDF) facilities. (RCRA, a federal law, covers only whether a solid waste is either hazardous or nonhazardous. Texas regulations further subdivide nonhazardous waste into Classes 1, 2, and 3.)

Regulated asbestos-containing material (RACM) (30 TAC Sections 335.508)—RACM includes the following:

- **friable** asbestos containing more than 1 percent asbestos[1] that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure;
- **nonfriable** asbestos-containing material containing more than 1 percent asbestos as measured by the method found in 40 CFR Part 763, Subpart E, Appendix E, Section 1 that, when dry, *cannot* be crumbled, pulverized, or reduced to powder by hand pressure.
- **Category I** nonfriable asbestos includes packings, gaskets, resilient floor coverings, and asphalt roofing products);
- **Category II** nonfriable asbestos includes transite shingles, transite pipes, and any nonfriable asbestos material not defined as Category I.

Regulated generators (30 TAC Chapter 335 Subchapters A and C)—If you generate the following amounts of waste, you are a regulated generator and must follow regulations in Chapter 335:

Waste Type	Monthly Amount
Class 1	100 kg (220 lbs) or more
hazardous	100 kg (220 lbs) or more
acutely hazardous	1 kg (2.2 lbs) or more

If you generate less than the amounts shown above, you are considered a Conditionally Exempt Small-Quantity Generator and are not subject to regulations requiring notification, manifesting, and fees.

[1]As determined using the method specified in 40 CFR Part 763, Subpart E, Appendix E, Section 1, Polarized Light Microscopy.

Sequence number (30 TAC Section 335.503)—The first 4 digits of the waste code (actually these four characters may be numbers, letters, or a combination of the two). The sequence number is used as an internal numbering system determined by each generator. The number of a waste may range from 0001 to 9999, and can only be used once.

Solid waste (30 TAC Section 335.1 and 40 CFR Section 261.2)—Any discarded material such as garbage; refuse; sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility; or other material including solid, liquid, semisolid, or contained gaseous material resulting from industrial, municipal, commercial, mining, and agricultural operations. Solid wastes include any material that is abandoned by being disposed of; burned or incinerated; or accumulated, stored, or treated before or in lieu of these activities. Certain recycled materials are also considered wastes. Solid wastes are often referred to simply as "wastes." For the complete definition of a "solid waste," please refer to 30 TAC Section 335.1 (Solid Waste).

Specific industrial solid waste (30 TAC Section 335.508)—A nonhazardous waste for which specific classification criteria and/or a form code have been established.

Stabilized wastes (30 TAC Section 335.508)—Wastes that originally exhibit hazardous characteristics can be *stabilized* so that they are no longer hazardous and can meet the criteria for classification as Class 1 or 2 nonhazardous industrial waste. For example a waste containing lead that exhibits the hazardous characteristic of toxicity can be stabilized by mixing with cement in the proper proportion to reduce the toxicity or mobility of contaminants. Depending on the process(es) used, stabilization achieves varying degrees of long-term effectiveness.

Synthetic oils—Oils not derived from crude oil, including those derived from shale, coal, or a polymer-based starting material; and nonpolymeric synthetic fluids that are used as hydraulic fluids and heat transfer fluids, such as those based on phosphate esters, diphenyl oxide, or alkylated benzenes. Synthetic oils are generally used for the same purpose as oils, and they present relatively the same level of hazardousness after use.

TAC—Texas Administrative Code. Title 30 of TAC contains TCEQ rules on industrial solid waste and municipal hazardous waste, among other subjects.

TSDF—Treatment, storage, and disposal facilities.

Universal Waste (30 TAC Section 335.261 and 40 CFR Part 273)—This rule covers five types of waste:

- lamps as described in 40 CFR §273.5, and §335.261(b)(16)(F).
- mercury-containing thermostats as described in 40 CFR 273.4;
- all hazardous waste batteries as described in 40 CFR 273.2;
- some hazardous waste pesticides as described in 40 CFR 273.3;
- paint and paint-related waste as described in §335.262(b);

The rule establishes a reduced set of regulatory requirements for facilities managing universal waste, depending on whether the facility falls into one of four categories:

- small-quantity handler of universal waste (SQHUW),
- large-quantity handler of universal waste (LQHUW),
- transporter of universal waste, or
- final destination facilities.

In addition, the rules establish a petitioning procedure whereby additional wastes may be added to the universal waste rule.

U.S.C.A.—*United States Code Annotated*.

Used oil (30 TAC Section 335.1, 30 TAC Section 324 (relating to used oil), and 40 CFR Part 279 (relating to standards for management of used oil)[2]— Any oil refined from crude oil, or any synthetic oil, that has been used and, from such use, is contaminated by physical or chemical impurities and cannot be used for its intended purpose (that is, it is a spent material).

Used oil fuel includes any fuel produced from used oil by processing, blending, or other treatment.

Waste—Unwanted materials left over from a manufacturing process; refuse from places of human or animal habitation.

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[2] Rules applicable to nonhazardous used oil, are found in Chapter 324, state regulations on recyclable used oil, and 40 CFR Part 279, federal regulations on used oil recycling.

Waste code—Also referred to as Texas waste code (30 TAC Section 335.503)—This 8-digit code identifies a waste stream. The first 4 digits are the ***sequence number***, the next 3 digits are the ***form code***, and the last digit is the waste's ***classification*** (sequence number + form code + classification code = waste code). (Some of the "digits" referred to here actually may be letters or a combination of letters and numbers.)

Waste matrices—Water and soil or sediment in which a waste is found.

Wastes generated out-of-state (30 TAC Section 335.508)—All nonhazardous industrial waste generated outside the state of Texas and transported into or through Texas for processing, storage, or disposal is classified as Class 1 unless the waste satisfies the Class 2 or 3 criteria as defined in 30 TAC Sections 335.506–8. A Class 2 or 3 waste determination, accompanied by all supporting process knowledge and analytical data, must be submitted to the TCEQ for approval.

Waste stream (30 TAC Section 335.503)—The total flow of solid waste from homes, businesses, institutions, and manufacturing plants that is recycled, burned, or disposed of in landfills; or segments of that total flow, such as the "residential waste stream" or the "recyclable waste stream." (It should be noted that the terms "waste stream", "solid waste", and "waste" are often used interchangeably by federal and state regulators as well as many members of the regulated community).

Appendix A

Hazardous Substances

Applicability: **Empty Container Class 2 Evaluations**

The following is a listing of materials identified as hazardous substances (40 CFR Table 302.4) in effect at the time of this guideline's printing. (As amended at 57 FR 61492, Dec. 24, 1992; 58 FR 35314, June 30, 1993; 59 FR 31551, June 20, 1994; 60 FR 7824 Feb. 9, 1995). Chemical Abstract Service (CAS) Registry Numbers of the materials are also provided.

Hazardous Substance	CAS Number
Acenaphthene	83329
Acenaphthylene	208968
Acetaldehyde	75070
Acetaldehyde, chloro-	107200
Acetaldehyde, trichloro-	75876
Acetamide, N-(aminothioxomethyl)-	591082
Acetamide, N-9H-fluoren-2-yl-	53963
Acetic acid	64197
Acetic acid (2,4-dichlorophenoxy)-	94757
Acetic anhydride	108247
Acetone	67641
Acetone cyanohydrin	75865
Acetonitrile	75058
Acetophenone	98862
2-Acetylaminofluorene	53963
Acetyl bromide	506967
Acetyl chloride	75365
1-Acetyl-2-thiourea	591082
Acrolein	107028
Acrylamide	79061
Acrylic acid	79107
Acrylonitrile	107131
Adipic acid	124049
Aldicarb	116063
Aldicarb sulfone	1646884
Aldrin	309002
Allyl alcohol	107186
Allyl chloride	107051
Aluminum phosphide	20859738
Aluminum sulfate	10043013
Ametycin (7-amino-9-a-methoxymitosane)	50077
5-(Aminomethyl)-3-isoxazolol	2763964
4-Aminopyridine	504245
Amitrole	61825
Ammonia	7664417
Ammonium acetate	631618
Ammonium benzoate	1863634
Ammonium bicarbonate	1066337
Ammonium bichromate	7789095
Ammonium bifluoride	1341497
Ammonium bisulfite	10192300
Ammonium carbamate	1111780
Ammonium carbonate	506876
Ammonium chloride	12125029
Ammonium chromate	7788989
Ammonium citrate, dibasic	3012655
Ammonium fluoborate	13826830
Ammonium fluoride	12125018
Ammonium hydroxide	1336216
Ammonium oxalate	6009707
Ammonium picrate	131748
Ammonium silicofluoride	16919190
Ammonium sulfamate	7773060
Ammonium sulfide	12135761
Ammonium sulfite	10196040
Ammonium tartrate	14307438
Ammonium thiocyanate	1762954
Ammonium vanadate	7803556
Amyl acetate	628637
iso-	123922
sec-	626380
tert-	625161
Aniline	62533
Anthracene	120127
Antimony	7440360
Antimony pentachloride	7647189
Antimony potassium tartrate	28300745
Antimony tribromide	7789619
Antimony trichloride	10025919
Antimony trifluoride	7783564
Antimony trioxide	1309644
Aroclor 1016	12674112
Aroclor 1221	11104282
Aroclor 1232	11141165
Aroclor 1242	53469219
Aroclor 1248	12672296
Aroclor 1254	11097691
Aroclor 1260	11096825
Arsenic	7440382
Arsenic acid H_3AsO_4	1327522
Arsenic disulfide	1303328
Arsenic pentoxide, As_2O_5	1303282
Arsenic trichloride	7784341
Arsenic trioxide, As_2O_3	1327533
Arsenic trisulfide	1303339
Arsinic acid, dimethyl-	75605
Asbestos	1332214
Auramine	492808
Azaserine	115026
1H-Azepine-1-carbothioic acid, hexahydro-, S-ethyl ester	2212671
Aziridine, 2-methyl	75558
Barium cyanide	542621
Benz[c]acridine	225514

Hazardous Substance	CAS Number
Benzanthracene	56553
Benz[a]anthracene	57976
Benzene	71432
Benzene, dichloromethyl-	98873
Benzene, 2,6-diisocyanato-1-methyl-	91087
Benzene, m-dimethyl	108383
Benzene, o-dimethyl	95476
Benzene, p-dimethyl	106423
Benzenesulfonic acid chloride	98099
Benzene, (trichloromethyl)	98077
Benzidine	92875
Benzo[a]anthracene	56553
1,3-Benzodioxol-4-ol, 2,2-dimethyl-, (Bendiocarb phenol)	22961826
1,3-Benzodioxol-4-ol, 2,2-dimethyl-, methyl carbamate (Bendiocarb)	22781233
Benzo[b]fluoranthene	205992
Benzo(k)fluoranthene	207089
Benzoic acid	65850
Benzoic acid, 2-hydroxy-, compound with (3aS-cis)-1,2,3,3a,8,8a-hexahydro-1,3a,8-trimethylpyrrolo-[2,3-b]indol- 5-yl methylcarbamate ester (1:1) (Physostigmine salicylate)	57647
Benzonitrile	100470
Benzo[rst]pentaphene	189559
Benzo[ghi]perylene	191242
Benzo[a]pyrene	50328
p-Benzoquinone	106514
Benzotrichloride	98077
Benzoyl chloride	98884
Benzyl chloride	100447
Beryllium chloride	7787475
Beryllium powder	7440417
Beryllium fluoride	7787497
Beryllium nitrate	13597994
alpha-BHC	319846
beta-BHC	319857
delta-BHC	319868
2,2′-Bioxirane	1464535
Bis(2-chloroethyl) ether	111444
Bis(2-chloroethoxy)methane	111911
Bis(dimethylthiocarbamoyl) sulfide	97745
Bis(2-ethylhexyl) phthalate	117817
Bromoacetone	598312
Bromoform	75252
4-Bromophenyl phenyl ether	101553
Brucine	357573
1-Butanol	71363
2-Butenal	123739
Butyl acetate	123864
iso-	110190
sec-	105464
tert-	540885
n-Butyl alcohol	71363
Butylamine	109739
iso-	78819
sec-	513495
sec-	13952846
tert-	75649
Butyl benzyl phthalate	85687
Butyric acid	107926
iso-Butyric acid	79312
Cadmium	7440439
Cadmium acetate	543908
Cadmium bromide	7789426
Cadmium chloride	10108642
Calcium arsenate	7778441
Calcium arsenite	52740166
Calcium carbide	75207
Calcium chromate	13765190
Calcium cyanide $Ca(CN)_2$	592018
Calcium dodecylbenzenesulfonate	26264062
Calcium hypochlorite	7778543
Captan	133062
Carbamic acid, butyl-, 3-iodo-2-n-butylcarbamate)	55406536
Carbamic acid, [1-[(butylamino)carbonyl]-1H-benzimidazol-2-yl, methyl ester (Benomyl)	17804352
Carbamic acid, 1H-benzimidazol-2-yl, methyl ester	10605217
Carbamic acid, (3-chlorophenyl)-, 4-chloro-2-butynyl ester	101279
Carbamic acid, dimethyl-,1-[(dimethylamino)carbonyl]-5-methyl-1H-pyrazol-3-yl ester	644644
Carbamic acid, dimethyl-, 3-methyl-1-(1-methylethyl)-1H-pyrazol-5-yl ester	119380
Carbamic acid, methyl-, 3-methylphenyl ester	1129415
Carbamic acid, [1,2-phenylenebis-(iminocarbonothioyl)]bis-, dimethyl ester	23564058
Carbamic acid, phenyl-, 1-methylethyl ester (Propham)	122429
Carbamic acid, methylnitroso-, ethyl ester	615532
Carbamic chloride, dimethyl-	79447
Carbamodithioic acid, dibutyl-, sodium salt	136301
Carbamodithioic acid, diethyl-, 2-chloro-2-propenyl ester	95067
Carbamodithioic acid, diethyl-, sodium salt	148185
Carbamodithioic acid, dimethyl-, potassium salt	128030
Carbamodithioic acid, dimethyl-, sodium salt	128041
Carbamodithioic acid, dimethyl-, tetraanhydrosulfide with orthothioselenious acid	144343
Carbamodithioic acid, (hydroxymethyl)methyl-, monopotassium salt	51026289
Carbamodithioic acid, methyl-, monopotassium salt	137417
Carbamodithioic acid, methyl-, monosodium salt	137428
Carbamothioic acid, bis(1-methylethyl)-, S-(2,3,3-trichloro -2-propenyl) ester	2303175
Carbamothioic acid, bis(2-methylpropyl)-, S-ethyl ester	2008415

Hazardous Substance	CAS Number
Carbamothioic acid, butylethyl-, S-propyl ester	1114712
Carbamothioic acid, cyclohexylethyl-, S-ethyl ester	1134232
Carbamothioic acid, dipropyl-, S-ethyl ester (EPTC)	759944
Carbamothioic acid, dipropyl-, S-(phenylmethyl) ester	52888809
Carbamothioic acid, dipropyl-, S-propyl ester	1929777
Carbaryl	63252
Carbofuran	1563662
Carbofuran, phenol	1563388
Carbosulfan	55285148
Carbon disulfide	75150
Carbon oxyfluoride	353504
Carbon tetrachloride	56235
Chlorambucil	305033
Chlordane	57749
Chlorine	7782505
Chlornaphazine	494031
p-Chloroaniline	106478
Chlorobenzene	108907
Chlorobenzilate	510156
p-Chloro-m-cresol	59507
Chlorodibromomethane	124481
Chloroethane	75003
2-Chloroethyl vinyl ether	110758
Chloroform	67663
Chloromethyl methyl ether	107302
2-Chloronaphthalene	91587
2-Chlorophenol	95578
4-Chlorophenyl phenyl ether	7005723
3-Chloropropionitrile	542767
Chlorosulfonic acid	7790945
4-Chloro-o-toluidine, hydrochloride	3165933
Chlorpyrifos	2921882
Chromic acetate	1066304
Chromic acid	11115745
Chromic sulfate	10101538
Chromium	7440473
Chromous chloride	10049055
Chrysene	218019
Cobaltous bromide	7789437
Cobaltous formate	544183
Cobaltous sulfamate	14017415
Copper	7440508
Copper, dimethyldithiocarbamate	137291
Copper cyanide CuCN	544923
Coumaphos	56724
Creosote	8001589
Cresol(s)	1319773
m-Cresol	108394
o-Cresol	95487
p-Cresol	106445
Cumene	98828
Cupric acetate	142712
Cupric acetoarsenite	12002038
Cupric chloride	7447394
Cupric nitrate	3251238
Cupric oxalate	5893663
Cupric sulfate	7758987

Hazardous Substance	CAS Number
Cupric sulfate, ammoniated	10380297
Cupric tartrate	815827
Cyanides	57125
Cyanogen	460195
Cyanogen bromide (CN)Br	506683
Cyanogen chloride	506774
Cyclohexane	110827
Cyclohexanone	108941
2-Cyclohexyl-4,6-dinitrophenol	131895
Cyclophosphamide	50180
2,4-D Acid	94757
2,4-D (isopropyl) Esters	94111
	94791
	94804
	1320189
	1928387
	1928616
Butoxyethl	1929733
	2971382
Isooctyl	25168267
Dichlorophenoxyaceticacid-polyproxybutyl	53467111
Daunomycin	20830813
DDD	72548
DDE	72559
DDT	50293
Diallate	2303164
Diazinon	333415
Dibenzo[a,h]anthracene	53703
1,2-Dibromo-3-chloropropane	96128
Dibutylnitrosoamine	924163
Di-n-butyl phthalate	84742
Dicamba	1918009
Dichlobenil	1194656
Dichlone	117806
Dichlorobenzene	25321226
1,2-Dichlorobenzene	95501
1,3-Dichlorobenzene	541731
1,4-Dichlorobenzene	106467
3,3′-Dichlorobenzidine	91941
Dichlorobromomethane	75274
1,4-Dichloro-2-butene	764410
Dichlorodifluoromethane	75718
1,1-Dichloroethane	75343
1,2-Dichloroethane	107062
1,1-Dichloroethylene	75354
1,2-Dichloroethylene	156605
Dichloroethyl ether	111444
Dichloroisopropyl	108601
Dichloromethoxyethane	111911
Dichloromethyl ether	542881
2,4-Dichlorophenol	120832
2,6-Dichlorophenol	87650
Dichlorophenylarsine	696286
Dichloropropane	26638197
1,1-Dichloropropane	78999
1,3-Dichloropropane	142289
1,2-Dichloropropane	78875
Dichloropropane	8003198
Dichloropropene	26952238
2,3-Dichloropropene	78886
1,3-Dichloropropene	542756

Hazardous Substance	CAS Number
2,2-Dichloropropionic acid	75990
Dichlorvos	62737
Dicofol	115322
Dieldrin	60571
Diethylamine	109897
Diethylarsine	692422
1,4-Diethylenedioxide	123911
O,O-Diethyl S-methyl dithiophosphate	3288582
Diethyl-p-nitrophenyl phosphate	311455
Diethyl-o-phthalate	84662
O,O-Diethyl O-pyrazinyl phosphorothioate	297972
Diethylstilbestrol	56531
Dihydrosafrole	94586
Diisopropylfluorophosphate	55914
3,3′-Dimethoxybenzidine	119904
Dimethylamine	124403
p-Dimethylamino-azobenzene	60117
3,3′-Dimethylbenzidine	119937
1,1-Dimethylhydrazine	57147
1,2-Dimethylhydrazine	540738
alpha,alpha-Dimethylphenethylamine	122098
2,4-Dimethylphenol	105679
Dimethyl phthalate	131113
Dimethyl sulfate	77781
Dinitrobenzene (mixed)	25154545
m-Dinitrobenzene	99650
o-Dinitrobenzene	528290
p-Dinitrobenzene	100254
4,6-Dinitro-o-cresol and salts	534521
Dinitrophenol	25550587
2,5-Dinitrophenol	329715
2,6-Dinitrophenol	573568
2,4-Dinitrophenol	51285
Dinitrotoluene	25321146
3,4-Dinitrotoluene	610399
2,4-Dinitrotoluene	121142
2,6-Dinitrotoluene	606202
Dinoseb	88857
Di-n-octyl phthalate	117840
1,2-Diphenylhydrazine	122667
Diphosphoramide, octamethyl-	152169
Diphosphoric acid, tetraethyl ester	107493
Dipropylamine	142847
Di-n-propylnitrosamine	621647
Diquat	85007
Disulfoton	298044
Dithiobiuret	541537
1,3-Dithiolane-2-carboxaldehyde, 2,4-dimethyl-, O-[(methylamino) carbonyl]oxime (Tirpate)	26419738
Diuron	330541
Dodecylbenzenesulfonic acid	27176870
Endosulfan	115297
alpha-Endosulfan	959988
beta-Endosulfan	33213659
Endosulfan sulfate	1031078
Endothall	145733
Endrin & metabolites	72208
Endrin aldehyde	7421934
Epichlorohydrin	106898
Epinephrine	51434
Ethanimidiothioic acid, 2-(dimethylamino-N-hydroxy-2-oxo-, methyl ester (A2213)	30558431
Ethanimidiothioic acid, 2-(dimethylamino)-N-[[(methylamino) carbonyl]oxy]-2-oxo-, methyl ester (Oxamyl)	23135220
Ethanimidothioic acid, N,N′-[thiobis[(methylimino) carbonyloxy]] bis-, dimethyl ester (Thiodicarb)	59669260
Ethanol, 2,2′-oxybis-, dicarbamate (Diethylene glycol, dicarbamate)	5952261
Ethion	563122
Ethyl acetate	141786
Ethyl acrylate	140885
Ethylbenzene	100414
Ethyl carbamate	51796
Ethyl cyanide	107120
Ethylenebisdithiocarbamic acid, salts & esters	111546
Ethylenediamine	107153
Ethylenediamine-tetraacetic acid (EDTA)	60004
Ethylene dibromide	106934
Ethylene glycol monoethyl ether	110805
Ethylene oxide	75218
Ethylenethiourea	96457
Ethylenimine	151564
Ethyl ether	60297
Ethyl methacrylate	97632
Famphur	52857
Ferric ammonium citrate	1185575
Ferric ammonium oxalate	2944674
Ferric chloride	7705080
Ferric fluoride	7783508
Ferric nitrate	10421484
Ferric sulfate	10028225
Ferrous ammonium sulfate	10045893
Ferrous chloride	7758943
Ferrous sulfate	7720787
Fluoranthene	206440
Fluorene	86737
Fluorine	7782414
Fluoroacetamide	640197
Fluoroacetic acid, sodium salt	62748
Formaldehyde	50000
Formic acid	64186
Fumaric acid	110178
Furan	110009
Furfural	98011
Glauramine	492808
Glycidylaldehyde	765344
Guanidine, N-methyl-N′-nitro-N-nitroso-	70257
Guthion	86500

Hazardous Substance	CAS Number
Heptachlor	76448
Heptachlor epoxide	1024573
Hexachlorobenzene	118741
Hexachlorobutadiene	87683
Hexachlorocyclohexane (all isomers)	608731
Hexachlorocyclohexane (gamma isomer - Lindane)	58899
Hexachlorocyclopentadiene	77474
Hexachloroethane	67721
Hexachlorophene	70304
Hexachloropropene	1888717
Hexaethyl tetraphosphate	757584
Hydrazine	302012
Hydrazine, 1,2-diethyl-	1615801
Hydrochloric acid	7647010
Hydrocyanic acid	74908
Hydrofluoric acid	7664393
Hydrogen sulfide H_2S	7783064
Hydroperoxide, 1-methyl-1-phenylethyl	80159
Indeno(1,2,3-cd)pyrene	193395
Iron, tris (dimethylcarbamodithioato-S,S′)-	14484641
Isobutyl alcohol	78831
Isodrin	465736
Isophorone	78591
Isoprene	78795
Isopropanolamine dodecylbenzenesulfonate	42504461
Isosafrole	120581
3(2H)-Isoxazolone, 5-(aminomethyl)-	2763964
Kepone	143500
Lasiocarpine	303344
Lead	7439921
Lead acetate	301042
Lead arsenate	7784409
Lead chloride	7758954
Lead fluoborate	13814965
Lead fluoride	7783462
Lead iodide	10101630
Lead nitrate	10099748
Lead phosphate	7446277
Lead stearate	7428480
Lead subacetate	1335326
Lead sulfate	15739807
Lead sulfide	1314870
Lead thiocyanate	592870
Lithium chromate	14307358
Malathion	121755
Maleic acid	110167
Maleic anhydride	108316
Maleic hydrazide	123331
Manganese dimethyldithiocarbamate	15339363
Melphalan	148823
Mercaptodimethur	2032657
Mercuric cyanide	592041
Mercuric nitrate	10045940
Mercuric sulfate	7783359
Mercuric thiocyanate	592858
Mercurous nitrate	10415755
Mercury	7439976
Mercury fulminate	628864

