Part III
Attachment III-C
Appendix III-C.1

FACILITY SURFACE WATER DRAINAGE REPORT NARRATIVE

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2.0 DRAINAGE REVISIONS PRIOR TO LANDFILL FACILITY DEVELOPMENT

The goal in developing a surface water drainage plan is to show that the development of a facility will not adversely alter, to any significant degree, the natural drainage patterns of the watershed that will be affected by the proposed development. This goal is typically achieved by comparing pre-development conditions to post-development conditions for both peak discharge rates (flows) and discharge volumes for various storm events. In the case of the PERC, several drainage modifications were designed in 2011 in order to remove the 100-year floodplain where landfilling was anticipated to occur. Stormwater analyses were developed that considered detailed grading plans for areas outside of the landfill facility boundary and split the landfill facility between two areas. These modifications have added an Intermediate Conditions step that must be used to compare pre-development and post-development conditions.

The 2011 drainage modifications were developed for the purpose of securing a Conditional Letter of Map Revision (CLOMR) from the Federal Emergency Management Agency (FEMA) which would approve modifying the location of the 100-year floodplain based on the proposed CLOMR modifications. A CLOMR Application was developed that included stormwater analyses that considered the detailed grading plans for areas outside of the landfill facility and general assumptions of discharge rates and locations for the facility which was not yet designed.

In addition, the CLOMR Application established the requirement of the landowner or operator to establish an inspection and maintenance program that will ensure that the proposed drainage modifications achieve and maintain their intended function for the life of the landfill facility The drainage modifications will be maintained for as long as waste remains in the landfill units (Appendix E of Attachment III-C.1-A).

The impact of these developments and the anticipated design on natural drainage patterns were thoroughly evaluated by FEMA and approved on November 21, 2014.

The following text briefly describes the pre-development and intermediate development (post-CLOMR) conditions that are expanded upon within the CLOMR Application in Attachment A of this Appendix (III-C.1-A).

2.1 Pre-Development Conditions

The proposed facility will be located on a 953 acre tract of land owned by Rancho Viejo Waste Management, LLC (RVWM). The facility is located approximately 20 miles east of Laredo in Webb County, Texas. The site is located entirely within the 12,194 acre Yugo Ranch that is owned by Rancho Viejo Cattle Company, Ltd., the same owner as the PERC, and has been used for cattle ranching and oil and gas production for many years.

The facility site slopes from north to south at approximate grades of 0.5 to 1 percent. Surficial soils generally have very low permeability, and the site is uniformly covered with native vegetation consisting of brush, forbs and grass. Stormwater runoff historically has not eroded bed-and-bank features into the shallow swales that covey drainage from the site. In recent times, several impoundments have been created on site by shallow excavation and embankment construction across the swales to create livestock watering tanks. Historically, patterns of storm water runoff have thus been significantly altered by the capture of rainfall by these tanks.

Drawing 1 of Appendix III-C.2 shows the regional pre-development topography of all areas that were reviewed as part of the CLOMR. The "drainage areas" (also referred to as "subcatchment areas") that were used for pre-development conditions modeling within the CLOMR are also shown on Drawing 1. Drawing 2 shows the pre-development topography of the facility and immediately surrounding area at a smaller scale to provide greater clarity.

2.2 Intermediate Conditions (Post-CLOMR Modifications)

Hydrologic modifications will be completed in accordance with CLOMR modifications prior to development of the facility. These intermediate conditions will remove the floodplain from the majority of the PERC without increasing peak flood discharges to downstream receiving areas. The CLOMR modifications include the removal of numerous impoundments located within the project area, ranging in size from very small to large (Burrito Tank). Three new detention basins outside the perimeter of the facility will be constructed in order to prevent run-on to the facility. Two of these detention basins are to be located to the north of the site and have been ~~be~~ designed to completely capture the 100-year flood ~~in~~flows from Drainage Areas 6 and 7. The two basins are referred to as the Northwest and Northeast Detention Basins in the hydrologic model for the CLOMR. See Figure 7 and Table 12 in the CLOMR application (Attachment A of this Appendix (III-C.1-A)). The two basins and drainage areas can be seen on Drawing III-C.2-3.

A larger detention basin located west of the property will also intercept flows from the western drainage area and from other areas to the north that currently flow through the project site. The basin is designed for temporary detention and attenuation of flows from the revised drainage basin. A new channel capable of handling the basin outflows and redirecting them around the project site will link this basin to a series of existing surface water features south of the project site. These modifications are fully described within the CLOMR Application, which has been reviewed and approved by FEMA.

