



WASTE MANAGEMENT, INC.

CWM Chemical Services, LLC

**Leachate Level Compliance Plan
for Residuals Management Unit 1,
Final Sequence Phase 3**

Residuals Management Unit 1
Model City, New York

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1. Introduction

1.1 Purpose of Plan

This Leachate Level Compliance Plan (LLCP) has been prepared to demonstrate that stormwater runoff from within uncapped areas of Residuals Management Unit 1 (RMU-1), when configured as shown on the proposed fill progression plan (Drawing 1), can be managed in accordance with the conditions of the Sitewide Part 373 Permit. This LLCP also establishes the design drainage areas for the various stormwater management features within uncapped areas of RMU-1 and the minimum dimensions of the stormwater management features. Finally, this LLCP determines the minimum capacities and dimensions for temporary stormwater management features that divert runoff from adjacent newly capped areas and off the landfill.

1.2 Previous Leachate Level Compliance Plan Submittals

A summary of the previous LLCP submittals is present below:

- In February 1997, CWM Chemical Services, LLC (CWM) submitted an LLCP for RMU-1 in accordance with Order on Consent No. 95-19, 96-11, and 96-12 entered into with the New York State Department of Environmental Conservation (NYSDEC). The February 1997 LLCP, which was prepared by Golder Associates, evaluated the existing removal, storage, transfer, and treatment system for management of RMU-1 leachate associated with Cells 1 through 8, and recommended modifications to the system to remain in compliance with various components of the RMU-1 Part 373 Permit, specifically Condition I.E.2 (a) (Module I). Subsequent to NYSDEC approval, CWM completed the recommended system upgrades.
- In May 1999, Addendum #1 to the February 1997 LLCP was prepared by Earth Tech, Inc. (formerly Rust Environment & Infrastructure) and EMCON to evaluate RMU-1 leachate management for Cells 1 through 10. In Addendum #1, relevant appendices of the LLCP were evaluated and revised to reflect cap progression (i.e., construction of Phases I, II, and III final cover) and baseliner construction activities in Cell 9/10. Additional modifications to the leachate removal, storage, transfer, and treatment system were also performed in response to a November 5, 1999 letter from the NYSDEC to CWM regarding assumptions made in the May 1999 Addendum #1 to the LLCP. In a subsequent correspondence relating to the November 5, 1999 letter, the NYSDEC approved various modifications to the system. These modifications included specific operational adjustments to be

maintained during design storm events, including an upgrade of pump P-3002A to 200 gallons per minute (gpm) at the aqueous wastewater treatment system (AWTS) facility, which has been implemented by CWM. The leachate tank farm (LTF) storage capacity was re-evaluated based on the approved modifications and accepted as a replacement of the previous evaluation presented in Appendix G of Addendum #1.

- Subsequently, Blasland, Bouck & Lee, Inc. (BBL) prepared several more LLCPS. In June 2001, CWM submitted an LLCPS (BBL, June 2001) associated with the opening of Cell 12/14 and completion of the Phase IV final cover that included recommendations for further upgrades to the existing leachate management system. The NYSDEC approved the June 2001 LLCPS on September 19, 2001.
- On May 3, 2002, CWM submitted an LLCPS (BBL, April 2002) for Cells 1 through 10 and 12/14 to revise the grading plan depicted in the June 2001 LLCPS and reflect completion of the Phase V final cover. The NYSDEC approved the April 2002 LLCPS on June 4, 2002. On September 9, 2002, the NYSDEC approved a minor revision to the April 2002 LLCPS, which was submitted by CWM on July 17, 2002.
- On November 22, 2002, CWM submitted an LLCPS (BBL, November 2002) to reflect the opening of Cell 11/13. The NYSDEC approved the November 2002 LLCPS on December 23, 2002, but required minor revisions to the document, which were subsequently incorporated and submitted to the NYSDEC on January 21, 2003. Final approval was issued by the NYSDEC on March 6, 2003.
- On December 18, 2007, CWM submitted an LLCPS (ARCADIS BBL, December 2007) for Cells 1 through 14 to revise the grading plan depicted in the November 2002 LLCPS and reflect completion of the Phase VI final cover. The NYSDEC approved the December 2007 LLCPS on January 10, 2008.
- On March 20, 2009, CWM submitted an updated LLCPS (ARCADIS, March 2009) based on a later stage of waste filling in Cells 1 through 14. The NYSDEC provided comments for that submission on September 2, 2009. CWM submitted a revised LLCPS (ARCADIS, October 2009) on October 14, 2009, to address these comments. The NYSDEC issued a conditional approval on November 25, 2009. A December 2009 LLCPS revision (ARCADIS) updated the March/October 2009 LLCPS to satisfy the NYSDEC approval conditions. A revision was submitted to the NYSDEC on March 16, 2010 (ARCADIS) that included a new calculation in Appendix A for the proposed leachate storage tank T-165 and revised report text. The NYSDEC approved the March 2010 revision on December 30, 2010.

1.3 Facility Description

CWM owns and operates the Model City Treatment, Storage, and Disposal Facility located in Model City, Niagara County, New York. The facility occupies approximately 710 acres in the Towns of Lewiston and Porter, of which, about 630 acres are available for permitting of waste management operations. The current active hazardous waste landfill (RMU-1) was permitted by the NYSDEC on November 16, 1993, under six New York Codes, Rules, and Regulations Part 373 (Part 373 Permit #9-2934-00022/00036). The RMU-1 Permit was renewed by the NYSDEC as part of the Sitewide Part 373 Permit #9-2934-00022/00097 on August 5, 2005. CWM submitted a Sitewide Part 373 Permit Renewal Application on February 1, 2010. The NYSDEC issued a Technical Notice of Incomplete Application to CWM on March 30, 2011. CWM submitted a revised Sitewide Permit Renewal Application on July 7, 2011. The NYSDEC is currently reviewing the revised Sitewide Permit Renewal Application.

1.4 Residuals Management Unit 1 Description

RMU-1 covers approximately 47.1 acres as measured to the outside of the perimeter berms, including 39.4 acres of lined disposal area. The design waste volume is 3,482,400 bank cubic yards (cy) resulting from a gross airspace of 3,601,900 cy less operational cover, roads, and berms.

RMU-1 is designed with 14 cells, numbered 1 through 14. The construction of RMU-1 has been performed in phases to match the operational requirements of the facility. To date, all 14 cells have been constructed and are currently in operation. In general, construction of the RMU-1 final cover is completed as final waste grades are achieved. Phases I through VI of the final cover were previously completed. The approximate limits of the next phase of final cover construction (Phase VII) completed in 2011 are indicated on Drawing 1. Likely future phases of final cover construction are depicted on Drawing 2. In general, stormwater falling on capped portions of RMU-1 (non-contact stormwater runoff) is directed off the landfill and into designated stormwater retention areas located at the facility. Stormwater falling on uncapped portions of RMU-1 (contact stormwater runoff) is captured and managed as leachate.

1.5 Leachate Management Description

For the proposed fill progression plan depicted on Drawing 1, stormwater runoff from uncapped portions of RMU-1 is directed into two detention basins located within the landfill and pumped to tank T-165 for temporary storage before being discharged through the RMU-1 leachate force main to the LTF for eventual treatment as leachate.

Rainfall that lands on uncapped portions of the landfill that does not run off infiltrates into the waste mass where it is either lost to the atmosphere by evaporation or percolates down to the primary leachate collection system (LCS) in the various cells. This latter mechanism is not considered herein because it represents a smaller percentage of the rainfall than the runoff component and reaches the primary LCS at a much later time and at a comparatively slow rate.

The RMU-1 leachate management system consists of primary and secondary leachate collection and pumping systems, a leachate removal and transfer system, and an RMU-1 lift station. The LCS is designed to drain leachate to a collection sump at the low point of each cell. Leachate is removed from the primary and secondary sumps by submersible pumps installed in a perforated section of the side slope riser pipe located at the bottom of each sump. Leachate is discharged to double-walled force mains located in the RMU-1 perimeter berm and transferred to the RMU-1 lift station at the western edge of RMU-1.

The lift station pumps leachate through underground force mains to the former oil/water separator (OWS) building and then through an aboveground 8-inch-diameter steel pipe to the LTF. (Tank T-157 and its associated pumps that are located in the OWS and formerly served to lift the leachate into the LTF were recently taken out of service and are no longer in use.) The LTF stores leachate from all active and closed landfills, as well as miscellaneous site waters. Aqueous phase leachate is then transferred from the LTF to the AWTS. Treated effluent from the AWTS is transferred to final effluent holding tanks T-58 and T-125, which have operating volumes of approximately 488,529 gallons and 394,271 gallons, respectively.

The AWTS consists of Aqueous Treatment (A/T) and Water Treatment (W/T) systems. The A/T system provides treatment of leachate from all landfills, other than SLF 12 and RMU-1 for metals, and includes a filter press for separation of the suspended solids from the wastewater stream, followed by treatment through the W/T system. The W/T system consists of pH adjustment, biological treatment, multi-media sand filters, and carbon adsorption. SLF 12 and RMU-1 leachate is treated only through the W/T system where it is pumped directly to the multi-media sand filters or the bypass line to tank T-3003. Tank T-3003 temporarily stores the liquid before pumping it to the carbon adsorption system. The treated effluent from the carbon adsorption system is transferred to final effluent holding tanks T-58 and T-125, and ultimately discharged to the facultative ponds.

1.6 Report Organization

This LLCP has been organized into six sections. Section 2, which follows this introductory section, presents a description of and design basis for the fill progression configuration for RMU-1 Cells 1 through 14. Section 3 presents an evaluation of the stormwater runoff conditions for Detention Basins J and K, leachate storage tank T-165, and other surface-water drainage features in and around RMU-1. Section 4 presents an evaluation of the leachate removal, storage, transfer, and treatment system. Section 5 discusses likely waste filling strategies beyond the fill progression plan prepared for this LLCP as well as means of managing contact water runoff. Section 6 presents conclusions and recommendations in order to manage contact and non-contact stormwater runoff resulting from the 25-year, 24-hour storm event.

In addition, two appendices have been included with this LLCP. Appendix A presents RMU-1 hydrologic and stormwater routing calculations, including the following analyses: detention basin and tank T-165 storage capacity calculations, interim drainage feature design calculations, culvert design calculations, and an assessment of permitted drainage features outside of RMU-1. Appendix B presents RMU-1 leachate removal, storage, and transfer calculations, including the following evaluations: RMU-1 lift station to LTF, tank farm to AWTS at carbon feed tank (T-3003), carbon feed tank (T-3003) to leachate tank T-58, carbon feed tank (T-3003) to leachate tank T-125, an LTF storage capacity analysis, and a secondary containment area tanker transfer analysis. Appendix C presents slope stability analyses for the fill progression design.

It is noted that certain analyses contained in previous LLCPs have not been included in this report. The proposed fill progression design on which this LLCP is based includes construction of two additional phases of final cover (Phases VIII and IX), which eliminates the remaining perimeter infiltration channels. Thus, an analysis of infiltration channels (formerly contained in Attachment 2 of Appendix A) has not been included. Because the infiltration channels are the only direct source of storm-related flows to the sumps of the landfill cells, evaluations of the cell leachate elevations and times of exceedance (formerly contained in Attachment 3 of Appendix A) and the cell pumping rates (formerly contained in Attachment 1 of Appendix B) have not been included. Additionally, CWM recently removed tank T-157 and its associated pumps from the RMU-1 leachate forcemain. Hence, the flow capacity demonstration of tank T-157 (formerly contained in Attachment 3 of Appendix B) has not been included. Because of this modification, a new RMU-1 lift station capacity analysis (Attachment 1 of Appendix B) has been included (originally submitted under separate cover and reviewed and approved by the NYSDEC).

2. Fill Progression Design

2.1 General

The fill progression design proposed for RMU-1 Cells 1 through 14 is presented on Drawing 1. The proposed design was prepared in general conformance with the approved Sitewide Part 373 Permit and the *RMU-1 Operations and Maintenance Manual* (O&M Manual), and presents permitted top of final waste grades within capped portions of RMU-1, final and interim waste grades in uncapped portions, surface-water management controls, and general truck access routes. A further description of the proposed fill progression and basis of design is provided in the following sections.

2.2 Fill Progression Configuration for Cells 1 through 14

In developing the proposed fill progression design, several factors were considered, including achieving final waste grades, where possible, waste grade transition from the December 2009 fill plan, stormwater management in both uncapped areas and newly capped areas, fill area accessibility, slope stability, and future final cover construction. Where possible, the proposed design integrates existing features within RMU-1, such as capped areas, access routes, and surface-water management controls, and builds upon the December 2009 fill plan.

Waste grades for the proposed fill progression design generally ranges from 5 percent on plateau areas to 33 percent on constructed side slopes. It should be noted that 50 percent slope gradients will be constructed in select locations (e.g., access road side slopes and some basin side slopes), in accordance with the provisions of the interim waste height stability analysis presented in the RMU-1 Engineering Report. Consistent with previous fill progression designs, setbacks have been established on the proposed waste slopes based on allowable fill placement criteria contained within the O&M Manual and RMU-1 Engineering Report, and provides for the minimum slope stability factors of safety. Slope stability analyses for the fill progression design are provided in Appendix C. As required by the Permit, the slope stability analyses were prepared using the same approach and assumptions as the original design calculations contained in the RMU-1 Engineering Report.

Specific changes from the December 2009 fill progression to the proposed design include the following:

- Achieving final waste grades along the southern and eastern edges of the landfill to allow for installation of Phase VIII and IX final cover along the landfill perimeter and downgradient of the lowermost bench.
- Elimination of Detention Basin H to allow for Phase IX final cover installation.
- Replacement of Detention Basin I with new Detention Basin J. The new basin is closer to the perimeter of the landfill than the old basin and is significantly smaller because the drainage area is smaller. Both basins are established at the elevation of the lowermost bench.
- Construction of new Detention Basin K. This basin receives the majority of the stormwater runoff from uncapped areas of RMU-1 and is established at the elevation of the middle bench.
- Raising the main truck route so that the road can be constructed on top of the Phase IX final cover up to the lowermost bench. The equipment and vehicle decontamination area is also moved up slope to the lowermost bench.

2.3 Stormwater Management

As in the past, surface-water runoff from the majority of the final cover areas is conveyed off the landfill and directed to on-site stormwater retention basins. Runoff from Phases I, II, III, and V final cover areas and portions of the Phases IV, VI, and VII final cover areas is directed to Retention Basin V01, which is located to the north of RMU-1. Runoff from the remainder of the Phases IV, VI, and VII final cover areas is directed into Retention Basin V02, which is located to the east of RMU-1. To route non-contact stormwater runoff from capped areas out of the landfill and prevent it from draining into uncapped areas or causing other operational issues, several temporary drainage features are proposed, including the following:

- A temporary downchute along the perimeter berm side slope on the eastern edge of the landfill (southeast temporary downchute). At this location, one downchute pipe carries flow from the Phase IX final cover area to the north of the truck route that drains into the perimeter channel at the top of the perimeter berm. Because of the truck route, the perimeter channel cannot be extended to drain to the south until the landfill is entirely capped and the truck route removed. The temporary downchute pipe allows this segment of the perimeter channel to drain to the ditch at the base of the perimeter berm. Details for the southeast temporary downchute are provided on Figure 16 of the O&M Manual.

- A temporary downchute along the Phase VII final cover at the southwestern corner of Cell 14 (southwest temporary downchute). At this location, two downchute pipes carry flow from the surface-water diversion berms to the V4 drainage channel that extends down the perimeter berm side slope. Under the permitted final grading plan, these surface-water diversion berms extend through the currently uncapped area and terminate on the eastern face of the landfill. The downchute pipes interrupt this flow path to segregate the non-contact stormwater runoff from contact stormwater runoff. Details for the southwest temporary downchutes are provided on Figure 17 of the O&M Manual.
- An interim drainage ditch along the inside edge of the truck route, downgradient of the lowermost surface-water diversion berm, in the event Phase IX final cover construction cannot be completed in one construction season. This drainage ditch, if installed, would intercept runoff from clean portions of the truck route and from interim cover within the Phase IX final cover area footprint that is south of the truck route and conveys it to the perimeter channel at the top of the perimeter berm along the southern edge of the landfill. Without this drainage feature, stormwater runoff would inundate the truck route. A detail for the interim drainage ditch is provided on Figure 18 of the O&M Manual.

The above-listed temporary non-contact stormwater runoff management features cause temporary modifications to certain watersheds within the landfill, causing higher flow rates to certain permanent drainage features as compared with the final permitted conditions. This effect is analyzed and discussed in greater detail in Section 3.

Unlike the December 2009 fill plan, the perimeter infiltration channels are completely eliminated under the proposed fill progression design. Thus, all stormwater runoff from uncapped portions of the landfill will be directed into two new detention basins (Detention Basins J and K). As depicted on Drawing 1, surface-water diversion berms and temporary diversion ditches are constructed along the waste side slopes, where appropriate, to carry runoff to the two new detention basins. These temporary contact stormwater runoff management features are discussed in greater detail in Section 3.

Detention Basins J and K provide sufficient volume to contain stormwater runoff from their tributary drainage areas and provide the minimum required freeboard of 1- foot. This condition is based on a 1-foot depth of liquid above the low point of the basins at the start of the storm event. Runoff contained within Detention Basin J is removed via pumping to Detention Basin K once the liquid depth in the pond is greater than or equal to 1 foot above the basin low point. Runoff contained within Detention Basin K is removed via pumping to Tank T-165 once the liquid depth in the pond is greater than

or equal to 1.5-foot above the basin low point. Tank T-165 has adequate capacity to contain the transferred liquid volume resulting from the 25-year, 24-hour design storm without discharging during the storm event. Following the storm event, stored liquid in the tank can be discharged to the LTF via the RMU-1 leachate forcemain. Additional detail regarding stormwater calculations is provided in Section 3.

2.4 Truck Traffic Pattern

The proposed fill progression design retains the same truck traffic patterns as the December 2009 fill plan; however, the elevation of the truck route within the landfill has been raised and the width reduced to 20 feet to minimize the impact of the road on airspace and allow for construction of the Phase IX final cover beneath the road and up to the lowermost surface-water diversion berm. The truck route design provides for intermittent two-way truck traffic into and out of RMU-1 at the southeastern corner of the landfill. The truck route road incorporates a localized high point at the intersection of the lowermost surface-water diversion berm. Immediately inboard of this high point, the road grade reverses into a vertical sag curve. This feature directs contact water runoff from upgradient portions of the road into Detention Basin J. Truck traffic will be directed to waste filling areas within RMU-1 along internal truck routes.

The equipment/vehicle decontamination area will be relocated upgradient from its current location to the intersection of the truck route and the lowermost surface-water diversion berm. This allows for decontamination of exiting vehicles to occur before the vehicles cross onto the Phase IX final cover. It is assumed that the truck route will be paved from the perimeter berm up to the decontamination area. Washwater from decontamination activities will drain to the southern edge of the truck route and into a sediment trap located on the side slope of the truck route. Washwater overflow from the sediment trap will drain into Detention Basin J.

3. Hydrologic Evaluation and Stormwater Routing

3.1 General

In general, stormwater runoff from the capped areas of RMU-1 is managed in accordance with the *Surface-Water Sampling and Analysis Plan* (Attachment M of the Sitewide Part 373 Permit), although certain temporary modifications were made in the proposed fill progression to accommodate the partially capped nature of the landfill. Runoff from uncapped areas within RMU-1 is managed as leachate and is directed into two detention basins within the landfill before being pumped to tank T-165 for temporary storage. Following the storm event, liquid stored in tank T-165 is pumped through the RMU-1 forcemain to the LTF and ultimately processed through the AWTs.

This section presents the methodology used to determine the stormwater runoff conditions to the various contact and non-contact stormwater management features that are necessitated or are affected by the proposed fill progression design. All hydrologic calculations were performed using HydroCAD Version 8.5 (HydroCAD Software Solutions, LLC), which is a hydrologic and hydraulic modeling software package that is based on the TR 20 methodology. All hydrologic calculations are based on the 25-year, 24-hour design storm event, which produces 4.0 inches of rainfall at the site.

3.2 Stormwater Routing through Detention Basins and Tank T-165

The fill progression configuration depicted on Drawing 1 results in a 2.16-acre watershed that drains into Detention Basin J and a 7.68-acre watershed that drains into Detention Basin K. Both proposed detention basins will be lined, similar to past basins. This liner greatly reduces leakage from the basins; therefore, no outflow due to infiltration through the basin interior surfaces is considered.