Hazardous Substance	CAS Number
Methacrylonitrile	126987
Methanesulfonic acid, ethyl ester	62500
Methanimidamide, N,N-dimethyl-N′-[3-[[(methylamino)carbonyl] oxylphenyl]-, monohydrochloride	23422539
Methanimidamide, N,N-dimethyl-N′-[2-methyl-4-[[(methylamino) carbonyl]oxy]phenyl]-	17702577
Methanol	67561
Methapyrilene	91805
Methomyl	16752775
Methoxychlor	72435
Methyl bromide	74839
1-Methylbutadiene	504609
Methyl chloride	74873
Methyl chlorocarbonate	79221
3-Methylcholanthrene	56495
4,4′-Methylene(bis)chloroaniline	101144
Methylene bromide	74953
Methylene chloride	75092
Methyl ethyl ketone (MEK)	78933
Methyl ethyl ketone peroxide	1338234
Methyl hydrazine	60344
Methyl iodide	74884
Methyl isobutyl ketone	108101
Methyl isocyanate	624839
Methylmercaptan	74931
Methyl methacrylate	80626
Methyl parathion	298000
Methylthiouracil	56042
Mevinphos	7786347
Mexacarbate	315184
Mitomycin C	50077
Monoethylamine	75047
Monomethylamine	74895
Naled	300765
1-Naphthalenamine	134327
2-Naphthalenamine	91598
Naphthalene	91203
1,4-Naphthalenedione	130154
Naphthenic acid	1338245
alpha-Naphthylthiourea	86884
Nickel	7440020
Nickel ammonium sulfate	15699180
Nickel carbonyl	13463393
Nickel chloride	7718549
Nickel cyanide $Ni(CN)_2$	557197
Nickel hydroxide	12054487
Nickel nitrate	14216752
Nickel sulfate	7786814
Nicotine, & salts	54115
Nitric acid	7697372
p-Nitroaniline	100016
Nitrobenzene	98953
Nitrogen dioxide NO_2	10102440
Nitrogen oxide NO	10102439
Nitroglycerine	55630
Nitrophenol (mixed)	25154556
m-Nitrophenol	554847

Hazardous Substance	CAS Number
o-Nitrophenol	88755
p-Nitrophenol	100027
2-Nitropropane	79469
N-Nitrosodiethanolamine	1116547
N-Nitrosodiethylamine	55185
N-Nitrosodimethylamine	62759
N-Nitrosodiphenylamine	86306
N-Nitrosopyrrolidine	930552
Nitrotoluene	1321126
m-Nitrotoluene	99081
o-Nitrotoluene	88722
p-Nitrotoluene	99990
5-Nitro-o-toluidine	99558
Osmium tetroxide OsO_4	20816120
Paraformaldehyde	30525894
Paraldehyde	123637
Parathion	56382
Pentachlorobenzene	608935
Pentachloroethane	76017
Pentachloronitrobenzene	82688
Pentachlorophenol	87865
Perchloroethylene	127184
Phenacetin	62442
Phenanthrene	85018
Phenol	108952
Phenol, 3-(1-methylethyl)-, methyl carbamate (m-Cumenyl methylcarbamate)	64006
Phenol, 3-methyl-5-(1-methylethyl)-, methyl carbamate (Promecarb)	2631370
Phenylmercury acetate	62384
Phenylthiourea	103855
Phorate	298022
Phosgene	75445
Phosphine	7803512
Phosphoric acid	7664382
Phosphorodithioic acid, O,O-dimethyl S-[2(methylamino)-2-oxoethyl] ester	60515
Phosphorus	7723140
Phosphorus oxychloride	10025873
Phosphorus pentasulfide	1314803
Phosphorus trichloride	7719122
Phthalic anhydride	85449
Piperidine, 1-nitroso-	100754
Piperidine, 1,1′-(tetrathiodicarbonothioyl)bis-(Bis(pentamenthylene)thiuram tetrasulfide)	120547
Polychlorinated biphenyls (PCBs)	1336363
Aroclor 1016	12674112
Aroclor 1221	11104282
Aroclor 1232	11141165
Aroclor 1242	53469219
Aroclor 1248	12672296
Aroclor 1254	11097691
Aroclor 1260	11096825
Potassium arsenate	7784410
Potassium arsenite	10124502
Potassium bichromate	7778509

Hazardous Substance	CAS Number
Potassium chromate	7789006
Potassium cyanide KCN	151508
Potassium hydroxide	1310583
Potassium permanganate	7722647
Potassium silver cyanide	506616
Pronamide	23950585
1,3-Propane sultone	1120714
Propanedinitrile	109773
Propargite	2312358
Propargyl alcohol	107197
Propionic acid	79094
Propionic anhydride	123626
n-Propylamine	107108
Propylene oxide	75569
Pyrene	129000
Pyrethrins	121299
Pyridine	110861
Pyridine, 2-methyl-	109068
Pyrrolo[2,3-b] indol-5-ol, 1,2,3,3a,8,8a-hexahydro-1,3a,8-trimethyl-, methylcarbamate (ester), (3aS-cis)-Physostigmine	57476
Quinoline	91225
Reserpine	50555
Resorcinol	108463
Saccharin and salts	81072
Safrole	94597
Selenious acid	7783008
Selenium	7782492
Selenium dioxide	7446084
Selenium sulfide SeS_2	7488564
Selenourea	630104
Silver	7440224
Silver cyanide AgCN	506649
Silver nitrate	7761888
Silvex (2,4,5-TP)	93721
Sodium	7440235
Sodium arsenate	7631892
Sodium arsenite	7784465
Sodium azide	26628228
Sodium bichromate	10588019
Sodium bifluoride	1333831
Sodium bisulfite	7631905
Sodium chromate	7775113
Sodium cyanide NaCN	143339
Sodium dodecyl-benzenesulfonate	25155300
Sodium fluoride	7681494
Sodium hydrosulfide	16721805
Sodium hydroxide	1310732
Sodium hypochlorite	7681529
Sodium methylate	124414
Sodium nitrite	7632000
Sodium phosphate, dibasic	7558794
Sodium phosphate, tribasic	7601549
Sodium selenite	10102188
Streptozotocin	18883664
Strontium chromate	7789062
Strychnine, & salts	57249
Styrene	100425
Sulfur monochloride	12771083

Hazardous Substance	CAS Number
Sulfuric acid	7664939
2,4,5-T acid	93765
2,4,5-T amines	2008460
	1319728
	3813147
	6369966
	6369977
2,4,5-T (n-butyl) esters	93798
	1928478
	2545597
Isooctyl	25168154
Methylpropyl	61792072
2,4,5-T salts	13560991
1,2,4,5-Tetrachlorobenzene	95943
2,3,7,8-Tetrachloro-dibenzo-p-dioxin (TCDD)	1746016
1,1,1,2-Tetrachloroethane	630206
1,1,2,2-Tetrachloroethane	79345
2,3,4,6-Tetrachlorophenol	58902
Tetraethyllead	78002
Tetraethyldithiopyrophosphate	3689245
Tetrahydrofuran	109999
Tetranitromethane	509148
Thallium	7440280
Thallium(I) acetate	563688
Thallium(I) carbonate	6533739
Thallium chloride TlCl	7791120
Thallium(I) nitrate	10102451
Thallium oxide Tl_2O_3	1314325
Thallium selenite	12039520
Thallium(I) sulfate	7446186
2H-1,3,5-Thiadiazine-2-thione, tetrahydro-3,5-dimethyl- (Dazomet)	533744
Thioacetamide	62555
Thiofanox	39196184
Thioperoxydicarbonic diamide, tetrabutyl (Tetrabutylthiuram disulfide)	1634022
Thioperoxydicarbonic diamide, tetraethyl (Disulfiram)	97778
Thiophenol	108985
Thiosemicarbazide	79196
Thiourea	62566
Thiourea, (2-chlorophenyl)-	5344821
Thiram	137268
Toluene	108883
Toluenediamine	95807
Toluene diisocyanate	584849
o-Toluidine	95534
p-Toluidine	106490
o-Toluidine hydrochloride	636215
Toxaphene	8001352
2,4,5-TP esters	32534955
Trichlorfon	52686
1,2,4-Trichlorobenzene	120821
1,1,1-Trichloroethane	71556
1,1,2-Trichloroethane	79005
Trichloroethene (Trichloroethylene)	79016
Trichloromethanesulfenyl chloride	594423
Trichloromonofluoromethane	75694
Trichlorophenol	25167822
2,3,4-Trichlorophenol	15950660
2,3,5-Trichlorophenol	933788
2,3,6-Trichlorophenol	933755
3,4,5-Trichlorophenol	609198
2,4,5-Trichlorophenol	95954
2,4,6-Trichlorophenol	88062
Triethanolamine dodecylbenzenesulfonate	27323417
Triethylamine	121448
Trimethylamine	75503
1,3,5-Trinitrobenzene	99354
Tris(2,3-dibromopropyl)phosphate	126727
Trypan blue	72571
Uracil mustard	66751
Uranyl acetate	541093
Uranyl nitrate	10102064
Urea, N-ethyl-N-nitroso-	759739
Urea, N-methyl-N-nitroso-	684935
Vanadium pentoxide	1314621
Vanadyl sulfate	27774136
Vinyl chloride	75014
Vinyl acetate	108054
Vinylamine, N-methyl-N-nitroso-	4549400
Warfarin, and salts, when present at concentrations greater than 0.3%	81812
Xylene (mixed)	1330207
Xylenol	1300716
Zinc	7440666
Zinc acetate	557346
Zinc ammonium chloride	52628258
Zinc, bis(dimethyl carbomodithioato-S,S′)- (Ziram)	137304
Zinc, bis(diethylcarbamo dithioato-S,S′)- (Ethyl Ziram)	14324551
Zinc borate	1332076
Zinc bromide	7699458
Zinc carbonate	3486359
Zinc chloride	7646857
Zinc cyanide $Zn(CN)_2$	557211
Zinc fluoride	7783495
Zinc formate	557415
Zinc hydrosulfite	7779864
Zinc nitrate	7779886
Zinc phenolsulfonate	127822
Zinc phosphide Zn_3P_2, when present at concentrations greater than 10%	1314847
Zinc silicofluoride	16871719
Zinc sulfate	7733020
Zirconium nitrate	13746899
Zirconium potassium fluoride	16923958
Zirconium sulfate	14644612
Zirconium tetrachloride	10026116

Appendix B

Ignitable Solids

(30 TAC Chapter 335 Subchapter R Appendix 1 Table 2)

Constituents listed from Department of Transportation Regulations, 49 CFR Part 173 Subpart E, October 1, 1993. Note: The presence of a constituent on this table in a nonhazardous waste does not automatically identify that waste as a Class 1 ignitable waste. The constituents on this table are examples of materials which could be considered Class 1 ignitable waste. The physical characteristics of the waste will be the determining factor as to whether or not a waste is ignitable. Refer to 30 TAC §335.505(2) (relating to Class 1 Waste Determination) for the Class 1 ignitable criteria.

Compound or Material
Aluminum, metallic, powder
Alkali metal amalgams
Alkali metal amides
Aluminum alkyl halides
Aluminum alkyl hydrides
Aluminum alkyls
Aluminum borohydrides
Aluminum carbide
Aluminum ferrosilicon powder
Aluminum hydride
Aluminum phosphide
Aluminum resinate
Aluminum silicon powder
Ammonium picrate
2,2′-Azodi(2,4-dimethyl-4-methoxyvaleronitrile)
2,2′-Azodi(2,4-dimethylvaleronitrile)
1,1′ Azodi(hexahydrobenzonitrile)
2,2′-Azodi(2-methyl-butyronitrile)
Azodiisobutryonitrile
Barium, metallic
Barium alloys, pyrophoric
Barium azide
Benzene-1,3-disulfohydrazide
Benzene sulfohydrazide
4-(Benzyl(ethly)amino)-3-ethoxy-benzenediazonium zinc chloride
4-(Benzyl(methyl)amino)-3-ethoxy-benzenediazonium zinc chloride
Borneol
Boron trifluoride dimethyl etherate
5-tert-Butyl-2,4,6-trinitro-m-xylene
Calcium, metallic
Calcium carbide
Calcium chlorite
Calcium cyanamide
Calcium dithionite
Calcium hypochlorite
Calcium manganese silicon
Calcium silicon powder
Calcium phosphide
Calcium pyrophoric
Calcium resinate
Calcium silicide
Camphor, synthetic
Carbon, activated
Celluloid
Cerium
Cesium metal
Chromic acid or chromic acid mixture, dry
Cobalt naphthenates, powder
Cobalt resinate
Decaborane
2-Diazo-1-naphthol-4-sulphochloride
2-Diazo-1-naphthol-5-sulphochloride
2,5-Diethoxy-4-morpholinobenzene-diazonium zinc choride
Diethylzinc
4-Dimethylamino-6-(2-dimethyaminoethoxy)-toluene-2-diazonium zinc chloride
Dimethylzinc
Dinitrophenolates
Dinitroresorcinol
N,N′-Dinitroso-N,N′-dimethylterephthalamide
N,N′-Dinitrosopentamethylenetetramine
Diphenyloxide-4,4′-disulfohydrazide
Dipicryl sulfide
4-Dipropylaminobenzenediazonium zinc chloride
Ferrocerium
Ferrosilicon
Ferrous metal
Hafnium powder
Hexamine
Hydrides, metal
3-(2-Hydroxyethoxy)-4-pyrrolidin-1-ylbenzenediazonium zinc chloride
Iron oxide, spent
Isosorbide dinitrate mixture
Lead phosphite, dibasic
Lithium acetylide-ethylene diamine complex
Lithium alkyls
Lithium aluminum hydride
Lithium amide, powdered
Lithium borohydride
Lithium ferrosilicon
Lithium hydride
Lithium metal
Lithium nitride
Lithium silicon
Magnesium granules
Magnesium aluminum phosphide

Compound or Material	Compound or Material
Magnesium diamide	Sodium aluminum hydride
Magnesium phosphide	Sodium amide
Magnesium silicide	Sodium borohydride
Maneb	Sodium chlorite
Manganese resinate	Sodium2-diazo-1-naphthol-4-sulphonate
Methyl magnesium bromide	Sodium2-diazo-1-naphthol-5-sulphonate
Methyldichlorosilane	Sodium dichloro-s-triazinetrione
Mono-(trichloro)tetra(monopotassium dichloro)-penta-s-triazinetrione	Sodium dinitro-ortho-cresolate
	Sodium hydride
N-Methyl-N′-nitronitrosoguanidine	Sodium hydrosulfite
Naphthalene	Sodium methylate
Nitrocellulose mixtures	Sodium nitrite and mixtures
Nitroguanidine	Sodium picramate, wet
p-Nitrosodimethylaniline	Sodium potassium alloys
Paraformaldehyde	Sodium sulfide, anhydrous
Pentaborane	Stannic phosphide
Peratic acid	Strontium phosphide
Phosphorous, amorphous, red	Sulfur
Phosphorous, white or yellow	Titanium metal powder
Phosphoric anhydride	Titanium hydride
Phosphorous pentachloride	Trichloroisocyanuric acid
Phosphorus pentasulfide	Trichlorosilane
Phosphorus sesquisulfide	Trichloro-s-triazinetrione
Phosphorus trisulfide	Trinitrobenzoic acid
Picric acid	Trinitrophenol
Potassium, metallic	Trinitrotoluene
Potassium dichloro-s-triazinetrione	Urea nitrate
Potassium borohydride	Zinc ammonium nitrite
Potassium dithionite	Zinc phosphide
Potassium phosphide	Zinc powder
Potassium sulfide, anhydrous	Zinc resinate
Rubidium metal	Zirconium hydride, powdered
Silicon powder, amorphous	Zirconium picramate
Silver picrate	Zirconium powder
Sodium, metallic	Zirconium scrap

Appendix C

Class 1 Toxic Constituents' Maximum Leachable Concentrations

(30 TAC Chapter 335 Subchapter R Appendix 1 Table 1)

Applicability: **Class 1, 2, and 3 Waste Evaluations**

Values are based on information contained in Federal Registers Vol. 55 / Friday, July 27, 1990; Vol. 56 / June 7, 1991; and Integrated Risk Information Systems, Environmental Protection Agency, and 40 CFR 264 Appendix 9.

Compound	CAS No.	Concentration (mg/l)
Acenaphthene	83-32-9	210
Acetone	67-64-1	400
Acetonitrile	75-05-8	20
Acetophenone	98-86-2	400
Acrylamide	79-06-1	0.08
Acrylonitrile	107-13-1	0.6
Aniline	62-53-3	60
Anthracene	120-12-7	1050
Antimony	7440-36-0	1
Arsenic	7440-38-2	1.8
Barium	7440-39-3	100.0
Benzene	71-43-2	0.50
Benzidine	92-87-5	0.002
Beryllium	7440-41-7	0.08
Bis(2-chloroethyl) ether	111-44-4	0.3
Bis(2-ethylhexyl) phthalate	117-81-7	30
Bromodichloromethane	75-27-4	0.3
Bromomethane	74-83-9	5
Butylbenzyl phthalate	85-68-7	700
Cadmium	7440-43-9	0.5
Carbon disulfide	75-15-0	400
Carbon tetrachloride	56-23-5	0.50
Chlordane	57-74-9	0.03
Chlorobenzene	108-90-7	70
Chloroform	67-66-3	6.0
Chloro-m-cresol, p	59-50-7	7000
2-Chlorophenol	95-57-8	20
Chromium	7440-47-3	5.0
m-Cresol	108-39-4	200.0*
o-Cresol	95-48-7	200.0*
p-Cresol	106-44-5	200.0*
DDD	72-54-8	1
DDE	72-55-9	1
DDT	50-29-3	1
Dibutyl phthalate	84-74-2	400
1,4-Dichlorobenzene	106-46-7	7.5
3,3-Dichlorobenzidine	91-94-1	0.8
1,2-Dichloroethane	107-06-2	0.50
Dichlorodifluoromethane	75-71-8	700
1,1-Dichloroethylene	75-35-4	0.6
1,3-Dichloropropene	542-75-6	1
2,4-Dichlorophenol	120-83-2	10
2,4-Dichlorophenoxy- acetic acid (2,4-D)	94-75-7	10.0

Compound	CAS No.	Concentration (mg/l)
Dieldrin	60-57-1	0.02
Diethyl phthalate	84-66-2	3000
Dimethoate	60-51-5	70
2,4-Dimethyphenol	105-67-9	70
2,6-Dimethyphenol	576-26-1	21
m-Dinitrobenzene	99-65-0	0.4
2,4-Dinitrophenol	51-28-5	7
2,4-Dinitrotoluene (and 2,6-, mixture)	602-01-7	0.13
Dinoseb	88-85-7	3.5
1,4-Dioxane	123-91-1	30
Dioxins (Polychlorinated dibenzo-p-dioxins)		
2,3,7,8-TCDD	1746-01-6	0.005
1,2,3,7,8-PeCDD	40321-76-4	0.010
1,2,3,4,7,8-HxCDD	57653-85-7	0.050
1,2,3,6,7,8-HxCDD	34465-46-8	0.050
1,2,3,7,8,9-HxCDD		0.050
Diphenylamine	122-39-4	90
1,2-Diphenylhydrazine	122-66-7	0.4
Disulfoton	298-04-4	0.1
Endosulfan	959-98-8	0.2
Endrin	72-20-8	.02
2-Ethoxyethanol	10-80-5	1400
Ethylbenzene	100-41-4	400
Ethylene dibromide	106-93-4	0.004
Ethylene glycol	107-21-1	7000
Fluoranthene	206-44-0	140
Fluorene	86-73-7	140
Furans (Polychlorinated dibenzofurans)		
2,3,7,8-TCDF	51207-31-9	0.050
1,2,3,7,8-PeCDF		0.100
2,3,4,7,8-PeCDF		0.010
1,2,3,4,7,8-HxCDF		0.050
1,2,3,6,7,8-HxCDF		0.050
1,2,3,7,8,9-HxCDF		0.050
Heptachlor	76-44-8	0.008
Heptachlor epoxide	1024-57-3	0.04
Hexachlorobenzene	118-74-1	0.13
Hexachloro-1,3-butadiene	87-68-3	0.4
Hexachlorocyclopentadiene	77-47-4	20
Hexachloroethane	67-72-1	3.0
Hexachlorophene	70-30-4	1
Isobutyl alcohol	78-83-1	1000
Isophorone	78-59-1	90

Appendix C — Class 1 Toxic Constituents' Maximum Leachable Concentrations (MCLs)

Compound	CAS No.	Concentration (mg/l)	Compound	CAS No.	Concentration (mg/l)
Lead	7439-92-1	1.5	Pyridine	110-86-1	4
Lindane	58-89-9	0.3	Selenium	7782-49-2	1.0
Mercury	7439-97-6	0.2	Silver	7440-22-4	5.0
Methacrylonitrile	126-98-7	0.4	Styrene	100-42-5	700
Methomyl	16752-77-5	90	1,1,1,2-Tetrachloroethane	630-20-6	10
Methoxychlor	72-43-5	10.0	1,1,2,2-Tetrachloroethane	79-34-5	2
2-Methoxyethanol	109-86-4	14.0	Tetrachloroethylene	127-18-4	0.7
Methyl ethyl ketone	78-93-3	200.0	2,3,4,6-Tetrachlorophenol	58-90-2	100
Methyl isobutyl ketone	108-10-1	200	Toluene	108-88-3	1000
Methylene chloride	75-09-2	50	Toxaphene	8001-35-2	0.3
Methyl parathion	298-00-0	0.9	trans-1,3-Dichloropropene	542-75-6	1
Mirex	2385-85-5	0.7	Tribromomethane (Bromoform)	75-25-2	70
Nickel	7440-02-0	70			
Nitrobenzene	98-95-3	2.0	1,2,4-Trichlorobenzene	120-82-1	70
N-Nitroso-di-n-butylamine	924-16-3	0.06	1,1,1-Trichloroethane	71-55-6	300
N-Nitrosodiphenylamine	86-30-6	70	Trichloroethylene	79-01-6	0.5
N-Nitrosomethylethylamine	10595-95-6	0.02	1,1,2-Trichloroethane	79-00-5	6
N-Nitroso-n-propylamine	621-64-7	0.05	Trichlorofluoromethane	75-69-4	1000
N-Nitrosopyrrolidine	930-55-2	0.2	2,4,5-Trichlorophenoxy-propionic acid (2,4,5-TP or Silvex)	93-72-1	1.0
p-Phenylenediamine	106-50-3	20			
Parathion	56-38-2	20			
Pentachlorobenzene	608-93-5	3	1,2,3-Trichloropropane	96-18-4	20
Pentachloronitrobenzene	82-68-8	10	2,4,5-Trichlorophenol	95-95-4	400.0
Pentachlorophenol	87-86-5	100.0	2,4,6-Trichlorophenol	88-06-2	2
Phenol	108-95-2	2000	Vanadium pentoxide	1314-62-1	30
Pronamide	23950-58-5	300	Vinyl chloride	75-01-4	0.2
Pyrene	129-00-0	5.9	Xylenes (all isomers)	1330-82-1	7000

* If o-, m-, and p-cresol concentrations cannot be differentiated, the total cresol concentration is used. The Maximum Concentration for total cresol is 200.0 mg/l.

Appendix D

7-Day Distilled Water Leachate Test's Maximum Contaminant Levels

(30 TAC Chapter 335 Subchapter R APPENDIX 1 Table 3)

Applicability: **Class 3 Waste Evaluations**

Values obtained from 40 Code of Federal Regulations Part 141, Subparts B and G, Maximum Contaminant Levels and 40 Code of Federal Regulations Part 143, Total Dissolved Solids.

Constituent	MCL (mg/l)
Arsenic	0.05
Barium	1
*Benzene	0.005
Cadmium	0.005
*Carbon tetrachloride	0.005
Chlordane	0.002
*Chlorobenzene	0.1
Chromium	0.1
2,4-D	0.07
*Dibromochloropropane	0.0002
*ortho-Dichlorobenzene	0.6
*para-Dichlorobenzene	0.075
*1,2-Dichloroethane	0.005
*1,1-Dichloroethylene	0.007
*trans-1,2-Dichloroethylene	0.1
*1,2-Dichloropropane	0.005
*Ethylbenzene	0.7
Heptachlor	0.0004
Heptachlor epoxide	0.0002
Lead	0.05
Mercury	0.002
Methoxychlor	0.04
Pentachlorophenol	0.001
Selenium	0.05
Silver	0.05
*Styrene	0.1
*Tetrachloroethylene	0.005
*1,1,1-Trichloroethane	0.20
*Trichloroethylene	0.005
*Toluene	1
Toxaphene	0.003
2,4,5-TP (Silvex)	0.05
*Vinyl chloride	0.002
*Xylenes (total)	10
Total dissolved solids	500

* For a Class 3 waste classification, these constituents must also be evaluated using the test methods described in 40 Code of Federal Regulations, Part 261, Appendix II. See §335.507 (4) (A) (ii) for additional information.