Drawing 3 of Appendix III-C.2 shows the regional intermediate topography described within the CLOMR. The "drainage areas" (also referred to as "subcatchment areas") that were used for

It is noted that the landfill catchment boundaries generally have two configuration types, as shown on Drawing 6 of Appendix III-C.2 and described in Appendix III-C.3-2 (Stormwater Management Features Delineation). Representative catchment areas are Landfill Catchment A (representative of Catchments C, E, G, I, K, M, and O) and Landfill Catchment B (representative of Catchments D, F, H, J, L, N, and P). Therefore, model output summary files are only provided for these representative catchments. However, all model output data is available upon request from TCEQ. Output files for all perimeter ditches, culverts, and the South Detention Basin are included in Appendix III-C.4.

5.4 Post-Development Hydrologic Overview

As previously mentioned, the intermediate conditions described within the CLOMR include all modifications that will take place prior to the development of the facility. However, intermediate conditions (post-CLOMR) modeling (identified as Proposed Conditions within the CLOMR) included assumed discharge rates, drainage areas, and discharge locations from the proposed landfill facility. For this reason, CB&I has intentionally developed the detailed landfill design to be consistent with the CLOMR assumptions. Additionally, all stormwater management features have been designed to ensure that the stormwater management system complies with all applicable regulations in 30 TAC, Section 330, Subchapter G. An overview of the post-development conditions is provided as Drawing 5 in Appendix III-C.2.

The proposed design has two waste units, both which have 4H:1V sideslopes and six percent plateau slopes. The northern landfill unit has a peak elevation of approximately 855 ft MSL, while the southern landfill unit has a peak elevation of approximately 840 ft MSL. The landfill units both drain to a common perimeter ditch drainage network that drains into the South Detention Basin, where stormwater ultimately discharges from the facility, as described in the following text.

5.4.1 Terrace benches

Vegetated terrace benches will be used to intercept stormwater sheet flow, collect runoff, and control erosion along the sideslopes of the landfill final cover. Terrace benches are located

5.4.3 Perimeter Ditches

As shown on Drawing 6 of Appendix III-C.2, ditches are positioned around the landfill perimeter. These ditches are used to convey non-contact stormwater runoff from the landfill units, landfill perimeter access road, and ancillary areas to the South Detention Basin. Perimeter ditch sizes vary between the North and South Units of the landfill to provide adequate size to handle the peak discharge rates of the 100-year storm without overtopping. The North Unit perimeter ditches are designed with 4H:1V side slopes, 4-ft depth, and a 15-ft bottom width. The South Unit perimeter ditches are designed with side slopes of 4H:1V and 3H:1V, a depth of 4-ft, and a bottom width of 40-ft. Details for the perimeter ditches are provided on Drawing 7. Ditch profiles are shown on Drawings 9 and 10.

Ditches will be vegetated. In the event that vegetation cannot be established within the ditches, they will~~may~~ be lined with an erosion control material (ECM), such as SmartDitch™, riprap, or other ECM to minimize scour potential. Any portions of the perimeter ditch that show velocities over 5-ft/sec for the 25-year, 24 hour storm event within Appendix III-C.3-8 will be lined with a Turf Reinforcement~~d~~ Mat (TRM). All ditches have been designed with excess capacity to convey the peak flow rates and depths of the 100-year 24-hour storm event (and thus, passing the 25-year, 24-hour storm), which exceeds the requirements specified in 30 TAC 330.305. The design parameters for the perimeter ditches and calculations demonstrating that the ditches will provide adequate stormwater control and are sufficiently sized are presented in Appendix III-C.3-8.

5.4.4 Ditch Discharge Culverts

Culverts will be installed at the discharge locations of the perimeter ditches into the South Detention Basin, as shown on Drawing 6 and 11 of Appendix III-C.2. Culverts will be in-line with stormwater ditches and have been sized to handle the 100-year 24-hour storm event, which is equal to the 100-year discharge rate in the ditch at that location. Culverts will be box culverts constructed of concrete, unless an alternate culvert design is approved. The design parameters for the culverts and demonstration that the culverts will safely convey stormwater associated with the 100-year 24-hour storm are provided in Appendix III-C.3-9.

5.4.5 South Detention Basin

The South Detention Basin will be installed along the southern border of the facility to temporarily detain all stormwater that falls on the landfill, perimeter roads, and ancillary facilities. The detention basin receives stormwater through the perimeter ditches. The size of the South Detention Basin has been designed based on a fully developed landfill footprint and will be constructed prior to the time that waste in the first cell developed is placed above existing ground. The basin has been designed with excess capacity to safely detain and release the 100-year, 24-hour and 25-year, 24-hour storm events while maintaining one foot of freeboard above the maximum water level, in accordance with best management practices.