Outflow from Detention Basin J occurs by pumping with a submersible pump to Detention Basin K. The pump is assumed to be operated with level controls and will pump at approximately 67 gpm (based on modeling performed for and documented in the March 2010 LLCp) whenever the liquid elevation in the basin is equal to or exceeds 347.75 (1-foot above basin low point). Outflow from Detention Basin K occurs by pumping with two submersible pumps to tank T-165. The pumps are assumed to be operated with level controls and will pump at approximately 1,032 gpm combined whenever the liquid elevation in the basin is equal to or exceeds 366.38 (1.5 feet above basin low point). Note that to maintain compliance with permit conditions, an additional

0.5 foot of liquid needs to be removed with the pumps by manually overriding the automatic level control until the liquid depth in the basin is 1-foot or less.

Attachment 1 of Appendix A contains stormwater routing calculations for both proposed detention basins and tank T-165. The calculation demonstrates the adequacy of the detention basins and the tank to manage the estimated stormwater runoff from the design watersheds while meeting the minimum required freeboard. The following table presents a summary of the routing calculations for the two proposed basins.

Detention Basin	Starting Liquid El. (ft)	Peak Inflow ^a (cfs)	Peak Outflow ^b (cfs)	Peak Liquid El. (ft)	Lowest Lined Crest El. (ft)	Freeboard (ft)
J	346.75 (Basin Floor)	10.89	0.15	351.25	352.52	1.27
	347.75 (1 Foot Above Basin Floor)	10.89	0.15	351.25		1.27
K	364.88 (Basin Floor)	38.20	2.30	371.01	374.40	3.39
	365.88 (1 Foot Above Basin Floor)	38.20	2.30	371.01		3.39

Notes:

- a. Peak inflow value for Detention Basin K includes direct runoff from tributary watershed and pumped inflow from Detention Basin J.
 - b. Peak outflow value is based on pumping rate.
- El. = elevation
cfs= cubic feet per second
ft = feet

As indicated in the table above, two different starting liquid elevations are considered for the detention basins to maintain consistency with previous LLCP evaluations. The first elevation assumes that the detention basins are completely dry at the beginning of the design storm event, while the second assumes that 1-foot of liquid is present above the low point of the basins at the beginning of the storm. Both detention basins provide the minimum required 1-foot of freeboard for both scenarios.

The following table presents a summary of the volume assessment for tank T-165. The volume pumped from Basin K excludes the volume that is below the pump level float setting (1.5 foot liquid depth) but above the permit compliance level of 1 foot. This additional volume will be transferred to the tank once the tank begins to dewater.

Tank T-165 Storage Capacity (gal)	Stormwater Volume Pumped from Basin K (gal)
777,797	775,201

Note:

gal = gallons

The indicated storage capacity is the usable tank capacity as prescribed by applicable conditions in the Sitewide Part 373 Permit, including an allowance for 1-foot of liquid in the tank at the start of the storm and 2 feet of freeboard. As indicated in the table above, the tank provides adequate capacity to manage the stormwater pumped from Detention Basin K.

3.3 Interim Drainage Features

As discussed in Section 2.3, several interim drainage features are proposed to direct contact stormwater runoff into the two detention basins and to divert non-contact stormwater from running into uncapped areas of the landfill. Attachment 2 of Appendix A contains calculations for the design of interim drainage features (other than culverts) depicted on Drawing 1. These features are discussed in greater detail below.

3.3.1 Interim Drainage Features for Contact Stormwater Runoff

Interim drainage features for management of contact stormwater runoff include a diversion ditch on the plateau of the landfill along the edge of the Phase VII final cover in Cells 6, 10, 12, and 14 and a modified surface-water diversion berm in Cells 13 and 14 at the edge of Phase VIII final cover. The Phase VII final cover area diversion ditch is triangular in cross section and will be excavated into the final waste surface just inside of the Phase VII final cover temporary termination. This feature will route contact stormwater runoff away from the final cover edge and ultimately into Detention Basin K. The lowermost surface-water diversion berm in Cells 13 and 14 will provide a modified cross section for conveyance of contact stormwater runoff along the Phase VIII final cover temporary termination to Detention Basin J. Further details of these interim drainage features are included on Figures 19 and 21 in the O&M Manual. The following table presents a summary of the peak discharge to each of the contact stormwater runoff interim drainage features and their respective hydraulic capacity.

Interim Drainage Feature	Peak Discharge (cfs)	Hydraulic Capacity (cfs)
Phase VII Final Cover Area Diversion Ditch	12.22	31.30
Lowermost Surface-Water Diversion Berm with Temporary Phase VIII Final Cover Termination	4.40	8.92

Note:

cfs= cubic feet per second

As shown in the table above, each interim drainage feature provides sufficient capacity to manage the peak discharge from its design watershed.

3.3.2 Interim Drainage Features for Non-Contact Stormwater Runoff

Interim drainage features for management of non-contact stormwater runoff include two temporary downchute locations (southeast and southwest) and an interim drainage ditch along the inside edge of the truck route. The temporary downchutes are assumed to consist of corrugated metal pipes. The interim drainage ditch is triangular in cross-section and is assumed to be lined with a geosynthetic liner to protect the interim cover. Further details of these interim drainage features are included on Figures 16 through 18 in the O&M Manual. The following table presents a summary of the peak discharge to each of the non-contact stormwater runoff interim drainage features and their respective hydraulic capacity.

Interim Drainage Feature	Peak Discharge (cfs)	Hydraulic Capacity (cfs)
Diversion Ditch (10% Slope Portion)	1.07	9.25
Diversion Ditch (0.3% Slope Portion)	4.45	10.18
Southwest Downchute Pipe – Upper Stormwater Bench	3.31	3.98
Southwest Downchute Pipe – Lower Stormwater Bench	3.16	3.98
Southeast Downchute	2.74	2.98

Note:

% = percent

cfs= cubic feet per second

As shown in the table above, each interim drainage feature provides sufficient capacity to manage the peak discharge from its design watershed.

3.4 Stormwater Routing through Culverts

Attachment 3 of Appendix A contains calculations for the design of new and analysis of existing culverts depicted on Drawing 1. Two culverts depicted on Drawing 1 are new, and one (beneath the access ramp along the southern edge of the landfill) is an existing culvert from an earlier fill progression design. Two other existing culverts in the same ditch as the one identified on Drawing 1 are also analyzed. The new culverts are assumed to consist of corrugated metal pipe, and the existing culvert consists of corrugated, smooth interior high-density polyethylene (HDPE) pipe. The following table presents a summary of the estimated peak discharge through the two proposed culverts, the culvert configuration, the predicted headwater depth, and the maximum allowable headwater depth.

Culvert ID	Peak Discharge (cfs)	Culvert Configuration	Predicted Headwater Depth (ft)	Maximum Allowable Headwater Depth (ft)
CV-2	4.45	1-18 inch CMP @ 1.0%	1.37	1.50
CV-3	1.44	1-12 inch CMP @ 0.5%	0.87	1.00

Note:

% = percent
cfs = cubic feet per second
CMP = corrugated metal pipe
ft = foot/feet

As indicated in the above table, the proposed culvert configurations result in predicted headwater depths that are less than the maximum allowable headwater depths. Consequently, the proposed configurations are deemed adequate.

The following table presents a summary of the estimated peak discharge through the three existing culverts along the southern edge of RMU-1, the culvert configuration, the predicted headwater elevation, and the maximum allowable headwater elevation based on a recent field survey.

Culvert ID	Peak Discharge (cfs)	Culvert Configuration	Predicted Headwater Depth (ft)	Maximum Allowable Headwater Depth (ft)
P9 Culvert 1	18.54	2-18 inch HDPE @ 0.75%	325.41	323.39
P9 Culvert 2	15.15	2-18 inch HDPE @ 1.0%	324.24	322.97

Culvert ID	Peak Discharge (cfs)	Culvert Configuration	Predicted Headwater Depth (ft)	Maximum Allowable Headwater Depth (ft)
CV-1	14.69	2-18 inch HDPE @ 0.25%	323.33	323.30

Note:

cfs = cubic feet per second

ft = foot/feet

HDPE = high-density polyethylene (corrugated, smooth-interior)

As shown in the table above, the headwater elevation for CV-1 is approximately equal to the maximum allowable headwater depth and so the ditch segment upstream of that culvert is deemed adequate. The ditch segments upstream of the other two existing culverts will need to be modified to provide containment to at least the predicted headwater elevation. Figure 20 in the O&M Manual depicts profiles and typical cross sections for the portions of the ditch needing modification.

3.5 Assessment of Permitted Drainage Features

Attachment 4 of Appendix A contains calculations to assess the adequacy of the permitted drainage features in Subareas A5 and P9 (as identified in the surface-water drainage calculations in Appendix I to the RMU-1 Engineering Report). These two drainage features will experience increased flows due to temporary drainage modifications associated with the proposed fill progression design.

Permitted Drainage Feature ID	Peak Discharge into Channel (cfs)	Required Flow Depth (ft)	Depth of Channel (ft)
A5	14.38	1.41	2.50
P9	21.41	1.87	2.00

Note:

cfs = cubic feet per second

ft = foot/feet

As indicated in the table above, the permitted drainage features affected by the fill progression design can convey the increased peak flow rate without exceeding the minimum design channel depths.

4. Residuals Management Unit 1 Leachate Removal, Storage, and Transfer System Evaluation

4.1 General

The RMU-1 leachate management system consists of primary and secondary leachate collection and pumping systems, a leachate removal and transfer system, and an RMU-1 lift station. The LCS is designed to drain leachate to a collection sump at the low point of each cell. Leachate is removed from the primary and secondary sumps by submersible pumps installed in a perforated section of each side slope riser pipe located at the bottom of each sump. Leachate is discharged to double-walled forcemains located in the RMU-1 perimeter berm and transferred to the RMU-1 lift station at the western edge of RMU-1.

The lift station pumps leachate through underground forcemains to the former OWS building, where the underground forcemain transitions to an aboveground 8-inch-diameter steel pipe leading to the LTF. The LTF stores leachate from all active and closed landfills, as well as miscellaneous site waters. Leachate is transferred from the LTF to the AWTs as the AWTs capacity allows. Treated effluent from the AWTs is transferred to final effluent holding tanks T-58 and T-125, which have operating volumes of 488,529 gallons and 394,271 gallons, respectively.

The following analyses of the leachate removal, storage, and transfer system are discussed in this section:

- RMU-1 lift station capacity (Attachment 1 of Appendix B).
- LTF storage capacity (Attachment 7 of Appendix B).
- LTF through AWTs to effluent holding tanks T-58 and T-125 (Attachments 5 and 6 of Appendix B).
- Secondary containment area tanker transfer to tank T-100 (Attachment 8 of Appendix B).

As discussed in Section 1.6, the design of the proposed fill progression plan and recent modifications to the leachate management system has made certain evaluations that were historically performed for LLCs unnecessary and these evaluations are not discussed further herein. For this reason, Attachments 2 and 3 of Appendix B have

been removed though the numbering of Attachments 4 through 8 have been preserved from previously submitted LLCs.

4.2 Detention Basin and Tank T-165 Pumps

The capacities of the pumps to be used in Detention Basins J and K and in Tank T-165 were previously evaluated, documented, and submitted to the NYSDEC. Specifically, the transfer pump in Basin J was modeled in the March 2010 LLC and determined to provide approximately 67 gpm. The two transfer pumps to be used in Basin K and the pump used to dewater tank T-165 were modeled by others as part of the tank T-165 permitting. The two transfer pumps were determined to provide a combined capacity of approximately 1,032 gpm from the detention basin to tank T-165. The tank dewatering pump was assumed to provide 160 gpm capacity to the RMU-1 primary forcemain in the March 2010 LLC, and this flowrate has been retained for this evaluation.

4.3 Residuals Management Unit 1 Lift Station Capacity

The RMU-1 lift station consists of a 9-foot-diameter, 3,000-gallon steel tank located in a concrete containment area measuring 18 feet by 15 feet by 3.75 feet deep. The previously existing submersible pump in the RMU-1 lift station was a Godwin model GSP300HV. This pump failed in September 2011 and CWM has been attempting to order an identical replacement pump. The model is in the process of being discontinued, which has delayed the order. In the event a model GSP300HV cannot be ordered, CWM will procure another submersible pump with similar or greater capacity. As discussed in Section 1.6, CWM recently modified the RMU-1 leachate forcemain to bypass tank T-157 located in the former OWS building and its associated pumps. With this modification, the RMU-1 lift station now delivers leachate directly to the LTF. An assessment by ARCADIS estimated the RMU-1 lift station pumping capacity to be 382 gpm when equipped with a Godwin GSP300HV. The assessment was documented in a letter to CWM dated September 9, 2011, which was later submitted to the NYSDEC for review. In an October 17, 2011, letter to CWM, the NYSDEC approved the model of the RMU-1 lift station. The September 9, 2011, evaluation is included in Attachment 1 to Appendix B.

As indicated in the LTF storage capacity analysis (refer to Section 4.4), the peak flow to the RMU-1 lift station is estimated to be 188 gpm (160 gpm from tank T-165 plus 2 gpm per cell baseflow). Thus, the predicted capacity of the RMU-1 lift station is sufficient to accommodate the worst-case inflow from the landfill under the proposed fill progression. In the event that another Godwin GSP300HV cannot be located and another pump model is purchased, ARCADIS recommends that CWM perform an

instrumented test of the new pump to estimate the in-service pumping capacity. It is noted that, while the minimum required pumping capacity at the RMU-1 lift station for this fill progression scenario is approximately 188 gpm, the September 9, 2011 evaluation indicated a minimum pumping capacity of approximately 330 gpm to accommodate the anticipated peak flow to the lift station under the currently approved (March 2010) fill progression. The 330 gpm capacity was based on the construction of Phase VII final cover and replacement of the Cell 9/10 primary pump with one delivering approximately 60 gpm to the lift station.

4.4 Leachate Tank Farm Storage Capacity Analysis

The LTF consists of three 350,000-gallon carbon steel tanks located inside a secondary containment area lined with a polyurethane coating system. The LTF stores leachate from all active and closed landfills, as well as miscellaneous site waters. As stated in the AWTs Report (CWM, 1996), CWM has historically segregated leachate from SLF 1 through 6, 7, 10, 11, and 12, which typically has higher organic, metal, polychlorinated biphenyl, and iron-complexed cyanide concentrations into tank T-101. This segregation strategy was accepted by the NYSDEC in a letter to CWM, dated April 2, 1996. Based on analytical data and the degree of treatment needed, leachate from SLF 12 is currently discharged into tanks T-102 and T-103, as well as with leachate from RMU-1 and miscellaneous site waters, including the LTF secondary containment areas.

The LTF storage capacity analysis is based on estimated flows resulting from the 25-year, 24-hour storm event. For the purposes of this evaluation, flow sources include the baseflow from the RMU-1 cells, tank T-165, the LTF secondary containment area, site groundwater extraction systems, and average flows from SLF 1 through 12.

According to the Sitewide Part 373 Permit, if the available capacity in the leachate storage tanks (T-101, T-102, T-103) is less than 625,000 gallons, CWM must treat or ship off site for treatment no less than 200,000 gallons per day (equivalent to 139 gpm) until the available capacity returns to 625,000 gallons. Based on information presented in Attachment 4 of Appendix B, the tank farm pump P-105 (an Ingersoll-Dresser HOC3+ variable speed pump rated at 250 gpm at 305 feet of total dynamic head) can discharge at a rate of 176 gpm, which exceeds the permit requirement of 139 gpm. According to information presented in Attachments 5 and 6 of Appendix B, the AWTs can process 227 gpm using Ingersoll-Dresser HOC3+ pump P-3002A to discharge from tank T-3003 to the effluent holding tanks T-58 and T-125. Assuming 2 hours of downtime, this results in an equivalent process rate of 208 gpm, which exceeds the permit-required treatment rate of 139 gpm discussed above. CWM performed flow rate

pump tests for pump P-105 and pump P-3002A in order to verify the model-predicted flow rates. The results of the flow rate pump test are contained in a report prepared by CWM entitled *Leachate Level Compliance Plan Pump Flow Rate Verification Report for Pumps P-105 and P-3002A*, dated October 2001.

A liquid mass balance, including a table depicting outflow conditions at the LTF is presented in Attachment 7 of Appendix B. Individual tank storage volumes and liquid heights are calculated and tabulated based on the following assumptions:

- In accordance with the site-specific CWM permit condition, liquid elevations in the tanks are such that only 625,000 gallons of storage capacity is available at the beginning of the analysis.
- Each tank has approximately the same liquid level at the start of the analysis.
- Flows from SLF 1 through 11 and groundwater extraction systems may be directed to tank T-101 or to the A/T system.
- Flows from SLF 12, RMU-1 landfill cells, and tank T-165 are directed to tanks T-102 and T-103.
- Tank T-165 dewatering pump runtime is determined by dividing the total stormwater runoff volume managed by the tank by the assumed pumping rate of 160 gpm.
- Baseflow from RMU-1 cells is 2 gpm per cell (28 gpm total) and is constant throughout the simulation.
- Flow from tank T-165 begins 11 hours after the start of the 25-year, 24-hour storm event to maintain consistency with previous LLCP analyses.
- Flow from secondary containment areas, other than the LTF, is directed to tank T-100 for 24 hours as shown in Attachment 8 of Appendix B.
- Based on information presented in Attachment 4 of Appendix B, the maximum outflow from the LTF via pump P-105 is 176 gpm.
- The AWTs capacity is 208 gpm (227 gpm with an average downtime of 2 hours per day). However, CWM has requested that the LTF assessment consider a

reduced treatment rate of 193 gpm (210 gpm with an average downtime of 2 hours per day) for this evaluation.

This transient mass balance verifies that the volume available in tank T-102 alone (i.e., without considering the additional available volume in tank T-103) is sufficient to temporarily store peak flows from the RMU-1 cells, tank T-165, and other sources during the 25-year, 24-hour storm event.

4.5 Leachate Tank Farm through AWTS Facility to Tanks T-58 and T-125

According to CWM, the piping and pumps at AWTS have been upgraded in accordance with recommendations in previous LLCPC evaluations. Based on information presented in Attachments 5 and 6 of Appendix B, as well as with the pump verification report prepared by CWM, the system is capable of treating 227 gpm through the AWTS to effluent holding tanks T-58 and T-125. This equates to an effective flow rate of 208 gpm for this system, based on an average downtime of 2 hours per day for maintenance purposes (e.g., carbon replacement). Hydraulic models showing the system flowrate from tank T-3003 to leachate tanks T-58 and T-125 are presented in Attachments 5 and 6 of Appendix B.

The evaluation presented in Attachment 7 of Appendix B includes inflow to the AWTS from two sources: the LTF and tank T-100. For the first 24 hours of the analysis (hours 11 to 35), the LTF discharges 116 gpm to the AWTS through pump P-105, and tank T-100 discharges 77 gpm to the AWTS (193 gpm total). After the 24-hour period, outflow from tank T-100 ceases, and the LTF discharges 176 gpm through pump P-105 to the AWTS. The treated effluent from the AWTS is transferred to final effluent holding tanks T-58 and T-125. These tanks serve as a monitoring point and buffer prior to discharge to the facultative ponds.

4.6 Secondary Containment Area Tanker Transfer Analysis

In accordance with previous LLCPCs and as required by the Sitewide Part 373 Permit, secondary containment areas are required to be dewatered within a 24-hour period. Attachment 8 of Appendix B presents an analysis of the transfer of secondary containment area waters to tank T-100 via tanker trucks. The calculations demonstrate that the tanker trucks CWM proposes to use to dewater secondary containment areas can transfer the required 64,836 gallons of water within a 24-hour period. It should be noted that the table presenting the summary of secondary containment stormwater volumes (included in Attachment 8 of Appendix B) is based on an in-depth field investigation of the secondary containment areas. This information is consistent with

the volumes listed in the Sitewide Part 373 Permit. The table includes a column for stormwater volumes transferred to tank T-100 following the LLCPP evaluation period and indicates inflows to tank T-100 received from secondary containment areas via direct pumping and by tanker transfer.

5. Late Stage Waste Placement

This section briefly describes concepts that are envisioned to advance the fill progression beyond the attached Drawing 1 to final permitted waste grades and strategies for management of contact and non-contact stormwater runoff. This LLCPP is based on the completion of Phase VIII and IX final cover areas. This section is organized according to the planned sequencing of future final cover areas (post Phase IX).