Appendix E

Class 1 Toxic Constituents

(other than those identified in Appendix C, *and their Estimated Quantitation Limits [EQLs])*

Applicability: **Class 3 Waste Evaluations**

This table is to be utilized by the generator in evaluating detection limits for the identified constituents. The EQLs in this table are defined as the lowest detectable levels that can be reliably achieved using the Toxicity Characteristic Leaching Procedure (TCLP) at the time of the printing of this guideline. Applicable EPA method numbers are provided and can be found in EPA Report SW-846 "Test Methods for Evaluating Solid Waste" except where noted. Please note that more than one test method may be available for a particular constituent. Synonyms are provided in brackets "[]".

Constituent	EQL (mg/l)	Method(s)
Acenaphthene	0.2	8100
	0.01	8270
	0.02	8250
Acetone	0.1	8240
Acetonitrile	0.1	8015
[Methyl cyanide]	0.1	8030
Acetophenone	0.001	8250
	0.01	8270
Acrylamide	0.005	8015
Acrylonitrile	0.005	8030
[Vinyl cyanide]	0.005	8240
Anthracene	0.2	8100
	0.02	8250
	0.01	8270
Aniline	0.01	8250
[Benzyl amine]	0.01	8270
Antimony	0.2	204
	0.3	6010
	2.0	7040
	0.03	7041
	2.0	7000A
Benzidine [Dianiline]	0.44	8250
Beryllium	**	210
	0.003	6010
	0.05	7090
	0.002	7091
	0.05	7000A
Bis(2-chloroethyl) ether	0.057	8250
[Dichloroethyl ether]	0.01	8270
Bis(2-ethylhexyl)	0.02	8060
phthalate	0.25	8250
	0.01	8270
Bromodichloromethane	0.001	8010
	0.005	8240
Bromomethane	0.003	8010
[Methylbromide]	0.01	8240
Butylbenzyl phthalate	0.005	8060
[Benzylbutyl phthalate]	0.025	8250
	0.01	8270
Carbon disulfide [CS_2]	0.005	8240
Chloroform	0.0005	8010
	0.005	8240
p-Chloro-m-cresol	0.005	8040
	0.02	8270
2-Chlorophenol	0.003	8040
[o-Chlorophenol]	0.01	8270
m-Cresol	0.01	8270
o-Cresol	0.01	8270
p-Cresol	0.01	8270
DDD [Dichlorodiphenyl-	0.0001	8080
dichloroethane]	0.028	8250
	0.01	8270
DDE [Dichlorodiphenyl-	0.00004	8080
ethylene]	0.056	8250
	0.01	8270
DDT [Dichlorodiphenyl-	0.0001	8080
trichloroethane]	0.047	8250
	0.01	8270
Dibutyl phthalate	0.005	8060
	0.01	8270
1,4-Dichlorobenzene	0.004	8010
	0.003	8020
	0.013	8120
	0.01	8270
3,3-Dichlorobenzidine	0.02	8270
Dichlorodifluoromethane	0.01	8010
	0.005	8240
1,3-Dichloropropene	0.003	8010
	0.005	8240
2,4-Dichlorophenol	0.05	8040
	0.01	8270
Dieldrin	0.00002	8080
	0.01	8270
Diethyl phthalate	0.005	8060
	0.01	8270
Dimethoate	0.02	8270
2,4-Dimethylphenol	0.003	8040
	0.01	8270
2,6-Dimethylphenol	**	**
m-Dinitrobenzene	0.01	8270

Constituent	EQL (mg/l)	Method(s)	Constituent	EQL (mg/l)	Method(s)
2,4-Dinitrophenol	0.13	8040	Methyl ethyl ketone [MEK]	0.01	8015
	0.05	8270		0.1	8240
2,4-Dinitrotoluene	0.0002	8090	Methyl isobutyl ketone [MIBK]	**	8015
(and 2,6-, mixture)	0.01	8270		0.005	8240
Dinoseb	0.007	8150	Methylene chloride	0.005	8010
	0.02	8270	[Dichloromethane]	0.005	8240
1,4-Dioxane	0.15	8015	Methyl parathion	0.0003	8140
Dioxins (Polychlorinated dibenzo-p-dioxins)				0.01	8270
2,3,7,8-TCDD	0.000005	8280	Mirex	**	**
1,2,3,7,8-PeCdd	0.00001	8280	Nickel	0.04	249
1,2,3,4,7,8-HxCDD	0.00001	8280		0.05	6010
1,2,3,6,7,8-HxCDD	0.00001	8280		0.4	7520
1,2,3,7,8,9-HxCDD	0.00001	8280		0.04	7000A
Diphenylamine	0.01	8270	Nitrobenzene	0.04	8090
1,2-Diphenylhydrazine	0.2	1625		0.01	8250
Disulfoton	0.002	8140		0.01	8270
	0.01	8270	N-Nitroso-di-n-butylamine	0.01	8270
Endosulfan	0.0001	8080	N-Nitrosodiphenylamine	0.01	8270
	0.056	8250	N-Nitrosomethylethylamine	0.02	8270
Endrin	0.00006	8080	N-Nitroso-n-propylamine	0.01	8270
	0.01	8250	N-Nitrosopyrrolidine	0.01	8270
2-Ethoxyethanol	**	**	p-Phenylenediamine	0.01	8270
Ethylene dibromide [EDB]	0.5	6231	Parathion	0.01	8270
(Standard Methods for Examination				0.0003	8140
of Water and Wastewater)			Pentachlorobenzene	0.02	8270
Ethylene glycol	**	**	Pentachloronitrobenzene	0.01	8270
Fluoranthene	0.2	8100	Phenol	0.001	8040
	0.01	8270		0.01	8270
Fluorene	0.2	8100	Pronamide	0.01	8270
	0.01	8270	Pyrene	0.2	8100
Furans (Polychlorinated dibenzofurans)				0.01	8270
2,3,7,8-TCDF	0.00001	8280	Pyridine	0.005	8240
1,2,3,7,8-PeCDF	0.00001	8280		0.01	8270
2,3,4,7,8-PeCDF	0.00001	8280	1,1,1,2-Tetrachloroethane	0.005	8010
1,2,3,4,7,8-HxCDF	0.00001	8280		0.005	8240
1,2,3,6,7,8-HxCDF	0.00001	8280	1,1,2,2-Tetrachloroethane	0.0003	8010
1,2,3,7,8,9-HxCDF	0.00001	8280		0.005	8240
Hexachlorobenzene	0.0005	8120	2,3,4,6-Tetrachlorophenol	0.01	8270
	0.0	8270	trans-1,3-Dichloropropene	0.0034	8010
Hexachloro-1,3-butadiene	0.0034	8120		0.005	8240
	0.01	8270	Tribromomethane [Bromoform]	0.002	8010
Hexachlorocyclopentadiene	0.004	8120		0.005	8240
	0.01	8270	1,2,4-Trichlorobenzene	0.01	8270
Hexachloroethane	0.0003	8120	1,1,2-Trichloroethane	0.0002	8010
	0.01	8270	[1,1,2-TCE]	0.005	8240
Hexachlorophene	0.05	8270	Trichlorofluoromethane	0.01	8010
Isobutyl alcohol	0.05	8015	[Freon 11]	0.005	8240
Isophorone	0.06	8090	1,2,3-Trichloropropane	0.01	8010
	0.01	8270		0.005	8240
Lindane	0.00004	8080	2,4,5-Trichlorophenol	0.01	8270
	0.01	8250	2,4,6-Trichlorophenol	0.006	8040
	0.00004	608		0.01	8270
	0.01	625	Vanadium pentoxide	0.2	286
Methacrylonitrile	0.005	8015		0.08	6010
Methomyl	0.09	632		2.0	7910
2-Methoxyethanol	**	**		0.04	7911

* If o-, m-, and p-cresol concentrations cannot be differentiated, the total cresol concentration is used.
** This information not available at time of publication.

Appendix F

7-Day Distilled Water Leachate Test Procedure

(30 TAC Chapter 335 Subchapter R Appendix 4)

Applicability: **Class 3 Waste Evaluations**

This test is intended only for dry, solid wastes, i.e., waste materials without any free liquids.

1. Place a 250 gram (dry weight) representative sample of the waste material in a 1500 milliliter Erlenmeyer flask.
2. Add 1 liter of deionized or distilled water into the flask and mechanically stir the material at a low speed for five (5) minutes.
3. Stopper the flask and allow to stand for seven (7) days.
4. At the end of seven (7) days, filter the supernatant solution through a 0.45 micron filter, collecting the supernatant into a separate flask.
5. Subject the filtered leachate to the appropriate analysis.

Appendix G

Form Codes

(30 TAC Chapter 335 Subchapter R Appendix 3)

Applicability: **All Waste**

In determining a waste stream's form code, it is recommended that the generator first determine into which major category the waste stream fits (e.g. inorganic liquids). The generator should then review all the form code descriptors in that category to determine which code or codes best describe the generator's waste stream. The generator should then choose, from the narrowed-down list, a form code for the waste stream.

Form codes are fairly generic in their descriptions. It is possible that more than one form code may be applicable to a particular waste stream. Generators should assign the form code which best describes the waste stream. If more than one form code can "best describe" the waste stream, then the generator should choose one of those several codes.

Code	Waste Description
	— Lab Packs —
	***Lab Packs** — Lab packs of mixed wastes, chemicals, lab wastes*
001	Lab packs of old chemicals only
002	Lab packs of debris only
003	Mixed lab packs
004	Lab packs containing acute hazardous wastes
009	Other lab packs (Specify in Comments)
	— Liquids —
	***Inorganic Liquids** — Waste that is primarily inorganic and highly fluid (e.g., aqueous), with low suspended inorganic solids and low organic content*
101	Aqueous waste with low solvents
102	Aqueous waste with low other toxic organics
103	Spent acid with metals
104	Spent acid without metals
105	Acidic aqueous waste
106	Caustic solution with metals but no cyanides
107	Caustic solution with metals and cyanides
108	Caustic solution with cyanides but no metals
109	Spent caustic
110	Caustic aqueous waste
111	Aqueous waste with reactive sulfides
112	Aqueous waste with other reactives (e.g., explosives)
113	Other aqueous waste with high dissolved solids
114	Other aqueous waste with low dissolved solids
115	Scrubber water
116	Leachate
117	Waste liquid mercury
119	Other inorganic liquids (Specify in Comments)
198	Nonhazardous photographic chemical wastes (inorganic)
199	Brine solution that could also bear the form code 113
	***Organic Liquids** — Waste that is primarily organic and is highly fluid, with low inorganic solids content and low-to-moderate water content*
201	Concentrated solvent-water solution
202	Halogenated (e.g., chlorinated) solvent
203	Non-halogenated solvent
204	Halogenated/non-halogenated solvent mixture
205	Oil-water emulsion or mixture
206	Waste oil
207	Concentrated aqueous solution of other organics
208	Concentrated phenolics
209	Organic paint, ink, lacquer, or vanish
210	Adhesives or epoxies
211	Paint thinner or petroleum distillates
212	Reactive or polymerizable organic liquids
219	Other organic liquids (Specify in Comments)
296	Ethylene glycol based antifreeze

Code	Waste Description
297	Nonhazardous liquids containing greater than or equal to (>) 50 and less than (<) 500 ppm PCBs
298	Nonhazardous liquids containing greater than or equal to (>) 500 ppm PCBs
299	Nonhazardous photographic chemical waste (organic)

— Solids —

*(These codes **do not** apply to pumpable waste.)*

Inorganic Solids** — Waste that is primarily inorganic and solid, with low organic content and low-to-moderate water content; **not pumpable

Code	Waste Description
301	Soil contaminated with organics
302	Soil contaminated with inorganics only
303	Ash, slag, or other residue from incineration of wastes
304	Other "dry" ash, slag, or thermal residue
305	"Dry" lime or metal hydroxide solids chemically "fixed"
306	"Dry" lime or metal hydroxide solids not "fixed"
307	Metal scale, filings, or scrap
308	Empty or crushed metal drums or containers
309	Batteries or battery parts, casings, cores
310	Spent solid filters or adsorbents
311	Asbestos solids and debris
312	Metal-cyanide salts/chemicals
313	Reactive cyanide salts/chemicals
314	Reactive sulfide salts/chemicals
315	Other reactive salts/chemicals
316	Other metal salts/chemicals
319	Other waste inorganic solids (Specify in Comments)
388	Empty or crushed glass containers
389	Nonhazardous sandblasting waste
390	Nonhazardous concrete/cement/ construction debris
391	Nonhazardous dewatered wastewater treatment sludge
392	Nonhazardous dewatered air pollution control device sludge
393	Catalyst waste
394	Nonhazardous solids containing greater than or equal to (>) 50 ppm and less than (<) 500 ppm PCBs
395	Nonhazardous solids containing greater than or equal to (>) 500 ppm PCBs
396	Nonhazardous electrical equipment/devices containing greater than or equal to (>) 50ppm and less than (<) 500 ppm PCBs
397	Nonhazardous electrical equipment/devices containing greater than or equal to (>) 500 ppm PCBs
398	Nonhazardous soils containing greater than or equal to (>) 50 ppm and less than (<) 500 ppm PCBs
399	Nonhazardous soils containing greater than or equal to (>) 500 ppm PCBs

Organic Solids** — Waste that is primarily organic and solid, with low-to-moderate inorganic content and water content; **not pumpable

Code	Waste Description
401	Halogenated pesticide solid
402	Non-halogenated pesticide solid
403	Solids resins or polymerized organics
404	Spent carbon
405	Reactive organic solid
406	Empty fiber or plastic containers
407	Other halogenated organic solids (Specify in Comments)
409	Other non-halogenated organic solids (Specify in Comments)
488	Wood debris
489	Petroleum contaminated solids
490	Sand blasting waste
491	Dewatered biological treatment sludge
492	Dewatered sewage or other untreated biological sludge
493	Catalyst waste
494	Solids containing greater than or equal to (>) 50 ppm and less than (<) 500 ppm PCBs
495	Solids containing greater than or equal to (>) 500 ppm PCBs
496	Electrical equipment/devices containing greater than or equal to (>) 50 ppm and less than (<) 500 ppm PCBs
497	Electrical equipment/devices containing greater than or equal to (>) 500 ppm PCBs
498	Soil containing greater than or equal to (>) 50 ppm and less than (<) 500 ppm PCBs
499	Soils containing greater than or equal to (>) 500 ppm PCBs

— Sludges —

(These codes only apply to pumpable waste.)

Inorganic Sludges** — Waste that is primarily inorganic, with moderate-to-high water content and low organic content, and **pumpable

Code	Waste Description
501	Lime sludge without metals
502	Lime sludge with metals/metal hydroxide sludge

Code	Waste Description
503	Wastewater treatment sludge with toxic organics
504	Other wastewater treatment sludge
505	Untreated plating sludge without cyanides
506	Untreated plating sludge with cyanides
507	Other sludge with cyanides
508	Sludge with reactive sulfides
509	Sludge with other reactives
510	Degreasing sludge with metal scale or filings
511	Air pollution control device sludge (e.g., fly ash, wet scrubber sludge)
512	Sediment or lagoon dragout contaminated with organics
513	Sediment or lagoon dragout contaminated with inorganics only
514	Drilling mud
515	Asbestos slurry or sludge
516	Chloride or other brine sludge
519	Other inorganic sludges (Specify in Comments)
597	Catalyst waste
598	Nonhazardous sludges containing greater than or equal to (>) 50 ppm and less than (<) 500 ppm PCBs
599	Nonhazardous sludges containing greater than or equal to (>) 500 ppm PCBs

Organic Sludges *— Waste that is primarily organic with low-to-moderate inorganic solids content and water content, and* ***pumpable***

Code	Waste Description
601	Still bottoms of halogenated (e.g., chlorinated) solvents or other organic liquids
602	Still bottoms on non-halogenated solvents or other organic liquids
603	Oily sludge
604	Organic paint or ink sludge
605	Reactive or polymerizable organics
606	Resins, tars, or tarry sludge
607	Biological treatment sludge
608	Sewage or other untreated biological sludge
609	Other organic sludges (Specify in Comments)
695	Petroleum contaminated sludges other than still bottoms and oily sludges
696	Grease
697	Catalyst waste
698	Nonhazardous sludges containing greater than or equal to (>) 50 ppm and less than (<) 500 ppm PCBs
699	Nonhazardous sludges containing greater than or equal to (>) 500 ppm PCBs

— Gases —

Inorganic Gases *— Waste that is primarily inorganic with a low organic content and is a gas at atmospheric pressure*

Code	Waste Description
701	Inorganic gases

Organic Gases *— Waste that is primarily organic with low-to-moderate inorganic content and is a gas at atmospheric pressure*

Code	Waste Description
801	Organic gases

— Plant Trash —

(In order to be considered for one of the two plant refuse designations, a waste must first meet the following two criteria.

First*, the waste* ***must*** *be a Class 2 waste. This means that a proper classification determination must be performed for each item which a facility is considering as one of the plant refuse designations. A waste is not a Class 2 solely because it has been designated as a plant refuse waste.* ***Hazardous*** *and* ***Class 1 wastes*** *are* ***not eligible*** *for designation as one of the plant refuses.*

Second*, the waste must meet the particular definition of the plant refuse term. For more information on these terms, please refer to the terms listed in this table as well as the "Definitions" section which follows this table.)*

Code	Waste Description
902	**Supplemental plant production refuse** – any Class 2 waste from production, manufacturing, or laboratory operations as long as the total amount of the supplemental plant production refuse does not exceed twenty percent of the total plant trash (form code 999) volume or weight, whichever is less – this could include, but is not limited to, such things as metal parts, floor sweepings, and off-specification materials
999	**Plant Trash** – any Class 2 waste originating in the facility offices, laboratory, plant production area or food services/cafeteria operations that is composed of paper, cardboard, linings, wrappings, paper and/or wooden packaging materials, uncontaminated food wastes and/or packaging, cafeteria wastes, glass, aluminum foil, aluminum cans, aluminum scrap, stainless steel, steel, iron scrap, plastics, styrofoam, rope, twine, uncontaminated rubber, uncontaminated wooden materials, equipment belts, wirings, uncontaminated cloth, metal bindings, empty containers with a holding capacity of less than five gallons, uncontaminated floor sweepings, and personal cosmetics generated by facility personnel (does not include cosmetics generated as a result of manufacturing or plant production operations).

Form Code Definitions

The following are definitions of terms utilized in form codes:

Acidic – A material having a pH less than 7.0.

Alkaline – A material having a pH greater than 7.0.

Aqueous – A water solution containing organic and/or inorganic constituents dissolved in solution.

Caustic – A material which is corrosive or irritating to living tissue and has a pH greater than 7.

Inorganic – Chemicals that are not organic (i.e., water, carbon dioxide, carbon disulfide, iron, zinc, steel). Generally, if a waste is composed of more than 50% inorganic materials, it is considered an inorganic waste.

Organic – Chemicals composed primarily of carbon and hydrogen and their derivatives. (i.e. methylene chloride, benzene, petroleum products). In general, if a waste is composed of 50% or more organic materials, it is considered an organic waste.

Plant Trash – Includes the following Class 2 wastes which are produced as a result of plant production, manufacturing, laboratory, general office, cafeteria or food service operations; paper, cardboard, linings, wrappings, paper or wood packaging materials, food wastes, cafeteria wastes, glass, aluminum foil, aluminum cans, aluminum scrap, stainless steel, steel, iron scrap, plastics, styrofoam, rope, twine, uncontaminated rubber, uncontaminated wooden materials, equipment belts, wirings, uncontaminated cloth, metal bindings, empty containers with a holding capacity of less than five gallons, uncontaminated floor sweepings, and personal cosmetics generated by facility personnel (does not include cosmetics generated as a result of manufacturing or plant production operations). **Please note that hazardous waste and Class 1 waste can not be designated as "plant office refuse".** Plant trash shall not include oils, lubricants of any type, oil filters, contaminated soils, sludges, or wastewaters.

Examples of "plant trash" include Class 2 soda cans, lunch sacks, food scraps, envelopes, plastic binders, empty boxes, pallets, styrofoam shipping boxes, chemical container liners, shrink wrap, and broken glassware.

As another example, used typing paper from the secretarial area could be considered "plant trash" because it resulted from general office operations. (Please note that typing paper would normally be considered a Class 2 waste unless it were contaminated with something to cause it to be considered a hazardous or Class 1 waste. For example, if typing paper were used to clean up a spill of a F003 waste, it would be considered a hazardous waste.)

As another example, a Class 2 off-specification production chemical could not be considered "plant trash" because it does not meet the definition of a "plant trash". However, the Class 2 off-specification production chemical might be considered a "supplemental plant production refuse" as long as the weight/volume limits established for "supplemental plant production refuse" were not exceeded. (For more information on "supplemental plant production refuse" and weight/volume limits, please see "Supplemental Plant Production Refuse" in these definitions.

Reactive – A material is reactive if it is capable of detonation or explosive decomposition:
1. at standard temperature and pressure, or
2. if subjected to a strong ignition source, or
3. heated under confinement.

A material is also considered reactive if, when mixed with water it is:
1. potentially explosive, or
2. reacts violently, or
3. generates toxic gases or vapors (i.e. hydrogencyanide or hydrogensulfide).

A material is also considered reactive if it is:
1. normally unstable and readily undergoes violent changes, or
2. a forbidden explosive (see 49 CFR §173.53), or
3. a Class B explosive (see 49 CFR §173.88).

Solvent – A liquid used to dissolve another material.

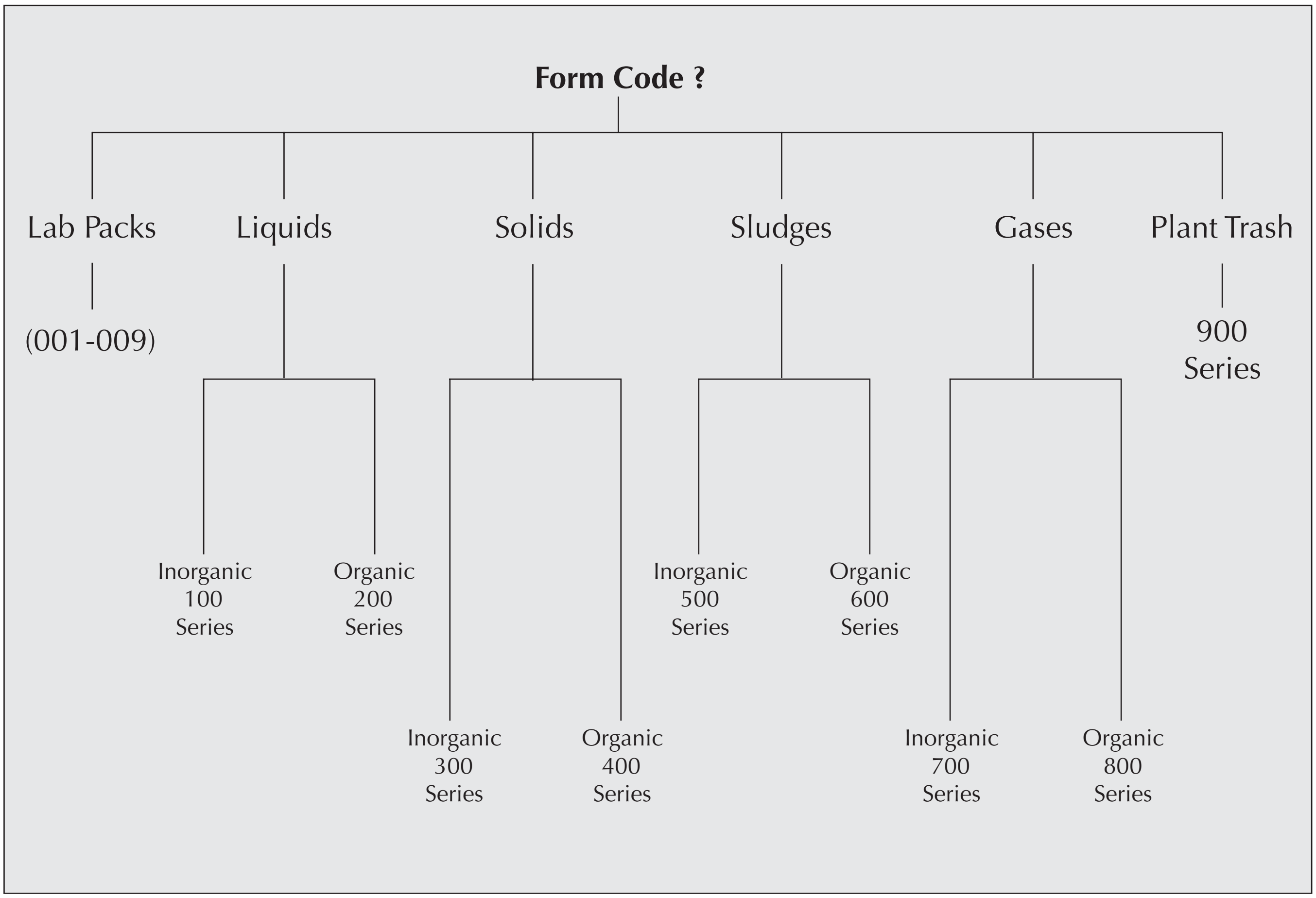
Supplemental Plant Production Refuse – Any **Class 2 Waste from production, manufacturing, or laboratory operations** can be designated as **"supplemental plant production refuse"** (form code 999) as long as the total amount of the supplemental plant production refuse **does not exceed twenty percent of the total plant production refuse volume or weight, whichever is less.**

Individual wastes which have been designated "supplemental plant production refuse" may be designated by the generator at a later time as a separate waste in order to maintain the "supplemental plant production refuse" at a level below 20% of the "plant trash" amount. For any waste stream so redesignated, the generator must provide the initial notification information required pursuant to 30 TAC Chapter 335.

