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

PERMIT AMENDMENT APPLICATION

PART III – FACILITY INVESTIGATION AND DESIGN
ATTACHMENT D7
LINER QUALITY CONTROL PLAN

Prepared for

Waste Management of Texas, Inc.

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Prepared by

BIGGS & MATHEWS ENVIRONMENTAL
1700 Robert Road, Suite 100 • Mansfield, Texas 76063 • 817-563-1144

TEXAS BOARD OF PROFESSIONAL ENGINEERS
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8-21-12

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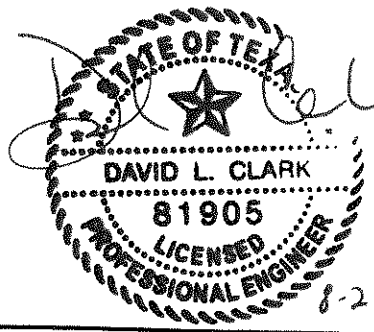

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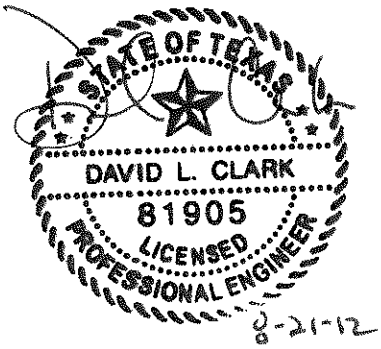

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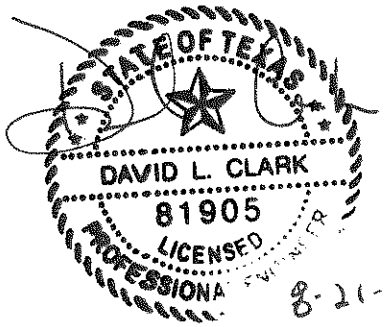

Daily and Intermediate Cover

Daily and intermediate cover materials consist of soil that has not been previously mixed with solid waste.

Topsoil

Topsoil consists of soil that is capable of sustaining vegetation and is free of debris, rubbish, and solid waste.

Unsuitable Materials

Unsuitable materials consist of any material that is determined by the GP to not be suitable for use as classified above.

3.3 Construction Below Groundwater

3.3.1 Highest Measured Water Elevations

The highest measured water elevations will be used as the design groundwater elevations. The most recent groundwater elevations must be reviewed before the construction of each cell and, if necessary, the highest measured water elevations will be adjusted upward.

3.3.2 Temporary Dewatering

Temporary dewatering will be required to construct the liner system in portions of the site that are excavated into Stratum I material that has recorded groundwater. The temporary dewatering system will provide a drainage system to intercept the Stratum I groundwater and convey it to an adjacent open excavation or to a sump from which the groundwater can be pumped into the perimeter drainage system. The temporary dewatering system will be operated to prevent potential uplift of the constructed liner system until sufficient ballast has been placed over the liner system to counteract hydrostatic pressure on the liner system from the Stratum I groundwater and the ballast has been documented in a Ballast Evaluation Report.

As shown in Attachment D3 – Construction Design Details, Drawing D3.7 – Temporary Dewatering Plan, a portion of the sideslopes in Cells 13-15, and portions of the sideslope of Cell 18 will be excavated in Stratum I materials below the highest recorded groundwater levels and these areas will required dewatering. The remainder of the excavation area will be excavated in Stratum I materials where groundwater has not been measured or in Stratum II materials that do not convey groundwater. ~~the excavation for Phase 3 will extend below the highest recorded groundwater elevations in the Stratum I materials in two areas, including portions of the side slope in Cells 13, 14, and 18. Consequently, the liners will be constructed below the highest measured groundwater elevations only in the two locations shown in Drawing D3.7. Areas where the liner is to be constructed below the highest measured groundwater elevations will be~~

~~dewatered during and after construction by a temporary dewatering system.~~ The temporary dewatering system on the ~~side~~side slopes will consist of geocomposite blanket drains and drainage trenches with either prefabricated composite drains encased in sand ~~filled trenches~~ or drainage pipe encased in aggregate.