5.1 Post Phase IX Final Cover and Through Phase X Final Cover

With the installation of Phase VIII final cover, the upgradient portions of the southern waste face will be built out to final waste grade in preparation for Phase X final cover. During this time, the drainage patterns are expected to remain as modeled in this LLCPP. Once the Phase X final cover is installed, the remaining uncapped area of the plateau to the west of the north-south ridgeline will be unable to gravity drain to the basins on the eastern side of the landfill. To allow this water to drain to the east where it can be contained in a basin and/or pumped to tank T-165, a ditch will be installed in an east-west orientation across the ridgeline of the landfill. This temporary feature will be excavated into the waste surface and will allow contact stormwater runoff to gravity drain to the east side of the landfill. Although the exact location of this feature will depend on waste grading conditions in place at the time, the required capacity of this ditch has been estimated and a minimum cross-sectional geometry defined in Attachment 5 of Appendix A. It may be necessary to move this ditch to accommodate waste placement but the minimum geometry will be utilized regardless of the ditch location. This ditch will remain in service until the installation of Phase XI final cover.

Several non-contact stormwater runoff features will be designed and constructed along with the Phase X final cover. Specifically, a diversion berm constructed of soil will be installed along the eastern edge of the cover on the landfill plateau. This temporary diversion feature will direct non-contact stormwater runoff to the south and into a temporary downchute pipe that will run down the south face of the landfill and carry the water out of the landfill. Additional temporary downchute pipes will be constructed at the same location to divert non-contact stormwater runoff in the two surface-water diversion berms away from the uncapped area and out of the landfill. Once these downchute pipes are installed, the temporary downchute pipes at the southwest corner of the landfill (Cell 14) may be dismantled so that the surface-water diversion berms flow continuously to the newly installed downchute pipes at the eastern edge of the Phase X final cover. Alternatively, the southwest downchute pipes may remain in service to reduce the flowrate to the new downchute pipes.

5.2 Post Phase X Final Cover and Through Landfill Closure

Construction of Phase X final cover is estimated to leave approximately 6.4 acres of the landfill uncapped. The majority of the non-contact stormwater runoff will be diverted away from the uncapped area, which will minimize the required size of contact stormwater runoff features. Consequently, Detention Basins J and K will be slowly filled once replacement features are constructed further to the north (see below for further discussion on the replacement features). The filling of the detention basins will allow buildout to final waste grade everywhere except in the alignment of the truck route and where the replacement contact water management features are located.

It is envisioned that the detention basins will be replaced with depressions along the alignment of the surface-water diversion berms on the eastern face of the landfill. The depths and widths of the depressions will be minimized to lessen their effect on achieving final waste grade in upgradient areas. These depressions will serve as collection points for contact stormwater runoff and will be equipped with pumps and float switches to allow automatic operation once the liquid depth exceeds 1 foot. The pumps in the depressions on the lower and upper surface-water diversion berms will likely discharge to the depression on the middle surface-water diversion berm which, in turn, will discharge to tank T-165.

The required size of these depressions will depend on the drainage area to each feature and the capacity of the pumps. Stormwater routing calculations, similar to those performed for Detention Basins J and K in this LLCP, have been performed (Attachment 5 to Appendix A) to estimate the required sizes of the depressions. It is noted that these calculations are preliminary in nature because the sizes of the contributing watersheds have been estimated. These calculations will be repeated during the quarterly waste surveys that are required by Module VI, Condition H.1 of the Sitewide Part 373 Permit to verify that the depressions are capable of managing the predicted runoff from the existing watersheds in place at those times. It is expected that the depressions will be required to comply with the same Permit conditions as detention basins and will thus be sized to provide a minimum freeboard of 1 foot.

The existing lower truck route will be maintained throughout the filling of Detention Basins J and K and creation of the depressions discussed above. At that point, the majority of the remaining airspace (other than the amount that must be preserved for the depressions) will be within the truck route footprint. The truck route will be eliminated by placing waste near the upgradient end and progressing downslope to the edge of the Phase IX final cover. Once the truck route is eliminated, the remaining

airspace will likely be filled using off-road dump trucks capable of climbing the steeper grades that will be necessary at that time.

Lastly, the depressions will be eliminated by controlled waste placement similar to what is planned for the south infiltration channel in the current fill progression design. However, because the surface-water diversions berms drain to the north, the depressions will need to be filled starting at the northern ends. As waste is placed in approximately 50- foot-long zones along the depressions, soil cover will be installed over the newly placed waste and the upgradient slope (to the next upgradient surface-water diversion berm) so that the runoff from that newly covered area may be allowed to drain out of the landfill. This allows the drainage areas to the depressions to be reduced in concert with the filling of the depressions. The waste filling and soil cover installation will continue to progress to the south until the eastern edge of Phase X final cover is reached.

6. Conclusions and Recommendations

Evaluations of the surface-water management features within uncapped areas of RMU-1 and to temporarily manage non-contact stormwater runoff demonstrate that the adequate capacity is provided to manage conditions associated with the 25-year, 24-hour design storm event, provided the following recommendations are implemented:

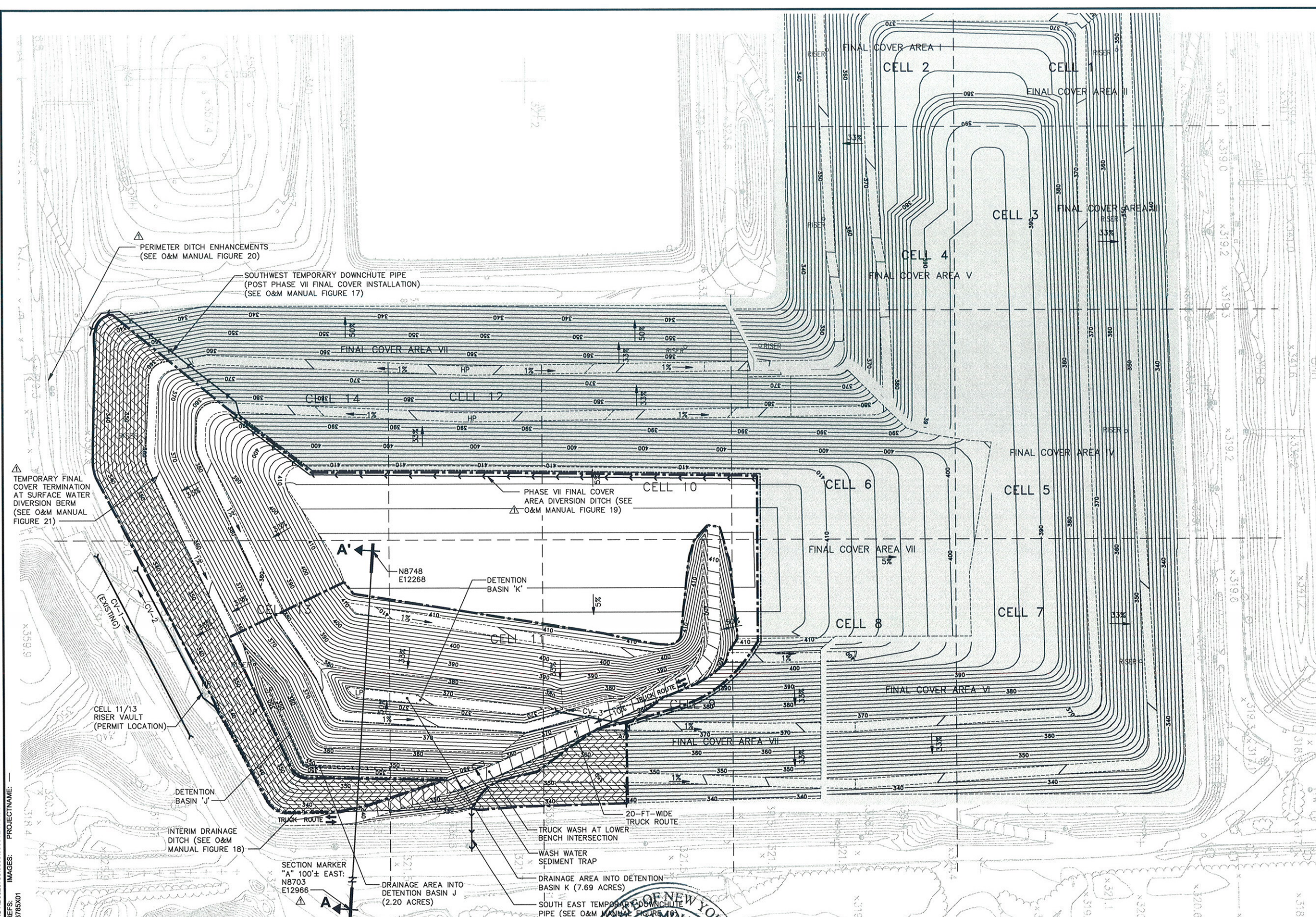
- Construct the southwest temporary downchute pipes in Cell 14 as shown on Drawing 1 to direct non-contact stormwater runoff from Phase VII final cover away from uncapped waste areas and out of the landfill.
- Enhance portions of the perimeter ditch along the southern edge of RMU-1 as indicated herein to provide the needed containment at the inlets to the two upstream most existing culverts.
- Replace the RMU-1 lift station pump with an identical Godwin GSP300HV pump, if possible. If an alternative pump must be used due to the GSP300HV being unavailable, perform an instrumented in-service flowrate capacity test of the new pump to verify that the capacity exceeds not only the 188 gpm peak flow associated with this proposed fill progression but also the 330 gpm peak flow identified in the September 9, 2011, RMU-1 lift station capacity evaluation prepared by ARCADIS.
- Construct Phases VIII and IX final cover, consisting of approximately 2.5 acres, as shown on Drawings 1 and 2.
- Reconstruct the truck route as shown on Drawing 1 to allow Phase IX final cover to be installed beneath the road and up to the lowermost surface-water diversion berm. As part of this effort, the equipment and vehicle decontamination area will be moved to the intersection of the truck route and the lowermost surface-water diversion berm.
- As perimeter infiltration channels in Cells 9/10, 11/13, and 12/14 are filled in to accommodate Phases VIII and IX final cover construction, remove large pumps from primary sumps and replace with small pumps, similar to other closed cells in RMU-1. Until that time, maintain the same pump configurations as indicated in December 2009 LLCP.
- Install a new pump in Detention Basin J and associated piping to provide approximately 67 gpm flow rate from the basin to the upgradient Detention Basin K

whenever the liquid elevation in Detention Basin J is equal to or greater than 347.75 feet (i.e., 1-foot above the low point of the basin floor).

- Install a new pump in Detention Basin K and associated piping to provide approximately 1,032 gpm flow rate from the basin to Tank T-165 whenever the liquid elevation in Detention Basin K is equal to or greater than 366.38 feet (i.e., 1.5 feet above the low point of the basin floor).

For the purpose of this evaluation, it is assumed that all of the necessary modifications and conditions presented in this LLCP have been implemented.

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- LEGEND**
- EXISTING FINAL COVER AREA (SEE NOTES 4 AND 5)
 - PROPOSED COVER AREA
 - INDEX ELEVATION CONTOUR
 - INTERMEDIATE ELEVATION CONTOUR
 - GRADE BREAK
 - LIMIT OF DRAINAGE AREA
 - LIMIT OF CURRENTLY UNCAPPED AREA DEPICTED AT FINAL WASTE GRADE
 - CELL DIVIDE
 - COORDINATE GRID (SEE NOTE 2)
 - INTERIM DRAINAGE FEATURE AND FLOW DIRECTION
 - TEMPORARY CULVERT (SEE CULVERT TABLE AND NOTES 7 AND 8)
 - SLOPE STABILITY CROSS SECTION
 - HP HIGH POINT
 - LP LOW POINT

- NOTES:**
- BASE MAP FEATURES OUTSIDE PERMITTED LIMIT OF WASTE COMPILED BY PHOTOGRAMMETRIC METHODS FROM AERIAL PHOTOGRAPHY DATED 5/31/01 (AIR SURVEY CORP. PROJECT NO. 71010503)
 - COORDINATES REFER TO CWM PLANT SITE GRID.
 - CONTOUR INTERVAL EQUALS 2 FEET.
 - GRADES WITHIN EXISTING FINAL COVER AREAS REPRESENT PERMITTED TOP OF WASTE. FINAL COVER LIMIT REPRESENTS APPROXIMATE EDGE OF FULL COVER THICKNESS BASED ON QUARTERLY WASTE SURVEYS.
 - GRADES WITHIN PROPOSED PHASE VII FINAL COVER AREA REPRESENT PERMITTED TOP OF WASTE.
 - PROPOSED WASTE GRADES AND INTERIM DRAINAGE FEATURES TO BE CONSTRUCTED AND MAINTAINED IN ACCORDANCE WITH THE RMU-1 OPERATIONS & MAINTENANCE MANUAL WHERE APPLICABLE.
 - THE CULVERT TABLE INDICATES REQUIRED CONFIGURATIONS FOR EXISTING AND PROPOSED CULVERT LOCATIONS. CULVERT CV-1 IS EXISTING AND IS TO BE RETAINED. ALL OTHER TEMPORARY CULVERTS ARE PROPOSED. THE CONFIGURATIONS INDICATED IN THE CULVERT TABLE ARE BASED ON THE ANTICIPATED PEAK FLOWRATES ASSOCIATED WITH THIS GRADING PLAN. ALTERNATIVE CULVERT CONFIGURATIONS MAY BE SUBSTITUTED FOR THOSE INDICATED IN THE TABLE ASSUMING THEY PROVIDE EQUAL OR GREATER HYDRAULIC CAPACITY. ALTERNATIVE CULVERT CONFIGURATIONS WILL BE SUBMITTED TO THE NYSDEC FOR APPROVAL PRIOR TO CONSTRUCTION.
 - PROPOSED CULVERTS CV-2 AND CV-3 MAY BE EITHER CORRUGATED METAL PIPE OR CORRUGATED HIGH DENSITY POLYETHYLENE (HDPE).

CULVERT TABLE		
CULVERT ID	NUMBER/SIZE (IN.)	MIN. SLOPE (%)
CV-1	2/18	0.25%
CV-2	1/18	1.0%
CV-3	2/18	0.5%

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USE TO VERIFY FIGURE REPRODUCTION SCALE

11/11	REVISED SECTION COORDINATE & ADDED INTERIM DRAINAGE FEATURES	PTO	BMS
No.	Date	By	Ckd
1	11/11	JOSEPH MOLINA III	JOSEPH MOLINA III

Professional Engineer's Name
JOSEPH MOLINA III
Professional Engineer's No.
NY 072644

State
NY

Date Signed
11/11/11

Project Mgr
BMS

Designed by
BMS/PTO

Drawn by
GMS

Checked by
PHB

ARCADIS
ARCADIS U.S., INC.

CWM CHEMICAL SERVICES, LLC • MODEL CITY, NEW YORK
RESIDUALS MANAGEMENT UNIT 1

FILL PROGRESSION AND TRUCK ROUTES CELLS 1 THRU 14 - FINAL SEQUENCE PHASE 3

GENERAL

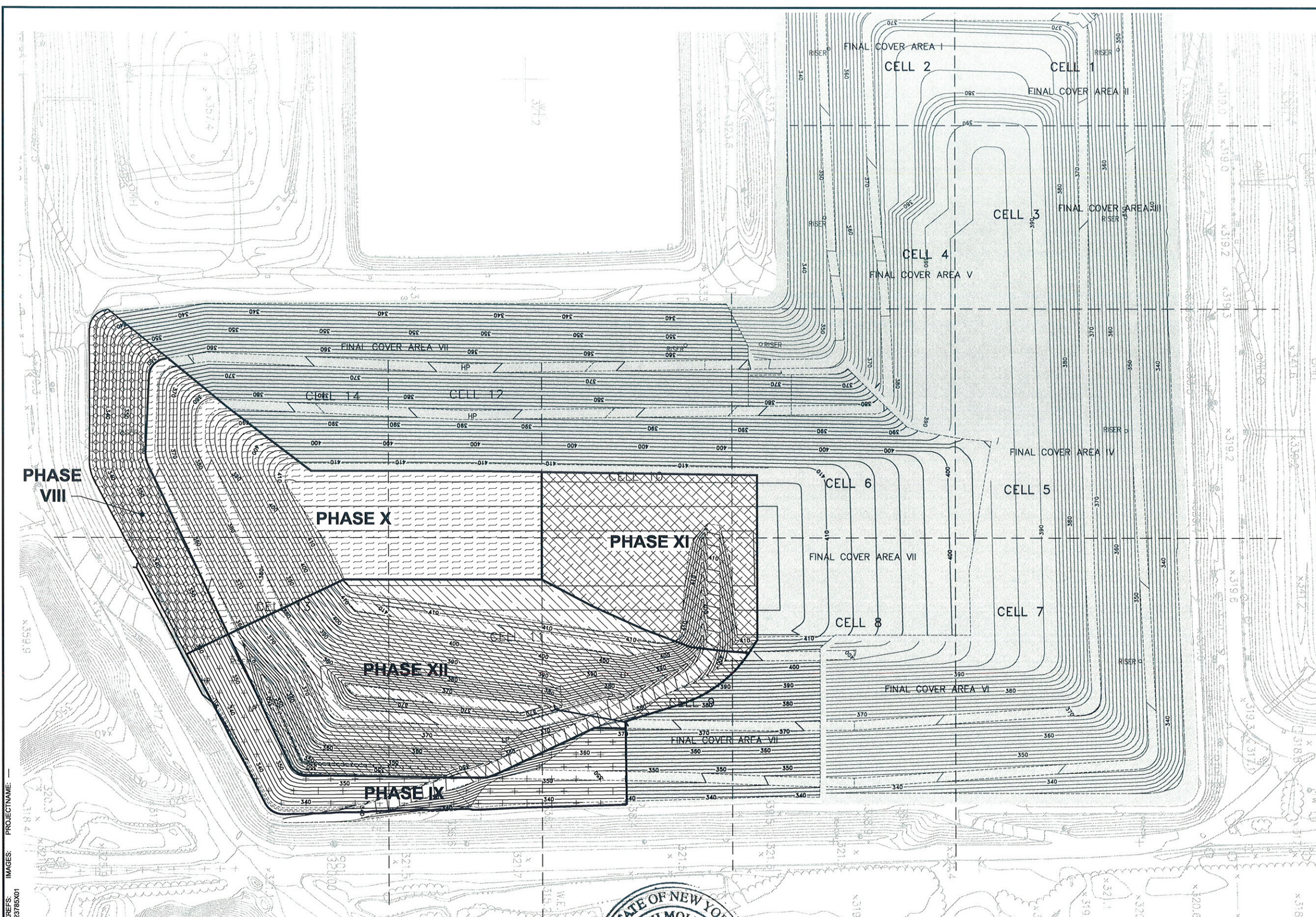
ARCADIS Project No.
B0023785.0000.00002

Date
AUGUST 2011

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315-446-9120

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- LEGEND:**
- EXISTING FINAL COVER AREA (SEE NOTE 5)
 - INDEX ELEVATION CONTOUR
 - INTERMEDIATE ELEVATION CONTOUR
 - GRADE BREAK
 - TENTATIVE PHASE VIII FINAL COVER AREA (APPROXIMATELY 1.1 ACRES)
 - TENTATIVE PHASE IX FINAL COVER AREA (APPROXIMATELY 1.4 ACRES)
 - TENTATIVE PHASE X FINAL COVER AREA (APPROXIMATELY 3.3 ACRES)
 - TENTATIVE PHASE XI FINAL COVER AREA (APPROXIMATELY 2.0 ACRES)
 - TENTATIVE PHASE XII FINAL COVER AREA (APPROXIMATELY 4.4 ACRES)

- NOTES:**
1. BASE MAP FEATURES OUTSIDE PERMITTED LIMIT OF WASTE COMPILED BY PHOTOGRAMMETRIC METHODS FROM AERIAL PHOTOGRAPHY DATED 5/31/01 (AIR SURVEY CORP. PROJECT NO. 71010503)
 2. COORDINATES REFER TO CWM PLANT SITE GRID.
 3. CONTOUR INTERVAL EQUALS 2 FEET.
 4. DEPICTED GRADES ARE FROM DRAWING ENTITLED "FILL PROGRESSION AND TRUCK ROUTES CELLS 1 THROUGH 14 - FINAL SEQUENCE PHASE 3" BY ARCADIS AND DATED AUGUST 2011.
 5. EXISTING FINAL COVER LIMIT REPRESENTS APPROXIMATE EDGE OF FULL COVER THICKNESS BASED ON QUARTERLY WASTE SURVEYS.
 6. THIS DRAWING DEPICTS ANTICIPATED LIMITS AND SEQUENCING OF FUTURE PHASES OF FINAL COVER CONSTRUCTION. ACTUAL LIMITS AND SEQUENCING OF FUTURE PHASES OF FINAL COVER MAY VARY TO ACCOMMODATE OPERATIONAL REQUIREMENTS.

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USE TO VERIFY FIGURE REPRODUCTION SCALE

1	11/11	REVISED FINAL COVER PHASING PLAN	NWF	BMS
No.	Date	Revisions	By	Ckd

THIS DRAWING IS THE PROPERTY OF THE ARCADIS ENTITY IDENTIFIED IN THE TITLE BLOCK AND MAY NOT BE REPRODUCED OR ALTERED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF SAME.