Please note that hazardous waste and Class 1 waste can not be designated as “supplemental plant production refuse”.

Examples of “supplemental plant production refuse” include Class 2 steel shavings, empty metal containers, aerosol cans, old chemicals, safety equipment, and machine parts.

Please note that when a site notifies the Commission that it generates “supplemental plant production refuse”, it must include a list of those wastes which are expected to be included in the “supplemental plant production refuse” designation. If that list increases, the generator must notify the Commission of the additions to that list; otherwise, the Commission will not view the additions as “supplemental plant production refuse”.



Lab Packs – 001-009 series

Examples:

1. Lab pack containing debris — **002**
2. Lab pack containing old unused or partially used chemicals — **001**

Plant Trash – 900 series

Examples:

1. Office debris (i.e., paper, plastic, aluminum cans and fax paper) — **999**
2. Scrap plastic from molds of toys and souvenirs — **902**
3. Packing debris from unpacking of raw materials — **999**

Liquids

Inorganic – 100 series

(Waste that is primarily inorganic and highly fluid, (e.g., aqueous), with low suspended solids and low organic content.)

Examples:

1. 99% water with 1% methanol — **101**
2. 98% water with 2% methyl ethyl ketone MEK — **102**
3. Waste sulfuric acid from plastics cleaning — **104**
4. Water with 0.73% potassium permanganate — **114**
5. Leachate from landfills — **116**
6. Waste photographic fixer — **198**

Organic – 200 series

(Waste that is primarily organic and is highly fluid, with low inorganic solids and low-to-moderate water content.)

Examples:

1. Solvent mixture 65% methylene chloride, 30% phenol, 5% cresol — **204**
2. 95% motor oil, 5% water emulsion — **205**
3. Used hydraulic oil — **206**
4. Unused varnish and organic paint — **209**
5. Waste ethylene glycol antifreeze — **296**

Solids

Inorganic – 300 series

*(Waste that is primarily inorganic and solid, with low organic content and low-to-moderate water content; **not pumpable**.)*

Examples:

1. Soil contaminated with naptha — **301**
2. Incinerator ash — **303**
3. Crushed RCRA empty metal drums — **308**
4. Lead acid batteries, chips and cores — **309**
5. Concrete, plaster and other construction debris — **390**
6. Metalic catalyst waste — **393**

Organic – 400 series

*(Waste that is primarily organic and solid, with low-to-moderate inorganic and water content; **not pumpable**.)*

Examples:

1. Unused malathion pellets — **402**
2. Spent carbon from filters — **404**
3. Wooden house exterior debris — **488**
4. Paper contaminated with oil — **489**
5. Sand blasting waste from petroleum tanks — **490**
6. Dewatered sewage sludge — **492**

Sludges

Inorganic – 500 series

*(Waste that is primarily inorganic, with moderate-to-high water content, and low organic content, and **pumpable**.)*

Examples:

1. Wastewater treatment sludge containing phenolics — **503**
2. Zinc plating wastewater sludge containing cyanide — **506**
3. Sludge from pollution removal scrubber — **511**
4. Sediment pond dragout contaminated with lead — **513**
5. Water based drilling mud with brine — **514**
6. Waste metal catalyst with 0.89% organics — **597**

Organic – 600 series

*(Waste that is primarily organic, with moderate-to-high water content, and low inorganic content, and **pumpable**.)*

Examples:

1. Still bottoms from naptha recovery — **602**
2. Ink and paint sludge from printing billboards — **604**
3. Bioremediation sludge from oil spill cleanup — **607**
4. Motor repair facility sludge with grease — **603**
5. Refinery wastewater sludge with petroleum compounds — **695**
6. Waste lubricating grease — **696**

Gases

Inorganic – 701

(Waste that is primarily inorganic with a low organic content and is a gas at atmospheric pressure.)

Organic – 801

(Waste that is primarily organic with low-to-moderate inorganic content and is a gas at atmospheric pressure.)

Appendix H

Codes for Out-of-State Waste Generators and Receivers

Codes for States of the United States			
State or Country	Abbreviation	Generator No.	Receiver No.
Alabama	AL	D0001	D0001
Alaska	AK	D0002	D0002
Arizona	AZ	D0004	D0004
Arkansas	AR	D0005	D0005
California	CA	D0006	D0006
Colorado	CO	D0008	D0008
Connecticut	CT	D0009	D0009
Delaware	DE	D0010	D0010
Dist. of Columbia		D0011	D0011
Florida	FL	D0012	D0012
Georgia	GA	D0013	D0013
Hawaii	HI	D0015	D0015
Idaho	ID	D0016	D0016
Illinois	IL	D0017	D0017
Indiana	IN	D0018	D0018
Iowa	IA	D0019	D0019
Kansas	KS	D0020	D0020
Kentucky	KY	D0021	D0021
Louisiana	LA	D0022	D0022
Maine	ME	D0023	D0023
Maryland	MD	D0024	D0024
Massachusetts	MA	D0025	D0025
Michigan	MI	D0026	D0026
Minnesota	MN	D0027	D0027
Mississippi	MS	D0028	D0028
Missouri	MO	D0029	D0029
Montana	MT	D0030	D0030
Nebraska	NE	D0031	D0031
Nevada	NV	D0032	D0032
New Hampshire	NH	D0033	D0033
New Jersey	NJ	D0034	D0034
New Mexico	NM	D0035	D0035
New York	NY	D0036	D0036
North Carolina	NC	D0037	D0037
North Dakota	ND	D0038	D0038
Ohio	OH	D0039	D0039
Oklahoma	OK	D0040	D0040
Oregon	OR	D0041	D0041
Pennsylvania	PA	D0042	D0042
Rhode Island	RI	D0044	D0044
South Carolina	SC	D0045	D0045
South Dakota	SD	D0046	D0046
Tennessee	TN	D0047	D0047
Utah	UT	D0049	D0049
Vermont	VT	D0050	D0050
Virginia	VA	D0051	D0051
Washington	WA	D0053	D0053
West Virginia	WV	D0054	D0054
Wisconsin	WI	D0055	D0055
Wyoming	WY	D0056	D0056

Country Codes		
State or Country	Generator No.	Receiver No.
American Samoa	D0083	D0083
Australia	F0095	F0095
Austria	F0078	F0078
Bahamas Islands	F0002	F0002
Belgium	F0069	F0069
Belize	F0091	F0091
Brazil	F0086	F0086
Cambodia	F0001	F0001
Canada	F0063	F0063
Chile	F0007	F0007
China	F0005	F0005
Columbia	F0003	F0003
Denmark	F0067	F0067
El Salvador	F0097	F0097
England	F0064	F0064
Finland	F0070	F0070
France	F0076	F0076
Germany	F0068	F0068
Greece	F0084	F0084
Guam	D0075	D0075
Haiti	F0093	F0093
Holland	F0079	F0079
Honduras	F0011	F0011
Hong Kong	F0080	F0080
India	F0006	F0006
Italy	F0090	F0090
Jamaica	F0089	F0089
Japan	F0062	F0062
Luxemburg	F0092	F0092
Malaysia	F0077	F0077
Marshall Islands	F0074	F0074
Mexico	F0061	F0061
Navajo Nation	D0057	D0057
Netherlands	F0071	F0071
Netherlands Antilles (A,B,C)	F0010	F0010
Nicaragua	F0094	F0094
Norway	F0081	F0081
Offshore beyond 12 mi.	F0087	F0087
Pacific Islands	F0072	F0072
Panama	F0082	F0082
Peru	F0085	F0085
Puerto Rico	D0060	D0060
Saudi Arabia	F0088	F0088
Slovenia	F0009	F0009
South Africa	F0004	F0004
Spain	F0065	F0065
Sweden	F0096	F0096
Taiwan	F0099	F0099
Thailand	F0008	F0008
Trinidad de Tobago	F0098	F0098
Venezuela	F0073	F0073
Virgin Islands	D0066	D0066

RG-029

SPECIAL WASTE REGULATIONS IN TEXAS

TCEQ REGULATORY GUIDANCE

Waste Permits Division
RG-029 • September 2006

Special Waste Regulations in Texas

Special waste is any solid waste that requires special handling and disposal because of its quantity, concentration, physical or chemical characteristics, or biological properties. Special waste is defined in Title 30 Texas Administrative Code (30 TAC), Chapter 330, 330.3. Special waste that is not specifically identified in 30 TAC 330.171(c) or (d), or 330.173 requires prior written authorization by the TCEQ for disposal. Written authorization for the disposal of a special waste can be obtained in two ways:

1. The generator, with written concurrence from a landfill willing to accept the special waste, may submit a Request for Authorization for Disposal of a Special Waste, agency form TCEQ-0152, along with any supporting documentation, to the Municipal Solid Waste (MSW) Permits Section for review; or
2. the generator may request approval to dispose of a special waste directly from an MSW landfill operator that has an approved Waste Acceptance Plan identified in 330.61(b) that authorizes the acceptance of the specific special waste as set out in 330.171(b)(2).

Special wastes identified in, and meeting the requirements of, 30 TAC 330.171(c) and (d) do not require prior written authorization before disposal, provided the MSW landfill is permitted to accept these wastes. These include:

- Municipal hazardous waste from conditionally exempt small-quantity generators may be accepted at a Type I or Type IAE landfill provided the amount of waste does not exceed 220 lb (100 kg) per month per generator.
- Municipal wastewater treatment plant sludges, other types of domestic sewage treatment plant sludges, and water-supply treatment plant sludges.
- Liquid wastes from municipal sources that are treated or processed to eliminate free liquids and tested in accordance with 30 TAC 330.171(c)(7).
- Grease-trap and grit-trap wastes.
- Slaughterhouse wastes.
- Dead animals.
- Empty pesticide (insecticide, herbicide, fungicide, or rodenticide) containers that have been triple rinsed and rendered unusable.

- Certain discarded materials containing asbestos as detailed in 30 TAC 330.171(c)(3) and (4). Regulated asbestos-containing material may be accepted for disposal at a Type I or Type IAE landfill. Nonregulated asbestos-containing materials (non-RACM) may be accepted for disposal at a Type I, Type IAE, Type IV, or Type IVAE landfill. For further information regarding asbestos abatement, contact the Asbestos Programs Branch of the Texas Department of State Health Services Toxic Substance Control Division at 512-834-6600 or 800-572-5548.

Special wastes that do require prior written authorization include:

- Untreated medical waste may be approved for disposal by the executive director when necessary to protect human health and the environment from the effects of a natural or man-made disaster.
- Class 1 nonhazardous industrial solid waste not routinely collected with municipal solid waste. (Also see the requirements of 30 TAC 330.173.)
- Wastes from commercial or industrial wastewater treatment plants; air pollution control facilities; and tanks, drums, or containers used for shipping or storing any material that has been listed as a hazardous constituent in 40 CFR, Part 261, Appendix VIII but has not been listed as a commercial chemical product in 40 CFR, 261.33(e) or (f).
- Drugs, contaminated foods, or contaminated beverages, other than those contained in normal household waste.
- Incinerator ash.
- Soil contaminated by petroleum products, crude oil, or chemicals in concentrations of greater than 1,500 milligrams per kilogram total petroleum hydrocarbons; or contaminated by constituents of concern that exceed the concentrations listed in Table 1 of 335.521(a)(1) of this title (relating to Appendices). Such contaminated soil must be disposed of in accordance with 330.171(b)(4).
- Waste from oil, gas, and geothermal activities subject to regulation by the Railroad Commission of Texas when those wastes are to be processed, treated, or disposed of at a municipal solid waste management facility permitted under Chapter 330.
- Waste generated outside the boundaries of Texas that contains:
  - Any industrial waste;
  - Any waste associated with oil, gas, or geothermal exploration, production, or development activities; or
  - Any item listed as a special waste in 30 TAC 330.3.

The following special wastes are prohibited from disposal in an MSW landfill:

- Used oil filters from internal combustion engines. Used oil filters are prohibited from disposal at MSW landfills by non-household generators by 30 TAC 330.171(d).
- Lead-acid storage batteries. Lead-acid storage battery disposal is prohibited at MSW landfills by 30 TAC 330.15(e).

Management and disposal options for special waste:

1. **Asbestos:** There are two types of asbestos waste—regulated (friable) and non-regulated (not friable) asbestos-containing material (RACM and non-RACM) as defined in 40 CFR Part 61 Section 141. Also, the amount of asbestos in the material contributes to the type of asbestos waste. Non-RACM may become RACM if subject to sanding, grinding, cutting, or abrading, or it has a high probability of being reduced to powder during demolition or renovation.
   a. RACM is friable asbestos-containing material that contains greater than 1 percent asbestos. Friable is defined as asbestos-containing material that, when dry, can be crushed to a powder by hand pressure. RACM may be disposed of at a Type I or Type I arid exempt (AE) MSW landfill in accordance with 30 TAC 330.171(c)(3).
   b. Non-RACM is material containing less than one percent asbestos or non-friable asbestos-containing material not identified as regulated. Non-RACM may be disposed of at any MSW landfill provided the facility is authorized to accept the waste in accordance with 30 TAC 330.171(c)(4).
2. **Grease-trap waste:** Material collected in and from a grease interceptor in the sanitary sewer service line of a commercial, institutional, or industrial food service or processing establishment, including the solids resulting from dewatering processes. Grease-trap waste may be from municipal sources and regulated under 30 TAC Chapter 330 or from industrial sources and regulated under 30 TAC Chapter 335. Industrial-waste generators must classify their waste in accordance with Subchapter R of 30 TAC Chapter 335. Grease-trap waste must be transported to an authorized facility which can be a processing or treatment facility, a liquid waste transfer station, or an MSW landfill. Grease-trap waste may also be processed on-site by mobile treatment or processing units. In order for grease-trap waste to be disposed of in an MSW landfill, the waste must pass the paint filter test, Method 9095. Some MSW landfills have liquid-waste solidification units and will process such waste prior to disposal.
3. **Grit-trap waste:** Includes waste from interceptors placed in the drains prior to entering the sewer system at maintenance and repair shops, automobile service stations, car washes, laundries,

and other similar establishments and is regulated under Chapters 330 and 335 in the same manner as grease-trap waste. Grit-trap waste must be transported to an authorized facility which can be a processing or treatment facility, a liquid waste transfer station, or an MSW landfill. Grit-trap waste may also be processed on-site by mobile treatment or processing units. In order for grit-trap waste to be disposed of in an MSW landfill, the waste must pass the paint filter test, Method 9095. Grit-trap waste from car washes may be dried on-site or at a location within 50 miles of generation that is owned by the generator and then disposed of at an authorized facility.

4. **Domestic septage:** Includes liquid and solid material pumped from a septic tank, cesspool, or similar sewage-treatment system and is regulated under 330 in the same manner as grease- and grit-trap waste, but is also subject to Chapter 312 of 30 TAC if used beneficially by land applying. Septage waste must be transported to an authorized facility which can be a wastewater treatment plant, a beneficial land-use site, an MSW processing facility or transfer station, a compost facility, a monofill (sludge only) landfill, or an MSW Type I landfill, or septage may be processed on-site by a mobile unit. Septage waste that is transported to a beneficial land-use site or a monofill must be treated by raising the pH of the waste to 12 for a period of 30 minutes. This treatment is usually performed in the transport unit by adding lime and is the only treatment process allowed for transporters. In addition, septage waste must meet the metal concentration requirements of 30 TAC 312.43 prior to beneficial land application. Like grease- and grit-trap waste, septage waste must pass the paint filter test prior to disposal in an MSW landfill or monofill.

5. **Liquid waste transporter requirements:** All transporters of liquid waste—including grease-trap, grit-trap, and septage waste—must be registered with the TCEQ. Transporters are required to manifest shipments of liquid waste in the form of a trip ticket that identifies the generator, the transporter, and the disposal facility. The transporter is required to provide the generator with the first copy of the trip ticket; after delivery, the transporter must provide the generator the completed fourth copy, which verifies that the disposal facility received the shipment of liquid waste. Transporter companies are required to maintain records of all shipments of liquid waste for five years.

6. **Liquid waste generator requirements:** Generators are responsible for the proper treatment and disposal of their waste. Generators must contract with a TCEQ-registered liquid-waste transporter and must receive a copy of the signed trip ticket from the transporter. The generator must also receive a second signed copy of the trip ticket with the treatment or disposal facility signature and information and must maintain trip-ticket records for three years. Industrial liquid-waste generators are responsible for properly

classifying their waste under Subchapter R of 30 TAC Chapter 335.

7. The following wastes pose a greater potential for objectionable odor. These wastes should be managed and transported to contain odor and then covered immediately at an MSW landfill:

   a. liquid waste

   b. grease-trap and grit-trap waste

   c. slaughterhouse waste

   d. dead animals

   e. sludges resulting from wastewater (and possibly water) treatment

8. Wastes which may cause a windblown particulate nuisance condition should be covered immediately at an MSW landfill.

For additional information or questions regarding the disposal of special waste, please contact the Municipal Solid Waste Permits Section of the TCEQ at 512-239-2334 or e-mail inquiries to <mswpermits@tceq.state.tx.us>.

RG-486

DISPOSAL OF EXEMPT WASTE THAT CONTAINS RADIOACTIVE MATERIAL

RG-486
November 2010

Disposal of Exempt Waste That Contains Radioactive Material

Radioactive Materials Division

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

DISPOSAL OF EXEMPT WASTE THAT CONTAINS RADIOACTIVE MATERIAL

Prepared by
Radioactive Materials Division

RG-486
November 2010

TCEQ

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Published and distributed
by the
Texas Commission on Environmental Quality
PO Box 13087
Austin TX 78711-3087

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RG-486
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Contents

Tables

ABBREVIATIONS AND SYMBOLS

Abbreviations

CFR	Code of Federal Regulations
DL	detection limit
dpm	disintegrations per minute
DSHS	(Texas) Department of State Health Services
DOT	(U.S.) Department of Transportation
LLD	lower limit of detection
MDA	minimum detectable activity
MSW	municipal solid waste
NELAC	National Environmental Laboratory Accreditation Conference
NORM	naturally occurring radioactive material
NRC	(U.S.) Nuclear Regulatory Commission
RRC	Railroad Commission of Texas
SI	International System of units, from the French *Le Système Internationale d'Unites*
SS&D	sealed source and device
TAC	Texas Administrative Code
	30 TAC *xx* = 'Title 30, Texas Administrative Code, Chapter (Section, etc.) *xx*
TCEQ	Texas Commission on Environmental Quality
THSC	Texas Health and Safety Code

Symbols

%	percent
4E-2	4×10^{-2} (actual number shown as an example)

Bq	becquerel (1 disintegration per second)
Ci	curie (3.7×10^{10} disintegrations per second)
cm	centimeter
GBq	gigabecquerel (1 million disintegrations per second)
J	joule (unit of energy)
kBq	kilobecquerel (1,000 disintegrations per second)
m^2	square meter
mg/cm^2	milligram per square centimeter
pCi/g	picocurie per gram (0.037 disintegrations per second per gram)
rad	The special unit of absorbed dose equal to an absorbed dose of 0.01 J/kg.
rem	Unit of dose equivalent equal to the absorbed dose in rad multiplied by the quality factor (1 rem = 0.01 sievert).
s	second
Si	sievert: SI unit of dose equivalent equal to the absorbed dose in J/kg (grays) multiplied by the quality factor
T	tritium (Hydrogen-3)
yd^3	cubic yard

1 INTRODUCTION

This guide explains and clarifies the instances where radioactive materials can be exempted from the standard disposal requirements for radioactive wastes. If radioactive materials meet the criteria detailed in this guide, the TCEQ may issue an exemption for the materials. If a radioactive material is exempted, it can be disposed of as if it was not a radioactive material—e.g., if the material would be municipal solid waste if it were not radioactive, then it can be disposed of in an authorized municipal solid waste disposal facility when it receives an exemption. Radioactive waste is exempt from regulations when it poses a reasonably low risk to public health and safety and the environment. *Systematic Radiological Assessment of Exemptions for Source and Byproduct Materials* (NRC, 2001) contains the calculations and methodology used to assess the potential radiation doses associated with the exemption regulations for the normal life cycle, which includes final disposal.

Despite its radioactive content, exempt materials do not need to be sent to a facility that is licensed for radioactive waste disposal [25 TAC 289.101(o)].[1] The disposal of exempt material **as a radioactive substance** is not subject to further regulation by the TCEQ, though the material will still be regulated for other non-radioactive constituents. If it does not meet the exemption criteria, then it must be disposed of in the manner stipulated in 30 TAC 336.211, as appropriate to the type of licensed material.

Before accepting exempt materials, a disposal facility may require a letter from the TCEQ stating that the waste meets the exemption criteria found in the regulations and is thereby exempt from other regulations concerning radioactive-waste disposal. This statement from the TCEQ is called an e*xemption concurrence*. Some hazardous-waste disposal facilities regulated by the TCEQ have a condition in their permit requiring them to obtain an exemption concurrence before disposing of exempt materials.

This guide focuses on the disposal of exempt material in TCEQ-regulated disposal facilities: the agencies in Texas that have authority over exempt materials, what materials are exempt, the TCEQ regulations over exempt materials, and what documentation and analysis are required to determine whether the material meets the TCEQ's exemption requirements. Several terms are defined in Appendix A, tables containing exemption-activity values from the regulations are reproduced in Appendix B, and a primer on radiation appears in Appendix C.

[1] Short for 'Title 25, Texas Administrative Code, Subsection 289.101(o).'

This guide summarizes the TCEQ rules and regulations concerning exempt materials to assist waste generators and disposal facilities. The rules in the Texas Administrative Code should always be reviewed. The rules will form the ultimate basis for granting an exemption concurrence. If any wording of this guide conflicts with the code, then the code takes precedence.

2 REGULATORY BASIS

2.1 State Agencies that Regulate Radioactive Material

Three state agencies regulate the handling, processing, transporting, transferring, receiving, storage, and disposal of radioactive material in Texas: the TCEQ, the Texas Department of State Health Services (DSHS), and the Railroad Commission of Texas (RRC).

The **Department of State Health Services** (<www.dshs.state.tx.us/radiation/> regulates and licenses the possession, receipt, use, handling, transfer, transport, and storage of all radioactive material except for the radioactive material specifically regulated under the authority of the RRC and the TCEQ. Additionally, the DSHS registers radiation-producing equipment and operates the radiological emergency–response program for Texas. The radiation rules of the DSHS appear at 25 TAC 289. All exemption concurrences for waste that was generated under a DSHS radioactive-material license must be obtained from the DSHS.

The **Railroad Commission of Texas** <www.rrc.state.tx.us/environmental/publications/norm.php> has authority over uranium exploration, surface mining, and handling and disposal of naturally occurring radioactive-material (NORM) wastes produced during the exploration and production of oil and gas. The radiation rules of the RRC can be found at 16 TAC 4 for NORM and 16 TAC 11 for uranium mining. Any exemption concurrences for NORM waste at oil- and gas-production sites must be obtained from the RRC.

The **Texas Commission on Environmental Quality** <www.tceq.state.tx.us/nav/permits/rw.html> regulates and licenses the following:

- Receipt, processing, storage and disposal of by-product and low-level radioactive waste from other "persons," which is defined as to include organizations such as companies or institutions.
- Uranium- and thorium-recovery facilities and the disposal of uranium and thorium by-product wastes.
- Decommissioning of inactive uranium-recovery facilities and sites for the disposal of radioactive material.

The TCEQ radiation rules can be found at 30 TAC 336. Exemption concurrences for waste generated in Texas that was not generated under the authority of the DSHS or the RRC must be obtained from the TCEQ. Exemption concurrences for waste generated outside of Texas, but to be disposed of in Texas, also must be obtained from the TCEQ.

2.2 TCEQ Regulations Concerning Exemptions

The use and disposal of radioactive materials in Texas is governed by Texas Health and Safety Code Chapter 401. The authorization and rules concerning exempt materials appear at THSC 401.106(a). Specific regulations concerning the criteria that materials containing radioactivity must meet to qualify for an exemption are described below, and are mostly found at 25 TAC 289.251 and 289.259. These exemption regulations are based on federal regulations promulgated by the NRC which require that agreement states have essentially identical language in their state rules.