The floor and side slope dewatering trenches will discharge into open sumps beyond the lined areas or closed sumps beneath the lined areas. The groundwater will be pumped from the closed sumps into the perimeter drainage system using an automated pump and control system that starts the pump electronically when groundwater levels begin to approach the top of the sump and turns the pump off when it reaches the lower operational limit of the pump. The pump system will be inspected regularly or equipped with a beacon to alert site personnel to pump system malfunctions. ~~The temporary dewatering system will be operated until sufficient ballast has been placed to offset the hydrostatic forces.~~

The anticipated location of the temporary dewatering system based on the information from the boring logs is shown in Attachment D3 – Construction Design Details, Drawing D3.7 – Temporary Dewatering Plan. The actual location of the dewatering system will be adjusted based upon where the Stratum I and II interface is exposed in the subgrade. The design procedures and typical details of the temporary dewatering system are provided in Attachment D7, Appendix D7-B – Temporary Dewatering System. Design and installation of the temporary dewatering system will be documented in the Soils and Liner Evaluation Report (SLER) in accordance with Attachment D7. The facility will submit a Ballast Evaluation Report (BER) to the TCEQ once it is determined that ballasting or dewatering is no longer necessary. If the TCEQ does not provide a response within 14 days of the date of receipt of the BER, the facility will discontinue dewatering or ballasting operations.

3.4 Excavation

A description of the materials that will be encountered in the excavations is provided in Attachment D5 – Geotechnical Design.

The slope stability analyses are provided in Attachment D5, Appendix D5-B – Slope Stability Analyses. The slope stability analyses are only valid for the conditions that were analyzed. Any changes to the excavation plan, dewatering system, ballast system, liner system, final cover system, or landfill completion plan will necessitate that the slope stability analyses be revised to reflect the actual conditions. Interim 3H:1V waste slopes shall not exceed 210 feet in height. Temporary construction slopes shall not be steeper than the interim slopes and concentrated loadings such as heavy equipment and soil stockpiles should not be placed near the crest of slopes unless additional slope stability analyses are performed.

observe the proof-rolling operation. Soft areas should be undercut to firm material, then backfilled with compacted general fill. The GP will observe the subgrade for signs of groundwater seepage and take appropriate actions, if necessary.

The subgrade elevations shall be verified in accordance with the requirements of Section 4.8.3 prior to the placement of compacted soil liner.

4.4 Placement and Processing

The compacted soil subgrade and surface of each lift should be roughened prior to placement of the next lift of compacted soil liner. The soil liner material should be placed in maximum 8-inch loose lifts to produce compacted lift thickness of approximately 6 inches. The material should be processed to a maximum particle size of 1 inch or less before water is added. Rocks and clods less than 1 inch in diameter should not total more than 10 percent by weight. The surface of the top lift shall contain no material larger than 3/8 inch.

If additional water is necessary to adjust the moisture content, it should be applied after initial processing, but prior to compaction. Water should be applied evenly across the lift and worked into the material. Water used for the soil liner compaction must not be contaminated by waste or any objectionable material.

4.5 Compaction

The soil liner shall be compacted with a pad/tamping-foot or prong-foot roller. A footed roller is necessary to bond the lifts, to distribute the water, and to blend the soil matrix through kneading action. Soil liner shall not be compacted with a bulldozer, rubber-tired roller, flat-wheel roller, scraper, truck, or any track equipment unless it is used to pull a footed roller. The compactor should weigh at least 40,000 pounds. The lift thickness shall be controlled to achieve penetration into the top of the previously compacted lift; therefore, the lift thickness should not be greater than the pad or prong length. Cleaning devices on the roller must be in place and maintained to prevent the prongs or pad feet from becoming clogged to the point that they cannot achieve full penetration.

The compactor should make approximately four passes across the area being compacted. A pass is defined as one pass of the compactor, front and rear drums. The material should be compacted to a minimum of 95 percent of the maximum dry density determined by standard Proctor (ASTM D 698) at a moisture content at or above optimum moisture. Areas with failing tests shall be reworked, recompacted, and retested, and passing tests must be achieved before another lift is added.

After a lift is compacted, it must be watered to prevent drying and desiccation until the next lift can be placed. If desiccation occurs, the GP must determine if the lift can be rehydrated by surface application of water or if the lift must be scarified, watered, and recompacted. Following compaction and fine grading of the final lift, the surface of the compacted soil liner shall be smooth drum rolled.

4.8.2 Construction Testing

All quality control testing will be performed during construction of the liner, except for testing that is required after individual lifts are constructed. Table D7-4 lists the minimum testing required for material used as compacted soil liner.