Professional Engineer's Name
JOSEPH MOLINA III

Professional Engineer's No.
NY 072644

State
NY

Date Signed
11/11/11

Project Mgr.
BMS

Designed by
BMS/PTO

Drawn by
GMS

Checked by
PHB

STATE OF NEW YORK
JOSEPH MOLINA III
072644
REGISTERED PROFESSIONAL ENGINEER

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ARCADIS U.S., INC.

CWM CHEMICAL SERVICES, LLC • MODEL CITY, NEW YORK
RESIDUALS MANAGEMENT UNIT 1

FINAL COVER PHASING PLAN

GENERAL

ARCADIS Project No.
B0023785.0000.00002

Date
JULY 2011

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SYRACUSE, NEW YORK
315-446-9120

2

Appendix A

RMU-1 Cell 1 Through 14
Hydrologic and Stormwater
Routing Calculations

Attachment 1

Detention Basins and Tank T-165
Storage Capacity

Calculation Sheet

Client: CWM Chemical Services, LLC

Project Location: Model City, New York

Project: RMU-1 Leachate Level Compliance Plan

Project No.: B0023785.0000

Subject: Detention Basins and Tank T-165 Storage Capacity

Prepared By: PTO

Date: August 2011

Reviewed By: BMS

Date: August 2011

Checked By: BMS

Date: August 2011

TASK:

Calculate the stormwater runoff (leachate) conditions into Detention Basin J and Detention Basin K from upgradient landfill areas for the 25-year, 24-hour design storm. Compare the peak liquid elevation in each basin with the lowest lined basin crest elevations to determine if the basins provide sufficient storage to contain the estimated stormwater runoff volume and provide for the minimum required freeboard. Compare the total volume pumped to the leachate storage tank T-165 to the tank capacity.

REFERENCES:

1. *Operations and Maintenance Manual For Residuals Management Unit-1*, September 1997 (latest revised date July 2011).
2. Proposed grading design for waste fill progression and capping for Cells 1 through 14 presented on Figure 1 entitled *Residuals Management Unit-1, Fill Progression and Truck Routes, Cells 1 Through 14 – Final Sequence Phase 3*, ARCADIS, July 2011.
3. HydroCAD Software Solutions LLC. HydroCAD. Vers. 8.5. Computer Software. 2006. (Output attached).
4. *Leachate Level Compliance Plan for Residuals Management Unit- One, Final Sequence Phase 2*, ARCADIS, March 2009 (latest revised date March 2010).
5. Site-Wide Permit, Module IV, Table 1.0 and Conditions B.(10) and L.(7).

ASSUMPTIONS:

1. Basin J receives inflow from its tributary watershed. The watershed predominately consists of the area drained by the lowermost surface water diversion berm within the uncapped portion of RMU-1. Stormwater outflow from Detention Basin J occurs via pumping by means of "Pump 1", a Goulds Model 3885 WE15H (or equivalent). Pump 1 is operated by a level control and is assumed to turn on once the liquid elevation in Basin J is greater than or equal to 347.75 feet (i.e., 1 foot above basin low point). Pump 1 is assumed to discharge stormwater from Basin J to upgradient Basin K at a rate of 66.8 gallons per minute (gpm) based on hydraulic modeling from Reference 4.
2. Basin K receives inflow from its tributary watershed as well as from Pump 1 as described in Assumption 1. The Basin K watershed predominately consists of the area drained by the middle surface water diversion berm within the uncapped portion of RMU-1. Stormwater outflow from

Calculation Sheet

Detention Basin K occurs via pumping (Pump 2) to on-site storage tank T-165 at a rate of approximately 1,032 gpm (Reference 4). Pump 2 is operated by a level control and is assumed to turn on once the liquid elevation in Basin K is greater than or equal to 366.38 feet (i.e., 1.5-feet above basin low point). The level control setting is based on not transferring more liquid to Tank T-165 than can be managed by the tank.

3. A minimum 1 foot freeboard (vertical distance between the estimated peak liquid elevations within the basins and the lowest lined crest elevations of the basins' berms) must be provided for the design storm.
4. Detention basin volumes are determined based on two initial conditions:
 - No liquid in the basins prior to the beginning of the design storm.
 - 1 foot of liquid in the basins above the basin low points prior to the beginning of the design storm.
5. Detention Basin J and Detention Basin K are lined to elevations of 352.52 and 374.40, respectively, based on the lowest perimeter elevations depicted in Reference 2.
6. On-site storage tank T-165 has a usable storage capacity of 777,797 gallons based on Reference 5. This volume assumes liquid is present in the lowest 1-foot of the tank at the start of the design storm, 2-feet of freeboard is required, and that 100 percent of the rainfall within the tank footprint (including secondary containment) is contained in the primary containment. No outflow occurs from Tank T-165 is assumed to occur during the design storm.

METHODOLOGY:

In general, the methodology used to determine the stormwater runoff (leachate) conditions into Basins J and K in this evaluation is based on that presented in Reference 1. The methodology is as follows:

1. Develop the runoff hydrograph for the watersheds that are tributary to the detention basins. These are the portions of RMU-1 that drain into each basin. The runoff hydrograph is based on the following:
 - Runoff curve number (CN) for uncapped waste = 90 (based on Reference 1).
 - Runoff CN for paved wheel wash area = 98 (based on TR-55 CN tables contained in Reference 3).
 - Rainfall = 4.00 inches for the 25-year, 24-hour design storm (based on Reference 1).
 - Watershed area:
 - o Detention Basin J = 2.20 acres (delineated based on Reference 2).
 - o Detention Basin K = 7.69 acres (delineated based on Reference 2).
 - Time of concentration (Tc) = 0.1 hour (assumed based on Reference 1).
2. Use Reference 3 to account for the following inflows to and outflows from Detention Basin J and

Calculation Sheet

Detention Basin K:

- Inflow from Detention Basin J and Detention Basin K watersheds (described above).
 - Outflow from Detention Basin J via Pump 1 based on the conditions outlined in Assumption 1.
 - Outflow from Detention Basin K via Pump 2 based on the conditions outlined in Assumption 2.
 - Inflow to Detention Basin K via Pump 1 based on the conditions outlined in Assumption 1.
3. Evaluate the adequacy of Tank T-165 to manage the volume pumped from Basin K via Pump 2 by comparing the pumped volume to the tank capacity.

CALCULATIONS:

1. Stormwater Runoff Hydrograph for Detention Basin Watersheds

Table 1 below summarizes the hydrologic parameters for the tributary watersheds that drain directly to Detention Basin J and Detention Basin K as well as the resulting stormwater runoff conditions into each basin from the tributary watersheds.

Table 1

Detention Basin Watershed	Watershed Area (acres)	Runoff Curve Number	Time of Concentration (hr)	Runoff (in)	Estimated Peak Discharge into Basin (cfs)	Total Stormwater Runoff Volume (cu. ft.)
Basin J	2.20	90	0.1	2.92	10.89	23,305
Basin K	7.69	90	0.1	2.92	38.05	81,501

It should be noted that the watershed times of concentration and estimated peak discharges for the tributary areas to Detention Basins J and K are presented to maintain consistency with previous LLCP evaluations. The total stormwater runoff volume for each watershed is dependent only on the amount of precipitation, watershed acreage and runoff curve number and is independent of the watershed time of concentration. The output from Reference 3 for the tributary area to Detention Basins J and K is included as an attachment to this calculation.

2. Detention Basin J Routing and Peak Liquid Elevations

A rating curve is used to route the various inflows and outflows through Detention Basin J. The rating curve is based on the design grades depicted on the fill progression figure (Reference 2) and the characteristics of the outflow device (Pump 1). The results of the routing procedure, including peak liquid elevations, for each initial condition are presented in Table 2 below. Output from Reference 3 is included as an attachment to this calculation sheet.

Table 2

Starting Liquid El. (ft)	Peak Inflow (cfs)	Peak Outflow (cfs)	Peak Liquid El. (ft)	Lowest Lined Crest El. (ft)	Freeboard (ft)
346.75 (Basin Floor)	10.89	0.15	351.25	352.52	1.27
347.75 (1 Foot Above Basin Floor)	10.89	0.15	351.25		1.27

Calculation Sheet

3. Detention Basin K Routing and Peak Liquid Elevations

A rating curve is used to route the various inflows and outflows through Detention Basin K. The rating curve is based on the design grades depicted on the fill progression figure (Reference 2), the characteristics of the inflow from Pump 1 (Assumption 1), and the characteristics of the outflow device (Pump 2). The results of the routing procedure, including peak liquid elevations, for each initial condition are presented in Table 3 below. Output from Reference 3 is included as an attachment to this calculation sheet.

Table 3

Starting Liquid El. (ft)	Peak Inflow (cfs)	Peak Outflow (cfs)	Peak Liquid El. (ft)	Lowest Lined Crest El. (ft)	Freeboard (ft)
364.88 (Basin Floor)	38.20	2.30	371.01	374.40	3.39
365.88 (1 Foot Above Basin Floor)	38.20	2.30	371.01		3.39

4. Tank T-165 Volume Assessment

Table 4 below shows the contact stormwater runoff that is pumped from Basin K by Pump 2 to Tank T-165 as well as the actual storage capacity of Tank T-165 as stated in Assumption 6. The volume transferred to Tank T-165 by the pump is obtained from the output from Reference 3. The volume is based on the second initial condition given in Assumption 4 which yields the maximum pump volume.

Table 4

Tank T-165 Storage Capacity (gal)	Stormwater Volume Pumped from Basin K (gal)
777,797	775,201

As shown in Table 4, Tank T-165 has sufficient capacity to manage the stormwater pumped from Basin K via Pump 2.

SUMMARY:

Based on the assumptions and calculations presented above, Detention Basin J and Detention Basin K provide sufficient storage to contain stormwater runoff from the 25-year, 24-hour storm event while maintaining a minimum 1 foot of freeboard with respect to the lowest lined crest elevations of the basins. Tank T-165 provides adequate capacity to manage the liquid volume transferred from Basin K during the 25-year, 24-hour storm event.

Basin J

RMU-1 Hydro Model 2011 LLCP*Type II 24-hr 25 yr Model City Rainfall=4.00"*

Prepared by {enter your company name here}

HydroCAD® 8.00 s/n 005596 © 2006 HydroCAD Software Solutions LLC

7/15/2011**Subcatchment 146S: Direct Flow to Basin J**

Runoff = 10.89 cfs @ 11.97 hrs, Volume= 0.535 af, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs

Type II 24-hr 25 yr Model City Rainfall=4.00"

Area (ac)	CN	Description
2.170	90	
0.030	98	
2.200	90	Weighted Average
2.170		Pervious Area
0.030		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

RMU-1 Hydro Model 2011 LLC

Type II 24-hr 25 yr Model City Rainfall=4.00"

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7/15/2011

Hydrograph for Subcatchment 146S: Direct Flow to Basin J

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
1.00	0.04	0.00	0.00	53.00	4.00	2.92	0.00
2.00	0.09	0.00	0.00	54.00	4.00	2.92	0.00
3.00	0.14	0.00	0.00	55.00	4.00	2.92	0.00
4.00	0.19	0.00	0.00	56.00	4.00	2.92	0.00
5.00	0.25	0.00	0.01	57.00	4.00	2.92	0.00
6.00	0.32	0.01	0.02	58.00	4.00	2.92	0.00
7.00	0.40	0.02	0.04	59.00	4.00	2.92	0.00
8.00	0.48	0.05	0.06	60.00	4.00	2.92	0.00
9.00	0.59	0.09	0.12				
10.00	0.72	0.16	0.18				
11.00	0.94	0.28	0.38				
12.00	2.65	1.67	10.03				
13.00	3.09	2.07	0.54				
14.00	3.28	2.24	0.32				
15.00	3.41	2.37	0.25				
16.00	3.52	2.47	0.20				
17.00	3.61	2.55	0.17				
18.00	3.68	2.62	0.15				
19.00	3.75	2.68	0.13				
20.00	3.81	2.74	0.11				
21.00	3.86	2.79	0.11				
22.00	3.91	2.83	0.10				
23.00	3.95	2.88	0.10				
24.00	4.00	2.92	0.09				
25.00	4.00	2.92	0.00				
26.00	4.00	2.92	0.00				
27.00	4.00	2.92	0.00				
28.00	4.00	2.92	0.00				
29.00	4.00	2.92	0.00				
30.00	4.00	2.92	0.00				
31.00	4.00	2.92	0.00				
32.00	4.00	2.92	0.00				
33.00	4.00	2.92	0.00				
34.00	4.00	2.92	0.00				
35.00	4.00	2.92	0.00				
36.00	4.00	2.92	0.00				
37.00	4.00	2.92	0.00				
38.00	4.00	2.92	0.00				
39.00	4.00	2.92	0.00				
40.00	4.00	2.92	0.00				
41.00	4.00	2.92	0.00				
42.00	4.00	2.92	0.00				
43.00	4.00	2.92	0.00				
44.00	4.00	2.92	0.00				
45.00	4.00	2.92	0.00				
46.00	4.00	2.92	0.00				
47.00	4.00	2.92	0.00				
48.00	4.00	2.92	0.00				
49.00	4.00	2.92	0.00				
50.00	4.00	2.92	0.00				
51.00	4.00	2.92	0.00				
52.00	4.00	2.92	0.00				

Basin K

RMU-1 Hydro Model 2011 LLCP*Type II 24-hr 25 yr Model City Rainfall=4.00"*

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Subcatchment 134S: Direct Flow to Basin K

Runoff = 38.05 cfs @ 11.97 hrs, Volume= 1.871 af, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs

Type II 24-hr 25 yr Model City Rainfall=4.00"

Area (ac)	CN	Description
7.690	90	
7.690		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

RMU-1 Hydro Model 2011 LLC

Type II 24-hr 25 yr Model City Rainfall=4.00"

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Hydrograph for Subcatchment 134S: Direct Flow to Basin K

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
1.00	0.04	0.00	0.00	53.00	4.00	2.92	0.00
2.00	0.09	0.00	0.00	54.00	4.00	2.92	0.00
3.00	0.14	0.00	0.00	55.00	4.00	2.92	0.00
4.00	0.19	0.00	0.00	56.00	4.00	2.92	0.00
5.00	0.25	0.00	0.02	57.00	4.00	2.92	0.00
6.00	0.32	0.01	0.08	58.00	4.00	2.92	0.00
7.00	0.40	0.02	0.15	59.00	4.00	2.92	0.00
8.00	0.48	0.05	0.23	60.00	4.00	2.92	0.00
9.00	0.59	0.09	0.41				
10.00	0.72	0.16	0.62				
11.00	0.94	0.28	1.31				
12.00	2.65	1.67	35.05				
13.00	3.09	2.07	1.88				
14.00	3.28	2.24	1.12				
15.00	3.41	2.37	0.89				
16.00	3.52	2.47	0.69				
17.00	3.61	2.55	0.60				
18.00	3.68	2.62	0.53				
19.00	3.75	2.68	0.46				
20.00	3.81	2.74	0.39				
21.00	3.86	2.79	0.37				
22.00	3.91	2.83	0.35				
23.00	3.95	2.88	0.34				
24.00	4.00	2.92	0.32				
25.00	4.00	2.92	0.00				
26.00	4.00	2.92	0.00				
27.00	4.00	2.92	0.00				
28.00	4.00	2.92	0.00				
29.00	4.00	2.92	0.00				
30.00	4.00	2.92	0.00				
31.00	4.00	2.92	0.00				
32.00	4.00	2.92	0.00				
33.00	4.00	2.92	0.00				
34.00	4.00	2.92	0.00				
35.00	4.00	2.92	0.00				
36.00	4.00	2.92	0.00				
37.00	4.00	2.92	0.00				
38.00	4.00	2.92	0.00				
39.00	4.00	2.92	0.00				
40.00	4.00	2.92	0.00				
41.00	4.00	2.92	0.00				
42.00	4.00	2.92	0.00				
43.00	4.00	2.92	0.00				
44.00	4.00	2.92	0.00				
45.00	4.00	2.92	0.00				
46.00	4.00	2.92	0.00				
47.00	4.00	2.92	0.00				
48.00	4.00	2.92	0.00				
49.00	4.00	2.92	0.00				
50.00	4.00	2.92	0.00				
51.00	4.00	2.92	0.00				
52.00	4.00	2.92	0.00				



**Initial Condition #1:
No Liquid in Basins at
Beginning of Storm Event**

Basin J

RMU-1 Hydro Model 2011 LLC

Type II 24-hr 25 yr Model City Rainfall=4.00"

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Pond 145P: Basin J

Inflow Area = 2.200 ac, Inflow Depth = 2.92" for 25 yr Model City event
 Inflow = 10.89 cfs @ 11.97 hrs, Volume= 0.535 af
 Outflow = 0.15 cfs @ 9.75 hrs, Volume= 0.525 af, Atten= 99%, Lag= 0.0 min
 Primary = 0.15 cfs @ 9.75 hrs, Volume= 0.525 af

Routing by Stor-Ind method, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs
 Peak Elev= 351.25' @ 18.15 hrs Surf.Area= 0.172 ac Storage= 0.365 af

Plug-Flow detention time= 1,016.5 min calculated for 0.525 af (98% of inflow)
 Center-of-Mass det. time= 1,004.3 min (1,799.7 - 795.4)

Volume	Invert	Avail.Storage	Storage Description
#1	346.75'	0.614 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
346.75	0.000	0.000	0.000
347.00	0.002	0.000	0.000
347.50	0.017	0.005	0.005
348.00	0.043	0.015	0.020
348.50	0.062	0.026	0.046
349.00	0.081	0.036	0.082
349.50	0.100	0.045	0.127
350.00	0.120	0.055	0.182
350.50	0.141	0.065	0.248
351.00	0.162	0.076	0.323
351.50	0.183	0.086	0.410
352.00	0.205	0.097	0.506
352.50	0.227	0.108	0.614

Device	Routing	Invert	Outlet Devices
#1	Primary	346.75'	Special & User-Defined Head (feet) 0.00 0.99 1.00 5.00 Disch. (cfs) 0.000 0.000 0.149 0.149

Primary OutFlow Max=0.15 cfs @ 9.75 hrs HW=347.75' (Free Discharge)
 ↑1=Special & User-Defined (Custom Controls 0.15 cfs)

RMU-1 Hydro Model 2011 LLCP*Type II 24-hr 25 yr Model City Rainfall=4.00"*

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Hydrograph for Pond 145P: Basin J

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
1.00	0.00	0.000	346.75	0.00
3.00	0.00	0.000	346.75	0.00
5.00	0.01	0.000	346.90	0.00
7.00	0.04	0.004	347.44	0.00
9.00	0.12	0.011	347.75	0.12
11.00	0.38	0.020	348.01	0.15
13.00	0.54	0.322	350.99	0.15
15.00	0.25	0.355	351.19	0.15
17.00	0.17	0.364	351.24	0.15
19.00	0.13	0.364	351.24	0.15
21.00	0.11	0.358	351.21	0.15
23.00	0.10	0.350	351.16	0.15
25.00	0.00	0.334	351.07	0.15
27.00	0.00	0.310	350.92	0.15
29.00	0.00	0.285	350.76	0.15
31.00	0.00	0.261	350.59	0.15
33.00	0.00	0.236	350.42	0.15
35.00	0.00	0.211	350.23	0.15
37.00	0.00	0.187	350.04	0.15
39.00	0.00	0.162	349.83	0.15
41.00	0.00	0.137	349.60	0.15
43.00	0.00	0.113	349.35	0.15
45.00	0.00	0.088	349.07	0.15
47.00	0.00	0.064	348.76	0.15
49.00	0.00	0.039	348.38	0.15
51.00	0.00	0.014	347.85	0.15
53.00	0.00	0.011	347.74	0.00
55.00	0.00	0.011	347.74	0.00
57.00	0.00	0.011	347.74	0.00
59.00	0.00	0.011	347.74	0.00

Basin K

RMU-1 Hydro Model 2011 LLC

Type II 24-hr 25 yr Model City Rainfall=4.00"

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Pond 143P: Basin K

[78] Warning: Submerged Pond 145P Primary device # 1 by 24.26'

[81] Warning: Exceeded Pond 145P by 20.12' @ 12.41 hrs

Inflow Area = 9.890 ac, Inflow Depth = 2.91" for 25 yr Model City event
 Inflow = 38.20 cfs @ 11.97 hrs, Volume= 2.395 af
 Outflow = 2.30 cfs @ 11.42 hrs, Volume= 2.345 af, Atten= 94%, Lag= 0.0 min
 Primary = 2.30 cfs @ 11.42 hrs, Volume= 2.345 af

