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Part III
Attachment III-F

GROUNDWATER MONITORING PLAN

Pescadito Environmental Resource Center
MSW No. 2374
Webb County, Texas

PESCADITO
ENVIRONMENTAL RESOURCE CENTER

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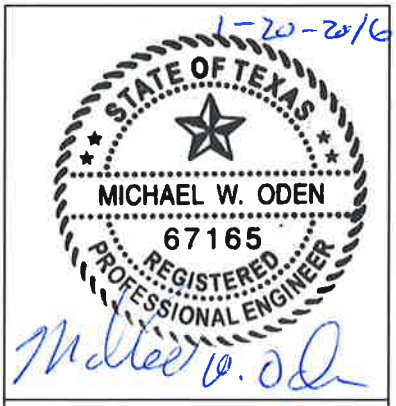
Revised January 2016



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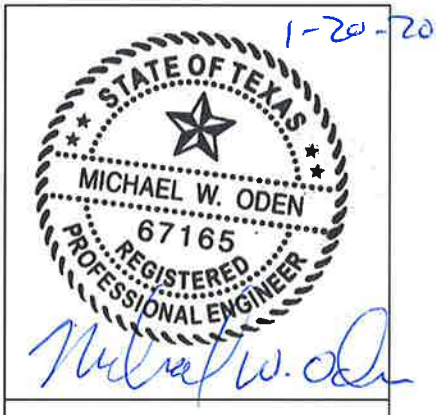

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1.0 Introduction 330.63(f)

This Groundwater Monitoring Program has been prepared for the Pescadito Environmental Resource Center (MSW 2374) in Webb County, Texas in accordance with Subchapter J of 30TAC330. It includes a discussion of the monitoring systems and the sampling and analysis requirements.

The system has been designed based on site specific information and shall be operated and maintained to perform through the life of the Monitoring Program. In order to comply with 30TAC330.403(e)(3), the facility must notify the executive director and any local pollution agency with jurisdiction, if changes in site construction or operation or changes in adjacent property affect or are likely to affect the direction and rate of groundwater flow and the potential for detecting groundwater contamination from the solid waste management units.

2.0 Point of Compliance 330.63(f)(1-3)

Figure III-F.1-1 in Appendix III-F.1 is a topographic map that shows the waste management units, the property boundary and the Point of Compliance (POC) as defined in 30TAC330.3.

This is a "greenfield" site with no previous MSW management units; therefore 330.63(f)(2) is not applicable.

2.1 Migration Pathways

As is more thoroughly discussed in the Geology Report for the facility (Part III, Attachment III-E), soils in the upper 160 feet at the site are predominantly clay, occasionally interbedded with claystone, sandstone and shale. While groundwater may be encountered in thin layers of sandy or silty material within the otherwise highly impermeable clay, this groundwater is essentially not usable due to its very low production potential and poor water quality. The uppermost recognized regional aquifer beneath the site that is capable of producing water in potentially useful quantities is the Yegua-Jackson Aquifer, which is expected to be encountered at least 750 feet below ground surface at the site. Water in this aquifer is poor to very poor in quality, due to concentrations of total dissolved solids, chloride and sulfate that exceed Federal drinking water standards.

Although a leak from a Subtitle D composite liner equipped with a leachate collection system is unlikely, the occasional layers of sandy or silty material at the site represent the most likely pathways for migration. The excavation bottom and leachate collection system are designed to convey any leachate that is generated to a series of sumps. If a leak were to occur, the most likely location would be from the leachate collection sumps in the lowest parts of landfill units.

Any contaminant leaking from the sumps would slowly move laterally for several reasons: (1) the anisotropy of the Yegua-Jackson results in vertical hydraulic conductivities at least an order of magnitude lower than horizontal hydraulic conductivity; and (2) the soil beneath the site gets denser and less permeable with depth. If there were a more transmissive zone in the vicinity of the leak, the most likely pathway for migration would be laterally until intercepting another deeper transmissive zone. The monitoring system has been designed to account for this situation in a location dominated by clay.

Groundwater flow resulting from construction of the facility is not expected to change. Local lenses of groundwater may be removed and some flow may be re-routed around the facility; however the flow direction would still be from the north to the south, mimicking the ground surface.

Based on potentiometric surfaces prepared from data obtained from on-site piezometers installed in the near surface soils at the site (see Appendix III-E.2), the POC is located along the west, south and a portion of the eastern boundary as shown on the figures in Appendix III-F.1.