Table D7-4
Skyline Landfill
Compacted Soil Liner Material Construction Tests

Test	Standard	Frequency
Field Density	ASTM D 2922	1/8,000 sf per 6-inch lift
Plasticity Index	ASTM D 4318	1/100,000 sf per 6-inch lift
Liquid Limit	ASTM D 4318	1/100,000 sf per 6-inch lift
Percent Passing 1-inch and No. 200 Sieve	ASTM D 1140 ASTM D 422	1/100,000 sf per 6-inch lift
Standard Proctor Test	ASTM D 698	1 per material type
Coefficient of Permeability[1]	ASTM D 5084 or COE EM 1110-2-1906 Appendix VII	1/100,000 sf per 6-inch lift
Moisture Content	ASTM D 2216	1/100,000 sf per 6-inch lift

~~[1]In the event that field permeability testing procedures are alternatively used for construction testing, field permeability tests will be performed in accordance with ASTM D5093 or procedures approved by the executive director, or in accordance with guidance furnished by the executive director.~~

The Atterberg limits of the in-place compacted soil liner must be compared to the Atterberg limits of the Proctor curve sample to assure that the Proctor curve represents the in-place material. Any variance of more than 10 points between the liquid limit or plasticity index of the in-place soil and those of the Proctor curve sample will require that a new Proctor curve be developed. Permeability testing will be performed on undisturbed samples from the compacted soil liner as described in Section 4.8.1 and all test data will be reported.

4.8.3 Thickness Verification

The as-built thickness of the compacted soil liner shall be determined by standard survey methods. Prior to the placement of liner material, the subgrade elevations will be determined at a minimum rate of 1 survey point per 5,000 sf of lined area. After the compacted soil liner is completed, the top of the liner elevations will be determined at the same locations as the subgrade elevations.

the panel contact area; and wrinkles shall be removed as much as practical. For extrusion welds, oxidation shall be ground from the seam area within one hour of the welding operation and the extrudiate shall be purged from the extrusion welding apparatus. Seaming operations shall not be allowed when the ambient temperature is below 40°F or above 104°F unless trial welds have demonstrated that adequate welds can be achieved outside these limits. Geomembrane seaming shall be performed in strict accordance with the methods approved or recommended by the geomembrane manufacturer.

During GM seaming operations, the CQA monitor must:

- Provide full time observation.
- Record seam numbers.
- Record weather conditions.
- Observe that only approved welding apparatus and operators are allowed to weld seams.
- Observe the condition of the seams and note any defects. All defects must be repaired in accordance with the requirements of Section 5.4.4.
- Observe that people working on the GM do not smoke, wear shoes that could damage the GM, or engage in activities that could damage the GM.
- Observe that the seams are free of grease, dirt, moisture, and wrinkles.
- Observe that welding operations take place within the approved ambient temperature range.
- Observe that seam grinding has been completed less than one hour before extrusion welding and the extrudiate has been purged from extrusion welders.
- Observe that there are no horizontal seams on side slopes and that the textured material extends a minimum of 5 feet past the toe of the slope.

5.4.3 Anchor Trenches

The GM anchor trench shall be left open until the seaming is completed. Expansion and contraction of the GM should be accounted for during deployment. The top corner of the anchor trenches shall be rounded to prevent crimping the GM. The bottom of the anchor trench shall be dry, stable and be free of loose particles and rocks. Anchor trenches shall be backfilled with compacted general fill that is free of particles larger than 1 inch in diameter. The anchor trenches shall be backfilled and compacted in a manner that does not damage or induce stress to the GM.

5.4.4 Repairs

Geomembrane repairs shall be performed in strict accordance with the methods approved or recommended by the geomembrane manufacturer. Defects in the GM, defects in seams, failing destructive tests, failing nondestructive tests, holes from nondestructive tests, and destructive test sample locations shall be repaired by one of the following repair techniques:

- Patching - used to repair large holes, tears, large GM defects, and destructive test locations.
- Extrusion - used to repair small GM defects, cuts, holes from nondestructive tests, and seam defects less than ½-inch long.
- Capping - used to repair failed seams or seams where nondestructive tests cannot be performed.
- Removal - used to replace areas with large defects where other repair techniques are not appropriate.