Exemptions are promulgated by the TCEQ under 30 TAC 336.5. Most exemption concurrences are granted under 30 TAC 336.5(c), which exempts waste from licensing requirements under THSC 401.106(a), thus authorizing the TCEQ to use the exemption rules from the DSHS, such as 25 TAC 289.251(d), 251(e), and 259(d). *See* 25 TAC 289.101(c)(2) and (o).

Senate Bill 1604 of the 80th regular legislative session transferred the authority over processing and storage of uranium, by-product, and radioactive waste from the DSHS to the TCEQ, effective June 15, 2007. That bill also transferred the responsibility to grant exemption concurrences from the DSHS to the TCEQ. SB 1604 is reflected in 30 TAC 336.5(d), which exempts any material exempted from licensing requirements for disposal by the DSHS before June 18, 2007.

2.3 Additional Regulatory Considerations

2.3.1 NRC Alternate Disposal Authorizations

The NRC has an additional option for exempting radioactive material under Title 10, Code of Federal Regulations (10 CFR) 20.2002, which states are not required to adopt into their own regulations. This federal rule is not in the Texas code and cannot exempt a waste for disposal in Texas.

2.3.2 Dilution Not Allowed to Change Waste Class

Texas does not allow dilution for reduction of the radioactive concentration so that the waste classification is lowered or disposal requirements lessened [30 TAC 336.229]. The TCEQ will not grant an exemption concurrence to any waste that was diluted so that it would meet the criteria. Waste that has been diluted due to stabilization, mixing, or treatment will be subject to the disposal regulations according to its pre-dilution concentration.

2.3.3 Department of Transportation Exempt Material

The U.S. Department of Transportation also has a category called *exempt radioactive material*. However, the DOT exemption rules regulate only how such material is to be transported, not how it is to be used or disposed of. DOT policy differs from the NRC exempt-material rules, and consequently the Texas rules. Therefore, this category only applies to issues related to transportation.

2.3.4 Use of Standard International Units

Additionally, whenever exemption limits are stated using both the units *curie* and *becquerel* in the regulations, the becquerel values are to be used. In such cases, the becquerel value is the legal limit, while the curie value is also stated in the rule since the curie is most widely used in the United States. The curie value is only an approximation of the becquerel unit due to rounding.

3 EXEMPTION RULES FOR RADIOACTIVE-MATERIAL LICENSEES ONLY

A radioactive-material licensee may dispose of the following licensed material exhibiting radioactivity as though it were exempt material. These exemptions apply only to licensees for the waste generated under authority of their radioactive-material license. Disposal of these materials is typically performed as one of several licensed activities (approved by the appropriate regulating agency in the license application and amendment reviews) and verified by inspections from the appropriate regulatory agency—not through an exemption concurrence. Occasionally, though, disposing of this material as exempt does require an exemption concurrence.

A licensee cannot exceed specific contamination limits for soil, facilities, or equipment in 25 TAC 289.202(eee) and 30 TAC 336.356. Contamination that exceeds those limits must be remediated and will not be considered exempt if left in place for unrestricted use. However, if removed for disposal, the contaminated soil, building rubble, or equipment may be considered exempt for disposal only. This rule applies to both specific licensees and general licensees. (General licenses are under the authority of the DSHS; the rules concerning them appear at 25 TAC 289.251.) However, the exemption rules discussed in this section may not apply to a general licensee and additional clarification should be obtained in such situations by contacting the appropriate regulatory agency.

3.1 Release into Sanitary Sewerage: 30 TAC 336.215

A licensee may discharge licensed material below specified activity levels into a sewer system ("sanitary sewerage") if the material is either readily soluble in water or is readily dispersible biological material. The quantity released into the sewer in one month divided by the average monthly volume of water released into the sewer cannot exceed the concentration values listed in Table III of 30 TAC 336.359 (values in this table can be found in Table B.1 in Appendix B). The sum-of-fractions rule (see Appendix A for definition) applies if more than one radionuclide is released.

The total activity released in one year may not exceed:

- 5 Ci (185 GBq) of hydrogen-3 (tritium),
- 1 Ci (37 GBq) of carbon-14, and
- 1 Ci (37 GBq) of all other radioactive materials combined.

3.2 Disposal of Hydrogen-3, Carbon-14, and Iodine-125 in Specific Media: 30 TAC 336.225(a) and (b), with qualifying rules at (e) and (f)

A licensee may dispose of the following licensed material as if it were not radioactive but not in a manner that would permit its use either as food for humans or as animal feed:

- 0.05 μCi (1.85 kBq), or less, of hydrogen-3, carbon-14, or iodine-125 per gram of medium used for liquid scintillation counting or in vitro clinical or in vitro laboratory testing.
- animal tissue containing 0.05 μCi (1.85 kBq), or less, of hydrogen-3, carbon-14, or iodine-125 per gram, averaged over the weight of the entire animal.

To qualify for this disposal exemption, the licensee must:

- perform surveys adequate to assure that the specified limits are not exceeded [336.225(e)(1)];
- remove or otherwise obliterate or obscure all labels, tags, or other markings which would indicate that the material or contents are radioactive [336.225(e)(2)]; and
- maintain records in accordance with 30 TAC 336.338 [336.225(f)].

3.3 The 300-Day Rule: 30 TAC 336.225(c)

A licensee may, if approved by the appropriate licensing authority (either the DSHS or the TCEQ), dispose of licensed material listed in 30 TAC 336.365 (and also in Table B.2 in Appendix B) in a Type I municipal solid-waste facility (as defined in TCEQ rules, 30 TAC 330) under the following provisions. The sum-of-fractions rule applies if more than one radionuclide is present. The rule is referred to as the “300-day” rule since the isotopes identified in 30 TAC 336.365 have a half-life under 300 days. The licensed material:

- cannot be hazardous waste, nor combined with hazardous waste, as defined at 30 TAC 330
- must not exceed the specified concentration and annual activity limits in 30 TAC 336.365, Appendix H (see Table B.2)
- must comply with all other requirements for disposals at a Type I municipal solid waste facility and any other requirements for those facilities as set forth in 30 TAC 330

If the material is hazardous waste or is combined with hazardous waste, then it must be disposed of at a hazardous waste disposal facility in accordance with TCEQ rules at 30 TAC 335. The licensee must:

- perform surveys adequate to assure that the specified limits are not exceeded [336.225(e)(1)]
- remove or otherwise obliterate or obscure all labels, tags, or other markings which would indicate that the material or contents are radioactive [336.225(e)(2)]
- maintain records in accordance with 30 TAC 336.338 [336.225(f)]
- submit a copy of the following procedures to TCEQ (or DSHS if it is a DSHS licensee) [336.225(d)]:
    - physical delivery of the material to the disposal facility
    - compliance surveys to be performed
    - maintaining secure packaging during transportation to the site
    - maintaining records of any disposals made under 30 TAC 336.225(d)

3.4 Decay in Storage: 30 TAC 336.211(a)(3)

Decay in storage is authorized in the regulations “according to law.” This authorization is mainly used by medical institutions, licensed by DSHS, for short-lived radionuclides—with half-lives below 120 days—used in nuclear medicine, such as metastable technetium-99, xenon-133, and fluorine-18.

3.5 Release of Sites for Unrestricted Use: 30 TAC 336.603 and 336.356

If a site has been released for unrestricted use (also known as *clean release*), then it has been released from regulatory authority for radioactive material. The soil that remains in place at this site released for unrestricted use does not need an exemption concurrence to be considered exempt. However, if contaminated soil has been removed from the site before the declaration of release for unrestricted use, the soil may not be exempt, and an exemption-concurrence request would need to demonstrate that the soil meets the exemption criteria stipulated in the regulations.

A site meets the unrestricted-use requirement if the residual radioactivity distinguishable from background radiation results in a total effective-dose equivalent of 25 mrem (0.25 mSv) per year or less to an average member of the critical group [30 TAC 336.603]. Additional activity requirements are stated in 30 TAC 336.356(a) for radium. The activity of radium-226 or radium-228 in soil, based on dry weight and averaged over any 100 square meters of area, is not to exceed 5 pCi/g averaged over the first 15 centimeters of soil below the surface and 15 pCi/g averaged over each 15 cm–thick layer of soil below the first 15 centimeters beneath the surface. Also, radium-226 or radium-228 activities in vegetation are not to exceed 5 pCi/g, based on dry weight.

All remediation and cleanup activities need the approval of the appropriate regulatory agency, which has the authority to determine if a site meets the requirements of unrestricted use.

3.6 Release for Unrestricted Use of Surface Contaminated Objects: 30 TAC 336.605

The release for unrestricted use of facilities, equipment, or materials with surface contamination is allowed if the radioactive surface contamination levels are below the limits specified in 30 TAC 336.364, Appendix G, which are replicated in Table 1 below. If it has been released for unrestricted use (through procedures approved by the regulatory license reviewers and inspectors), then it has been released from regulatory authority for radioactive material and does not need an exemption concurrence to be exempt.

Table 1. Acceptable Surface Contamination Levels from 30 TAC 336.364

Radionuclide	Average	Maximum	Removable
U-natural, U-235, U-238, and associated decay products except Ra-226, Th-230, Ac-227, and Pa-231	5,000 dpm alpha/ 100 cm^2	15,000 dpm alpha/100 cm^2	1,000 dpm alpha/100 cm^2
Transuranics, Ra-223, Ra-224, Ra-226, Ra-228, Th-natural, Th-228, Th-230, Th-232, U-232, Pa-231, Ac-227, Sr-90, I-125, I-126, I-129, I-131, and I-133	1,000 dpm/100 cm^2	3,000 dpm/100 cm^2	200 dpm/100 cm^2
Beta-gamma emitters (radionuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above	5,000 dpm beta-gamma/100 cm^2	15,000 dpm beta-gamma/100 cm^2	1,000 dpm beta-gamma/100 cm^2

Porous materials (e.g., concrete), before being released for unrestricted use, must be evaluated to determine whether radioactive contamination has penetrated to the interior of the material. If so, an average concentration, in picocuries per gram, must be determined by the facility, subject to TCEQ review. This interior contaminated porous material may be exempt if the radionuclide concentrations do not exceed the exemption limits specified in the regulations.

4 NATURALLY OCCURRING RADIOACTIVE MATERIAL

4.1 Definitions

NORM is any substance that naturally contains one or more radionuclides. Under 25 TAC 289.259(c)(4), NORM is naturally occurring material not regulated under the Atomic Energy Act which has had its radionuclide concentrations increased by, or as a result of, human practices. NORM does not include the natural radioactivity of rocks or soils, or background radiation, but instead refers to material which has had its radioactivity concentrated by controllable practices (or by past human practices).

The DSHS and the TCEQ have slightly different definitions of NORM in their rules. The DSHS definition is used for exemption concurrences, since the exemption rules are mostly contained in the DSHS regulations. The TCEQ definition can be found at 30 TAC 336.2(83): a solid, liquid, or gaseous material or combination of materials, excluding source material, special nuclear material, and by-product material, that

- in its natural physical state spontaneously emits radiation,
- is discarded or unwanted, and
- is not exempt under rules of the DSHS adopted pursuant to THSC 401.106.

Natural radioactivity is defined in 25 TAC 289.201(b)(63) as radioactivity of naturally occurring nuclides whose location and chemical and physical form have not been altered by humans.

4.2 Sources of Naturally Occurring Radioactivity

Naturally occurring radioactivity can be divided into two categories: *cosmogenic* and *primordial*. Cosmogenic radioactivity consists of radionuclides formed by interaction of cosmic rays with atoms in the atmosphere, which include carbon-14 (with a half-life of 5,715 years), tritium or hydrogen-3 (12.32 years), sodium-22 (2.6 years), and beryllium-7 (53 days).

Primordial radioactivity consists of radionuclides with half-lives over hundreds of millions of years that were present at the formation of the Earth, which include potassium-40, rubidium-87, uranium, and thorium. Uranium and thorium (the *parent* nuclides) decay into shorter-lived radionuclides (*daughter* nuclides) such as radium and radon. Since the half-life of the parent is much larger than the half-lives of the daughters, the activity of each daughter approaches the activity of the parent after a time period approximately equal to five times the daughter's half-life. This is called secular equilibrium and results in an increase of the total activity of the material beyond the activity of the uranium or thorium alone. The three main decay chains of uranium and thorium, along with the daughters formed, are listed in the order in which they are formed in Table 2.

Since parent and daughter nuclides are different elements and thus have different chemical properties, they are often separated when the material containing them is processed. For example, NORM waste from the oil-and-gas industry either has radium as its main radionuclide of concern (from process water, scale, and sludge at exploration sites) or contains mainly lead-210 and its decay daughters, bismuth-210 and polonium-210 (typically found inside gas-processing equipment). Radium and lead were combined under the ground before being pumped up and processed.

Table 2. Uranium-238, Uranium-235, and Thorium-232 natural radioactivity decay chains

Radioisotope	Half-life[a]	Radioisotope	Half-life[a]	Radioisotope	Half-life[a]
uranium-238	4.5 By	uranium-235	0.7 By	thorium-232	14 By
thorium-234	21.4 d	thorium-231	25.6 y	radium-228	6.7 y
protactinum-234 (metastable)	1.2 m	proctacium-231	34,300 y	actinium-228	6.1 h
uranium-234	245,500 y	actinium-227	21.8 y	thorium-228	1.9 y
thorium-230	77,000 y	thorium-227	18.4 d	radium-224	3.6 d
radium-226	1,600 y	francium-223	21 m	radon-220	55 s
radon-222	93.8 d	radium-223	11.7 d	polonium-216	0.15 s
polonium-218	3.1 m	radon-219	3.9 s	lead-212	10.6 h
lead-214	26.8 m	polonium-215	0.002 s	bismuth-212	60.6 m
bismuth-214	19.7 m	lead-211	36.1 m	thallium-208	3.0 m
polonium-214	0.0002 s	bismuth-211	2.16 m	lead-208	stable
lead-210	22.3 y	polonium-211	0.5 s		
bismuth-210	5 d	thallium-207	4.78 m		
polonium-210	138.4 d	lead-207	stable		
lead-206	stable				

[a] By = billion years, y = years, d = days, h = hours, m = minutes, s = seconds

4.3 Small Quantities of Radium or NORM in Soil or Other Media: 25 TAC 289.259(d)

NORM waste is exempt for purposes of disposal under 25 TAC 289.259(d) if it contains, or is contaminated at, the following concentrations in soil or other media:

- 30 picocuries per gram (pCi/g) or less of radium-226 or radium-228 provided the radon emanation rate is less than 20 picocuries per square meter per second (pCi/m^2/sec),
- 5 pCi/g or less of radium-226 or radium-228 in which the radon emanation rate is equal to or greater than 20 pCi/m^2/sec; or
- 150 pCi/g or less of any other NORM radionuclide.

Radium-226 and radium-228 are considered separately, so both isotopes can be up to the limit (30 or 5 pCi/g) and still be exempt. Typically, Ra-226 is present in larger quantities than Ra-228. *Other media* is defined in 25 TAC 289.259(c)(5) as “any volumetric material other than soils or liquids (for example: sludge, scale, slag, etcetera [sic]).”

Note that the radon-220 emanation rate, formed by the decay of radium-228–contaminated material, would likely be undetectable due to the extremely short half-life of radon-220. The radon-emanation rate specified in the rule above does not apply to:

- known NORM types for which the radon-emanation fraction has been documented to be low, e.g. oil-production scales and sludges;
- soil in which the known volume of NORM would be too low to produce a radon-emanation rate of 20 pCi/m^2/s (as demonstrated by calculation); or
- soil that has been displaced from its natural location and is to be disposed of in a (permitted) disposal site for hazardous material.

This 30 pCi/g rule [289.259(d)] is not applicable to pipe or other equipment as a means of determining exemption. It is more appropriate for volumetric media, such as sludge, slag, soil, scale, or rubble mixed with other media.

This rule is not to be confused with the “release for unrestricted use” rules at 30 TAC 336.356 (see section 3.5); 25 TAC 289.259(d) applies to soil that has been removed from the site before the site was declared to be released for unrestricted use. These rules are not to be used for determining if soil or other media can be released for unrestricted use.

4.4 Source Material: 25 TAC 289.251(d)(1) and (2)

4.4.1 Weight Percent of 0.05

For the purpose of exemption concurrences, source material is defined as uranium or thorium, or any combination thereof, in any physical or chemical form [30 TAC 336.2(125)]. Source material does not include special nuclear material (defined in Appendix A). Any chemical mixture, compound, solution, or alloy of source material is exempt if the source material is by weight less 0.05% of the mixture, compound, solution, or alloy [25 TAC 251(d)(1)].

The levels of activity per unit mass that corresponds to 0.05% by weight for different source material radionuclides are shown in Table 3. In the calculations of weight percent, the isotopes Th-228, Th-230, and U-234 can be ignored, since their activity values at 0.05 weight percent exceed the limit of U-238 or Th-232 by over three orders of magnitude and these isotopes, being in equilibrium with Th-232 and U-238, will have activities equal to or less than their parents'. Additionally, U-235 can usually be ignored for uranium that has not been enriched, since it is present in natural ore at only 0.72% by mass, and 2.2% by activity, compared to total uranium.

If radium and other daughters are at or reaching secular equilibrium with the uranium or thorium (each daughter activity should then be equal to or less than the parent activity), then the activity of the daughter is not considered for determining the exemption status of the material. The daughter radionuclides are considered to be covered under the exemption of the uranium or thorium parent. For example, if the material contains 100 pCi/g uranium-238 (under 0.05% by weight) and 90 pCi/g radium-226, it is still exempt even though the radium exceeds 30 pCi/g (see Section 4.1).

Table 3. Specific-Activity Values for 0.05 Weight Percent of Source Material

Isotope	Specific Activity	Material	Specific activity
thorium-232	54.9 pCi/g	natural thorium	110 pCi/g of total Thorium[a]
uranium-238	167.5 pCi/g	natural uranium	340 pCi/g of total Uranium[b]
uranium-235	1,078 pCi/g	depleted uranium	199 pCi/g of total Uranium[c]

[a] Th-232 is in secular equilibrium with its daughter Th-228 (both isotopes are at equal activity level).
[b] By activity, 48.8% U-234 (daughter of U-238), 2.4% U-235, and 48.8% U-238 (IAEA, 2010).
[c] Typically, by activity, 15.2% U-234, 1.1% U-235, and 83.7% U-238 (IAEA, 2010).

4.4.2 Unrefined or Unprocessed Ore

Unrefined and unprocessed ore containing source material are exempt provided that the ore has not been refined or processed [25 TAC

289.251(d)(2)]. This exemption does not apply to the mining of ore containing source material for the extraction of source material (known as *source recovery*), which requires a specific license from the TCEQ or the RRC.

4.4.3 Rare-Earth Elements with Source Material

Rare-earth metals and compounds, mixtures, and products containing no more than 0.25% by weight of thorium, uranium, or any combination of these are exempt [25 TAC 289.251(d)(A)(vi)]. Rare-earth metals include the elements scandium, yttrium, and the 15 lanthanides (also referred to as lanthanoids) with atomic numbers 57–71: lanthanum, cerium, praseodymium, neodymium, promethium, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, and lutetium.

4.5 Specific Items Containing Source Material: 25 TAC 289.251(d)(3)

4.5.1 Thorium

The following specific items containing thorium are exempt, provided that they meet the weight percentage and other requirements found in the rule.

- incandescent gas mantles: any quantity of Th [25 TAC 251(d)(3)(A)(i)]
- vacuum tubes: any quantity of Th [25 TAC 251(d)(3)(A)(ii)]
- welding rods: any quantity of Th [25 TAC 251(d)(3)(A)(iii)]
- electric lamps used for illuminating: no more than 50 mg Th per lamp [25 TAC 251(d)(3)(A)(iv)]
- germicidal lamps, sunlamps, and lamps for outdoor or industrial lighting: no more than 2 g Th per lamp [25 TAC 251(d)(3)(A)(v)]
- personnel neutron dosimeters: no more than 50 mg Th per dosimeter [25 TAC 251(d)(3)(A)(vi)]
- finished optical lenses (except for contact lenses, spectacles, or in eyepieces in binoculars or in other optical instruments): no more than 30% by weight of Th (does not include the shaping, grinding, or polishing of such lenses or manufacturing processes other than the assembly of such lenses into optical systems and devices without any alteration of the lens) [25 TAC 251(d)(3)(G)]
- finished aircraft-engine parts containing nickel-thoria alloy [25 TAC 251(d)(3)(I)], provided that:

  - the thorium is dispersed in the nickel-thoria alloy in the form of finely divided thoria (thorium dioxide) and
  - the thorium content in the nickel-thoria alloy does not exceed 4.0% by weight
- any finished product or part containing metal-thorium alloys [25 TAC 289.259(d)(3)(D)], provided that:
  - the thorium content of the alloy does not exceed 4% by weight

  The chemical, physical, or metallurgical treatment or processing of these products or parts is not authorized under this rule. However, if parts are machined to ensure they still meet tolerance levels after a period of use, the shavings will be considered exempt for waste-disposal purposes

4.5.2 Uranium

Uranium contained in detector heads for use in fire-detection units are exempt, provided that each detector head contains not more than 0.005 microcuries of uranium [25 TAC 251(d)(3)(H)].

4.5.3 Source Material

The following items containing source material are exempt provided that they meet the weight percentages and other requirements in the rule.

- glazed ceramics (for example tableware): the glaze may not contain more than 20% source material by weight [25 TAC 251(d)(3)(B)(i)]
- glassware (except commercially manufactured glass brick, pane glass, ceramic tile, or other glass or ceramic used in construction): no more than 10% source material by weight [25 TAC 251(d)(3)(B)(ii)]
- glass enamel or glass-enamel frit imported or ordered for importation into the U.S., or initially distributed by manufacturers in the U.S., before July 25, 1983: no more than 10% source material by weight [25 TAC 251(d)(3)(B)(iii)]
- piezoelectric ceramic: no more than 2.0% source material by weight [25 TAC 251(d)(3)(B)(iv)]
- photographic film, negatives, and prints [25 TAC 251(d)(3)(C)]: no weight-percent limit

4.6 Depleted Uranium

Additionally, depleted uranium is exempt if it is used as shielding constituting part of any shipping container, provided that the shipping container is conspicuously and legibly impressed with the legend "CAUTION—RADIOACTIVE SHIELDING—URANIUM;" and the uranium metal is encased in mild steel or an equally fire-resistant material, with a wall thickness of at least $^1/_8$ inch [25 TAC 289.251(d)(3)(F)].

Depleted uranium is exempt if it is contained in counterweights installed (also if stored or handled in connection with the installation or removal of such counterweights) in aircraft, rockets, projectiles, and missiles [25 TAC 289.251(d)(3)(E)]. The rule does not authorize the chemical, physical, or metallurgical treatment or processing of any of these counterweights except for the purpose of repairing or restoring any plating, covering, or labeling. This exemption applies provided that:

- the counterweights are manufactured in accordance with a specific license issued by the NRC authorizing distribution by the licensee in accordance with 10 CFR 40;
- each counterweight has been impressed with the following legend clearly legible through any plating or other covering: "DEPLETED URANIUM" ("CAUTION—RADIOACTIVE MATERIAL—URANIUM" if manufactured prior to December 31, 1969); and
- each counterweight is durably and legibly labeled or marked with the identification of the manufacturer and the statement: "UNAUTHORIZED ALTERATIONS PROHIBITED" ("CAUTION—RADIOACTIVE MATERIAL—URANIUM" if manufactured prior to December 31, 1969).

4.7 Other Exempt NORM Items

4.7.1 Recycled Contaminated Objects

Materials and equipment in the recycling process contaminated with NORM scale or residue are exempt if the maximum radiation exposure level, including the background radiation level, does not exceed 50 microroentgens per hour (μR/hr) at any accessible point [25 TAC 289.259(d)(2)]. Recycling is defined in this context as "a process by which materials that have served their useful purpose are collected, separated, or processed and returned to use in the form of raw materials in the production of new products" [25 TAC 289.259(c)(8)]. Recycling does not include the reuse of an oil pipe after cleaning.

4.7.2 Oil and Gas Products and Processing

Pipe (tubulars) and other downhole or surface equipment used in oil production contaminated with NORM scale or residue are exempt if the maximum radiation exposure level, including the background radiation level, does not exceed 50 μR/hr at any accessible point [25 TAC 289.259(d)(3)]. Unlike other exemption rules that apply to both gas and oil, this rule applies only to oil production.

Natural gas, natural-gas products, crude oil, and crude-oil products containing NORM are exempt [25 TAC 289.259(d)(7)]. However, the processing and manufacturing of natural-gas and crude-oil products containing NORM are subject to general license requirements. Possession of produced waters from crude oil and natural gas production is exempt if the produced waters are reinjected into a well approved by the agency having jurisdiction or if the produced waters are discharged under the authority of the appropriate agency [25 TAC 289.259(d)(8)].