3.0 Groundwater Monitoring Program 330.63(f)(4)

With respect to the usual regulatory practice, the "uppermost aquifer" is the very limited quantity of shallow subsurface water, i.e., perched groundwater, primarily associated with the relatively continuous contact zone consisting of a very thin layer of coarse-grained sediments occurring at shallow depth at the base of the surficial Recent-Pleistocene (R-P) and above the underlying Eocene-age Yegua-Jackson (Y-J) sediments. The shallow subsurface water appears to be unconfined, i.e., under "water-table" conditions. The shallow subsurface water associated with the contact zone also appears to be present in the highly weathered and weathered Y-J stratum, i.e. Strata II and III. Within the Yegua-Jackson sediments, the shallow subsurface water appears to be located in transmissive secondary structure in the clays and the thin, isolated shallow sand units. It should be noted that the Y-J sediments are typically unsaturated. Site-specific piezometer information indicates that some very limited hydraulic communication with the contact zone may exist down to approximately sixty feet bgs. Below 60-feet at the site, the clays form an aquiclude between the "uppermost aquifer" and the deeper Y-J. Inferred flow direction for the shallow groundwater appears to mimic surface drainage patterns, i.e., to the south with gradients ranging from 0.002 to 0.003.

Note that the designated "uppermost aquifer" does not extend down to the bottom elevations of the proposed excavation. Potential migration pathways below 60 feet bgs would be isolated sand units and anisotropic, more transmissive horizontal bedding characteristics in Strata IV (unweathered Y-J) down to the proposed depth of excavation. It should be noted that the Y-J sediments are typically unsaturated. In the unweathered Y-J, Stratum IV, the regional geologic dip controls potential water flow direction. Even though Stratum IV may contain very limited water, it still functions as an effective confining unit or "aquiclude" to the vertical migration of water from the designated "uppermost aquifer."

The uppermost recognized aquifer at the facility is the regional Yegua-Jackson Aquifer which is greater than 600-feet beneath the deepest excavation. Flow in the Yegua-Jackson appears to coincide with the regional dip of the Yegua-Jackson to the east at approximately fifty feet per mile.

Per 330.63(f)(3), 330.63(f)(4) and 330.403(e)(1), the groundwater monitoring program has been

designed to detect a possible release from the landfill based on site specific conditions. As detailed above the "uppermost aquifer" for groundwater monitoring purposes is the contact zone at the base of R-P and extending down into the Y-J to a depth of 60 feet bgs. Groundwater flow rate is on the order of 1 to 2 feet per year to the south to southwest and is not affected by seasonal fluctuations based on data presented in Appendix III-E.2. The Y-J beneath the contact zone (Stratum III, III and IV) is predominately clay (95% clay per III-E.3) to great depths. Construction of the landfill may divert water around the facility but the overall direction will remain to the south to southwest. Therefore, no provisions are needed in the monitoring program to account for this.

If a release from the landfill were to occur, the highest probability is association with one of the leachate sumps. To ensure earliest possible detection of such a release, the groundwater monitoring system will consist of groundwater monitoring wells which will be installed to, or below, the deepest sump excavation elevation depth nearest the well. To determine monitor well depths, the excavation elevation of the nearest sump to the monitor well location will be used and will assume a 3-foot thick compacted soil liner. The monitored interval will extend from the deepest sump excavation elevation depth nearest the well to within nine (9) feet of the surface as shown on Drawing III-F.1-2.

The Groundwater Monitoring Program for the Pescadito Environmental Resource Center (MSW 2374) has been prepared to meet the requirements of 30TAC330.403. The compliance monitoring wells will be installed along the POC as shown on Figure III-F.1-1. Well spacing will be a maximum of 600-feet and will consist of a minimum of 38 wells. However, in the event that a transmissive sand zone containing perched water is encountered in the sidewall of the excavation within approximately fifty feet of the bottom of the excavation, the next well along the POC boundary will be relocated to that area, with depths determined as outlined above, and the 600-foot spacing will be re-started. That specific groundwater monitoring well will be screened across the transmissive sand zone using the installation detail previously provided. Monitoring well installation will be performed so that there is always a well along the POC a minimum of 600-feet downgradient from the most recent cell constructed.