Routing by Stor-Ind method, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs
 Peak Elev= 371.01' @ 12.81 hrs Surf.Area= 0.257 ac Storage= 0.853 af

Plug-Flow detention time= 156.1 min calculated for 2.345 af (98% of inflow)
 Center-of-Mass det. time= 114.4 min (1,129.7 - 1,015.4)

Volume	Invert	Avail.Storage	Storage Description
#1	364.88'	1.442 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
364.88	0.000	0.000	0.000
365.00	0.008	0.000	0.000
365.50	0.027	0.009	0.009
366.00	0.050	0.019	0.028
366.50	0.075	0.031	0.060
367.00	0.102	0.044	0.104
367.50	0.132	0.059	0.162
368.00	0.156	0.072	0.234
368.50	0.172	0.082	0.316
369.00	0.189	0.090	0.407
369.50	0.205	0.098	0.505
370.00	0.222	0.107	0.612
370.50	0.239	0.115	0.727
371.00	0.257	0.124	0.851
371.50	0.275	0.133	0.984
372.00	0.293	0.142	1.126
372.50	0.316	0.152	1.278
373.00	0.339	0.164	1.442

Device	Routing	Invert	Outlet Devices
#1	Primary	364.88'	Special & User-Defined Head (feet) 0.00 1.49 1.50 10.00 Disch. (cfs) 0.000 0.000 2.300 2.300

Primary OutFlow Max=2.30 cfs @ 11.42 hrs HW=366.38' (Free Discharge)
 ↑1=Special & User-Defined (Custom Controls 2.30 cfs)

RMU-1 Hydro Model 2011 LLC*Type II 24-hr 25 yr Model City Rainfall=4.00"*

Prepared by {enter your company name here}

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Hydrograph for Pond 143P: Basin K

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
1.00	0.00	0.000	364.88	0.00
3.00	0.00	0.000	364.88	0.00
5.00	0.02	0.000	364.98	0.00
7.00	0.15	0.014	365.65	0.00
9.00	0.53	0.051	366.37	0.52
11.00	1.46	0.051	366.38	1.46
13.00	2.03	0.851	371.00	2.30
15.00	1.04	0.696	370.37	2.30
17.00	0.75	0.459	369.27	2.30
19.00	0.61	0.191	367.71	2.30
21.00	0.52	0.051	366.37	0.52
23.00	0.49	0.051	366.37	0.49
25.00	0.15	0.050	366.37	0.15
27.00	0.15	0.050	366.37	0.15
29.00	0.15	0.050	366.37	0.15
31.00	0.15	0.050	366.37	0.15
33.00	0.15	0.050	366.37	0.15
35.00	0.15	0.050	366.37	0.15
37.00	0.15	0.050	366.37	0.15
39.00	0.15	0.050	366.37	0.15
41.00	0.15	0.050	366.37	0.15
43.00	0.15	0.050	366.37	0.15
45.00	0.15	0.050	366.37	0.15
47.00	0.15	0.050	366.37	0.15
49.00	0.15	0.050	366.37	0.15
51.00	0.15	0.050	366.37	0.15
53.00	0.00	0.050	366.37	0.00
55.00	0.00	0.050	366.37	0.00
57.00	0.00	0.050	366.37	0.00
59.00	0.00	0.050	366.37	0.00



**Initial Condition #2:
1 Foot of Liquid in Basins at
Beginning of Storm Event**

Basin J

RMU-1 Hydro Model 2011 LLCP

Type II 24-hr 25 yr Model City Rainfall=4.00"

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Pond 145P: Basin J

Inflow Area = 2.200 ac, Inflow Depth = 2.92" for 25 yr Model City event
 Inflow = 10.89 cfs @ 11.97 hrs, Volume= 0.535 af
 Outflow = 0.15 cfs @ 9.75 hrs, Volume= 0.536 af, Atten= 99%, Lag= 0.0 min
 Primary = 0.15 cfs @ 9.75 hrs, Volume= 0.536 af

Routing by Stor-Ind method, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs
 Starting Elev= 347.75' Surf.Area= 0.030 ac Storage= 0.011 af
 Peak Elev= 351.25' @ 18.15 hrs Surf.Area= 0.172 ac Storage= 0.365 af (0.354 af above start)

Plug-Flow detention time= 1,016.4 min calculated for 0.525 af (98% of inflow)
 Center-of-Mass det. time= 976.1 min (1,771.5 - 795.4)

Volume	Invert	Avail.Storage	Storage Description
#1	346.75'	0.614 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
346.75	0.000	0.000	0.000
347.00	0.002	0.000	0.000
347.50	0.017	0.005	0.005
348.00	0.043	0.015	0.020
348.50	0.062	0.026	0.046
349.00	0.081	0.036	0.082
349.50	0.100	0.045	0.127
350.00	0.120	0.055	0.182
350.50	0.141	0.065	0.248
351.00	0.162	0.076	0.323
351.50	0.183	0.086	0.410
352.00	0.205	0.097	0.506
352.50	0.227	0.108	0.614

Device	Routing	Invert	Outlet Devices
#1	Primary	346.75'	Special & User-Defined Head (feet) 0.00 0.99 1.00 5.00 Disch. (cfs) 0.000 0.000 0.149 0.149

Primary OutFlow Max=0.15 cfs @ 9.75 hrs HW=347.75' (Free Discharge)
 ↑1=Special & User-Defined (Custom Controls 0.15 cfs)

RMU-1 Hydro Model 2011 LLCP*Type II 24-hr 25 yr Model City Rainfall=4.00"*

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Hydrograph for Pond 145P: Basin J

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
1.00	0.00	0.011	347.75	0.15
3.00	0.00	0.011	347.74	0.00
5.00	0.01	0.011	347.74	0.01
7.00	0.04	0.011	347.74	0.04
9.00	0.12	0.011	347.75	0.12
11.00	0.38	0.020	348.01	0.15
13.00	0.54	0.322	350.99	0.15
15.00	0.25	0.355	351.19	0.15
17.00	0.17	0.364	351.24	0.15
19.00	0.13	0.364	351.24	0.15
21.00	0.11	0.358	351.21	0.15
23.00	0.10	0.350	351.16	0.15
25.00	0.00	0.334	351.07	0.15
27.00	0.00	0.310	350.92	0.15
29.00	0.00	0.285	350.76	0.15
31.00	0.00	0.261	350.59	0.15
33.00	0.00	0.236	350.42	0.15
35.00	0.00	0.211	350.23	0.15
37.00	0.00	0.187	350.04	0.15
39.00	0.00	0.162	349.83	0.15
41.00	0.00	0.137	349.60	0.15
43.00	0.00	0.113	349.35	0.15
45.00	0.00	0.088	349.07	0.15
47.00	0.00	0.064	348.76	0.15
49.00	0.00	0.039	348.38	0.15
51.00	0.00	0.014	347.85	0.15
53.00	0.00	0.011	347.74	0.00
55.00	0.00	0.011	347.74	0.00
57.00	0.00	0.011	347.74	0.00
59.00	0.00	0.011	347.74	0.00

Basin K

RMU-1 Hydro Model 2011 LLC

Type II 24-hr 25 yr Model City Rainfall=4.00"

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Pond 143P: Basin K

[82] Warning: Early inflow requires earlier time span

[78] Warning: Submerged Pond 145P Primary device # 1 by 24.26'

[81] Warning: Exceeded Pond 145P by 20.12' @ 12.41 hrs

Inflow Area = 9.890 ac, Inflow Depth > 2.92" for 25 yr Model City event
 Inflow = 38.20 cfs @ 11.97 hrs, Volume= 2.406 af
 Outflow = 2.30 cfs @ 11.42 hrs, Volume= 2.379 af, Atten= 94%, Lag= 0.0 min
 Primary = 2.30 cfs @ 11.42 hrs, Volume= 2.379 af

Routing by Stor-Ind method, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs

Starting Elev= 365.88' Surf.Area= 0.044 ac Storage= 0.023 af

Peak Elev= 371.01' @ 12.81 hrs Surf.Area= 0.257 ac Storage= 0.853 af (0.830 af above start)

Plug-Flow detention time= 155.8 min calculated for 2.355 af (98% of inflow)

Center-of-Mass det. time= 108.0 min (1,120.7 - 1,012.7)

Volume	Invert	Avail.Storage	Storage Description
#1	364.88'	1.442 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
364.88	0.000	0.000	0.000
365.00	0.008	0.000	0.000
365.50	0.027	0.009	0.009
366.00	0.050	0.019	0.028
366.50	0.075	0.031	0.060
367.00	0.102	0.044	0.104
367.50	0.132	0.059	0.162
368.00	0.156	0.072	0.234
368.50	0.172	0.082	0.316
369.00	0.189	0.090	0.407
369.50	0.205	0.098	0.505
370.00	0.222	0.107	0.612
370.50	0.239	0.115	0.727
371.00	0.257	0.124	0.851
371.50	0.275	0.133	0.984
372.00	0.293	0.142	1.126
372.50	0.316	0.152	1.278
373.00	0.339	0.164	1.442

Device	Routing	Invert	Outlet Devices
#1	Primary	364.88'	Special & User-Defined
			Head (feet) 0.00 1.49 1.50 10.00
			Disch. (cfs) 0.000 0.000 2.300 2.300

Primary OutFlow Max=2.30 cfs @ 11.42 hrs HW=366.38' (Free Discharge)

↑1=Special & User-Defined (Custom Controls 2.30 cfs)

RMU-1 Hydro Model 2011 LLC*Type II 24-hr 25 yr Model City Rainfall=4.00"*

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Hydrograph for Pond 143P: Basin K

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
1.00	0.15	0.023	365.88	0.00
3.00	0.00	0.023	365.89	0.00
5.00	0.03	0.024	365.90	0.00
7.00	0.19	0.041	366.22	0.00
9.00	0.53	0.051	366.37	0.52
11.00	1.46	0.051	366.38	1.46
13.00	2.03	0.851	371.00	2.30
15.00	1.04	0.696	370.37	2.30
17.00	0.75	0.459	369.27	2.30
19.00	0.61	0.191	367.71	2.30
21.00	0.52	0.051	366.37	0.52
23.00	0.49	0.051	366.37	0.49
25.00	0.15	0.050	366.37	0.15
27.00	0.15	0.050	366.37	0.15
29.00	0.15	0.050	366.37	0.15
31.00	0.15	0.050	366.37	0.15
33.00	0.15	0.050	366.37	0.15
35.00	0.15	0.050	366.37	0.15
37.00	0.15	0.050	366.37	0.15
39.00	0.15	0.050	366.37	0.15
41.00	0.15	0.050	366.37	0.15
43.00	0.15	0.050	366.37	0.15
45.00	0.15	0.050	366.37	0.15
47.00	0.15	0.050	366.37	0.15
49.00	0.15	0.050	366.37	0.15
51.00	0.15	0.050	366.37	0.15
53.00	0.00	0.050	366.37	0.00
55.00	0.00	0.050	366.37	0.00
57.00	0.00	0.050	366.37	0.00
59.00	0.00	0.050	366.37	0.00

ARCADIS

Attachment 2

Interim Drainage Feature Design

Calculation Sheet

Client: CWM Chemical Services, LLC

Project Location: Model City, New York

Project: RMU-1 Leachate Level Compliance Plan

Project No.: B0023785.0000

Subject: Interim Drainage Feature Design

Prepared By: NWF/PTO

Date: November 2011

Reviewed By: BMS

Date: November 2011

Checked By: BMS

Date: November 2011

TASK:

Demonstrate that the interim drainage features depicted on the drawing entitled *Residuals Management Unit One - Fill Progression and Truck Routes, Cells 1 Through 14 – Final Sequence Phase 3* provide sufficient hydraulic capacity to convey the estimated peak discharge from the 25-year, 24-hour storm.

REFERENCES:

1. Proposed grading design for waste fill progression and capping for Cells 1 through 14 presented on Figure 1 entitled *Residuals Management Unit One - Fill Progression and Truck Routes, Cells 1 Through 14 – Final Sequence Phase 3*, ARCADIS, August 2011 (revised November 2011).
2. HydroCAD Version 8.5, hydrologic evaluation software, HydroCAD Software Solutions, LLC, 2006.
3. *Engineer-in-Training Reference Manual*, 8th Edition, Lindeburg, Michael R., P.E., pp. A-45, 1992.
4. *Operations and Maintenance Manual for Residuals Management Unit-1*, dated September 1997 (latest revised date November 2011).
5. Appendix I of the *Engineering Report for Residuals Management Unit 1* entitled "Surface Water Drainage and Erosion Calculations."

ASSUMPTIONS:

1. Several interim drainage features are depicted on Reference 1 to convey non-contact stormwater runoff from the Phase VII final cover area and the proposed interim cover area to existing stormwater controls outside of the landfill. These interim drainage features include the following:
 - A drainage ditch along the inside edge of the RMU-1 access road at the southeastern corner of RMU-1 (interim drainage ditch) as depicted on Figure 18 from Reference 4.
 - The southwest downchute at the southwest corner of RMU-1 as depicted on Figure 17 from Reference 4.
 - The southeast header pipe within the trapezoidal perimeter ditch at the base of the RMU-1 perimeter berm as depicted on Figure 16 from Reference 4.
 - The southeast downchute on the eastern face of RMU-1 as depicted on Figure 16 from Reference 4.

Calculation Sheet

Additionally, an interim drainage feature will be installed on the landfill's plateau along the eastern edge of the Phase VII final cover area. This Phase VII final cover area diversion ditch will intercept and convey contact stormwater runoff from the western half of the plateau that would otherwise pond against the temporary termination of the final cover. The temporary termination of the proposed Phase VIII final cover area on the lowermost surface water diversion berm (SWDB) will create a different geometry for the conveyance of contact stormwater runoff and this geometry is evaluated herein as well.

2. The interim drainage ditch consists of two segments that convey stormwater from the RMU-1 access road and interim cover sideslopes to culvert CV-2. Segment one of the drainage ditch has a triangular cross section, 3H:1V interior and 2H:1V exterior sideslopes, a 10 percent bed slope, and a minimum depth of 0.5 feet. Segment two of the drainage ditch also has a triangular cross section, 3H:1V interior and 2H:1V exterior sideslope, a 0.3 percent minimum bed slope, and a minimum depth of 1 foot. A Manning "n" value of 0.015 is assumed based on the presence of a geosynthetic along the channel interior.
3. The southwest downchute consists of two corrugated metal pipes (corrugated high-density polyethylene [HDPE] pipes may also be used) used to convey stormwater from the upper and lower surface water diversion berms on the western face of RMU-1 into riprap lined drainage channel V4 and ultimately into the drainage area P9 perimeter channel at the base of the perimeter berm. One pipe receives flow from the upper surface water diversion berm and the other receives flow from the lower surface water diversion berm. Both the upper and lower downchute pipes are 15 inches in diameter. Both downchute pipe inlets are assumed to be mitered to conform to fill. Although the downchute pipes generally follow the design final cover slope (i.e., 33 percent), there are areas (such as inlets and intersections with surface water diversion berms) where the slope reduces to 2 percent. This flatter slope is used to compute hydraulic capacity for the downchute pipes.
4. The southeast downchute consists of a single corrugated metal pipe (a corrugated HDPE pipe may also be used). The pipe is 15 inches in diameter and receives flow from the interim cover area to the north of the RMU-1 access road. Although the downchute pipe generally follows the perimeter berm sideslope gradient, (i.e., 50 percent), the slope reduces to 2 percent at the pipe inlet. Therefore the flatter slope is used to compute hydraulic capacity.
5. The southeast downchute discharges into a southeast downchute header pipe (not shown on Reference 1, but shown on Figure 16 in Reference 4). This header pipe dissipates the flow from the southeast downchute pipe and aligns the flow with the drainage area P5 perimeter channel. The header pipe also conveys flow from the upgradient portion of drainage area P5 that drains to the P5 perimeter channel. The header pipe is an 18-inch-diameter corrugated metal pipe. The pipe slope is equal to the ditch slope (i.e., 0.25 percent).
6. The Phase VII final cover area diversion ditch consists of a ditch excavated into the final waste grade adjacent to the temporary termination of the final cover on the western side of the landfill plateau. The diversion ditch has a triangular cross section, 2H:1V sideslopes, a 0.5 percent bed slope, and a minimum depth of 2 feet. A Manning "n" of 0.025 is assumed based on the ditch surface consisting of bare soil.
7. The lowermost SWDB with the temporary Phase VIII final cover termination consists of a triangular channel with 3H:1V and 2H:1V sideslopes, a 1.0 percent bed slope, and a lined depth of 2 feet. A Manning "n" of 0.025 is assumed based on the channel surfaces consisting of bare soil.

Calculation Sheet

8. The interim drainage features are deemed acceptable if the hydraulic capacities are equal to or greater than the respective peak discharges from the 25-year, 24-hour storm. The capacity of the southwest downchute is based on a headwater depth of 1.2 feet, which is equal to the depth of the surface water diversion berm. The capacity of the southeast downchute pipe is based on a headwater depth of 2.5 feet, which is equal to the depth of the drainage area A6 perimeter channel. The capacity of the southeast downchute header pipe is based on a headwater depth of 2.0 feet, which is equal to the depth of the P5 drainage ditch. The capacity of the Phase VII final cover area diversion ditch is based on the bank-full flow capacity of the ditch. The capacity of the lowermost SWDB with the temporary Phase VIII final cover termination is based on a flow depth of 1.0 foot, which provides 1.0 foot of freeboard with respect to the adjacent final cover liner crest elevation as shown in RMU-1 O&M Manual Figure 21.
9. The 25-year, 24-hour estimated peak discharges for the interim drainage features are calculated using Reference 2. The watersheds for the drainage ditch, southwest downchute, southeast header pipe, southeast downchute, and the Phase VII final cover area diversion ditch are delineated from Reference 1. The watershed characteristics for each drainage feature are as follows:
- Drainage Ditch (Segment 1)
 - o Watershed area= 0.19 acres
 - o CN=96 (Weighted average)
 - CN=94, 0.11 acres (Interim cover from Reference 2 ,Hydrologic Soil Group D, newly graded areas)
 - CN=98, 0.09 acres (Paved roads)
 - o Time of Concentration = 0.1 hours
 - Drainage Ditch (Segment 2)
 - o Watershed area= 0.80 acres
 - o CN=96 (Weighted average)
 - CN=94, 0.50 acres (Interim cover)
 - CN=98, 0.30 acres (Paved roads)
 - o Time of Concentration = 0.1 hours
 - Southwest Downchute (Upper)
 - o Watershed area= 0.74 acres
 - o CN=86 (Open spaces, Hydrologic Soil Group C)
 - o Time of Concentration = 0.1 hours
 - Southwest Downchute (Lower)
 - o Watershed area= 0.72 acres
 - o CN= 86 (Open spaces)
 - o Time of Concentration = 0.1 hours
 - Southeast Downchute
 - o Watershed area= 1.01 acres
 - o CN=91 (Weighted average)
 - CN=94, 0.51 acres (Interim cover)
 - CN=98, 0.32 acres (Paved roads)
 - CN=86, 0.18 acres (Open Spaces)
 - o Time of Concentration = 0.1 hours

Calculation Sheet

- Southeast Downchute Header Pipe
 - o Watershed area= 1.19 acres
 - o CN=90 (Weighted average)
 - CN=94, 0.51 acres (Interim cover)
 - CN=98, 0.32 acres (Paved roads)
 - CN=86, 0.36 acres (Open Spaces)
 - o Time of Concentration = 0.1 hours
- Phase VII Final Cover Area Diversion Ditch
 - o Watershed area= 2.47 acres
 - o CN=90 (uncapped waste)
 - o Time of Concentration = 0.1 hours
- Lowermost SWDB with Temporary Phase VIII Final Cover Termination
 - o Watershed area= 0.89 acres
 - o CN=90 (uncapped waste)
 - o Time of Concentration = 0.1 hours

CALCULATIONS:

1. Estimated Peak Discharges

Table 1 below summarizes the watershed acreages and estimated peak discharges to the various interim drainage features during the 25-year, 24-hour storm based on References 1 and 2.

Table 1

Interim Drainage Feature	Watershed Area (acres)	CN (Weighted Average)	Time of Concentration (hours)	Estimated Peak Discharge (cfs)
Interim Diversion Ditch – Segment 1	0.19	96	0.1	1.07
Interim Diversion Ditch – Segment 2	0.80	96	0.1	4.45
Southwest Downchute Pipe – Upper Surface Water Diversion Berm	0.74	86	0.1	3.31
Southwest Downchute Pipe – Lower Surface Water Diversion Berm	0.72	86	0.1	3.16
Southeast Downchute	1.01	91	0.1	5.13
Southeast Downchute Header Pipe	1.19	90	0.1	5.93
Phase VII Final Cover Area Diversion Ditch	2.47	90	0.1	12.22
Lowermost SWDB with Temporary Phase VIII Final Cover Termination	0.89	90	0.1	4.40

Supporting output from Reference 2 for the determination of estimated peak discharges is included as an attachment to this calculation.