If the waste is under the authority of the Railroad Commission, contact the RRC for the application of this rule to exempt material. Oil-production waste generated outside of Texas falls under the authority of TCEQ if disposed of in Texas.

4.7.3 Phosphate Industry

The wholesale and retail commercial distribution (including custom blending), possession, and use of the following products and materials, or the recycling of equipment or containers used to produce, contain, or transport them, are exempt [25 TAC 289.259(d)(6)]:

- Phosphate and potash fertilizer. (Note that the manufacture of phosphate and potash fertilizer is subject to general license requirements.)
- Phosphogypsum for agricultural uses, if such commercial distribution and uses meet the requirements of 40 CFR 61.204.

4.7.4 Building, Construction, Industrial Processing, and Other NORM

Materials used for building construction are exempt if the materials contain NORM that has not been concentrated to higher levels than those found in their natural state. This exemption includes the wholesale and retail commercial distribution, possession, use, and recycling of equipment or containers used to produce, contain, or transport these materials [25 TAC 289.259(d)(6)].

Material used for building construction, industrial processing, sand blasting, metal casings, or other NORM in which the radionuclide content has not been concentrated to higher levels than found in its natural state is exempt. This exemption includes any products or materials and the recycling of equipment or containers used to produce, contain, or transport those products or materials [25 TAC 289.259(d)(5)].

The following materials commonly contain NORM at relatively high concentrations (but have not been concentrated to higher levels than those found in their natural state and are therefore exempt) and are frequently seen in exemption requests:

- Refractory bricks: NORM is not concentrated during use in a furnace and is therefore exempt under 25 TAC 289.259(d)(5)(C).
- Zirconium oxide (zircon, zirconium): commonly used as a blasting agent. It has a typical total activity of 130 to 145 pCi/g but contains a higher activity of radium (greater than 30 pCi/g) than uranium and thorium. It is exempt under 25 TAC 259(d)(5)(C) as a NORM material used in industrial processing in which radionuclide content has not been concentrated to higher levels than found in its natural state.
- Monazite sand containing thorium-232 and its daughters.
- Alumina, used for ceramic insulators in electrical equipment.

4.7.5 Potassium and By-Products from Fossil-Fuel Combustion

The following products and materials and the recycling of equipment or containers used to produce, contain, or transport them, are exempt [25 TAC 289.259(d)(5)]:

- potassium and potassium compounds that have not been isotopically enriched in the radionuclide K-40
- byproducts from fossil-fuel combustion (bottom ash, fly ash, and by-products of flue-gas emission control)

5 NON-NORM EXEMPTIONS

5.1 Exempt Concentrations of Radionuclides

Rule 25 TAC 289.251(e)(1) exempts materials (solid, liquid, or gaseous) containing radioactive material other than source material which have radionuclide concentrations that do not exceed those listed in 25 TAC §289.251(l)(1), which can be found in Tables B.3 and B.4 in Appendix B.

If a radionuclide decays to a radioactive daughter, the value in those tables for the parent radionuclide includes the daughter activity. The activity of the daughter, as long as it is not greater than the activity of the parent, is not considered in the determination of whether the material is exempt. The sum-of-fractions rule applies if more than one radionuclide is present.

Please note that in most disposal situations, waste form restrictions (such as moisture being below a certain percentage) at landfills and disposal facilities would rule out the disposal of liquid and gaseous wastes, even though values are given for liquid and gaseous concentrations in 25 TAC 289.251(l)(1). These exemption rules were written for use, as well as disposal, of those materials.

This exemption only applies to waste in which radioactive or by-product[2] material was introduced into the waste in accordance to a specific or general license (a specific license **only** for by-product material) of the NRC, an agreement state, or a licensing state.

5.2 Exempt Quantities of Radionuclides

Rule 25 TAC 289.251(e)(2) grants exemptions for materials (solid, liquid, or gaseous) containing radioactive material, other than source material, which have individual quantities of radionuclides that do not exceed those listed in 25 TAC 289.251(l)(2), reproduced in Table B.5 in Appendix B. The sum-of-fractions rule applies if more than one radionuclide is present.

Examples of individual quantities for which this rule applies include, but are not limited to, sealed sources and, for liquid waste, the container—such as a tank, truck, or train car—in which the waste is transported into the facility. If the radionuclide is listed in both 25 TAC 289.251(l)(1) and (2), then the concentration limit in 25 TAC 289.251(l)(1) is to be used.

[2] See Appendix A for definition.

This exemption only applies to waste into which radioactive material has been introduced in accordance with a specific or general license of the NRC, an agreement state, or a licensing state. Additionally, waste in which the radionuclide activity has decayed from quantities not originally exempt does not qualify for this exemption.

Note that in most disposal situations, restrictions on the form of waste (such as moisture being below a certain percentage) of landfills and disposal facilities would rule out the disposal of liquid and gaseous waste even though values are given for liquid and gaseous concentrations in 25 TAC 289.251(l)(1). Those exemption rules were written for use, as well as disposal, of such materials.

5.3 Specific Items: 25 TAC 289.251(e)(3)

The following items, which incorporate radioactivity for functional purposes, are exempt if they meet the activity and radiation exposure levels in the rule:

- Timepieces, hands, or dials [25 TAC 289.251(e)(3)(A)(i)(I)] containing not more than—
  - tritium (Hydrogen-3): 25 mCi per timepiece, 5 mCi per hand, 15 mCi per dial (bezels when used shall be considered as part of the dial);
  - radium-226: 1 μCi per timepiece in intact timepieces manufactured prior to January 1, 1986; or
  - promethium-147:
    - 100 μCi per watch or 200 μCi per any other timepiece, 20 μCi per watch hand or 40 μCi per other timepiece hand, 60 μCi per watch dial or 120 μCi per other timepiece dial (bezels when used shall be considered as part of the dial), and
    - The radiation exposure at 10 centimeters when measured through 50 milligrams per square centimeter (mg/cm^2) of absorber from any surface shall not exceed
      - 0.1 mrad/hr for wristwatches,
      - 0.1 mrad/hr for pocket watches, and
      - 0.2 mrad/hr for any other timepiece.
- Lock illuminators installed in automobile locks containing not more than [25 TAC 289.251(e)(3)(A)(i)(II)]—
  - tritium: 15 mCi or
  - promethium-147:
    - 2 mCi and

        - an exposure rate not exceeding 1 mrad/hr at 1 cm from any surface when measured through 50 mg/cm^2 of absorber.

- Precision balances containing not more than 1 mCi of tritium per balance or not more than 0.5 mCi of tritium per balance part [25 TAC 289.251(e)(3)(A)(i)(III)].
- Automobile shift quadrants containing not more than 25 mCi of tritium [25 TAC 289.251(e)(3)(A)(i)(IV)].
- Marine compasses containing not more than 750 mCi of tritium gas and other marine navigational instruments containing not more than 250 mCi of tritium gas [25 TAC 289.251(e)(3)(A)(i)(V)].
- Thermostat dials and pointers containing not more than 25 mCi of tritium per thermostat [25 TAC 289.251(e)(3)(A)(i)(VI)].
- Electron tubes (including spark-gap tubes, power tubes, gas tubes, glow lamps, receiving tubes, microwave tubes, indicator tubes, pick-up tubes, radiation detection tubes, and any other completely sealed tube designed to control electrical currents) [25 TAC 289.251(e)(3)(A)(i)(VII)] provided that—
    - each tube does not contain more than one of the following specified quantities of radioactive material:
        - Tritium: 150 mCi per microwave receiver protector tube or 10 mCi per any other electron tube,
        - Cobalt-60: 1 μCi,
        - Nickel-63: 5 μCi,
        - Krypton-85: 30 μCi,
        - Cesium-137: 5 μCi, or
        - Promethium-147: 30 μCi, and
    - for each tube, the exposure level does not exceed 1 mrad/hr at 1 cm from any surface when measured through 7 mg/cm^2 of absorber.
- Instruments for measuring ionizing radiation containing, for purposes of internal calibration or standardization, a source of radioactive material not exceeding either the applicable quantity set forth in 25 TAC 289.251(l)(2) [see Table B.5] or 0.05 μCi of americium-241 [25 TAC 289.251(e)(3)(A)(i)(VIII)].
- Spark-gap irradiators, each containing no more than 1 μCi of cobalt-60, for use in electrically ignited fuel-oil burners having a firing rate of at least 3 gallons per hour [25 TAC 289.251(e)(3)(A)(i)(IX)].
- Capsules containing 1 μCi or less of carbon-14 urea for *in vivo* diagnostic use in humans [25 TAC 289.251(e)(4)]. (A specific license is required to manufacture, prepare, process, produce, package, repackage, or transfer for commercial distribution such capsules.)

- Self-luminous products containing tritium, krypton-85, or promethium-147 if manufactured, processed, produced, imported, or transferred in accordance with a specific license issued by the NRC authorizing the transfer of the product to persons exempt from regulatory requirements except for [25 TAC 289.251(e)(3)(B)(i)]:
  - those who manufacture, process, or produce these products,
  - products in which self-luminosity serves frivolous purposes, or
  - toys or adornments.
- Ionization-chamber smoke detectors containing no more than 1 μCi of Am-241 per detector in the form of a foil and designed to protect life and property from fire [25 TAC 289.251(e)(3)(A)(i)(X)].
- Items that contain less than 0.1 μCi of radium-226 if received, possessed, used, transferred, or owned prior to January 1, 1986 [25 TAC 289.251(e)(3)(B)(ii)].
- Gas and aerosol detectors containing radioactive material designed to protect life or property from fires and airborne hazards are exempt (except for persons who manufacture, process, produce, or initially transfer these detectors) provided that the detectors were manufactured, imported, or transferred in accordance with a specific license issued by the NRC, an agreement state or a licensing state which authorizes the initial transfer of the detectors to persons who are exempt from regulatory requirements [25 TAC 289.251(e)(3)(C)].
  - Detectors must be intact to qualify for this exemption. That is, the cover must not have been removed, nor the source removed from the unit.
  - Required documentation to qualify for this exemption is typically either a sealed-source-and-device (SS&D) sheet or a copy of the radioactive-material license that identifies the make and model of the smoke detector as exempt. The SS&D sheet can be obtained from the manufacturer. If it is unobtainable, the state regulator (Chapter 7 has contact information) has access to additional resources not available to the public that may be able to identify the detector's make and model as exempt. If documentation cannot be found, then that item cannot be exempted under this rule.

5.4 Emission-control dust from electric arc furnaces: 25 TAC 289.202(ff)(2)

This exemption requires approval from either the TCEQ or the DSHS. The DSHS is the appropriate agency if the generator of the material was a DSHS licensee. The TCEQ is the appropriate agency in all other instances.

Emission-control dust and other material from electric-arc furnaces or foundries contaminated as a result of inadvertent melting of cesium-137 or americium-241 sources may be transferred for disposal to a hazardous-waste disposal facility authorized by the TCEQ without regard to its radioactivity if all of the following conditions are met [25 TAC 289.202(ff)(2)]. ("Licensee" includes the owner-operator of an electric arc furnace or foundry or the service contractor hired to handle the waste.)

- The emission-control dust and other incident-related materials ("contaminated materials"), whether packaged or unpackaged (i.e., bulk), must be treated through stabilization to comply with all waste-treatment requirements by the licensee, who must be licensed to possess, treat, or transfer incident-related material contaminated with Cs-137 or Am-241, .
- Transfer and storage (if applicable) and storage of the contaminated materials were in accordance with operating and emergency procedures approved by the appropriate regulatory agency.
- The total Cs-137 or Am-241 activity contained in the contaminated materials to be transferred for disposal was specifically approved by the NRC or all appropriate agreement states and does not exceed the total activity associated with the inadvertent melting incident.
- The operator of the hazardous-waste disposal facility has been notified in writing of the impending transfer and has agreed in writing to receive and dispose of the materials. (Copies of the notification and agreement must be submitted to the appropriate regulatory agency.)
- The licensee has notified the NRC or all agreement states in which the transferor and transferee are located, in writing, of the impending transfer, at least 30 days before the transfer.
- The stabilized contaminated materials had been packaged for transportation and disposal in non-bulk steel packaging as defined in DOT regulations at 49 CFR 173.213.
- The pretreatment average concentrations of Cs-137 in the stabilized contaminated materials do not exceed 130 pCi/g for packaged contaminated materials and 100 pCi/g for unpackaged contaminated materials.
- The pretreatment average concentrations of Am-241 in the stabilized materials do not exceed 3 pCi/g for packaged and unpackaged contaminated materials.
- The dose rate at 3.28 feet (1 meter) from the surface of any package containing the stabilized waste does not exceed 20 μrem/hr above background.
- The licensee transferring the contaminated materials must consult with the NRC, the appropriate state and federal agencies, and local governments and obtain all necessary approvals.

- The total incident-related activity received by a disposal facility over its operating life shall not exceed 1 Ci of Cs-137 and 30 mCi of Am-241.

6 ALTERNATIVE METHOD FOR OBTAINING AN EXEMPTION CONCURRENCE

Another option for obtaining an exemption concurrence is stipulated at 30 TAC 336.5(a): the TCEQ may exempt a radioactive material if it determines that the exemption is not prohibited by law and will not result in a significant risk to public health and safety or the environment. Persons requesting an exemption under this rule need to submit an application to TCEQ using the process in 30 TAC 90 (relating to regulatory flexibility).

The application must be accompanied by certain fees and must include:

- the nature of the request,
- a legal analysis to demonstrate that the exemption is not prohibited by law,
- a technical analysis to demonstrate that the exemption will not result in a significant risk to public health and safety or the environment, and
- a detailed explanation, including a demonstration as appropriate, that the proposed exemption is:
    - not prohibited by law, including any requirement for a federally approved or authorized program, and
    - at least as protective of the environment and the public health as the method or standard prescribed by the TCEQ rule that would otherwise apply.

7 OBTAINING AN EXEMPTION CONCURRENCE

To request an exemption concurrence, send a signed letter with the appropriate documentation to the Radioactive Materials Division, MC 233, TCEQ, P.O. Box 13087, Austin TX 78711-3087. Please mark on the envelope that an exemption is being requested. The request can also be scanned and electronically submitted to the Radioactive Materials Division. However, if the request is over 50 pages, a hard copy must be mailed as well. To determine the point of contact for exemptions, call the Radioactive Materials Division at 512-239-6466.

Often, a hazardous-waste disposal facility will request an exemption concurrence for the waste generator as part of its process of receiving and disposing of waste that contains radioactive material.

Please include the following information in the exemption-concurrence request:

- the waste-generator identification
- the volume of waste
- the physical form of the waste
- a sampling protocol and sampling data
- characterization
- the device manufacturer's name and device model number (if appropriate)
- any other information that may help in making the exemption determination

The TCEQ typically needs up to two weeks to review an exemption request. If the agency requires additional information, its staff will contact the requester by letter, e-mail, or phone. There is no fee for an exemption-concurrence request (or for the actual concurrence) unless the exemption is processed according to 30 TAC 336.5(a) (see Chapter 6).

An exemption concurrence can only be granted to a material or item if documentation shows that it meets the exemption criteria. Documentation can be one or more of the following: process knowledge, radiochemical analysis of the sample, radiation surveys of the item or material, or NRC analysis documenting that it meets the exemption criteria, provided that the criteria are also in the Texas Administrative Code.

7.1 Process Knowledge

Many items identified in the exemption rules have been manufactured with specific radioactive content so that those items would satisfy the exemption limits. Such items can be exempted without radiochemical analysis if it can be documented that they were manufactured to contain a radioactive content at or below the exemption limits. Some examples of such items or documentation include:

- a smoke detector which has a sticker attached verifying that it contains 1 μCi or less of americium-241
- a sealed-source-or-device sheet from the NRC exempting this specific sealed source, identified by manufacturer and model number
- NRC license showing the make and model of a device or sealed source as being authorized to be commercially distributed as an exempt item
- company literature
- a Material Data Safety Sheet
- items used by the U.S. armed forces that are built according to military specifications and listed by a national part number in the Technical Bulletin (Army, 1998) as exempt.

The list above is not an exhaustive discussion of the different possibilities for using process knowledge but only gives examples from prior exemption-concurrence requests.

Clearly defined manufacturing processes that use NORM material can be exempted using process knowledge [under 25 TAC 289.259(d)(5)(A), (5)(C), and (6)(C)] if it can be documented that the process does not concentrate the naturally occurring radionuclides according to the appropriate regulation.

7.2 Radiochemical Analysis

If process knowledge cannot demonstrate whether an item or material is exempt, then the TCEQ may require sampling to ascertain whether the waste meets the exemption criteria.

7.2.1 NELAC Accreditation

Analytical data from samples measured by a laboratory can only be accepted if the laboratory is National Environmental Laboratory Accreditation Conference (NELAC) accredited by the Texas Laboratory Accreditation Program operated by the TCEQ[3] or the data are exempt from the NELAC-accreditation requirement under one of the following criteria [30 TAC 25.6]:

- The laboratory is an on-site or in-house environmental testing laboratory that
  - is inspected at least every three years by the executive director,
  - is located in another state and accredited or periodically inspected by that state, or
  - gets inspected at least every three years by the executive director and is performing work:
    - for another company with a unit located on the same site, or
    - without compensation for a governmental agency or a charitable organization.
- The lab is accredited under federal law, including certification by the United States Environmental Protection Agency to provide analytical data for decisions relating to compliance with the Safe Drinking Water Act.
- The lab supplies analytical data necessary for emergency response and the required analytical data are not otherwise available from an environmental testing laboratory that is accredited by the TCEQ or federal law.
- The lab supplies analytical data for which the commission does not offer accreditation.

7.2.2 Minimum Detectable Activity and Detection Limit

The *minimum detectable activity* (MDA) is the smallest activity above the background level of a radionuclide that will be detected with a 95% probability (a 5% probability of a *false negative*) and a 5% probability of falsely concluding that a sample at background is above the background activity value (*false positive*). The MDA is the minimum radionuclide activity that an instrument can reliably detect.

The *detection limit* (DL) is the smallest activity that will be detected with a 5% false positive probability but with a false negative probability higher than 5%. The DL is also known as the *lower level of detection*. If the analytical result is above the DL, even if the value is below the MDA, it can be concluded that the radionuclide is present above background in that sample. The DL is the minimum activity that an instrument can detect.

It is a common error to assume that measurements below the MDA indicate that the sample does not contain that radionuclide or that the radionuclide is at background levels. Reported values below the MDA should be reported as

[3] A list of which laboratories are accredited by the TCEQ appears at <www.tceq.state.tx.us/assets/public/compliance/compliance_support/qa/txnelap_lab_list.pdf>.

measured, even if negative, and not be listed only as being below the MDA. Since values above the DL indicate the presence of the radionuclide, the MDA should not be used as the detection cutoff point.

The MDA and DL depends upon the type of instrument, the counting geometry (position and size of the radiation source in relation to the detector), the measurement methodology, and the radionuclide to be detected. The DL must be below the exemption limits or the values cannot be used to confirm that the exemption requirements have been met.

Equations 1 and 2 determine the MDA and LLD, respectively. The square root of the background activity is also the standard deviation of the background count.

Eqn. 1 $$LLD = 2.33\sqrt{B}$$

Eqn. 2 $$MDA = 3 + 4.66\sqrt{B}$$

B is the measured background activity.

7.2.3 Averaging and Homogeneity

It is important that the sample accurately represent the average activity level of the waste volume. If homogeneity cannot be guaranteed, then four to five samples are required for every 20 cubic yards (yd^3). The maximum volume of material over which averaging may be performed is 20 yd^3. No single measurement made to calculate an average volumetric or surface-activity contamination can exceed 10 times the exemption criteria.

A total of fewer than four to five samples per 20 yd^3 will be accepted if additional data are included such as the studies of contaminated soil from an environmental remediation project which had been sampled extensively during the characterization or remediation stage. Examples of acceptable data successfully used in prior exemption-concurrence requests, combined with analytical laboratory analysis of samples, include the results of an *in situ* object-counting system (ISOCS) and screening surveys of soil or debris with the intent of on-site segregation into waste types.

Each waste container is considered as a separate waste volume. Two waste volumes cannot be averaged together to determine if the activity is below the exemption limit. For example, two containers, one at 34 pCi/g Ra-226 and the other at 20 pCi/g Ra-226 cannot be averaged to yield a result of 27 pCi/g Ra-226 and thereby exempt both containers. Only the container at 20 pCi/g Ra-226 would be exempt.

7.2.4 Measurement of Daughters to Determine Parent Radionuclide Activity

Some radiochemical analyses are difficult to perform, given the isotope and the material. These analyses may require alternative testing methodologies. For example, analysis of thorium in metal is a difficult measurement to perform since iron in the sample interferes with measuring the thorium. However, the daughters of the parent nuclide (uranium or thorium) may be measured to determine the parent radionuclide concentration. In addition, whether equilibrium has been reached (daughter activity equals parent activity) or the ratio of daughter activity to parent activity (if equilibrium has not yet been reached) can be calculated from the elapsed time since the item was processed or manufactured and the half-life values of the applicable isotopes.

7.2.5 Surface Contaminated Waste

Volumetric measurements of surface-contaminated waste (averaging the activity on the surface over the mass of the piece of debris)—such as fixed contamination on concrete rubble—for disposal exemption concurrences are allowed, case by case, if the procedures in ANSI/HPS N13.12-1999 are closely followed. Contaminated distinct items or equipment, if they are to be disposed of, do not need to meet the surface-contamination release limits in 30 TAC 336.364 (see Table 1). The TCEQ will not accept a calculation that averages the activity on the surface of a piece of debris and the entire mass of material in a container containing non-contaminated rubble or other waste. *Radiological Assessments for Clearance of Materials from Nuclear Facilities* (NRC, 2003: section 3.8) contains a methodology relating specific activities (Bq/cm^2) to specific areal activity (Bq/g), including the mass-to-surface-ratio conversion factors for various steel components of nuclear power plants.

7.3 Radiation Survey

Radiation surveys (wipes or exposure rates) are sometimes required to determine if exemption requirements are met. Rules regarding the radiation-survey instruments are at 25 TAC 289.259(e), which is summarized below.

- The radiation-survey instrument must be:
  - able to measure from 1 μR/hr to at least 500 μR/hr,
  - calibrated,
  - appropriate (for example, a detector able to measure alpha radiation shall be used for alpha-emitting radionuclides), and
  - operable.
- Calibration of the radiation-survey instrument must:

  - be performed by a person licensed or registered by the DSHS, another agreement state or licensing state, or the NRC to perform such service;
  - be for the same energy values as the radiation to be measured;
  - be performed annually and also after each time that the instrument is serviced (changing the battery does not require that the instrument be calibrated); and
  - demonstrate an accuracy within ±20% using a reference source supplied by a person properly authorized.
- Records of instrument calibrations are to be maintained for inspection by the NRC, DSHS, or an appropriate agreement-state agency for five years after the calibration date.

7.4 NRC Analysis

A letter from the NRC documenting its analysis and conclusion that a specific waste volume or stream meets the exemption requirements may be accepted by TCEQ to grant an exemption concurrence in Texas, provided that the rule in the Code of Federal Regulations used by the NRC to exempt the material is also in the Texas Administrative Code (see Subsection 2.3.1).

8 REFERENCES

American National Standards Institute–Health Physics Society. 1999. *Surface and Volume Radioactivity Standards for Clearance*. ANSI/HPS N13.12-1999. McLean, VA: Health Physics Society.

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APPENDIX A: DEFINITIONS

agreement state. Any state with which the NRC has entered into an effective agreement under 274b of the Atomic Energy Act of 1954, as amended. An agreement state regulates radioactive material within its boundaries except for federal sites and nuclear power plants.

by-product material. Defined in 30 TAC 336.2(16) in regards to source material as "the tailings or wastes produced by or resulting from the extraction or concentration of uranium or thorium from ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes, and other tailings having similar radiological characteristics." It excludes underground ore bodies depleted by these solution-extraction processes.

executive director. The executive director of the commission, or any authorized individual designated to act for the executive director [30 TAC 3.2(16)].

exempt material. Radioactive material that is exempt from the radioactive-material regulations and can therefore be used or disposed of without consideration of its radioactive content.

exemption concurrence. A letter from the appropriate regulatory agency stating that a specific radioactive material or object meets the exemption criteria stipulated in the Texas Administrative Code and is therefore exempt from the radioactive material regulations.

false negative. Failure of an analysis of a sample for a radionuclide contaminant to detect that radionuclide when the sample actually is contaminated with it.

false positive. Seeming detection of a radionuclide contaminant in a sample when the sample actually is not contaminated with that radionuclide.

licensed material. Radioactive material received, possessed, used, or transferred under a general or specific license issued by the agency [25 TAC 289.201(b)(53)].

naturally occurring radioactive material. Defined in 25 TAC 289.259(c)(4) as:

> Naturally occurring materials not regulated under the A[tomic] E[nergy] A[ct] whose radionuclide concentrations have been increased by or as a result of human practices. NORM does not include the natural radioactivity of rocks or soils, or background radiation, but instead refers to materials whose radioactivity is

concentrated by controllable practices (or by past human practices). NORM does not include source, byproduct, or special nuclear material.

special nuclear material. Either (A) plutonium, uranium-233, uranium enriched in the isotope 233 or in the isotope 235, and any other material that NRC, in accordance with the provisions of the Atomic Energy Act of 1954, 51 as amended, determines to be special nuclear material, but does not include source material; or (B) any material artificially enriched by any of the foregoing, but not source material [25 TAC 289.201(b)(101)].

sum-of-fractions rule. Equation used to determine if a mixture of radionuclides exceeds a regulatory limit when each radionuclide has a different activity limit. The rule is shown in Equation A-1, but can be described as the requirement that the sum of the ratios of the radionuclide concentrations over its regulatory limit is less than or equal to one.

