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Part III, Appendix III-D.6

Leachate and Contaminated Water Plan

Part III
Attachment III-D
Appendix III - D.6

LEACHATE AND CONTAMINATED WATER PLAN

Pescadito Environmental Resource Center
MSW-2374
Webb County, Texas

PESCADITO
ENVIRONMENTAL RESOURCE CENTER

Initial Submittal March 2015
Revised September 2015
Technically Complete March 11, 2016
Modified October 2016
Modified November 2016
Modified August 2017

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situated within the protective soil layer. Six-inch diameter perforated HDPE pipes run along the inside of the trenches, sloping toward the leachate sumps at a minimum grade of 0.5 percent. The collector pipes are HDPE SDR 7.3 with 1/2-inch perforations. The perforated collector pipes will be placed at the invert of the bottom slopes and embedded in granular material. The collection trenches will be wrapped with a geotextile to prevent soil from entering the granular layer and potentially clogging the perforated collection pipe. Spacing between collector pipes varies from cell to cell with a maximum spacing of approximately ~~1,100~~ 1,000 feet ~~in the north unit and 1,000 feet in the south unit~~. The perforated collector pipes discharge directly into the sump area at the base grade low points of each of the cells. Refer to Drawing D.3-5 for sump layout and leachate collection trench spacing. Refer to Drawing D.3-7 for leachate collection trench and collector pipe details.

Cleanouts are provided at the top of the sideslopes for periodic maintenance of the collector pipes for each of the cells. The cleanouts are constructed of a minimum six-inch diameter non-perforated HDPE pipe that is joined to the perforated collector pipe. The six-inch pipe size allows sufficient cross-sectional area for effective cleaning by pressurized jetting equipment. Details showing the HDPE cleanout pipes are shown in Drawing D.3-6 and D.3-7.

Pipe crushing, buckling and ring deflection calculations were performed to demonstrate that the leachate collection piping will perform satisfactorily under expected maximum overburden pressures.

3.3 Leachate Collection Sumps

Leachate entering the drainage layer and collector lines will be discharged into collection sumps. Leachate sumps will be located at the toe of the landfill sideslopes in the center of each cell and will consist of a 4-foot deep inverted truncated square pyramid with 3H:1V sidewalls. The top of thc sumps will be 30 feet by 30 feet and the bottom of the sumps will be 6 feet by 6 feet. The sumps are sized to handle leachate generated for 1 week from the largest cell using the peak daily generation rate obtained from the Hydrologic Evaluation of Landfill Performance (HELP) model. Refer to Drawing D.3-7 and D.3-8 for layout and details of the leachate collection sumps.

3.4 Leachate Pump and Riser System

Extraction of leachate from the collection sumps will be accomplished by submersible pumps, which can be operated either manually or automatically. Leachate levels in the collection sumps, will be monitored to maintain a head buildup of no greater than the lowest point of the landfill floor adjacent to the sump in each cell.

Sump riser pipes will be located directly up the sideslopes from the sumps at the disposal area perimeter. Risers will be 18-inch diameter HDPE pipe and provide a means for lowering submersible pumps down the 3:1 sideslope incline into the collection sumps. The lower portion of the riser within the sump is perforated (1/2-inch diameter holes), which will allow leachate to flow to the pumps.

The depth of leachate on the liner will be measured using electronic transducers mounted on the leachate pump. Leachate pumps will be sized appropriately to ensure that leachate levels can be maintained at a depth no greater than the lowest point of the landfill floor adjacent to the sump in each cell, without short-cycling. Pumps will be automatically controlled using liquid level sensors installed at appropriate elevations to activate the pump when the leachate level reaches the lowest point of the landfill floor adjacent to the sump, and deactivate the pump when the leachate level is six inches, or less above the bottom of the sump.

3.5 Conveyance

Leachate will be transferred to storage tank(s) or disposal locations by tanker truck or pipeline. Leachate may be withdrawn from the collection sumps or lines, or storage tank(s)/ponds into tanker trucks. Spill containment for truck hose connection and loading will be provided by a portable trough or similar spill containment. Protection will be provided at hose connection locations. Contaminated water will be transported to an authorized and permitted facility, or to the on-site evaporation pond, for treatment and disposal.