Calculation Sheet

2. Hydraulic Capacity of Interim Drainage Features

Table 2 below summarizes the estimated peak discharges to the interim drainage features and the hydraulic capacities of each feature.

Table 2

Interim Drainage Feature	25-Year, 24-Hour Estimated Peak Discharge (cfs)	Hydraulic Capacity (cfs)
Interim Diversion Ditch – Segment 1	1.07	7.40 ¹
Interim Diversion Ditch – Segment 2	4.45	8.14 ¹
Southwest Downchute Pipe - Upper Surface Water Diversion Berm	3.31	3.98 ²
Southwest Downchute Pipe - Lower Surface Water Diversion Berm	3.16	3.98 ²
Southeast Downchute	5.13	5.76 ²
Southeast Downchute Header Pipe	5.93	6.27 ²
Phase VII Final Cover Area Diversion Ditch	12.22	31.30 ³
Lowermost SWDB with Temporary Phase VIII Final Cover Termination	4.40	8.92 ⁴

Notes:

1. Capacity obtained from the Manning equation based on the parameters from Assumption 2.
2. Capacity based on stage-discharge values from Reference 2.
3. Capacity obtained from the Manning equation based on the parameters from Assumption 6.
4. Capacity obtained from the Manning equation based on the parameters from Assumption 7.

As indicated in Table 2, the hydraulic capacity of each interim drainage feature exceeds the peak discharge from the 25-year, 24-hour storm. Hydraulic capacity calculations for the interim drainage features are included as an attachment.

SUMMARY:

Based on the assumptions and calculations above, the hydraulic capacities of the interim drainage features depicted on Reference 1 are sufficient to convey the estimated peak discharges from the 25-year, 24-hour storm.

Estimated Peak Discharges

RMU-1 Hydro Model 2011 LLC*Type II 24-hr 25 yr Model City Rainfall=4.00"*

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Subcatchment 131S: Access Road Ditch (Segment 1)

Runoff = 1.07 cfs @ 11.97 hrs, Volume= 0.057 af, Depth= 3.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs

Type II 24-hr 25 yr Model City Rainfall=4.00"

Area (ac)	CN	Description
0.107	94	
0.085	98	Paved parking & roofs
0.192	96	Weighted Average
0.107		Pervious Area
0.085		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

RMU-1 Hydro Model 2011 LLCP*Type II 24-hr 25 yr Model City Rainfall=4.00"*

Prepared by {enter your company name here}

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Subcatchment 154S: Access Road Ditch (Segment 2)

Runoff = 4.45 cfs @ 11.97 hrs, Volume= 0.236 af, Depth= 3.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs

Type II 24-hr 25 yr Model City Rainfall=4.00"

Area (ac)	CN	Description
0.500	94	
0.300	98	Paved parking & roofs
0.800	96	Weighted Average
0.500		Pervious Area
0.300		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

RMU-1 Hydro Model 2011 LLCP

Type II 24-hr 25 yr Model City Rainfall=4.00"

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Subcatchment 159S: Downchute area (Upper)

Runoff = 3.31 cfs @ 11.97 hrs, Volume= 0.157 af, Depth= 2.55"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs

Type II 24-hr 25 yr Model City Rainfall=4.00"

Area (ac)	CN	Description
0.740	86	
0.740		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	50	0.3300	0.43		Sheet Flow, Range n= 0.130 P2= 2.30"
0.1	29	0.3300	4.02		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
3.8	360	0.0100	1.60	2.87	Channel Flow, Area= 1.8 sf Perim= 6.9' r= 0.26' n= 0.038
5.8	439	Total			

RMU-1 Hydro Model 2011 LLCP

Type II 24-hr 25 yr Model City Rainfall=4.00"

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Subcatchment 160S: Downchute area (Lower)

Runoff = 3.16 cfs @ 11.97 hrs, Volume= 0.153 af, Depth= 2.55"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs

Type II 24-hr 25 yr Model City Rainfall=4.00"

Area (ac)	CN	Description
0.720	86	
0.720		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	50	0.3300	0.43		Sheet Flow, Range n= 0.130 P2= 2.30"
0.0	10	0.3300	4.02		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
4.4	440	0.0100	1.65	3.30	Channel Flow, Area= 2.0 sf Perim= 7.3' r= 0.27' n= 0.038
6.3	500	Total			

RMU-1 Hydro Model 2011 LLC*Type II 24-hr 25 yr Model City Rainfall=4.00"*

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Link 154L: Combined Southeast Area

Inflow Area = 1.192 ac, Inflow Depth = 2.95" for 25 yr Model City event

Inflow = 5.93 cfs @ 11.97 hrs, Volume= 0.293 af

Primary = 5.93 cfs @ 11.97 hrs, Volume= 0.293 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs

RMU-1 Hydro Model 2011 LLCP*Type II 24-hr 25 yr Model City Rainfall=4.00"*

Prepared by {enter your company name here}

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Subcatchment 161S: Southeast Temporary Downchute Area

Runoff = 5.13 cfs @ 11.97 hrs, Volume= 0.254 af, Depth= 3.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs

Type II 24-hr 25 yr Model City Rainfall=4.00"

Area (ac)	CN	Description
0.508	94	Interim Cover
0.324	89	Gravel roads, HSG C
0.180	86	Open Space
1.012	91	Weighted Average
1.012		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

RMU-1 Hydro Model 2011 LLCP*Type II 24-hr 25 yr Model City Rainfall=4.00"*

Prepared by {enter your company name here}

Printed 11/13/2011

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Summary for Subcatchment 162S: Phase VII Final Cover Area Diversion Ditch

Runoff = 12.22 cfs @ 11.97 hrs, Volume= 0.601 af, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs

Type II 24-hr 25 yr Model City Rainfall=4.00"

	Area (ac)	CN	Description
*	2.470	90	
	2.470		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

RMU-1 Hydro Model 2011 LLCP*Type II 24-hr 25 yr Model City Rainfall=4.00"*

Prepared by {enter your company name here}

Printed 11/14/2011

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Summary for Subcatchment 169S: Lower Bench FC Termination

Runoff = 4.40 cfs @ 11.97 hrs, Volume= 0.217 af, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs

Type II 24-hr 25 yr Model City Rainfall=4.00"

Area (ac)	CN	Description
* 0.890	90	
0.890		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Hydraulic Capacity of Interim
Drainage Features

Interim Diversion Ditch (Segment 1)

Channel Design (Input)	
Channel Depth (ft)	0.50
Base Width (ft)	0.00
Left Side Slope (x:1)	2.00
Right Side Slope (x:1)	3.00
Bed Slope	0.100
Manning "n"	0.015

Flow Conditions (Output)	
Flowrate from Manning Equation (cfs)	7.40
Resulting Flow Depth (ft)	0.50
Resulting Flow Velocity (ft/s)	11.84
Resulting Flow Width at Top (ft)	2.50
Resulting Flow Area (ft ²)	0.63
Resulting Wetted Perimeter (ft)	2.70
Resulting Hydraulic Radius (ft)	0.23

Interim Diversion Ditch (Segment 2)

Channel Design (Input)	
Channel Depth (ft)	1.00
Base Width (ft)	0.00
Left Side Slope (x:1)	2.00
Right Side Slope (x:1)	3.00
Bed Slope	0.003
Manning "n"	0.015

Flow Conditions (Output)	
Flowrate from Manning Equation (cfs)	8.14
Resulting Flow Depth (ft)	1.00
Resulting Flow Velocity (ft/s)	3.26
Resulting Flow Width at Top (ft)	5.00
Resulting Flow Area (ft ²)	2.50
Resulting Wetted Perimeter (ft)	5.40
Resulting Hydraulic Radius (ft)	0.46

RMU-1 Hydro Model 2011 LLCP

Type II 24-hr 25 yr Model City Rainfall=4.00"

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Pond 162P: Southwest Culvert (Upper)

[57] Hint: Peaked at 1.04' (Flood elevation advised)

Inflow Area = 0.740 ac, Inflow Depth = 2.55" for 25 yr Model City event
Inflow = 3.31 cfs @ 11.97 hrs, Volume= 0.157 af
Outflow = 3.31 cfs @ 11.97 hrs, Volume= 0.157 af, Atten= 0%, Lag= 0.0 min
Primary = 3.31 cfs @ 11.97 hrs, Volume= 0.157 af

Routing by Stor-Ind method, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs

Peak Elev= 1.04' @ 11.97 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	15.0" x 316.3' long Culvert CMP, mitered to conform to fill, Ke= 0.700 Outlet Invert= -6.33' S= 0.0200 '/' Cc= 0.900 n= 0.025 Corrugated metal

Primary OutFlow Max=3.31 cfs @ 11.97 hrs HW=1.04' (Free Discharge)↑**1=Culvert** (Barrel Controls 3.31 cfs @ 4.13 fps)

RMU-1 Hydro Model 2011 LLCP*Type II 24-hr 25 yr Model City Rainfall=4.00"*

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Stage-Discharge for Pond 162P: Southwest Culvert (Upper)

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.52	0.99	1.04	3.33
0.01	0.00	0.53	1.03	1.05	3.38
0.02	0.00	0.54	1.07	1.06	3.42
0.03	0.00	0.55	1.11	1.07	3.47
0.04	0.00	0.56	1.14	1.08	3.52
0.05	0.01	0.57	1.18	1.09	3.56
0.06	0.01	0.58	1.22	1.10	3.60
0.07	0.02	0.59	1.26	1.11	3.65
0.08	0.02	0.60	1.30	1.12	3.69
0.09	0.03	0.61	1.34	1.13	3.73
0.10	0.03	0.62	1.38	1.14	3.77
0.11	0.04	0.63	1.42	1.15	3.81
0.12	0.05	0.64	1.47	1.16	3.84
0.13	0.06	0.65	1.51	1.17	3.88
0.14	0.07	0.66	1.55	1.18	3.92
0.15	0.08	0.67	1.59	1.19	3.95
0.16	0.09	0.68	1.64	1.20	3.98
0.17	0.10	0.69	1.68	1.21	4.02
0.18	0.12	0.70	1.73	1.22	4.05
0.19	0.13	0.71	1.77	1.23	4.07
0.20	0.14	0.72	1.81	1.24	4.10
0.21	0.16	0.73	1.86	1.25	4.12
0.22	0.18	0.74	1.90		
0.23	0.19	0.75	1.95		
0.24	0.21	0.76	2.00		
0.25	0.23	0.77	2.04		
0.26	0.25	0.78	2.09		
0.27	0.27	0.79	2.14		
0.28	0.29	0.80	2.18		
0.29	0.31	0.81	2.23		
0.30	0.33	0.82	2.28		
0.31	0.36	0.83	2.32		
0.32	0.38	0.84	2.37		
0.33	0.41	0.85	2.42		
0.34	0.43	0.86	2.47		
0.35	0.46	0.87	2.51		
0.36	0.48	0.88	2.56		
0.37	0.51	0.89	2.61		
0.38	0.54	0.90	2.66		
0.39	0.57	0.91	2.71		
0.40	0.60	0.92	2.75		
0.41	0.63	0.93	2.80		
0.42	0.66	0.94	2.85		
0.43	0.69	0.95	2.90		
0.44	0.72	0.96	2.95		
0.45	0.75	0.97	2.99		
0.46	0.78	0.98	3.04		
0.47	0.82	0.99	3.09		
0.48	0.85	1.00	3.14		
0.49	0.89	1.01	3.19		
0.50	0.92	1.02	3.23		
0.51	0.96	1.03	3.28		

RMU-1 Hydro Model 2011 LLCP

Type II 24-hr 25 yr Model City Rainfall=4.00"

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Pond 163P: Southwest Culvert (Lower)

[57] Hint: Peaked at 1.01' (Flood elevation advised)

Inflow Area = 0.720 ac, Inflow Depth = 2.55" for 25 yr Model City event
Inflow = 3.16 cfs @ 11.97 hrs, Volume= 0.153 af
Outflow = 3.16 cfs @ 11.97 hrs, Volume= 0.153 af, Atten= 0%, Lag= 0.0 min
Primary = 3.16 cfs @ 11.97 hrs, Volume= 0.153 af

Routing by Stor-Ind method, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs

Peak Elev= 1.01' @ 11.97 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	15.0" x 188.6' long Culvert CMP, mitered to conform to fill, Ke= 0.700 Outlet Invert= -3.77' S= 0.0200 '/' Cc= 0.900 n= 0.025 Corrugated metal

Primary OutFlow Max=3.16 cfs @ 11.97 hrs HW=1.01' (Free Discharge)↑**1=Culvert** (Barrel Controls 3.16 cfs @ 4.06 fps)

Stage-Discharge for Pond 163P: Southwest Culvert (Lower)

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.52	0.99	1.04	3.30
0.01	0.00	0.53	1.02	1.05	3.34
0.02	0.00	0.54	1.06	1.06	3.39
0.03	0.00	0.55	1.10	1.07	3.44
0.04	0.00	0.56	1.14	1.08	3.48
0.05	0.01	0.57	1.17	1.09	3.53
0.06	0.01	0.58	1.21	1.10	3.58
0.07	0.02	0.59	1.25	1.11	3.62
0.08	0.02	0.60	1.29	1.12	3.67
0.09	0.03	0.61	1.33	1.13	3.71
0.10	0.03	0.62	1.37	1.14	3.76
0.11	0.04	0.63	1.41	1.15	3.80
0.12	0.05	0.64	1.46	1.16	3.84
0.13	0.06	0.65	1.50	1.17	3.88
0.14	0.07	0.66	1.54	1.18	3.92
0.15	0.08	0.67	1.58	1.19	3.95
0.16	0.09	0.68	1.62	1.20	3.98
0.17	0.10	0.69	1.67	1.21	4.02
0.18	0.12	0.70	1.71	1.22	4.05
0.19	0.13	0.71	1.76	1.23	4.07
0.20	0.14	0.72	1.80	1.24	4.10
0.21	0.16	0.73	1.84	1.25	4.12
0.22	0.18	0.74	1.89		
0.23	0.19	0.75	1.93		
0.24	0.21	0.76	1.98		
0.25	0.23	0.77	2.02		
0.26	0.25	0.78	2.07		
0.27	0.27	0.79	2.12		
0.28	0.29	0.80	2.16		
0.29	0.31	0.81	2.21		
0.30	0.33	0.82	2.25		
0.31	0.36	0.83	2.30		
0.32	0.38	0.84	2.35		
0.33	0.40	0.85	2.40		
0.34	0.43	0.86	2.44		
0.35	0.45	0.87	2.49		
0.36	0.48	0.88	2.54		
0.37	0.51	0.89	2.58		
0.38	0.54	0.90	2.63		
0.39	0.56	0.91	2.68		
0.40	0.59	0.92	2.73		
0.41	0.62	0.93	2.77		
0.42	0.65	0.94	2.82		
0.43	0.68	0.95	2.87		
0.44	0.71	0.96	2.92		
0.45	0.75	0.97	2.97		
0.46	0.78	0.98	3.01		
0.47	0.81	0.99	3.06		
0.48	0.85	1.00	3.11		
0.49	0.88	1.01	3.16		
0.50	0.92	1.02	3.20		
0.51	0.95	1.03	3.25		

RMU-1 Hydro Model 2011 LLC

Type II 24-hr 25 yr Model City Rainfall=4.00"

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Pond 154P: Southeast Culvert

Inflow Area = 1.012 ac, Inflow Depth = 3.02" for 25 yr Model City event
Inflow = 5.13 cfs @ 11.97 hrs, Volume= 0.254 af
Outflow = 5.13 cfs @ 11.97 hrs, Volume= 0.254 af, Atten= 0%, Lag= 0.0 min
Primary = 5.13 cfs @ 11.97 hrs, Volume= 0.254 af

Routing by Stor-Ind method, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs

Peak Elev= 1.95' @ 11.97 hrs

Flood Elev= 2.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	15.0" x 69.7' long Culvert CMP, mitered to conform to fill, Ke= 0.700 Outlet Invert= -1.39' S= 0.0199 '/' Cc= 0.900 n= 0.025 Corrugated metal

Primary OutFlow Max=5.12 cfs @ 11.97 hrs HW=1.95' (Free Discharge)↑**1=Culvert** (Barrel Controls 5.12 cfs @ 4.18 fps)

RMU-1 Hydro Model 2011 LLC

Type II 24-hr 25 yr Model City Rainfall=4.00"

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Stage-Discharge for Pond 154P: Southeast Culvert

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	1.04	3.18	2.08	5.28
0.02	0.00	1.06	3.28	2.10	5.31
0.04	0.00	1.08	3.37	2.12	5.33
0.06	0.01	1.10	3.45	2.14	5.36
0.08	0.02	1.12	3.54	2.16	5.38
0.10	0.03	1.14	3.63	2.18	5.40
0.12	0.05	1.16	3.72	2.20	5.43
0.14	0.07	1.18	3.80	2.22	5.45
0.16	0.09	1.20	3.89	2.24	5.47
0.18	0.12	1.22	3.97	2.26	5.49
0.20	0.14	1.24	4.05	2.28	5.52
0.22	0.17	1.26	4.13	2.30	5.54
0.24	0.21	1.28	4.21	2.32	5.56
0.26	0.25	1.30	4.28	2.34	5.59
0.28	0.29	1.32	4.35	2.36	5.61
0.30	0.33	1.34	4.41	2.38	5.63
0.32	0.37	1.36	4.47	2.40	5.65
0.34	0.42	1.38	4.53	2.42	5.67
0.36	0.47	1.40	4.59	2.44	5.70
0.38	0.53	1.42	4.65	2.46	5.72
0.40	0.58	1.44	4.71	2.48	5.74
0.42	0.64	1.46	4.76	2.50	5.76
0.44	0.70	1.48	4.82		
0.46	0.76	1.50	4.88		
0.48	0.83	1.52	4.92		
0.50	0.90	1.54	4.95		
0.52	0.96	1.56	4.97		
0.54	1.03	1.58	4.98		
0.56	1.11	1.60	4.99		
0.58	1.18	1.62	4.97		
0.60	1.26	1.64	4.94		
0.62	1.34	1.66	4.86		
0.64	1.41	1.68	4.78		
0.66	1.50	1.70	4.81		
0.68	1.58	1.72	4.84		
0.70	1.66	1.74	4.86		
0.72	1.75	1.76	4.89		
0.74	1.83	1.78	4.91		
0.76	1.92	1.80	4.94		
0.78	2.00	1.82	4.97		
0.80	2.09	1.84	4.99		
0.82	2.18	1.86	5.02		
0.84	2.27	1.88	5.04		
0.86	2.36	1.90	5.07		
0.88	2.45	1.92	5.09		
0.90	2.54	1.94	5.11		
0.92	2.64	1.96	5.14		
0.94	2.73	1.98	5.16		
0.96	2.82	2.00	5.19		
0.98	2.91	2.02	5.21		
1.00	3.00	2.04	5.24		
1.02	3.09	2.06	5.26		

RMU-1 Hydro Model 2011 LLC

Type II 24-hr 25 yr Model City Rainfall=4.00"

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Pond 156P: Southeast Header Pipe

[81] Warning: Exceeded Pond 154P by 0.28' @ 12.02 hrs

Inflow Area = 1.192 ac, Inflow Depth = 2.95" for 25 yr Model City event
Inflow = 5.93 cfs @ 11.97 hrs, Volume= 0.293 af
Outflow = 5.93 cfs @ 11.97 hrs, Volume= 0.293 af, Atten= 0%, Lag= 0.0 min
Primary = 5.93 cfs @ 11.97 hrs, Volume= 0.293 af

Routing by Stor-Ind method, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs

Peak Elev= 1.81' @ 11.97 hrs

Flood Elev= 2.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	18.0" x 15.0' long Culvert CMP, mitered to conform to fill, Ke= 0.700 Outlet Invert= -0.03' S= 0.0020 '/' Cc= 0.900 n= 0.025 Corrugated metal

Primary OutFlow Max=5.92 cfs @ 11.97 hrs HW=1.81' (Free Discharge)↑**1=Culvert** (Barrel Controls 5.92 cfs @ 3.52 fps)

RMU-1 Hydro Model 2011 LLCP*Type II 24-hr 25 yr Model City Rainfall=4.00"*

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Stage-Discharge for Pond 156P: Southeast Header Pipe