~~, although detention basin may be constructed in stages, provided that adequate storage capacity and discharge can be demonstrated.~~ The location of the South Detention Basin is shown in Drawings 5, 6, 11 and 12 of Appendix III-C.2. Profiles and details of the basin are provided on Drawings 11 and 12.

~~The basin has been designed with excess capacity to safely detain and release the 100-year, 24-hour and 25-year, 24-hour storm events while maintaining one foot of freeboard above the maximum water level, in accordance with best management practices.~~

5.4.6 South Detention Basin Discharge

The South Detention Basin will have two discharge points, located approximately at the southwest and southeast corners of the basin. Each discharge point will contain multiple culvert outlets that will facilitate the controlled release of stormwater. Stormwater will discharge through the culverts to the outside of the basin. Riprap or other erosion control material will be placed at the discharge locations to minimize the potential for erosion and scour. Refer to Drawing 12 of Appendix III-C.2 for details of the proposed outlet structure design.

Discharge from the detention basin will be sent to both the east and the west into Drainage Areas DA-3 and DA-2, respectively. Percentage of the discharge volume from the detention basin to DA-2 and DA-3 has been split to provide discharge rates and volumes consistent with the CLOMR (intermediate conditions). Additional stormwater conveyance features may be installed ~~at the discretion of the owner and engineer~~ to direct water directly into the San Jauanito Creek

tributary system. Please note that the outlet structure design may be changed ~~at the owner/operator's discretion,~~ provided that the revised design provides adequate reinforcement and protection of the outfall and equivalent release rates to the modeled design. Any changes desired will be submitted as a permit modification and approval obtained prior to implementation.

The outlet structures are designed so that the total release rates from the post-development conditions of the modeled storm events are similar to the corresponding discharge rates for the intermediate conditions, as demonstrated and described in the subsequent modeling text.

5.4.7 Run-On Protection

Run-on from off-site areas will be prevented from flowing onto the active portion of the landfill by virtue of the fact that outer alignment of the perimeter road, which will surround both waste units, has been designed to be at least one foot higher than the surrounding existing topography. This creates an island affect where surficial water will flow around the landfill facility. Additionally, the waste boundary is located one-foot in elevation higher than the crest of the perimeter channels, which are designed to convey the 100-year storm. Thus, the top of slope for the waste boundary is located at least two feet in elevation higher than the surrounding topography in all areas of the landfill.

5.4.8 Flood Protection

No portion of the landfill footprint, proposed landfill development, ancillary facilities, or associated appurtenances are located within the revised 100-year floodplain, as shown on Drawing 5 and 6 of Appendix III-C.2. Consistent with 30 TAC Section 330.63(c)(2), 330.307, 330.547(a) and (b), neither waste disposal unit or any operations area will be located within the 100-year floodplain. The facility development will not restrict the flow of the 100-year flood, will not reduce the temporary water storage capacity of the floodplain, and will not result in the washout of solid waste.

6.0 OBJECTIVE 3

Update the Intermediate Conditions (post-CLOMR) Model to include detailed landfill design. Verify that the updated results are substantially similar to the intermediate conditions described in the CLOMR for the 100-year storm to ensure that the CLOMR conclusions are maintained.

In order to ensure that the determinations made in the CLOMR were maintained, the proposed stormwater model including the detailed stormwater management system was compared to the proposed stormwater model from the CLOMR for the 100-year, 24-hour event.

This model is a hybrid:

A. Areas inside of the landfill's stormwater management footprint will use the detailed stormwater modeling based on CB&I's design.
B. Areas outside of the landfill's stormwater management footprint that will be modified from existing conditions are modeled as described within the CLOMR.

Because some of the drainage areas in the CLOMR proposed model were modified by the detailed proposed model, the two models were compared at the "Junction 1-Downstream Discharge Point" for the 100-year, 24-hour storm event to demonstrate that the design of the stormwater management system does not significantly or negatively impact the downstream discharge values determined in the CLOMR. The Junction 1-Downstream Discharge Point is shown on Drawings 1 and 3 of Appendix III-C.2. The stormwater model output files are provided in Appendix III-C.4. Table 5 below summarizes the comparison of the two models.

Table 5
100-Year, 24-Hour Storm Event Model Comparison

Model Run	Intermediate (post-CLOMR)	Post Development	Percent Difference
Peak Discharge Rate (cfs)			
Junction-1 (Downstream Discharge Point)	14,083.77	14,070.88	-0.1%
Peak Discharge Volume (af)			
Junction-1 (Downstream Discharge Point)	6,536.62	6,734.90	3.0%