3.6 Leachate Storage

Leachate will be stored on-site in one or more~~two~~ on-site leachate storage tank(s) or evaporation pond prior to transport to a permitted treatment facility. The leachate storage facility will have adequate secondary containment in the event of a tank failure. Secondary containment will be sized to handle either 110% of the volume in ~~one~~ the tank or the volume of ~~one~~ the tank plus the rainfall generated from the 100-year, 24-hour storm event. Tanks will include spill containment structures in conformance with TCEQ requirements. Evaporation ponds will be monitored so that a minimum of one foot of freeboard is available at all times to handle the 100-year, 24-hour storm event of 9.8 inches. Should the liquid level in the pond(s) be such that one foot of freeboard is not available, contaminated water will be removed to the storage tanks or hauled off to an authorized and permitted facility.

- 18-inch SDR-11 Leachate On Side-Wall
- 6-inch SDR-11 Leachate Cleanout Pipe On Side-Wall

When pressure is applied to the sidewall of a pipe due to loading, the pipe will undergo a deformation identified as ring deflection. This deformation results in an elliptical-shaped pipe with the shortest cross-section aligned with the direction of loading. The leachate collection and conveyance pipes have been analyzed to ensure that the degree of ring deflection does not exceed material performance specifications. In addition to verifying that the pipe is operating within manufacturer recommendations for ring deflection, this analysis is also important for pipe cleaning operations: by knowing the maximum ring deflection and resulting minimum diameter within the pipe, the appropriate cleanout jet head size can be selected. The maximum ring deflection calculated for the pipes to be used at PERC is ~~7.88~~5.19 percent, which is less than the eight percent maximum allowable ring deflection recommended by the manufacturer. Therefore, the pipes are deemed able to support the overlying waste with continued performance. Please see **III-D.6-A** for additional information.

The leachate collection and conveyance pipes were also reviewed to ensure that the pipes would not undergo crushing failure (pipe collapse) or buckling (bending) failure. All pipes were found to have a safety factor of 2.5 or more for both failure scenarios. Therefore, the pipes are deemed appropriate for loading associated with landfill construction and operations. Please see **III-D.6-A** for additional information.

4.2 Geocomposite and Geotextile Flow Capacity Analysis

The geocomposite is the principal leachate collection and conveyance material throughout the landfill, due to the fact that it is located above the composite liner in all areas and is used to direct leachate toward the leachate collection pipes and, ultimately, to the leachate sumps for removal. The geocomposite has been analyzed to ensure that it is able to convey the peak daily leachate generation rate without restrictions or backup for the landfill during open, intermediate, and closed conditions.

It is recognized that the performance of the geocomposite will decrease after installation due to partial clogging of the geotextile (a component of the geocomposite) and the compression of the

4.3.1 Open Conditions Analysis

The HELP model was first used to simulate open conditions when landfilling begins. The open conditions HELP Model runs estimate the leachate that will be generated from the first lift of waste when it is overlain with 6-inches of daily cover. The leachate generation rate represents the rate at which leachate will reach the leachate collection layer below the waste. The first run was modeled for one year, which is the minimum time increment provided in the model. A thickness of ten feet was selected for the first lift of waste. Complete leachate recirculation was considered, as this creates a higher peak daily leachate generation rate and is conservative when used to size leachate conveyance materials.

Multiple open conditions runs were required to be modeled due to the fact that the liner slopes and drainage lengths will vary between landfill cells. Based on a review of the proposed leachate collection system grades, threefour different liner configurations were modeled to determine which configuration produces the peak daily leachate generation rate.

Table D.6-1		
Liner Configurations		
Liner Configuration	Leachate Collection Layer Slope	Drainage Length
(Used for Model Naming)	(percent)	(feet)
A	2.5	500461
B	2.52.0	500614
C	2.0	450461
D	2.0	614

Based on the analyses, it was determined that the peak generation rate was determined to occur for Liner Configuration A, in which the leachate collection system grades are steepest and exhibit the shortest drainage length. Therefore, this liner configuration was used for all other modeling analyses for intermediate and closed conditions, as it has been shown to be the conservative liner configuration. A peak daily leachate generation rate of 8.49 cubic feet per day per acre (ft^3/day-acre) was determined for this scenario. Please refer to **III-D.6-A** for additional information on model input parameters and detailed results; see **Attachment B to Appendix III-D.6 (III-D.6-B)** for HELP Model output files for each identified run.

4.3.2 Intermediate Conditions Analysis

Intermediate filling conditions were modeled using HELP based on the Liner Configuration A, which produced the greatest leachate generation rate for Open Conditions. The HELP intermediate conditions run estimates the leachate that will be generated when half of the total waste height has been placed (120.5190 feet of waste), assuming 100 percent leachate recirculation. The waste is assumed to be overlain with 12-inches of intermediate cover material. The model was run for a 5-year period. Based on this analysis, approximately 5.98.6 ft^3/day-acre will be generated for the intermediate cover scenario, which is less slightly more than the open conditions. Please refer to **III-D.6A** for additional information on model input parameters and detailed results; see **III-D.6-B** for HELP Model output files.