Repair procedures include the following:

- Abrade geomembrane surfaces to be repaired (extrusion welds only) no more than one hour prior to the repair.
- Clean and dry all surfaces at the time of repair.
- Extend patches or caps at least 6 inches beyond the edge of the defect, and round all corners of material to be patched and the patches to a radius of at least 3 inches. Bevel the top edges of patches prior to extrusion welding.

Destructive and non-destructive testing will be performed on all repairs in accordance with Section 5.5.4.

5.5 Testing and Verification

5.5.1 Manufacturer's Quality Control Testing

The GM manufacturer shall test the geomembrane and raw materials in accordance with GRI Standard GM13 to assure the quality of the GM.

5.5.2 Conformance Testing

Conformance samples of the GM shall be cut across the full width of selected rolls in accordance with the test frequency specified in Table D7-5. Conformance samples may be taken at the manufacturing plant or at the project site and will be forwarded to a third party laboratory for testing. Material property requirements are provided in Section 5.2.1. Minimum conformance testing requirements are provided in Table D7-5.

Table D7-10
Skyline Landfill
Geocomposite Manufacturer's Tests

Material	Test	Standard
Geotextile	Weight	ASTM D 5261
	Apparent Opening Size	ASTM D 4751
	Grab Strength	ASTM D 4632
	Puncture Strength	ASTM D 4833
HDPE Drainage Net	Specific Gravity	ASTM D 1505
	Thickness	ASTM D 5199
	Carbon Black	ASTM D 1603
Geocomposite	Transmissivity[1]	ASTM D 4716

[1]Transmissivity testing to be conducted under the conditions specified by the GP according to the design conditions

The geotextile manufacturer shall test the geotextile to assure the quality of the geotextile. Material property requirements are provided in Section 6.2.2. Minimum manufacturer's testing requirements are provided in Table D7-11. The manufacturer's testing shall be conducted at a minimum frequency of 1 test per 100,000 sf of material.

Table D7-11
Skyline Landfill
Geotextile Manufacturer's Tests

Test	Standard
Weight	ASTM D 5261
Apparent Opening Size	ASTM D 4751
Grab Strength	ASTM D 4632
Tear Strength	ASTM D 4533
Puncture Strength	ASTM D 4833

The leachate piping manufacturer shall provide a certification that the pipe meets the cell classification PE345434C in accordance with ASTM D 3350, and the minimum SDR rating and perforation schedule shown on the plans and specifications.

6.5.2 Construction Testing

The leachate aggregate shall be tested to assure that the aggregate meets the specifications. Material property requirements are provided in Section 6.2.4. Minimum construction testing requirements are provided in Table D7-12.

7 PROTECTIVE COVER

30 TAC §330.339

7.1 General

The protective cover component of the composite liner system consists of a 24-inch-thick layer of soils placed over the leachate collection layer. The drainage aggregate around the leachate collection pipes will extend through the protective cover to form a chimney drain for the leachate collection system. The CQA monitor shall provide continuous on-site observation during protective cover placement to assure that protective cover placement does not damage underlying geosynthetics (geomembrane liner and geocomposite leachate collection layer) in accordance with 30 TAC §330.339(a)(2). The GP shall make sufficient site visits during protective cover placement to document the construction activities, testing, and thickness verification in the GLER in accordance with Section 9.3.

7.2 Materials

Protective cover material shall consist of soil that is free from debris, rubbish, frozen materials, foreign objects, and organic material, or any material that could damage the underlying geosynthetics. Since drainage aggregate chimneys will be provided above the LCS trenches, there are no permeability requirements for protective cover materials.

7.3 Preparation

Prior to placing the protective cover material, the top of compacted soil liner elevations shall be verified in accordance with the requirements of Section 4.8.3 and all testing on the underlying geosynthetics shall be completed.

7.4 Placement

The protective cover shall be placed in a manner that minimizes the potential to damage the underlying geosynthetics. Hauling equipment shall be restricted to haul roads of sufficient thickness to protect the underlying geosynthetics. The protective cover shall be dumped from the haul road and spread by low ground pressure equipment in a manner that minimizes wrinkles and stress in the geosynthetics. On sidewalls, protective cover shall be placed from the bottom to the top, not across or down. Protective cover shall not be placed over geosynthetics ~~that~~ while they are stretched across the toes of slopes. Protective cover soil shall only be placed in these area when geosynthetics have relaxed to conform to the top of the soil liner or additional

geosynthetics have been added in accordance with the requirements of the Section 5 and 6 to relieve bridging. The minimum separation distances between construction equipment and the geosynthetics are listed in Table D7-13.