Note that the POC well locations were selected based on the potential flow direction in the

"uppermost aquifer", i.e., flow direction to the south and generally mimicking surface topography. However, the POC well locations are also effective for any shift in the flow direction in the deeper (> 60 feet bgs) unweathered Y-J to align with the regional geologic dip. As a consequence, the POC well locations are strategically placed to intercept any potential migration pathways for any release from the landfill.

A total of 7 groundwater monitoring wells will be placed along the northern and portion of the east and west boundaries on an approximately 1200-foot spacing to obtain background or upgradient groundwater quality for comparison to the compliance wells located at the POC.

As each phase of monitoring well installation is completed and prior to placement of waste within 600-feet of newly installed wells, the owner or operator will submit a certification in accordance with 30 TAC §330.401(e) that the facility is in compliance with the groundwater monitoring requirements of §§330.403, 330.405, 330.407, and 330.409.

3.1 Monitoring Well Design and Construction

In accordance with the Monitor Well Construction Specifications found at 30TAC330.421, all monitoring wells will be installed by a licensed Texas driller in accordance with all applicable regulations. The wells will be drilled by a method that will not introduce contaminants into the borehole or casing. A licensed professional geoscientist or engineer who is familiar with the geology of the area will supervise the monitoring well installation and development and will prepare a log of the boring. Monitoring well construction details including proposed screen intervals, well locations and elevations, filter pack and bentonite seal elevations, and surface completion are shown on Figure III-F.1-2. Equivalent alternatives to the construction specifications in 330.421 may be used if prior written approval is obtained from the executive director.

If any fluid is required in the drilling of the monitoring wells, only clean, treated city water will be used and a chemical analysis provided to the executive director along with the installation report. No glue or solvents will be used in the construction of groundwater monitoring wells.

After installation, the monitoring wells will be developed to remove drilling artifacts and open any water-bearing zone for maximum flow. The wells will be developed until all water that was

used or affected during the drilling activities is removed and the field measurements of pH, specific conductance, and temperature are stabilized.

Within 30 days of completion of a monitoring well or any other part of the monitoring system, an installation report will be submitted to TCEQ. The report will include construction and installation details for each well and will be provided on forms available from the commission. The report will include a site map drawn to scale showing the location of all installed monitoring wells to date, the relevant point(s) of compliance, top of casing elevations to the nearest 0.01 foot, tied to the mean sea level (msl), latitude and longitude or landfill grid location of each well, copies of detailed geologic logs including soil sample data, if performed and copies of driller's reports required by other agencies. A registered professional land surveyor will survey the well location and elevation of the top of casing and surface pad.

Any monitoring wells that are damaged and no longer usable will be reported to the executive director for a determination whether to replace or repair the well. In accordance with 30 TAC §305.70, if a compromised well requires replacement a permit modification request will be submitted within 45 days of the discovery.

Plugging and abandonment of monitoring wells will be performed in accordance with 16 TAC §76.702 and §76.1004. No abandonment will be performed without prior written authorization from the executive director.

4.0 Groundwater Sampling and Analysis Plan 330.63(f)(5)

No hazardous constituents have been identified in the groundwater at the site; therefore a detection monitoring program has been established for the facility. Part III, Appendix III-F.2 - Groundwater Sampling and Analysis Plan (GWSAP) contains the general requirements, sampling procedures and methods, and statistical analysis information required in 30 TAC §330.405(a)-(f).

The GWSAP contains information on the Detection monitoring program as well as Assessment and Corrective Action.

5.0 Groundwater Monitoring System Certification 330.403(e)

General Site Information:

Pescadito Environmental Resource Center
Webb County, Texas
MSW Permit Application No.: 2374

Qualified Groundwater Scientist Statement

I, Michael W. Oden, am a registered professional engineer in the State of Texas and a qualified groundwater scientist as defined in 30 TAC §330.3. I have reviewed the groundwater monitoring system and supporting data contained in the permit documents. In my professional opinion, the groundwater monitoring system is in compliance with the groundwater monitoring requirements specified in 30 TAC §330.401 through §330.421. This system has been designed specifically for the Pescadito Environmental Resource Center (Permit Application No. MSW No. 2374). The only warranty made by me in connection with this document is that I have used that degree of care and skill ordinarily exercised under similar conditions by reputable members of my profession, practicing in the same or similar locality. No other warranty, expressed or implied, is made or intended.

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Signature: Michael W. Oden

Date: 1-20-2016