Eqn. A-1 $$Ratio = \sum_{i=1}^{N} \frac{C_i}{R_i} \leq 1.0$$

C is the measured concentration or activity of radioisotope *i.*

R is the regulatory limit for the concentration or activity of radioisotope *i.*

N is the total number of radioisotopes in the waste.

transuranics (TRUs). Elements with an atomic number higher than that of uranium, which is 92. Common transuranic elements are neptunium, plutonium, americium, and curium.

tritium. A hydrogen isotope with one proton and two neutrons. It is commonly referred as tritium (T) instead of hydrogen-3 (H-3).

APPENDIX B: REGULATORY TABLES USED TO DETERMINE IF A MATERIAL IS EXEMPT

Table B.1. Monthly Average Radionuclide Concentrations Allowed for Release to Sewers as Authorized at 25 TAC 336.215

Element	N	Radionuclides with monthly average concentration (µCi/ml)					
Hydrogen (H)	1	H-3	1E-2				
Beryllium (Be)	4	Be-7	6E-3	Be-10	2E-4		
Carbon (C)	6	C-11	6E-2	C14	3E-4		
Fluorine (F)	9	F-18	7E-3				
Sodium (Na)	11	Na-22	6E-5	Na-24	5E-4		
Magnesium (Mg)	12	Mg-28	9E-5				
Aluminum (Al)	13	Al-26	6E-5				
Silicon (Si)	14	Si-31	1E-3	Si-32	4E-4		
Phosphorus (P)	15	P-32	9E-5	P-33	8E-4		
Sulfur (S)	16	S-35	1E-3				
Chlorine (Cl)	17	Cl-36	2E-4	Cl-38	3E-3	Cl-39	5E-3
Potassium (K)	19	K-40	4E-5	K-42	6E-4	K-43	9E-4
		K-44	5E-3	K-45	7E-3		
Calcium (Ca)	20	Ca-41	6E-4	Ca-45	2E-4	Ca-47	1E-4
Scandium (Sc)	21	Sc-43	1E-3	Sc-44m	7E-5	Sc-44	5E-4
		Sc-46	1E-4	Sc-47	4E-4	Sc-48	1E-4
		Sc-49	3E-3				
Titanium (Ti)	22	Ti-44	4E-5	Ti-45	1E-3		
Vanadium (V)	23	V-47	4E-3	V-48	9E-5	V-49	1E-2
Chromium (Cr)	24	Cr-48	8E-4	Cr-49	4E-3	Cr-51	5E-3
Manganese (Mn)	25	Mn-51	3E-3	Mn-52m	5E-3	Mn-52	1E-4
		Mn-53	7E-3	Mn-54	3E-4	Mn-56	7E-4
Iron (Fe)	26	Fe-52	1E-4	Fe-55	1E-3	Fe-59	1E-4
		Fe-60	4E-6				
Cobalt (Co)	27	Co-55	2E-4	Co-56	6E-5	Co-57	6E-4
		Co-58m	8E-3	Co-58	2E-4	Co-60m	2E-1
		Co-60	3E-5	Co-61	3E-3	Co-62m	7E-3
Nickel (Ni)	28	Ni-56	2E-4	Ni-57	2E-4	Ni-59	3E-3
		Ni-63	1E-3	Ni-65	1E-3	Ni-66	6E-5
Copper (Cu)	29	Cu-60	4E-3	Cu-61	2E-3	Cu-64	2E-3
		Cu-67	6E-4				
Zinc (Zn)	30	Zn-62	2E-4	Zn-63	3E-3	Zn-65	5E-5
		Zn-69m	6E-4	Zn-69	8E-3	Zn-71m	8E-4
		Zn-72	1E-4				
Gallium (Ga)	31	Ga-65	9E-3	Ga-66	1E-4	Ga-67	1E-3
		Ga-68	2E-3	Ga-70	1E-2	Ga-72	2E-4
		Ga-73	7E-4				
Germanium (Ge)	32	Ge-66	3E-3	Ge-67	6E-3	Ge-68	6E-4
		Ge-69	2E-3	Ge-71	7E-2	Ge-75	9E-3
		Ge-77	1E-3	Ge-78	3E-3		
Arsenic (As)	33	As-69	6E-3	As-70	2E-3	As-71	5E-4
		As-72	1E-4	As-73	1E-3	As-74	2E-4
		As-76	1E-4	As-77	6E-4	As-78	1E-3
Selenium (Se)	34	Se-70	1E-3	Se-73m	4E-3	Se-73	4E-4
		Se-75	7E-5	Se-79	8E-5	Se-81m	3E-3

Element	N	Radionuclides with monthly average concentration (µCi/ml)					
		Se-81	1E-2	Se-83	4E-3		
Bromine (Br)	35	Br-74m	3E-3	Br-74	5E-3	Br-75	5E-3
		Br-76	5E-4	Br-77	2E-3	Br-80m	3E-3
		Br-80	1E-2	Br-82	4E-4	Br-83	9E-3
		Br-84	4E-3				
Rubidium (Rb)	37	Rb-79	8E-3	Rb-81m	4E-2	Rb-81	5E-3
		Rb-82m	2E-3	Rb-83	9E-5	Rb-84	7E-5
		Rb-86	7E-5	Rb-87	1E-4	Rb-88	4E-3
		Rb-89	9E-3				
Strontium (Sr)	38	Sr-80	6E-4	Sr-81	3E-3	Sr-82	3E-5
		Sr-83	3E-4	Sr-85m	3E-2	Sr-85	4E-4
		Sr-87m	6E-3	Sr-89	8E-5	Sr-90	5E-6
		Sr-91	2E-4	Sr-92	4E-4		
Yttrium (Y)	39	Y-86m	3E-3	Y-86	2E-4	Y-87	3E-4
		Y-88	1E-4	Y-90m	1E-3	Y-90	7E-5
		Y-91m	2E-2	Y-91	8E-5	Y-92	4E-4
		Y-93	2E-4	Y-94	4E-3	Y-95	7E-3
Zirconium (Zr)	40	Zr-86	2E-4	Zr-88	5E-4	Zr-89	2E-4
		Zr-93	4E-4	Zr-95	2E-4	Zr-97	9E-5
Niobium (Nb)	41	Nb-88	1E-2	Nb-89 (22 min)	1E-3	Nb-89 (122 min)	7E-4
		Nb-90	1E-4	Nb-93m	2E-3	Nb-94	1E-4
		Nb-95m	3E-4	Nb-95	3E-4	Nb-96	2E-4
		Nb-97	3E-3	Nb-98	2E-3		
Molybdenum (Mo)	42	Mo-90	3E-4	Mo-93m	6E-4	Mo-93	5E-4
		Mo-99	2E-4	Mo-101	7E-3		
Technetium (Tc)	43	Tc-93m	1E-2	Tc-93	4E-3	Tc-94m	3E-3
		Tc-94	1E-3	Tc-95m	5E-4	Tc-95	1E-3
		Tc-96m	2E-2	Tc-96	3E-4	Tc-97m	6E-4
		Tc-97	5E-3	Tc-98	1E-4	Tc-99m	1E-2
		Tc-99	6E-4	Tc-101	2E-2	Tc-104	4E-3
Ruthenium (Ru)	44	Ru-94	2E-3	Ru-97	1E-3	Ru-103	3E-4
		Ru-105	7E-4	Ru-106	3E-5		
Rhodium (Rh)	45	Rh-99m	2E-3	Rh-99	3E-4	Rh-100	2E-4
		Rh-101m	8E-4	Rh-101	3E-4	Rh-102m	2E-4
		Rh-102	8E-5	Rh-103m	6E-2	Rh-105	5E-4
		Rh-106m	1E-3	Rh-107	1E-2		
Palladium (Pd)	46	Pd-100	2E-4	Pd-101	2E-3	Pd-103	1E-3
		Pd-107	5E-3	Pd-109	3E-4		
Silver (Ag)	47	Ag-102	9E-3	Ag-103	5E-3	Ag-104m	4E-3
		Ag-104	3E-3	Ag-105	4E-4	Ag-106m	1E-4
		Ag-106	9E-3	Ag-108m	9E-5	Ag-110m	6E-5
		Ag-111	2E-4	Ag-112	4E-4	Ag-115	4E-3
Cadmium (Cd)	48	Cd-104	3E-3	Cd-107	3E-3	Cd-109	6E-5
		Cd-113m	5E-6	Cd-113	4E-6	Cd-115m	4E-5
		Cd-115	1E-4	Cd-117m	6E-4	Cd-117	6E-4
Indium (In)	49	In-109	3E-3	In-110 (69.1 min)	2E-3	In-110 (4.9 hr)	7E-4
		In-111	6E-4	In-112	2E-2	In-113m	7E-3
		In-114m	5E-5	In-115m	2E-3	In-115	5E-6
		In-116m	3E-3	In-117m	2E-3	In-117	8E-3
		In-119m	7E-3				
Tin (Sn)	50	Sn-110	5E-4	Sn-111	1E-2	Sn-113	3E-4
		Sn-117m	3E-4	Sn-119m	6E-4	Sn-121m	5E-4
		Sn-121	8E-4	Sn-123m	7E-3	Sn-123	9E-5

Element	N	Radionuclides with monthly average concentration (µCi/ml)					
		Sn-125	6E-5	Sn-126	4E-5	Sn-127	9E-4
		Sn-128	1E-3				
Antimony (Sb)	51	Sb-115	1E-2	Sb-116m	3E-3	Sb-116	1E-2
		Sb-117	9E-3	Sb-118m	7E-4	Sb-119	2E-3
		Sb-120	2E-2	Sb-120 (5.8d)	1E-4	Sb-122	1E-4
		Sb-124m	3E-2	Sb-124	7E-5	Sb-125	3E-4
		Sb-126m	9E-3	Sb-126	7E-5	Sb-127	1E-4
		Sb-128 (10 min)	1E-2	Sb-128 (9.01 hr)	2E-4	Sb-129	4E-4
		Sb-130	3E-3	Sb-131	2E-3		
Tellurium (Te)	52	Te-116	1E-3	Te-121m	1E-4	Te-121	4E-4
		Te-123m	1E-4	Te-123	2E-4	Te-125m	2E-4
		Te-127m	9E-5	Te-127	1E-3	Te-129m	7E-5
		Te-129	4E-3	Te-131m	8E-5	Te-131	8E-4
		Te-132	9E-5	Te-133m	9E-4	Te-133	4E-3
		Te-134	3E-3				
Iodine (I)	53	I-120m	2E-3	I-120	1E-3	I-121	4E-3
		I-123	1E-3	I-124	2E-5	I-125	2E-5
		I-126	1E-5	I-128	8E-3	I-129	2E-6
		I-130	2E-4	I-131	1E-5	I-132m	1E-3
		I-132	1E-3	I-133	7E-5	I-134	4E-3
		I-135	3E-4				
Cesium (Cs)	55	Cs-125	1E-2	Cs-127	9E-3	Cs-129	3E-3
		Cs-130	1E-2	Cs-131	3E-3	Cs-132	4E-4
		Cs-134m	2E-2	Cs-134	9E-6	Cs-135m	1E-2
		Cs-135	1E-4	Cs-136	6E-5	Cs-137	1E-5
		Cs-138	4E-3				
Barium (Ba)	56	Ba-126	8E-4	Ba-128	7E-5	Ba-131m	7E-2
		Ba-131	4E-4	Ba-133m	4E-4	Ba-133	2E-4
		Ba-135m	4E-4	Ba-139	2E-3	Ba-140	8E-5
		Ba-141	3E-3	Ba-142	7E-3		
Lanthanum (La)	57	La-131	6E-3	La-132	4E-4	La-135	5E-3
		La-137	2E-3	La-138	1E-4	La-140	9E-5
		La-141	5E-4	La-142	1E-3	La-143	5E-3
Cerium (Ce)	58	Ce-134	8E-5	Ce-135	2E-4	Ce-137m	3E-4
		Ce-137	7E-3	Ce-139	7E-4	Ce-141	3E-4
		Ce-143	2E-4	Ce-144	3E-5		
Praseodymium (Pr)	59	Pr-136	1E-2	Pr-137	5E-3	Pr-138m	1E-3
		Pr-139	6E-3	Pr-142m	1E-2	Pr-142	1E-4
		Pr-143	2E-4	Pr-144	6E-3	Pr-145	4E-4
		Pr-147	1E-2				
Neodymium (Nd)	60	Nd-136	2E-3	Nd-138	3E-4	Nd-139m	7E-4
		Nd-139	1E-2	Nd-141	2E-2	Nd-147	2E-4
		Nd-149	1E-3	Nd-151	9E-3		
Promethium (Pm)	61	Pm-141	8E-3	Pm-143	7E-4	Pm-144	2E-4
		Pm-145	1E-3	Pm-146	2E-4	Pm-147	7E-4
		Pm-148m	1E-4	Pm-148	7E-5	Pm-149	2E-4
		Pm-150	7E-4	Pm-151	2E-4		
Samarium (Sm)	62	Sm-141m	4E-3	Sm-141	8E-3	Sm-142	1E-3
		Sm-145	8E-4	Sm-146	3E-6	Sm-147	4E-6
		Sm-151	2E-3	Sm-153	3E-4	Sm-1552	1E-2
		Sm-156	7E-4				
Europium (Eu)	63	Eu-145	2E-4	Eu-146	1E-4	Eu-147	4E-4
		Eu-148	1E-4	Eu-149	2E-3	Eu-150	4E-4

Element	N	Radionuclides with monthly average concentration (µCi/ml)					
						(12.6 h)	
		Eu-150 (34.2 y)	1E-4	Eu-152m	4E-4	Eu-152	1E-4
		Eu-154	7E-5	Eu-155	5E-4	Eu-156	8E-5
		Eu-157	3E-4	Eu-158	3E-3		
Gadolinium (Gd)	64	Gd-145	6E-3	Gd-146	2E-4	Gd-147	3E-4
		Gd-148	3E-6	Gd-149	4E-4	Gd-151	9E-4
		Gd-152	4E-6	Gd-153	6E-4	Gd-159	4E-4
Terbium (Tb)	65	Tb-147	1E-3	Tb-149	7E-4	Tb-150	7E-4
		Tb-151	5E-4	Tb-153	7E-4	Tb-154	2E-4
		Tb-155	8E-4	Tb-156m (5.0 hr)	2E-3	Tb-156m (24.4 hr)	1E-3
		Tb-156	1E-4	Tb-157	7E-3	Tb-158	2E-4
		Tb-160	1E-4	Tb-161	3E-4		
Dysprosium (Dy)	66	Dy-155	1E-3	Dy-157	3E-3	Dy-159	2E-3
		Dy-165	2E-3	Dy-166	1E-4		
Holmium (Ho)	67	Ho-155	6E-3	Ho-157	4E-2	Ho-159	3E-2
		Ho-161	1E-2	Ho-162m	7E-3	Ho-162	1E-1
		Ho-164m	1E-2	Ho-164	3E-2	Ho-166m	9E-5
		Ho-166	1E-4	Ho-167	2E-3		
Erbium (Er)	68	Er-161	2E-3	Er-165	9E-3	Er-169	5E-4
		Er-171	5E-4	Er-172	2E-4		
Thulium (Tm)	69	Tm-162	1E-2	Tm-166	6E-4	Tm-167	3E-4
		Tm-170	1E-4	Tm-171	2E-3	Tm-172	1E-4
		Tm-173	6E-4	Tm-175	1E-2		
Ytterbium (Yb)	70	Yb-162	1E-2	Yb-166	2E-4	Yb-167	4E-2
		Yb-169	2E-4	Yb-175	4E-4	Yb-177	2E-3
		Yb-178	2E-3				
Lutetium (Lu)	71	Lu-169	3E-4	Lu-170	2E-4	Lu-171	3E-4
		Lu-172	1E-4	Lu-173	7E-4	Lu-174m	4E-4
		Lu-174	7E-4	Lu-176m	1E-3	Lu-176	1E-4
		Lu-177m	1E-4	Lu-177	4E-4	Lu-178m	8E-3
		Lu-178	6E-3	Lu-179	9E-4		
Hafnium (Hf)	72	Hf-170	4E-4	Hf-172	2E-4	Hf-173	7E-4
		Hf-175	4E-4	Hf-177m	3E-3	Hf-178m	3E-5
		Hf-179m	1E-4	Hf-180m	1E-3	Hf-181	2E-4
		Hf-182m	5E-3	Hf-182	5E-5	Hf-183	3E-3
		Hf-184	3E-4				
Tantalum (Ta)	73	Ta-172	5E-3	Ta-173	9E-4	Ta-174	4E-3
		Ta-175	8E-4	Ta-176	5E-4	Ta-177	2E-3
		Ta-178	2E-3	Ta-179	3E-3	Ta-180m	3E-3
		Ta-180	2E-4	Ta-182m	3E-2	Ta-182	1E-4
		Ta-183	2E-4	Ta-184	3E-4	Ta-185	4E-3
		Ta-186	1E-2				
Tungsten (W)	74	W-176	1E-3	W-177	3E-3	W-178	7E-4
		W-179	7E-2	W-181	2E-3	W-185	4E-4
		W-187	3E-4	W-188	7E-5		
Rhenium (Re)	75	Re-177	2E-2	Re-178	1E-2	Re-181	7E-4
		Re-182 (12.7 hr)	9E-4	Re-182 (64.0 hr)	2E-4	Re-184m	3E-4
		Re-184	3E-4	Re-186m	2E-4	Re-186	3E-4
		Re-187	8E-2	Re-188m	1E-2	Re-188	2E-4
		Re-189	4E-4				
Osmium (Os)	76	Os-180	1E-2	Os-181	2E-3	Os-182	3E-4
		Os-185	3E-4	Os-189m	1E-2	Os-191m	2E-3

Element	N	Radionuclides with monthly average concentration (µCi/ml)					
		Os-191	3E-4	Os-193	2E-4	Os-194	8E-5
Iridium (Ir)	77	Ir-182	6E-3	Ir-184	1E-3	Ir-185	7E-4
		Ir-186	3E-4	Ir-187	1E-3	Ir-188	3E-4
		Ir-189	7E-4	Ir-190m	2E-2	Ir-190	1E-4
		Ir-192m	4E-4	Ir-192	1E-4	Ir-194m	9E-5
		Ir-194	1E-4	Ir-195m	1E-3	Ir-195	2E-3
Platinum (Pt)	78	Pt-186	2E-3	Pt-188	2E-4	Pt-189	1E-3
		Pt-191	5E-4	Pt-193m	4E-4	Pt-193	6E-3
		Pt-195m	3E-4	Pt-197m	2E-3	Pt-197	4E-4
		Pt-199	7E-3	Pt-200	2E-4		
Gold (Au)	79	Au-193	1E-3	Au-194	4E-4	Au-195	7E-4
		Au-198m	1E-4	Au-198	2E-4	Au-199	4E-4
		Au-200m	2E-4	Au-200	4E-3	Au-201	1E-2
Mercury (Hg)	80	Hg-193m	6E-4	Hg-193	3E-3	Hg-194	2E-6
organic		Hg-195m	4E-4	Hg-195	2E-3	Hg-197m	5E-4
		Hg-197	9E-4	Hg-199m	1E-2	Hg-203	7E-5
Mercury (Hg)	80	Hg-193m	4E-4	Hg-193	2E-3	Hg-195	1E-4
sulfate		Hg-195m	3E-4	Hg-195	2E-3	Hg-197m	4E-4
		Hg-197	8E-4	Hg-199m	8E-3	Hg-203	3E-4
Thallium (Tl)	81	Tl-194m	1E-2	Tl-194	4E-2	Tl-195	9E-3
		Tl-197	1E-2	Tl-198m	4E-3	Tl-198	3E-3
		Tl-199	9E-3	Tl-200	1E-3	Tl-201	2E-3
		Tl-202	5E-4	Tl-204	2E-4		
Lead (Pb)	82	Pb-195m	8E-3	Pb-198	4E-3	Pb-199	3E-3
		Pb-200	4E-4	Pb-201	1E-3	Pb-202m	1E-3
		Pb-202	2E-5	Pb-203	7E-4	Pb-205	5E-4
		Pb-209	3E-3	Pb-210	1E-7	Pb-211	2E-3
		Pb-212	2E-5	Pb-214	1E-3		
Bismuth (Bi)	83	Bi-200	4E-3	Bi-201	2E-3	Bi-202	2E-3
		Bi-203	3E-4	Bi-205	2E-4	Bi-206	9E-5
		Bi-207	1E-4	Bi-210m	8E-6	Bi-210	1E-4
		Bi-212	7E-4	Bi-213	1E-3	Bi-214	3E-3
Polonium (Po)	84	Po-203	3E-3	Po-205	3E-3	Po-207	1E-3
		Po-210	4E-7				
Astatine (At)	85	At-207	8E-4	At-211	2E-5		
Francium (Fr)	87	Fr-222	3E-4	Fr-223	8E-5		
Radium (Ra)	88	Ra-223	1E-6	Ra-224	2E-6	Ra-225	2E-6
		Ra-226	6E-7	Ra-227	3E-3	Ra-228	6E-7
Actinium (Ac)	89	Ac-224	3E-4	Ac-225	7E-6	Ac-226	2E-5
		Ac-227	5E-8	Ac-228	3E-4		
Thorium (Th)	90	Th-226	7E-4	Th-227	2E-5	Th-228	2E-6
		Th-229	2E-7	Th-230	1E-6	Th-231	5E-4
		Th-232	3E-7	Th-234	5E-5		
Protactinium (Pa)	91	Pa-227	5E-4	Pa-228	2E-4	Pa-230	1E-4
		Pa-231	6E-8	Pa-232	2E-4	Pa-233	2E-4
		Pa-234	3E-4				
Uranium (U)	92	U-230	8E-7	U-231	6E-4	U-232	6E-7
		U-233	3E-6	U-234	3E-6	U-235	3E-6
		U-236	3E-6	U-237	3E-4	U-238	3E-6
		U-239	9E-3	U-240	2E-4	U-natural	3E-6
Neptunium (Np)	93	Np-232	2E-2	Np-233	1E-1	Np-234	3E-4
		Np-235	3E-3	Np-236 (1.2E5 yr)	9E-7	Np-236 (22.5 hr)	5E-4
		Np-237	2E-7	Np-238	2E-4	Np-239	2E-4
		Np-240	3E-3				

Element	N	Radionuclides with monthly average concentration (µCi/ml)					
Plutonium (Pu)	94	Pu-234	1E-3	Pu-235	1E-1	Pu-236	6E-7
		Pu-237	2E-3	Pu-238	2E-7	Pu-239	2E-7
		Pu-240	2E-7	Pu-241	1E-5	Pu-242	2E-7
		Pu-243	2E-3	Pu-244	2E-7	Pu-245	3E-4
		Pu-246	6E-5				
Americium (Am)	95	Am-237	1E-2	Am-238	5E-3	Am-239	7E-4
		Am-240	3E-4	Am-241	2E-7	Am-242m	2E-7
		Am-242	5E-4	Am-243	2E-7	Am-244m	1E-2
		Am-244	4E-4	Am-245	4E-3	Am-246m	8E-3
		Am-246	4E-3				
Curium (Cm)	96	Cm-238	2E-3	Cm-240	1E-5	Cm-241	2E-4
		Cm-242	7E-6	Cm-243	3E-7	Cm-244	3E-7
		Cm-245	2E-7	Cm-246	2E-7	Cm-247	2E-7
		Cm-248	5E-8	Cm-249	7E-3	Cm-250	9E-9
Berkelium (Bk)	97	Bk-245	3E-4	Bk-246	4E-4	Bk-247	2E-7
		Bk-249	6E-5	Bk-250	1E-3		
Californium (Cf)	98	Cf-244	4E-3	Cf-246	5E-5	Cf-248	2E-6
		Cf-249	2E-7	Cf-250	3E-7	Cf-251	2E-7
		Cf-252	7E-7	Cf-253	5E-5	Cf-254	3E-7
Einsteinium (Es)	99	Es-250	6E-3	Es-251	1E-3	Es-253	2E-5
		Es-254m	4E-5	Es-254	2E-6		
Fermium (Fm)	100	Fm-252	6E-5	Fm-253	1E-4	Fm-254	4E-4
		Fm-255	7E-5	Fm-257	5E-6		
Mendelevium (Md)	101	Md-257	1E-3	Md-258	6E-6		
Any single radionuclide not listed above with decay mode other than alpha emission or spontaneous fission and with radioactive half-life greater than 2 hours							1E-7
Any single radionuclide not listed above that decays by alpha emission or spontaneous fission, or any mixture for which either the identity or the concentration of any radionuclide in the mixture is not known							2E-8