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.52	0.61	1.04	2.45	1.56	4.88
0.01	0.00	0.53	0.64	1.05	2.49	1.57	4.93
0.02	0.00	0.54	0.66	1.06	2.54	1.58	4.97
0.03	0.00	0.55	0.69	1.07	2.58	1.59	5.02
0.04	0.00	0.56	0.71	1.08	2.63	1.60	5.06
0.05	0.00	0.57	0.74	1.09	2.67	1.61	5.11
0.06	0.00	0.58	0.77	1.10	2.72	1.62	5.15
0.07	0.01	0.59	0.80	1.11	2.76	1.63	5.20
0.08	0.01	0.60	0.83	1.12	2.81	1.64	5.24
0.09	0.01	0.61	0.85	1.13	2.85	1.65	5.29
0.10	0.02	0.62	0.88	1.14	2.90	1.66	5.33
0.11	0.02	0.63	0.91	1.15	2.94	1.67	5.37
0.12	0.02	0.64	0.94	1.16	2.99	1.68	5.41
0.13	0.03	0.65	0.97	1.17	3.04	1.69	5.46
0.14	0.03	0.66	1.00	1.18	3.08	1.70	5.50
0.15	0.04	0.67	1.04	1.19	3.13	1.71	5.54
0.16	0.04	0.68	1.07	1.20	3.18	1.72	5.58
0.17	0.05	0.69	1.10	1.21	3.22	1.73	5.62
0.18	0.06	0.70	1.13	1.22	3.27	1.74	5.66
0.19	0.07	0.71	1.17	1.23	3.32	1.75	5.70
0.20	0.07	0.72	1.20	1.24	3.36	1.76	5.74
0.21	0.08	0.73	1.23	1.25	3.41	1.77	5.78
0.22	0.09	0.74	1.27	1.26	3.46	1.78	5.81
0.23	0.10	0.75	1.30	1.27	3.51	1.79	5.85
0.24	0.11	0.76	1.34	1.28	3.55	1.80	5.89
0.25	0.12	0.77	1.37	1.29	3.60	1.81	5.92
0.26	0.13	0.78	1.41	1.30	3.65	1.82	5.96
0.27	0.15	0.79	1.44	1.31	3.70	1.83	5.99
0.28	0.16	0.80	1.48	1.32	3.74	1.84	6.02
0.29	0.17	0.81	1.52	1.33	3.79	1.85	6.06
0.30	0.18	0.82	1.55	1.34	3.84	1.86	6.09
0.31	0.20	0.83	1.59	1.35	3.89	1.87	6.12
0.32	0.21	0.84	1.63	1.36	3.93	1.88	6.14
0.33	0.23	0.85	1.67	1.37	3.98	1.89	6.17
0.34	0.24	0.86	1.71	1.38	4.03	1.90	6.20
0.35	0.26	0.87	1.74	1.39	4.08	1.91	6.22
0.36	0.28	0.88	1.78	1.40	4.13	1.92	6.24
0.37	0.29	0.89	1.82	1.41	4.17	1.93	6.26
0.38	0.31	0.90	1.86	1.42	4.22	1.94	6.28
0.39	0.33	0.91	1.90	1.43	4.27	1.95	6.30
0.40	0.35	0.92	1.94	1.44	4.32	1.96	6.31
0.41	0.37	0.93	1.98	1.45	4.36	1.97	6.32
0.42	0.39	0.94	2.03	1.46	4.41	1.98	6.32
0.43	0.41	0.95	2.07	1.47	4.46	1.99	6.32
0.44	0.43	0.96	2.11	1.48	4.51	2.00	6.27
0.45	0.45	0.97	2.15	1.49	4.55		
0.46	0.47	0.98	2.19	1.50	4.60		
0.47	0.49	0.99	2.23	1.51	4.65		
0.48	0.52	1.00	2.28	1.52	4.70		
0.49	0.54	1.01	2.32	1.53	4.74		
0.50	0.56	1.02	2.36	1.54	4.79		
0.51	0.59	1.03	2.41	1.55	4.83		

Phase VII Final Cover Area Diversion Ditch

Channel Design (Input)	
Channel Depth (ft)	2.00
Base Width (ft)	0.00
Left Side Slope (x:1)	2.00
Right Side Slope (x:1)	2.00
Bed Slope	0.005
Manning "n"	0.025

Flow Conditions (Output)	
Flowrate from Manning Equation (cfs)	31.30
Resulting Flow Depth (ft)	2.00
Resulting Flow Velocity (ft/s)	3.91
Resulting Flow Width at Top (ft)	8.00
Resulting Flow Area (ft ²)	8.00
Resulting Wetted Perimeter (ft)	8.94
Resulting Hydraulic Radius (ft)	0.89

**Surface Water Diversion Berm with Temporary Final Cover
Termination**

Channel Design (Input)	
Channel Depth (ft)	2.00
Base Width (ft)	0.00
Left Side Slope (x:1)	3.00
Right Side Slope (x:1)	2.00
Bed Slope	0.010
Manning "n"	0.025

Flow Conditions (Output)	
Flowrate from Manning Equation (cfs)	8.92
Resulting Flow Depth (ft)	1.00
Resulting Flow Velocity (ft/s)	3.57
Resulting Flow Width at Top (ft)	5.00
Resulting Flow Area (ft ²)	2.50
Resulting Wetted Perimeter (ft)	5.40
Resulting Hydraulic Radius (ft)	0.46

ARCADIS

Attachment 3

Culvert Design

Calculation Sheet

Client: CWM Chemical Services, LLC

Project Location: Model City, New York

Project: RMU-1 Leachate Level Compliance Plan

Project No.: B00023785

Subject: Culvert Design

Prepared By: PTO

Date: August 2011

Reviewed By: BMS

Date: August 2011

Checked By: BMS

Date: August 2011

TASK:

Demonstrate that the culvert configurations depicted on the drawing entitled *Residuals Management Unit – One Fill Progression and Truck Routes, Cells 1 Through 14 – Final Sequence Phase 3* provides sufficient hydraulic capacity to convey the estimated peak discharge from the 25-year, 24-hour storm.

REFERENCES:

1. Proposed grading design for waste fill progression and capping for Cells 1 through 14 presented on Figure 1 entitled *Residuals Management Unit – One Fill Progression and Truck Routes, Cells 1 Through 14 – Final Sequence Phase 3*, prepared by ARCADIS, dated August 2011.
2. HydroCAD Software Solutions LLC. HydroCAD. Vers. 8.5. Computer Software. 2006. (Output attached).
3. *Engineer-in-Training Reference Manual*, 8th Edition, Lindeburg, Michael R., P.E., pp. A-45, 1992.
4. *Leachate Level Compliance Plan for Residuals Management Unit- One, Final Sequence Phase 2* prepared by ARCADIS, dated March 2009 (latest revised date March 2010).
5. Calculation Sheet entitled *Interim Drainage Feature Design*, ARCADIS, August 2011.
6. Calculation Sheet entitled *Assessment of Permitted Drainage Features*, ARCADIS, August 2011.
7. Appendix I of the *Engineering Report for Residuals Management Unit 1* entitled *Surface Water Drainage and Erosion Calculations*.

ASSUMPTIONS:

1. Reference 1 includes three culverts identified as CV-1, CV-2, and CV-3. Culvert CV-1 is an existing culvert that conveys non-contact runoff from the drainage area P9 channel (defined in Reference 7) at the toe of the Residuals Management Unit 1 (RMU-1) perimeter berm beneath the RMU-1 access ramp. Culvert CV-2 is a proposed culvert that will convey non-contact runoff from the interim drainage ditch (shown in Reference 1) to the perimeter channel along the southern edge of RMU-1. Culvert CV-3 is a proposed culvert that will convey contact runoff from the area to the north of the RMU-1 access road and above the middle surface-water diversion berm into Detention Basin K.

Calculation Sheet

2. In addition to the three culverts identified in Reference 1 and discussed in Assumption 1, an August 2011 field survey by Ensol, Inc. (Ensol) indicated the presence of two additional culverts within the P9 perimeter channel upstream from CV-1. These culverts, referred to herein as P9 Culvert 1 and P9 Culvert 2, were installed to convey flow around existing groundwater monitoring wells or other structures at the perimeter of the landfill. These culverts are considered in this evaluation to evaluate their effect on the flow depth within the ditch. The stormwater storage volume within the P9 channel is considered in this evaluation because of the likelihood of ponding to occur at the culvert inlets and because the relatively flat ditch slope allows for significant storage upstream of each culvert. Reference 2 is used to evaluate this system of three culverts in series and accounts for tailwater effects on upstream culverts due to the downstream culverts. The ditch segment upstream of each culvert is modeled as a detention basin with the culvert acting as the detention basin outlet structure.
3. The contributing drainage areas to the culverts evaluated herein are as follows:
 - P9 Culvert 1:
 - Drainage area A5 Modified (Reference 6)
 - Drainage area A16 (Reference 6)
 - Drainage area managed by the southwest downchute (Reference 5)
 - A portion of drainage area P9 (up to the inlet to P9 Culvert 1)
 - P9 Culvert 2:
 - Cumulative drainage areas to P9 Culvert 1
 - Additional portion of drainage area P9 (between P9 Culvert 1 and P9 Culvert 2)
 - Culvert CV-1:
 - Cumulative drainage areas to P9 Culvert 2
 - Additional portion of drainage area P9 (between P9 Culvert 2 and Culvert CV-1)
 - Culvert CV-2:
 - Drainage area managed by Segment 2 of the interim drainage ditch (Reference 5)
 - Culvert CV-3:
 - A portion of the Detention Basin K drainage area
4. Because the three culverts in the P9 channel are already in existence and cannot easily be modified to convey additional flow, the analysis is based on determining the minimum required ditch bank elevations to allow the existing culvert configurations to remain in service. The Ensol survey is used to identify the lowest ditch bank elevation around the perimeter of each ditch segment. This value represents the elevation at which stormwater would first begin to flow out of that ditch segment. The adequacy of a given ditch segment is determined by comparing the predicted peak water surface elevation in the ditch segment upstream of the culvert to the lowest ditch bank elevation.
5. Culvert CV-2 is deemed adequate if it can convey the 25-year, 24-hour estimated peak discharge without causing a headwater condition that exceeds the interim drainage ditch depth at the pipe inlet. Based on Reference 5, the interim drainage ditch has a depth of 18 inches at the pipe inlet. Therefore, the maximum allowable headwater is assumed to equal 18 inches.

Calculation Sheet

6. Culvert CV-3 is deemed acceptable if it can convey the 25-year, 24-hour estimated peak discharge without causing a headwater condition that exceeds the pipe diameter (i.e. 12 inches).
7. Existing Culvert CV-1, and the two upstream culverts identified in Assumption 2, consist of two 18-inch-diameter corrugated smooth-bore high-density polyethylene (HDPE) pipes (in parallel) having a Manning "n" of 0.012 based on Reference 2. The pipe slope of Culvert CV-1 is assumed to be equal to the design slope (0.25 percent). The pipe slopes of P9 Culvert 1 and P9 Culvert 2 are based on surveyed pipe elevations from the Ensol survey. Culvert CV-2 consists of a single 18-inch-diameter corrugated metal pipe (CMP) having a Manning "n" of 0.025 and a slope of 1.0 percent based on References 2 and 1, respectively. Culvert CV-3 consists of a single 12-inch-diameter CMP having a Manning "n" of 0.025 and a slope of 1.0 percent based on References 2 and 1, respectively. Other pipe materials, such as corrugated or smooth interior HDPE, may be substituted for culverts CV-2 and CV-3 assuming the overall capacity of the culvert is not adversely affected.
8. The flow capacity of the culverts is modeled using Reference 2, which accounts for both pipe friction losses and energy losses at the culvert entrances and exits.

CALCULATIONS:

1. Estimated Peak Discharges to Culverts

Table 1 below shows the total watershed acreages and estimated peak discharges to the culvert inlets during the 25-year, 24-hour storm. For the culverts in the P9 channel, the peak discharges reflect the hydrologic routing process through the ditch reaches upstream of the respective culvert, as explained in Assumption 2. Thus, although the total drainage increases as one proceeds downstream in the P9 channel, the successive hydrologic routing through each culvert results in a continual decrease in peak discharge to the next downstream culvert.

Table 1
Estimated Peak Discharges

Culvert ID	Total Watershed Area (acres)	CN (Weighted average)	25-Year, 24-Hour Estimated Peak Discharge (cfs)
P9 Culvert 1 (Existing)	4.55	91	23.10
P9 Culvert 2 (Existing)	4.75	90	19.42
CV-1 (Existing)	5.04	90	16.36
CV-2 (Proposed)	0.80	96	4.45
CV-3 (Proposed)	0.29	90	1.44

Supporting output from Reference 2 for the determination of individual drainage area peak discharges and cumulative peak discharges to the various culverts are included as attachments to this calculation.

Calculation Sheet

2. Culvert Capacity and Resulting Headwater Depth

Table 2 below summarizes the estimated peak discharge to the culverts, the resultant headwater depths (or elevations), as well as the culvert configurations (i.e., number and diameter of pipes, pipe construction, and pipe slope).

Table 2
Culvert Configurations and Resulting Headwater

Culvert ID	25-Year, 24-Hour Estimated Peak Discharge (cfs)	Culvert Configuration	Peak Flow Through Culvert ¹ (cfs)	Resulting Headwater Depth/EI. (ft)	Maximum Allowable Headwater Depth/EI. (ft)
P9 Culvert 1 (Existing)	23.10	Two 18-inch HDPE @ 0.75%	18.54	325.41	323.39
P9 Culvert 2 (Existing)	19.42	Two 18-inch HDPE @ 1.0%	15.15	324.24	322.97
CV-1 (Existing)	16.36	Two 18-inch HDPE @ 0.25%	14.69	323.33	323.30
CV-2 (Proposed)	4.45	One 18-inch CMP @ 1.0%	4.45	1.37	1.50
CV-3 (Proposed)	1.44	One 12-inch CMP @ 0.5%	1.44	0.87	1.00

Note:

1. The peak flow through P9 Culvert 1, P9 Culvert 2, and Culvert CV-1 accounts for the storage effects upstream of the culvert as discussed in Assumption 2. Such storage effects for Culverts CV-2 and CV-3 are not considered because of the reduced storage potential upstream of these culverts. Hence for Culverts CV-2 and CV-3, the peak discharges through the culverts is the same as the peak discharges to the culverts.

Note that for the three culverts in the P9 channel, the predicted and maximum allowable headwater values are presented in terms of elevation rather than depth. This was done to allow a direct comparison of predicted conditions to surveyed ditch perimeter elevations. A comparison of these two terms for each of the three culverts in the P9 channel shows that the ditch segment upstream of Culvert CV-1 is sufficient to manage the peak discharge because the predicted headwater elevation is approximately equal to the lowest surveyed ditch bank elevation. In contrast, it can be seen that the ditch segments upstream of the P9 Culvert 1 and P9 Culvert 2 need to be modified to contain the predicted flows. Specifically, the ditch banks in these areas need to be increased in elevation to at least equal the predicted headwater elevation. Because the stormwater will pond at each culvert inlet in an essentially level pool, it is not necessary to increase the ditch bank elevations by a constant amount continuously along the ditch length.

Because the predicted headwater depths for proposed culverts CV-2 and CV-3 are less than the maximum allowable headwater depths, the proposed culvert configurations are adequate. Supporting output from Reference 2 showing the culvert routing calculations and peak headwater depths/elevations is included as an attachment.

SUMMARY:

The hydraulic capacity of the proposed culverts CV-2 and CV-3 is adequate to manage the peak discharge from the 25-year, 24-hour storm. The ditch segment upstream of existing culvert CV-1 and downstream of P9 Culvert 2 is adequately deep to contain the predicted headwater during the 25-year, 24-hour storm. The ditch segments upstream of the other two existing culverts in the P9 channel need to

Calculation Sheet

be enhanced to provide a greater depth to contain the predicted flows. Specifically, the ditch banks must be increased to the following minimum elevations:

- Ditch segment upstream of P9 Culvert 1 (upstream most culvert): 325.41 feet
- Ditch segment upstream of P9 Culvert 2 and downstream of P9 Culvert 1: 324.24 feet

Estimated Peak Discharges for
Individual Drainage Areas

RMU-1 Hydro Model 2011 LLC

Type II 24-hr 25 yr Model City Rainfall=4.00"

Prepared by {enter your company name here}

Printed 9/8/2011

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Summary for Subcatchment 155S: Subarea A5 Modified

Runoff = 14.38 cfs @ 11.95 hrs, Volume= 0.695 af, Depth= 3.32"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs

Type II 24-hr 25 yr Model City Rainfall=4.00"

Area (ac)	CN	Description
* 1.810	94	Interim Cover
* 0.330	98	Paved
0.370	89	Gravel roads, HSG C
2.510	94	Weighted Average
2.180		Pervious Area
0.330		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	50	0.3300	3.12		Sheet Flow, Smooth surfaces n= 0.011 P2= 2.30"
1.4	402		4.90		Direct Entry, Ditch Flow
0.6	220	0.0100	6.44	11.38	Circular Channel (pipe), Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PE, smooth interior
1.8	520		4.90		Direct Entry, Ditch Flow
4.1	1,192	Total			

RMU-1 Hydro Model 2011 LLCP*Type II 24-hr 25 yr Model City Rainfall=4.00"*

Prepared by {enter your company name here}

Printed 9/8/2011

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Summary for Subcatchment 135S: Subarea A16

Runoff = 2.04 cfs @ 11.97 hrs, Volume= 0.098 af, Depth= 2.55"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs

Type II 24-hr 25 yr Model City Rainfall=4.00"

Area (ac)	CN	Description
* 0.460	86	
0.460		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Permitted Tc

RMU-1 Hydro Model 2011 LLC

Type II 24-hr 25 yr Model City Rainfall=4.00"

Prepared by {enter your company name here}

Printed 9/8/2011

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Summary for Subcatchment 156S: Downchute Area - Upper

Runoff = 3.31 cfs @ 11.97 hrs, Volume= 0.157 af, Depth= 2.55"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs

Type II 24-hr 25 yr Model City Rainfall=4.00"

Area (ac)	CN	Description
* 0.740	86	
0.740		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	50	0.3300	0.43		Sheet Flow, Range n= 0.130 P2= 2.30"
0.1	29	0.3300	4.02		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
3.8	360	0.0100	1.60	2.87	Channel Flow, Area= 1.8 sf Perim= 6.9' r= 0.26' n= 0.038
5.8	439	Total			

RMU-1 Hydro Model 2011 LLC

Type II 24-hr 25 yr Model City Rainfall=4.00"

Prepared by {enter your company name here}

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Summary for Subcatchment 157S: Downchute Area - Lower

Runoff = 3.16 cfs @ 11.97 hrs, Volume= 0.153 af, Depth= 2.55"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs

Type II 24-hr 25 yr Model City Rainfall=4.00"

Area (ac)	CN	Description			
* 0.720	86				
0.720		Pervious Area			
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	50	0.3300	0.43		Sheet Flow, Range n= 0.130 P2= 2.30" Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps Channel Flow, Area= 2.0 sf Perim= 7.3' r= 0.27' n= 0.038
0.0	10	0.3300	4.02		
4.4	440	0.0100	1.65	3.30	
6.3	500	Total			

RMU-1 Hydro Model 2011 LLCP*Type II 24-hr 25 yr Model City Rainfall=4.00"*

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Summary for Subcatchment 165S: Drainage Area P-9 Culvert 1

Runoff = 0.53 cfs @ 11.97 hrs, Volume= 0.025 af, Depth= 2.55"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs

Type II 24-hr 25 yr Model City Rainfall=4.00"

Area (ac)	CN	Description
0.120	86	<50% Grass cover, Poor, HSG C
0.120		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

RMU-1 Hydro Model 2011 LLCP*Type II 24-hr 25 yr Model City Rainfall=4.00"*

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Summary for Subcatchment 166S: Drainage Area P9 Culvert 2

Runoff = 0.89 cfs @ 11.97 hrs, Volume= 0.042 af, Depth= 2.55"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs

Type II 24-hr 25 yr Model City Rainfall=4.00"

Area (ac)	CN	Description
0.200	86	<50% Grass cover, Poor, HSG C
0.200		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

RMU-1 Hydro Model 2011 LLC*Type II 24-hr 25 yr Model City Rainfall=4.00"*

Prepared by {enter your company name here}

Printed 9/8/2011

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Summary for Subcatchment 167S: Direct Flow to CV-1 from P9

Runoff = 1.44 cfs @ 11.97 hrs, Volume= 0.071 af, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs

Type II 24-hr 25 yr Model City Rainfall=4.00"

Area (ac)	CN	Description
0.160	86	<50% Grass cover, Poor, HSG C
0.100	98	Paved parking & roofs
0.030	89	Gravel roads, HSG C
0.290	90	Weighted Average
0.190		Pervious Area
0.100		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