4.3.3 Closed Conditions Analysis

Closed conditions were modeled using HELP based on the Liner Configuration A. The intermediate conditions HELP Model runs estimate the leachate that will be generated from when the entire waste column has been placed (380 241 feet of waste), assuming 100 percent leachate recirculation. The waste is assumed to be overlain with final cover. The model was run for a 30-year period. Based on this analysis, no leachate will be generated. This is anticipated, based on the fact that the incoming waste is at a moisture content lower than the field capacity of the waste and the large amount of evaporation versus the precipitation of the area (see results in **III-D.6A** and the associated model output files in **III-D.6-B**). With the final cover in-place minimal water will enter the landfill, resulting in a negligible leachate generation rate.

4.3.4 Introduced Leachate Analysis

In order to provide operational flexibility for the landfill, additional model runs were completed to determine the impact of introducing leachate to the landfill during open and intermediate conditions. It is important to note that the introduced leachate would be applied to the landfill in addition to the assumed 100 percent leachate recirculation. Potential sources of introduced leachate are leachate that is stored in the leachate containment tank(s) and/or the leachate evaporation pond.

Open and intermediate conditions models were developed to assume that 10-inches of leachate per acre per day (744 gal/acre-day) were introduced to the landfill. All were developed based on Liner Configuration A described in **Table III-D.6-1** and run with a model time of one year. Open conditions were run based on a 20-foot waste thickness, while intermediate conditions were run for both 50-foot and 100-foot waste thicknesses.

Based on the introduced leachate analyses, the open conditions run produced a peak daily leachate generation rate of ~~8.9~~8.4 ft^3/acre-day, while the intermediate conditions runs produced 8.4~~5.9~~ ft^3/acre-day for ~~both modeled~~the 50-foot waste thicknesses and 8.6 ft^3/acre-day for the 100-foot waste thickness. It is noted that the leachate generation rate is significantly lower than the introduced leachate rate, which signifies that the waste has not reached field capacity and absorbs the introduced leachate in a sponge-like manner. The landfill is not anticipated to reach field capacity at any point of its operational life. It should also be noted that the HELP model demonstrates that leachate generated with introduced contaminated water is the same at the leachate generated without contaminated water introduced.

Based on the results of these model runs, the operator may introduce additional leachate while also recirculating any leachate generated without impacting leachate generation rates or the hydraulic head on the liner. Please refer to **III-D.6A** for additional information on model input parameters and detailed results and **III-D.6-B** for the associated HELP Model output files.

4.3.5 Leachate Head

Based on the HELP model results for all modeled runs discussed in previous text, the maximum leachate head was found to be 0.0~~09~~18 inches, which significantly exceeds Section 330.331 requirements that less than 30-cm head be present over the liner. It is also noted that the maximum head buildup of 0.~~009~~ 018 inches is less than the compressed geonet thickness.

4.3.6 Leachate Pipe and Sump Sizing

The leachate pipes and sumps have been sized to accommodate the peak daily leachate generation rate determined through HELP modeling described in the previous sections. As noted, the peak leachate generation rate of all modeled operating conditions (including open, intermediate, closed, open with introduced leachate, and intermediate with introduced leachate) is 8.6~~8.9~~ ft^3/acre-day, which equates to 0.00260.047 cfs when considering a 2646 acre cell. This peak daily leachate generation rate is based on open conditions, and is the same whether or not leachate is introduced (see discussion in Section 4.3.4).

Based on the design configuration and parameters for the leachate collection pipe and aggregate, it has been determined that they are appropriately sized to handle these peak flows. Demonstration is provided in **III-D.6A**.

4.3.7 Leachate Tank Sizing

Two At least one 15,000 gallon tanks will be located at the facility to store leachate that has been extracted from the landfill. The This size of tanks are is appropriately sized to store one week's worth of leachate based on the maximum leachate generation rate determined from the HELP model runs and assumes no leachate recirculation. Secondary containment is provided for 110% or more of the total tank volume including the 100-year, 24-hour storm without overtopping. Larger and/or additional tanks may be used as long as the proper containment is provided. Demonstration is provided in **III-D.6A.B**. It is noted that an evaporation pond may also be available for leachate storage, if needed.