Table D7-13
Skyline Landfill
Minimum Separation Distance

Equipment Ground Pressure (psi)	Minimum Separation Distance (in)
< 4	12
4 - 8	18
8 - 16	24
> 16	36

Any geosynthetic material that, in the opinion of the CQA monitor, has been damaged by the protective cover placement must be repaired and retested in accordance with Sections 5.4 and 6.4.

7.5 Testing and Verification

7.5.1 Testing

If the protective cover is counted as ballast against hydrostatic forces, the field density of the in-place protective cover shall be determined at a rate of 1 test per 10,000 sf. The in-place field density will be determined for information only, and there is no minimum compaction requirement for protective cover.

7.5.2 Thickness Verification

The as-built thickness of the protective cover shall be determined by standard survey methods. Prior to the placement of protective cover, the top of compacted soil liner elevations will be determined at a minimum rate of 1 survey point per 5,000 sf of lined area. After the protective cover is completed, the top of the protective cover elevations will be determined at the same locations as the top of compacted soil liner elevations.

9 DOCUMENTATION

30 TAC §330.341

9.1 Reports

Each report shall be submitted in triplicate to the ~~Municipal Solid Waste Division~~TCEQ and shall be prepared in accordance with the methods and procedures contained in this LQCP. The evaluated area should not be used for the receipt of solid waste until acceptance is received from the executive director. The executive director may respond to the permittee either verbally or in writing within 14 days from the date on which the SLER document is date-stamped by the ~~Municipal Solid Waste Division~~TCEQ. Verbal acceptance may be obtained from the executive director, which will be followed by written concurrence. If no response, either written or verbal, is received within 14 days, the SLER or GLER shall be considered accepted and the owner or operator may continue facility construction or operations. Each report must be signed and, where applicable, sealed by the individual performing the evaluation and countersigned by the site operator or his authorized representative.

Markers will be placed to identify all disposal areas for which a SLER has been submitted and accepted by the executive director. These markers shall be located so that they are not destroyed during operations.

The surface of a liner should be covered with a layer of solid waste within a period of six months to mitigate the effects of surface erosion and rutting due to traffic. Liner surfaces not covered with waste within six months shall be checked by the SLER evaluator, who shall then submit a letter report on his findings to the executive director. Any required repairs shall be performed properly. A new SLER shall be submitted on the new construction for all liners that need repair due to damage.

9.2 Soils and Liner Evaluation Report

After construction of the compacted soil liner, the GP will submit a Soils and Liner Evaluation Report (SLER) to the TCEQ on behalf of the owner. Preparation and submission of the SLER shall be in accordance with TCEQ MSWR. The purpose of the SLER is to document that the construction methods and test procedures are consistent with this LQCP, the TCEQ MSWR, and the project specifications.

At a minimum, the SLER will contain the properly completed TCEQ SLER form and necessary documents to supplement the form ~~following~~including:

- A summary of all construction activities
- A summary of all laboratory and field test results

- Sampling and testing location drawings
- A description of significant construction problems and the resolution of these problems
- Record drawings
- A statement of compliance with the LQCP
- An updated seasonal high water table map
- A detailed description of the temporary dewatering system
- The seal and signature of the GP and assistant GP, if applicable, in accordance with the Texas Engineering Practice Act

9.3 Geomembrane Liner Evaluation Report

After construction of the geosynthetics portion of the liner, the GP will submit a Geomembrane Liner Evaluation Report (GLER) to the TCEQ on behalf of the owner. Preparation and submission of the GLER shall be in accordance with TCEQ MSWR. The purpose of the GLER is to document that the construction methods and test procedures are consistent with this LQCP, the TCEQ MSWR, and the project specifications.

At a minimum, the GLER will contain the properly completed TCEQ GLER form and necessary documents to supplement the form including following:

- A summary of all construction activities
- A summary of all laboratory and field test results
- Sampling and testing location
- A description of significant construction problems and the resolution of these problems
- Record drawings
- A statement of compliance with the LQCP
- An updated seasonal high water table map
- A brief description of the temporary dewatering system
- Calculations for the required ballast thickness
- The seal and signature of the GP and assistant GP, if applicable, in accordance with the Texas Engineering Practice Act