Table B.2. Radionuclide Concentration and Annual Activity Limits for Disposal in a Type I Municipal Solid Waste Facility or a Hazardous Waste Facility According to 30 TAC 336.225(c) and 336.365 (Section 3.3)

Radioisotope	Concen-tration Limit (Ci/m^3)	Annual Generator Limit (Ci/yr)	Radioisotope	Concen-tration LImit (Ci/m^3)	Annual Generator Limit (Ci/yr)
Fluorine-18	3E-1	8	Rhodium-106	1	30
Sodium-24	9E-4	2E-2	Ag-110m	2E-3	5E-2
Silicon-31	1E+2	3E+3	Cadmium-115m	2E-1	5
Phosphorus-32	2	50	Indium-111	9E-2	2
Phosphorus-33	10	3E+2	Indium-113m	9	2E+2
Sulfur-35	9	2E+2	Tin-113	6E-2	2
Argon-41	3E-1	8	Tin-119	20	5E+2
Potassium-42	2E-2	5E-1	Antimony-124	2E-3	5E-2
Calcium-45	4	1E+2	Iodine-123	4E-1	10
Calcium-47	2E-2	5E-1	Iodine-125	7E-1	20
Scandium-46	2E-3	5E-2	Iodine-131	4E-2	1
Chromium-51	6E-1	20	Iodine-133	2E-2	5E-1
Iron-59	5E-3	1E-1	Tellurium-129	2E-1	5
Cobalt-57	6E-2	2	Xenon-127	8E-2	2
Cobalt-58	1E-2	3E-1	Xenon-133	1	30
Zinc-65	7E-3	2E-1	Barium-140	2E-3	5E-2
Gallium-67	3E-1	8	Lanthanum-140	2E-3	5E-2
Selenium-75	5E-2	1	Cerium-141	4E-1	10
Bromine-82	2E-3	5E-2	Cerium-144	1E-3	3E-2
Rubidium-86	4E-2	1	Praseodymium-143	6	2E+2
Strontium-85	2E-2	5E-1	Neodymium-147	7E-2	2
Strontium-89	8	2E+2	Ytterbium-169	6E-2	2
Yttrium-90	4	1E+2	Iridium-192	1E-2	3E-1
Yttrium-91	4E-1	10	Gold-198	3E-2	8E-1
Zirconium-95	8E-3	2E-1	Mercury-197	8E-1	20
Niobium-95	8E-3	2E-1	Thallium-201	4E-1	10
Molybdenum-99	5E-2	1	Mercury-203	1E-1	3
Technetium-99m	1	30			

Table B.3. Concentration Limits for Exemptions for Liquid (µCi/ml) and for Solids (µCi/g) According to 25 TAC 289.251(e)(1) and 289.251(l)(1) (see Section 5.1)

Element (Atomic Number)	Isotope[a]	Concentration	Isotope[a]	Concentration
Antimony (51)	Sb-122	3E-4	Sb-124	2E-4
	Sb-125	1E-3		
Arsenic (33)	As-73	5E-3	As-74	5E-4
	As-76	2E-4	As-77	8E-4
Barium (56)	Ba-131	2E-3	Ba-140	3E-4
Beryllium (4)	Be-7	2E-2		
Bismuth (83)	Bi-206	4E-4		
Bromine (35)	Br-82	3E-3		
Cadmium (48)	Cd-109	2E-3	Cd-115m	3E-4
	Cd-115	3E-4		
Calcium (20)	Ca-45	9E-5	Ca-47	5E-4
Carbon (6)	C-14	8E-3		
Cerium (58)	Ce-141	9E-4	Ce-143	4E-4
	Ce-144	1E-4		
Cesium (55)	Cs-131	2E-2	Cs-134m	6E-2
	Cs-134	9E-5		
Chlorine (17)	Cl-138	4E-3		
Chromium (24)	Cr-51	2E-2		
Cobalt (27)	Co-57	5E–3	Co-58	1E-3
	Co-60	5E-4		
Copper (29)	Cu-64	3E-3		
Dysprosium (66)	Dy-165	4E-3	Dy-166	4E-4
Erbium (68)	Er-169	9E-4	Er-171	1E-3
Europium (63)	Eu-152[b]	6E-4	Eu-155	2E-3
Fluorine (9)	F-18	8E-3		
Gadolinium (64)	Gd-153	2E-3	Gd-159	8E-4
Gallium (31)	Ga-72	4E-4		
Germanium (32)	Ge-71	2E-2		
Gold (79)	Au-196	2E-3	Au-198	5E-4
	Au-199	2E-3		
Hafnium (72)	Hf-181	7E-4		
Hydrogen (1)	H-3	3E-2		
Indium (49)	In-113m	1E-2	In-114m	2E-4
Iodine (53)	I-126	2E-5	I-131	2E-5
	I-132	6E-4	I-133	7E-5
	I-134	1E-3		
Iridium (77)	Ir-190	2E-3	Ir-192	4E-4
	Ir-194	3E-4		
Iron (26)	Fe-55	8E-3	Fe-59	6E-4
Lanthanum (57)	La-140	2E-4		
Lead (82)	Pb-203	4E-3		
Lutetium (71)	Lu-177	1E-3		
Manganese (25)	Mn-52	3E-4	Mn-54	1E-3
	Mn-56	1E-3		
Mercury (80)	Hg-197m	2E-3	Hg-197	3E-3
	Hg-203	2E-4		
Molybdenum (42)	Mo-99	2E-3		
Neodymium (60)	Nd-147	6E-4	Nd-149	3E-3
Nickel (28)	Ni-65	1E-3		
Niobium (Columbium) (41)	Nb-95	1E-3	Nb-97	9E-3
Osmium (76)	Os-185	7E-4	Os-191m	3E-2
	Os-191	2E-3	Os-193	6E-4

Element (Atomic Number)	Isotope[a]	Concentration	Isotope[a]	Concentration
Palladium (46)	Pd-103	3E-3	Pd-109	9E-4
Phosphorus (15)	P-32	2E-4		
Platinum (78)	Pt-191	1E-3	Pt-193m	1E-2
	Pt-197m	1E-2	Pt-197	1E-3
Polonium (84)	Po-210	7E-6		
Potassium (19)	K-42	3E-3		
Praseodymium	Pr-142	3E-4	Pr-143	5E-4
Promethium (61)	Pm-147	2E-3	Pm-149	4E-4
Radium (88)	Ra-226	1E-7	Ra-228	3E-7
Rhenium (75)	Re-183	6E-3	Re-186	9E-4
	Re-188	6E-4		
Rhodium (45)	Rh-103m	1E-1	Rh-105	1E-3
Rubidium (37)	Rb-86	7E-4		
Ruthenium (44)	Ru-97	4E-3	Ru-103	8E-4
	Ru-105	1E-3	Ru-106	1E-4
Samarium (62)	Sm-153	8E-4		
Scandium (21)	Sc-46	4E-4	Sc-47	9E-4
	Sc-48	3E-4		
Selenium (34)	Se-75	3E-3		
Silicon (14)	Si-131	9E-3		
Ag (47)	Ag-105	1E-3	Ag-110m	3E-4
	Ag-111	4E-4		
Sodium (11)	Na-24	2E-3		
Strontium (38)	Sr-85	1E-3	Sr-89	1E-4
	Sr-91	7E-4	Sr-92	7E-4
Sulfur (16)	S-35	6E-4		
Tantalum (73)	Ta-82	4E-4		
Technetium (43)	Tc-96m	1E-1	Tc-96	1E-3
Tellurium (52)	Te-125m	2E-3	Te-127m	6E-4
	Te-127	3E-3	Te-129m	3E-4
	Te-131m	6E-4	Te-132	3E-4
Terbium (65)	Tb-160	4E-4		
Thallium (81)	Tl-200	4E-3	Tl-201	3E-3
	Tl-202	1E-3	Tl-204	1E-3
Thulium (69)	Tm-170	5E-4	Tm-171	5E-3
Tin (50)	Sn-113	9E-4	Sn-125	2E-4
Tungsten(Wolfram) (74)	W-181	4E-3	W-187	7E-4
Vanadium (23)	V-48	3E-4		
Ytterbium (70)	Yb-175	1E-3		
Yttrium (39)	Y-90	2E-4	Y-91m	3E-2
	Y-91	3E-4	Y-92	6E-4
	Y-93	3E-4		
Zinc (30)	Zn-65	1E-3	Zn-69m	7E-4
	Zn-69	2E-2		
Zirconium (40)	Zr-95	6E-4	Zr-97	2E-4
Beta and/or gamma emitting radioactive material not listed above with half-life less than 3 years			1E-6	

[a] m referes to the metastable state of that radioisotope.
[b] Value for the isotope Eu-152, with a half-life of 9.2 hours.

Table B.4.Concentration Limits for Exemptions for Gases (µCi/ml) According to 25 TAC 289.251(e)(1) and 289.251(l)(1) (see Section 5.1)

Element (Atomic Number)	Isotope	Concentration	Isotope	Concentration
Argon (18)	Ar-37	1E-3	Ar-41	1E-7
Bromine (35)	Br-82	4E-7		
Carbon (6)	C-14	1E-6		
Chlorine (17)	Cl-138	9E-7		
Fluorine (9)	F-18	2E-6		
Hydrogen (1)	H-3	5E-6		
Iodine (53)	I-126	3E-9	I-131	3E-9
	I-132	8E-8	I-133	1E-8
	I-134	2E-7		
Krypton (36)	Kr-85m	1E-6	Kr-85	3E-6
Sulfur (16)	S-35	9E-8		
Xenon (54)	Xe-131m	4E-6	Xe-133	3E-6
	Xe-135	1E-6		
Beta and/or gamma emitting radioactive material not listed above with half-life less than 3 years			1E-10	

Table B.5.Total Activity Limits for Exemptions of Individual Quantities per Container According to 25 TAC 289.251(e)(2) and 289.251(l)(2) (see Section 5.2)

Isotope	µCi	Isotope	µCi	Isotope	µCi	Isotope	µCi
Antimony-122 (Sb-122)	100	Sb-124	10	Sb-125	10		
Arsenic-73 (As-73)	100	As-74	10	As-76	10	As-77	100
Barium-131 (Ba-131)	10	Ba-133	10	Ba-140	10		
Beryllium-7 (Be-7)	100						
Bismuth-210 (Bi-210)	1						
Bromine-82 (Br-82)	10						
Cadmium-109 (Cd-109)	10	Cd-115m	10	Cd-115	100		
Calcium-45 (Ca-45)	10	Ca-47	10				
Carbon-14 (C-14)	100						
Cerium-141 (Ce-141)	100	Ce-143	100	Ce-144	1		
Cesium-129 (Cs-129)	100	Cs-131	1,000	Cs-134m	100	Cs-134	1
		Cs-135	10	Cs-136	10	Cs-137	10
Chlorine-36 (Cl-36)	10	Cl-38	10				
Chromium-51 (Cr-51)	1,000						
Cobalt-57 (Co-57)	100	Co-58m	10	Co-58	10	Co-60	1
Copper-64 (Cu-64)	100						
Dysprosium-165 (Dy-165)	10	Dy-166	100				
Erbium-169 (Er-169)	100	Er-171	100				
Europium-152 (Eu-152), 9.2 hour half-life	100	Eu-152 13 year	1	Eu-154	1	Eu-155	10
Fluorine-18 (F-18)	1,000						
Gadolinium-153 (Gd-153)	10	Gd-159	100				
Gallium-67 (Ga-67)	100	Ga-72	10				
Germanium-68 (Ge-68)	10	Ge-71	100				
Gold-195 (Au-195)	10	Au-198	100	Au-199	100		
Hafnium-181 (Hf-181)	10						
Holmium-166 (Ho-166)	100						
Hydrogen-3 (H-3)	1,000						
Indium-111 (In-111)	100	In-113m	100	In-114m	10	In-115m	100
		In-115	10				
Iodine-123 (I-123)	100	I-125	1	I-126	1	I-129	0.1
		I-131	1	I-132	10	I-133	1
		I-134	10	I-135	10		
Iridium-192 (Ir-192)	10	Ir-194	100				
Iron-52 (Fe-52)	10	Fe-55	100	Fe-59	10		
Krypton-85 (Kr-85)	100	Kr-87	10				
Lanthanum-140 (La-140)	10						
Lutetium-177 (Lu-177)	100						
Manganese-52 (Mn-52)	10	Mn-54	10	Mn-56	10		
Mercury-197m (Hg-197m)	100	Hg-197	100	Hg-203	10		
Molybdenum-99 (Mo-99)	100						
Neodymium-147 (Nd-147)	100	Nd-149	100				
Nickel-59 (Ni-59)	100	Ni-63	10	Ni-65	100		
Niobium-93m (Nb-93m)	10	Nb-95	10	Nb-97	10		
Osmium-185 (Os-185)	10	Os-191m	100	Os-191	100	Os-193	100
Palladium-103 (Pd-103)	100	Pd-109	100				
Phosphorus-32 (P-32)	10						
Platinum-191 (Pt-191)	100	Pt-193m	100	Pt-193	100	Pt-197m	100
		Pt-197	100				
Polonium-210 (Po-210)	0.1						
Potassium-42 (K-42)	10	K-43	10				
Praseodymium-142 (Pr-142)	100	Pr-143	100				

Isotope	µCi	Isotope	µCi	Isotope	µCi	Isotope	µCi
Promethium-147 (Pm-147)	10	Pm-149	10				
Radon-222 (Rn-222)	100						
Rhenium-186 (Re-186)	100	Re-188	100				
Rhodium-103m (Rh-103m)	100	Rh-105	100				
Rubidium-81 (Rb-81)	10	Rb-86	10	Rb-87	10		
Ruthenium-97 (Ru-97)	100	Ru-103	10	Ru-105	10	Ru-106	1
Samarium-151 (Sm-151)	10	Sm-153	100				
Scandium-46 (Sc-46)	10	Sc-47	100	Sc-48	10		
Selenium-75 (Se-75)	10						
Silicon-31 (Si-31)	100						
Silver-105 (Ag-105)	10	Ag-110m	1	Ag-111	100		
Sodium-22 (Na-22)	10	Na-24	10				
Strontium-85 (Sr-85)	10	Sr-87m	10	Sr-89	1	Sr-90	0.1
		Sr-91	10	Sr-92	10		
Sulphur-35 (S-35)	100						
Tantalum-182 (Ta-182)	10						
Technetium-96 (Tc-96)	10	Tc-97m	100	Tc-97	100	Tc-99m	100
		Tc-99	10				
Tellurium-125m (Te-125m)	10	Te-127m	10	Te-127	100	Te-129m	10
		Te-129	100	Te-131m	10	Te-132	10
Terbium-160 (Tb-160)	10						
Thallium-200 (Tl-200)	100	Tl-201	100	Tl-202	100	Tl-204	10
Thulium-170 (Tm-170)	10	Tm-171	10				
Tin-113 (Sn-113)	10	Sn-125	10				
Tungsten-181 (W-181)	10	W-185	10	W-187	100		
Vanadium-48 (V-48)	10						
Xenon-131m (Xe-131m)	1,000	Xe-133	100	Xe-135	100		
Ytterbium-175 (Yb-175)	100						
Yttrium-87 (Y-87)	10	Y-88	10	Y-90	10	Y-91	10
		Y-92	100	Y-93	100		
Zinc-65 (Zn-65)	10	Zn-69m	100	Zn-69	1,000		
Zirconium-93 (Zr-93)	10	Zr-95	10	Zr-97	10		
Any radioactive material not listed above other than alpha emitting radioactive material							0.1

APPENDIX C: RADIATION PRIMER

Radiation is the release of energy by the nucleus of an atom to obtain a more stable (but still radioactive) or a stable (non-radioactive) state, which is called a *decay*. Radioactive materials are detected and analyzed by measuring the radiation released by the material.

An atom consists of a nucleus in its center, containing most of the atomic mass, and electrons surrounding the nucleus, comprising most of the atomic volume. The nucleus is composed of a combination of two particles: protons and neutrons. Atoms with the same number of protons are of the same element. For example, all atoms with six protons are carbon atoms and all atoms with eight protons are oxygen atoms. The atomic number of an atom is the sum of the protons and neutrons in the nucleus.

Atoms of the same element (same number of protons) but with different number of neutrons are called *isotopes*. Isotopes of the same element have the same chemical properties but the nuclei may have different radioactive statuses. For example, beryllium (Be), which has four protons in its nucleus, has several isotopes: Be-7 (3 neutrons) has a half-life of 53.28 days and emits a gamma ray, Be-9 (5 neutrons) is stable, and Be-10 (6 neutrons) has a half-life of 1.5 million years and emits a beta particle. Both *radioisotope* and *radionuclide* are terms for an atom with a radioactive nucleus.

A metastable isotope is an atom whose nucleus has excess energy that will undergo radioactive decay by emitting the excess energy to become the isotope with a non-energized nucleus, which may still be radioactive. For example, Tc-99m will undergo radioactive decay and become the radioisotope Tc-99.

The excess energy released by the nucleus is either in the form of a light particle, also known as a photon (this is *non-ionizing* radiation), or an energized charged particle (this is *ionizing* radiation). Each type of radiation interacts with matter differently, and thus different types of detectors are required to detect and measure each type. The different kinds of detectors used to measure radiation are not discussed in this primer. The three main types of radiation are:

1. A *gamma ray*, which is a photon emitted by the nucleus (in contrast to an x-ray which is a photon emitted by changes in the position of the electrons inside an atom to a lower energy state).
2. A *beta particle*, which is an electron.
3. An *alpha particle*, which is a helium nucleus (two protons and two neutrons).

The lifespan of a specific radioisotope is measured by its half-life, which is the amount of time required for half of these radioisotopes to decay. For example: Cesium-137 (atomic number, 137; its nucleus has 55 protons and 82 neutrons) has a half-life of 30 years and, in 30 years, 2 grams of Cs-137 will have decayed to 1 gram.

A related concept is the *decay constant*, which is the probability that the radionuclide will decay within a specified time. The decay constant can be calculated using the half-life as shown in equation C.1. The decay constant of Cs-137 is 0.023 per year. A Cs-137 atom has a 2.3% probability of decaying in any year. The equation to determine how many radioactive isotopes remain after a period of time is shown in equation C.2

Eqn. C.1 $$\lambda = \frac{\ln(2)}{T_{1/2}}$$

λ is the radioactive decay constant.

ln(2) is the natural log of 2, which is equal to 0.69315

$T_{1/2}$ = half-life.

Eqn. C.2 $$N(t) = N_0 e^{-\lambda t}$$

$N(t)$ is the number of radioactive isotopes at time t.

N_0 is the initial number of radioactive isotopes (at $t = 0$).

t is time.

The activity of a radioactive material is the number of decays that happen per unit time and is measured in units of counts per minute, disintegrations per minute, becquerel (Bq, one disintegration per second), or curie (Ci, 3.7×10^{10} disintegrations per second). The becquerel is the International System (SI) unit. Activity is measured by radiation detectors and can be calculated using equation C.3:

Eqn. C.3 $A = \lambda N$

A is the activity.

N is the number of atoms.

Radiation detectors only detect some of the radiation that enters the detector. Careful calibration of the instrument allows one to determine what percentage of radiation is detected, which is called the efficiency of the detector. The efficiency depends on the radiation type and its energy. Counts per minute (cpm) are the number of radiation particles that are detected (counted) in a minute. Disintegrations per minute (dpm) are the actual number of radiation particles emitted; dpm is calculated in equation D.4.

Eqn. C.4 $$\text{dpm} = \frac{\text{cpm}}{\text{efficiency}}$$

Additionally, radiation is present in the background due to naturally occurring radioactive materials and cosmic rays. This background radiation is not included in the radiation measurements to determine if a waste is at or below the exemption limits, unless the rule for that specific exemption stipulates that background be included. Therefore, a background count is typically measured (in an area close to the waste but at a sufficient distance so that the radioactivity in the waste does not affect the measurement) using the same radiation detector before measuring the waste sample. The background activity value is then subtracted from the measured activity value of the waste to obtain the activity value for the waste.

APPENDIX IVI

LIQUID WASTE SOLIDIFICATION PLAN

PERMIT AMENDMENT APPLICATION

Part IV, Appendix I

LIQUID WASTE SOLIDIFICATION PLAN

Edinburg Regional Disposal Facility

Edinburg, Hidalgo County, Texas

TCEQ Permit MSW-956C

Submitted To: City of Edinburg
Department of Solid Waste Management
8601 North Jasman Road
Edinburg, Texas 78542 USA

Submitted By: Golder Associates Inc.
500 Century Plaza Drive, Suite 190
Houston, TX 77073 USA

November 2017 **Project No. 1401491**

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EXECUTIVE SUMMARY

To process/stabilize/solidify approved liquid wastes that are received at the facility, and wastes that do not pass the paint filter liquids test, the facility will utilize a liquid waste solidification/stabilization area(s) located within a constructed waste disposal unit constructed in accordance with 30 TAC §330.331(b).

This plan has been prepared to ensure proper handling practices of liquid waste during disposal operations at the facility, in accordance with applicable federal, state, and local requirements, including Texas Administrative Code, Title 30, Chapter 330, Subchapter E.

1.0 PROCESSING BASINS

The facility will utilize a liquid waste solidification/stabilization area(s) located within a constructed waste disposal unit constructed in accordance with 30 TAC §330.331(b) to process/solidify/stabilize approved liquid wastes that are received at the facility and wastes that do not pass the paint filter liquids test. The liquid waste solidification/stabilization area(s) will include basins that may vary in size.

1.1 Design and Installation

The facility will utilize a metal basin(s), constructed of plate steel, placed and secured in landfill material and soil. The basin will be installed so that a minimum of 1 foot of the basin extends above the surrounding soil where the surrounding soils are graded away from the basin to prevent stormwater run-on. In addition, the bottom of the basin will be at least 10 ft above the top of protective cover soil of the underlying constructed lining system.

1.2 Basin Cover

When not in use, basins will be covered with either a portable synthetic cover or fitted cover to prevent accumulation of rainfall within the basin or discharge of contaminated water from the basin.

1.3 Inspection

Each time the metal basin is relocated, operators will inspect the integrity of the metal basins for holes or other signs of leakage. If holes are observed, the basin will be removed and the remaining pit will be observed for the presence of free liquids. If present, free liquids will be removed to another basin. The damaged basin will be repaired prior to further use.

1.4 Decommissioning

If the metal basin is not repaired and decommissioned, the City will either repurpose the metal basin for beneficial use, place it back into existing pit and fill with soil, or dispose it at the active working face. Any repurposed metal basin must be properly washed and cleaned prior removal from within the limits of waste disposal units.

2.0 HANDLING PROCEDURES

2.1 Notification of Delivery and Load Receipt

The Director of Solid Waste Management (DSWM) or the Site Manager (SM) should be notified by the transporter at least 24 hours in advance of the delivery liquid waste. Less than 24 hour notice is acceptable provided the DSWM or SM determines that the load can be properly handled and processed.

When a liquid waste load arrives at the gate house, the gate attendant shall notify the DSWM, SM, or designee who will oversee the liquid waste solidification/stabilization operations. The gate attendant shall check the accompanying waste profile to ensure that all necessary information is properly recorded. If the waste profile is properly completed, the gate attendant will direct the driver to the liquid waste solidification/stabilization area.

2.2 Unloading

When the liquid waste load arrives at the designated liquid waste solidification/stabilization area, it will be unloaded into the metal basin(s). Unloading of liquid waste into the basin(s) will be only to an appropriate level within the basin to allow sufficient remaining capacity to accommodate the addition of stabilizing material and effective processing to adequately stabilize the liquid waste.

2.3 Processing

Using an excavator or similar mixing equipment, the liquid wastes will be mixed with a stabilizing material (see Appendix IVH, Special Waste Acceptance Plan) or soil within the basin and will be removed from the basin for disposal by the same equipment. The mixing equipment will scrape any residual materials from the basin sides to prevent any cumulative build-up of material that could contribute to odors or vectors. Once stabilized, the waste will be removed from the basin and deposited in the active face for landfilling.

2.4 Verification

If necessary, a batch of solidified/stabilized material will be tested for free liquids in accordance with the Method 9095B (Paint Filter Liquids Test), as described in “Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods” (EPA Publication Number SW-846), as amended. Upon verification of the solidified/stabilized material passing the paint filter liquids test, or other approved test, the mixture will be removed for disposal.