RMU-1 Hydro Model 2011 LLCP*Type II 24-hr 25 yr Model City Rainfall=4.00"*

Prepared by {enter your company name here}

Printed 9/8/2011

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Summary for Subcatchment 154S: Access Road Ditch (Segment 2)

Runoff = 4.45 cfs @ 11.97 hrs, Volume= 0.236 af, Depth= 3.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs

Type II 24-hr 25 yr Model City Rainfall=4.00"

Area (ac)	CN	Description
0.500	94	
0.300	98	Paved parking & roofs
0.800	96	Weighted Average
0.500		Pervious Area
0.300		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

RMU-1 Hydro Model 2011 LLCP*Type II 24-hr 25 yr Model City Rainfall=4.00"*

Prepared by {enter your company name here}

Printed 9/8/2011

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Summary for Subcatchment 164S: CV-3 AREA

Runoff = 1.44 cfs @ 11.97 hrs, Volume= 0.071 af, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs

Type II 24-hr 25 yr Model City Rainfall=4.00"

Area (ac)	CN	Description
* 0.290	90	
0.290		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Pond 160P: P9 Culvert 1

Inflow Area = 4.550 ac, 7.25% Impervious, Inflow Depth = 2.98" for 25 yr Model City event
 Inflow = 23.10 cfs @ 11.95 hrs, Volume= 1.128 af
 Outflow = 18.54 cfs @ 11.98 hrs, Volume= 1.128 af, Atten= 20%, Lag= 1.6 min
 Primary = 18.54 cfs @ 11.98 hrs, Volume= 1.128 af

Routing by Sim-Route method, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs
 Peak Elev= 325.41' @ 12.01 hrs Surf.Area= 1,388 sf Storage= 2,634 cf

Plug-Flow detention time= 1.7 min calculated for 1.128 af (100% of inflow)
 Center-of-Mass det. time= 1.6 min (790.0 - 788.4)

Volume	Invert	Avail.Storage	Storage Description
#1	321.80'	3,205 cf	2.00'W x 70.00'L x 4.00'H Prismatic Z=2.0

Device	Routing	Invert	Outlet Devices
#1	Primary	321.80'	18.0" x 40.0' long Culvert X 2.00 CMP, mitered to conform to fill, Ke= 0.700 Outlet Invert= 321.50' S= 0.0075 '/' Cc= 0.900 n= 0.012

Primary OutFlow Max=17.96 cfs @ 11.98 hrs HW=325.27' TW=323.84' (Dynamic Tailwater)
 ↑**1=Culvert** (Inlet Controls 17.96 cfs @ 5.08 fps)

Summary for Pond 161P: P9 Culvert 2

Inflow Area = 4.750 ac, 6.95% Impervious, Inflow Depth = 2.96" for 25 yr Model City event
 Inflow = 19.42 cfs @ 11.98 hrs, Volume= 1.171 af
 Outflow = 15.15 cfs @ 12.02 hrs, Volume= 1.170 af, Atten= 22%, Lag= 2.5 min
 Primary = 15.15 cfs @ 12.02 hrs, Volume= 1.170 af

Routing by Sim-Route method, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs
 Peak Elev= 324.24' @ 12.06 hrs Surf.Area= 2,090 sf Storage= 3,419 cf

Plug-Flow detention time= 3.8 min calculated for 1.170 af (100% of inflow)
 Center-of-Mass det. time= 3.4 min (794.1 - 790.7)

Volume	Invert	Avail.Storage	Storage Description
#1	321.30'	3,540 cf	2.00'W x 140.00'L x 3.00'H Prismaoid Z=2.0

Device	Routing	Invert	Outlet Devices
#1	Primary	321.40'	18.0" x 10.0' long Culvert X 2.00 CMP, mitered to conform to fill, Ke= 0.700 Outlet Invert= 321.30' S= 0.0100 '/' Cc= 0.900 n= 0.012

Primary OutFlow Max=14.77 cfs @ 12.02 hrs HW=324.15' TW=323.18' (Dynamic Tailwater)
 ↑**1=Culvert** (Inlet Controls 14.77 cfs @ 4.18 fps)

Summary for Pond 159P: Culvert CV-1

Inflow Area = 5.040 ac, 8.53% Impervious, Inflow Depth = 2.95" for 25 yr Model City event
 Inflow = 16.36 cfs @ 12.00 hrs, Volume= 1.240 af
 Outflow = 14.69 cfs @ 12.08 hrs, Volume= 1.240 af, Atten= 10%, Lag= 4.7 min
 Primary = 14.69 cfs @ 12.08 hrs, Volume= 1.240 af

Routing by Sim-Route method, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs
 Peak Elev= 323.33' @ 12.08 hrs Surf.Area= 1,879 sf Storage= 2,700 cf

Plug-Flow detention time= 3.1 min calculated for 1.240 af (100% of inflow)
 Center-of-Mass det. time= 3.0 min (797.2 - 794.2)

Volume	Invert	Avail.Storage	Storage Description
#1	320.80'	3,660 cf	2.00'W x 145.00'L x 3.00'H Prismatic Z=2.0

Device	Routing	Invert	Outlet Devices
#1	Primary	320.80'	18.0" x 343.0' long Culvert X 2.00 CPP, mitered to conform to fill, Ke= 0.700 Outlet Invert= 319.94' S= 0.0025 '/' Cc= 0.900 n= 0.012

Primary OutFlow Max=14.69 cfs @ 12.08 hrs HW=323.33' (Free Discharge)

↑**1=Culvert** (Barrel Controls 14.69 cfs @ 4.16 fps)

RMU-1 Hydro Model 2011 LLC

Type II 24-hr 25 yr Model City Rainfall=4.00"

Prepared by {enter your company name here}

Printed 9/8/2011

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Summary for Pond 166P: CV-2

[57] Hint: Peaked at 1.37' (Flood elevation advised)

Inflow Area = 0.800 ac, 37.50% Impervious, Inflow Depth = 3.54" for 25 yr Model City event
Inflow = 4.45 cfs @ 11.97 hrs, Volume= 0.236 af
Outflow = 4.45 cfs @ 11.98 hrs, Volume= 0.236 af, Atten= 0%, Lag= 0.6 min
Primary = 4.45 cfs @ 11.98 hrs, Volume= 0.236 af

Routing by Sim-Route method, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs

Peak Elev= 1.37' @ 11.98 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	18.0" x 200.0' long Culvert CMP, mitered to conform to fill, Ke= 0.700 Outlet Invert= -2.00' S= 0.0100 '/ Cc= 0.900 n= 0.025 Corrugated metal

Primary OutFlow Max=4.44 cfs @ 11.98 hrs HW=1.36' (Free Discharge)↑**1=Culvert** (Barrel Controls 4.44 cfs @ 3.46 fps)

Summary for Pond 165P: CV-3

[57] Hint: Peaked at 0.87' (Flood elevation advised)

Inflow Area = 0.290 ac, 0.00% Impervious, Inflow Depth = 2.92" for 25 yr Model City event
 Inflow = 1.44 cfs @ 11.97 hrs, Volume= 0.071 af
 Outflow = 1.44 cfs @ 11.98 hrs, Volume= 0.071 af, Atten= 0%, Lag= 0.6 min
 Primary = 1.44 cfs @ 11.98 hrs, Volume= 0.071 af

Routing by Sim-Route method, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs

Peak Elev= 0.87' @ 11.98 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	12.0" x 140.0' long Culvert CMP, mitered to conform to fill, Ke= 0.700 Outlet Invert= -1.40' S= 0.0100 '/ Cc= 0.900 n= 0.025 Corrugated metal

Primary OutFlow Max=1.43 cfs @ 11.98 hrs HW=0.87' (Free Discharge)

↑ **1=Culvert** (Barrel Controls 1.43 cfs @ 2.63 fps)

Attachment 4

Assessment of Permitted
Drainage Features

Calculation Sheet

Client: CWM Chemical Services, LLC

Project Location: Model City, New York

Project: RMU-1 Leachate Level Compliance Plan

Project No.: B0023785.0000

Subject: Assessment of Permitted Drainage Features

Prepared By: PTO

Date: August 2011

Reviewed By: BMS

Date: August 2011

Checked By: BMS

Date: August 2011

TASK:

Demonstrate that the permitted drainage features for subareas A5 and P9 can adequately convey the increased peak discharges resulting from temporary drainage area modifications associated with the new fill progression design.

REFERENCES:

1. Appendix I of the *Engineering Report for Residuals Management Unit 1* entitled "Surface Water Drainage and Erosion Calculations."
2. Proposed grading design for waste fill progression and capping for Cells 1 through 14 presented on Figure 1 entitled *Residuals Management Unit-1, Fill Progression and Truck Routes, Cells 1 Through 14 – Final Sequence Phase 3*, ARCADIS, July 2011.
3. HydroCAD Software Solutions LLC. HydroCAD. Vers. 8.5. Computer Software. 2006. (Output attached).
4. *Leachate Level Compliance Plan for Residuals Management Unit- One, Final Sequence Phase 3*, ARCADIS, July 2011.

ASSUMPTIONS:

1. The surface cover type and watershed acreages resulting from the grading shown in Reference 2 differ from those evaluated in Reference 1. As a result, the permitted drainage features for A5 and P9 will experience different (higher) peak flowrates than are predicted in Reference 1. Thus to ensure adequate hydraulic capacity is available, these features are evaluated for the proposed conditions presented in Reference 2.
2. Based on Reference 1, runoff from A5 is conveyed first in a triangular ditch with sideslopes of 1H:1V and 2H:1V. The channel has a longitudinal invert slope of 0.5 percent and a depth of 2.5 feet. A Manning "n" value of 0.015 is assumed for the short- term condition analyzed herein based on the assumed presence of a geomembrane along the channel interior. The channel is not assumed to be vegetated because only interim cover is constructed upgradient of the channel.
3. Based on Reference 1, runoff from A5, A16 and P9 is conveyed in a ditch at the base of the perimeter berm that is trapezoidal in geometry having a base width of 2.0 feet, and sideslopes of 2H:1V. The channel has a longitudinal invert slope of 0.025 percent and a depth of 2.0 feet based on Reference

Calculation Sheet

1. A Manning “n” value of 0.038 is assumed based on vegetated conditions within the channel as documented in Reference 1.
4. Based on References 1 and 2, the A5 drainage area is larger than the permitted size. The modified A5 drainage area consists of the currently permitted drainage area A5 as well as additional drainage area from currently permitted drainage area A6 whose surface cover includes the paved RMU-1 access road and a portion of the RMU-1 sideslope which is assumed to be interim cover. The time of concentration is calculated based on the modified condition. The watershed characteristics for the modified A5 drainage area are as follows:
 - Watershed Area = 2.51 acres
 - CN=94 (weighted average)
 - o Interim cover, CN=94, 1.81 acres
 - o Paved roads, CN=98, 0.33 acres
 - o Gravel roads, CN=89, 0.37 acres
 - Time of Concentration = 0.07 hours
5. The trapezoidal channel that passes through drainage area P9 receives flow from drainage areas A5 (modified), A16 and P9 as well as from two temporary downchute pipes at the southwest corner of RMU-1. The drainage areas to the temporary downchute pipes are presented and discussed in a separate calculation sheet contained in Reference 4. The contributing watersheds to the P9 trapezoidal channel have the following characteristics:
 - Modified A5 (see Assumption 4)
 - o Watershed Area = 2.51 acres
 - o CN=94
 - o Time of Concentration = 0.21 hours (incl. travel time through P9)
 - A16 (permitted condition, see Reference 1)
 - o Watershed Area = 0.46 acres
 - o CN=86
 - o Time of Concentration = 0.24 hours (incl. travel time through P9)
 - P9 (permitted size but modified curve number due to paved road, see Reference 1)
 - o Watershed Area = 1.05 acres
 - o CN=89 (weighted average)
 - o Paved roads, CN=98, 0.24 acres
 - o Gravel roads, CN=89, 0.17 acres
 - o Vegetated, CN=86, 0.64 acres
 - o Time of Concentration = 0.15 hours
 - Upper Downchute area (Reference 4)
 - o Watershed Area = 0.74 acres
 - o CN=86
 - o Time of Concentration = 0.24 hours (incl. travel time through P9)
 - Lower Downchute area (Reference 4)
 - o Watershed Area = 0.72 acres
 - o CN=86

Calculation Sheet

- o Time of Concentration = 0.25 hours (incl. travel time through P9)
6. The channels passing through drainage areas A5 and P9 are deemed adequate if they can convey the peak discharges resulting from the 25-year, 24-hour design storm (Type II, 4-inches of rainfall) without exceeding the channel depth. Note that no freeboard is required based on Reference 1.

CALCULATIONS:

1. Stormwater Analysis for A5 Channel

Table 1 below summarizes the hydrologic parameters for the tributary watershed to the A5 channel. These parameters as well as the resulting peak discharge are based on Assumption 4 above.

Table 1

Watershed ID	Watershed Area (acres)	Weighted Runoff Curve Number	Time of Concentration (hr)	Estimated Peak Discharge into Channel (cfs)
Modified A5	2.51	94	0.07	14.38

Table 2 below shows the required flow depth for the proposed condition and the design channel depth from Reference 1.

Table 2

Estimated Peak Discharge into Channel (cfs)	Required Flow Depth (ft)	Depth of Channel (ft)
14.38	1.41	2.50

As shown in Table 2, the A5 channel can adequately manage the increased peak discharge resulting from the temporary drainage area modifications.

2. Stormwater Analysis for P9 Channel

Table 3 below summarizes the hydrologic parameters for the tributary watersheds to the P9 channel. These parameters as well as the resulting peak discharge are based on Assumptions 3 and 5.

Table 3

Watershed ID	Watershed Area (acres)	Weighted Runoff Curve Number	Time of Concentration (hr)	Estimated Peak Discharge into Channel (cfs)
Modified A5	2.51	94	0.21	10.92
A16	0.46	86	0.24	1.53
P9	1.05	89	0.15	4.55
Upper Downchute	0.74	86	0.24	2.48
Lower Downchute	0.72	86	0.25	2.37
Cumulative Flow:				21.41

Calculation Sheet

Note that the cumulative flow is not necessarily equal to the sum of the individual peak flows of the contributing drainage areas and is instead a graphical summation of the runoff hydrographs. Table 4 below shows the required flow depth for the proposed condition and the design channel depth from Reference 1.

Table 4

Estimated Peak Discharge into Channel (cfs)	Required Flow Depth (ft)	Depth of Channel (ft)
21.41	1.87	2.00

As shown in Table 4, the P9 channel can adequately manage the increased peak discharge resulting from the temporary drainage area modifications.

SUMMARY:

Based on the assumptions and calculations presented above, the A5 and P9 channels have adequate capacity to convey the increased peak discharges resulting from the temporary drainage area modifications necessary for the new fill progression design.



Attachment 1

A5 Channel Analysis

RMU-1 Hydro Model 2011 LLC

Type II 24-hr 25 yr Model City Rainfall=4.00"

Prepared by {enter your company name here}

Printed 7/19/2011

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Summary for Subcatchment 136S: Subarea A5 Modified

Runoff = 14.38 cfs @ 11.95 hrs, Volume= 0.695 af, Depth= 3.32"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs

Type II 24-hr 25 yr Model City Rainfall=4.00"

Area (ac)	CN	Description
* 1.810	94	Interim Cover
* 0.330	98	Paved
0.370	89	Gravel roads, HSG C
2.510	94	Weighted Average
2.180		Pervious Area
0.330		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	50	0.3300	3.12		Sheet Flow, Smooth surfaces n= 0.011 P2= 2.30"
1.4	402		4.90		Direct Entry, Ditch Flow
0.6	220	0.0100	6.44	11.38	Circular Channel (pipe), Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PE, smooth interior
1.8	520		4.90		Direct Entry, Ditch Flow
4.1	1,192	Total			

Project: CWM Model City
Project No.: 23785.0000
Subject: RMU-1 LLCP

Prepared by: PTO
Date: 7/15/11

**Drainage Channel A5
Worksheet for Triangular Channel**

Channel Design (Input)	
Flow Capacity (cfs)	14.38
Base Width (ft)	0.00
Left Side Slope (x:1)	1.00
Right Side Slope (x:1)	2.00
Bed Slope	0.005
Manning "n"	0.015

Flow Conditions (Output)	
Flowrate from Manning Equation (cfs)	14.56
Required Flow Depth (ft)	1.41
Resulting Flow Velocity (ft/s)	4.88
Resulting Flow Width at Top (ft)	4.23
Resulting Flow Area (ft ²)	2.98
Resulting Wetted Perimeter (ft)	5.15
Resulting Hydraulic Radius (ft)	0.58



Attachment 2

P9 Channel Analysis

RMU-1 Hydro Model 2011 LLCP

Type II 24-hr 25 yr Model City Rainfall=4.00"

Prepared by {enter your company name here}

Printed 7/19/2011

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Summary for Subcatchment 155S: Subarea A5 Modified (through P9)

Runoff = 10.92 cfs @ 12.04 hrs, Volume= 0.695 af, Depth= 3.32"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs

Type II 24-hr 25 yr Model City Rainfall=4.00"

Area (ac)	CN	Description
* 1.810	94	Interim Cover
* 0.330	98	Paved
0.370	89	Gravel roads, HSG C
2.510	94	Weighted Average
2.180		Pervious Area
0.330		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	50	0.3300	3.12		Sheet Flow, Smooth surfaces n= 0.011 P2= 2.30"
1.4	402		4.90		Direct Entry, Ditch Flow
0.6	220	0.0100	6.44	11.38	Circular Channel (pipe), Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PE, smooth interior
1.8	520		4.90		Direct Entry, Ditch Flow
8.5					Direct Entry, Travel Time Through P9
12.6	1,192	Total			

RMU-1 Hydro Model 2011 LLC

Type II 24-hr 25 yr Model City Rainfall=4.00"

Prepared by {enter your company name here}

Printed 7/19/2011

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Summary for Subcatchment 135S: Subarea A16

Runoff = 1.53 cfs @ 12.06 hrs, Volume= 0.098 af, Depth= 2.55"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs

Type II 24-hr 25 yr Model City Rainfall=4.00"

Area (ac)	CN	Description
* 0.460	86	
0.460		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Permitted Tc
8.5					Direct Entry, Travel time through P9
14.5	0	Total			

RMU-1 Hydro Model 2011 LLC*Type II 24-hr 25 yr Model City Rainfall=4.00"*

Prepared by {enter your company name here}

Printed 7/19/2011

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Summary for Subcatchment 137S: Subarea P9

Runoff = 4.55 cfs @ 12.01 hrs, Volume= 0.247 af, Depth= 2.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs

Type II 24-hr 25 yr Model City Rainfall=4.00"

Area (ac)	CN	Description
0.640	86	
* 0.170	98	Paved
0.240	89	Gravel roads, HSG C
1.050	89	Weighted Average
0.880		Pervious Area
0.170		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2					Direct Entry, Permitted Tc

RMU-1 Hydro Model 2011 LLC

Type II 24-hr 25 yr Model City Rainfall=4.00"

Prepared by {enter your company name here}

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Summary for Subcatchment 156S: Downchute Area - Upper (through P9)

Runoff = 2.48 cfs @ 12.06 hrs, Volume= 0.157 af, Depth= 2.55"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs

Type II 24-hr 25 yr Model City Rainfall=4.00"

Area (ac)	CN	Description
* 0.740	86	
0.740		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	50	0.3300	0.43		Sheet Flow, Range n= 0.130 P2= 2.30"
0.1	29	0.3300	4.02		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
3.8	360	0.0100	1.60	2.87	Channel Flow, Area= 1.8 sf Perim= 6.9' r= 0.26' n= 0.038
8.5					Direct Entry, Travel time through P9
14.3	439	Total			

RMU-1 Hydro Model 2011 LLC

Type II 24-hr 25 yr Model City Rainfall=4.00"

Prepared by {enter your company name here}

Printed 7/19/2011

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Summary for Subcatchment 157S: Downchute Area - Lower (through P9)

Runoff = 2.37 cfs @ 12.07 hrs, Volume= 0.153 af, Depth= 2.55"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs

Type II 24-hr 25 yr Model City Rainfall=4.00"

Area (ac)	CN	Description			
* 0.720	86				
0.720		Pervious Area			
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	50	0.3300	0.43		Sheet Flow, Range n= 0.130 P2= 2.30"
0.0	10	0.3300	4.02		
4.4	440	0.0100	1.65	3.30	Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
8.5					Channel Flow, Area= 2.0 sf Perim= 7.3' r= 0.27' n= 0.038
14.8	500	Total			Direct Entry, Travel time through P9

RMU-1 Hydro Model 2011 LLCP*Type II 24-hr 25 yr Model City Rainfall=4.00"*

Prepared by {enter your company name here}

Printed 7/19/2011

HydroCAD® 8.50 s/n 005124 © 2007 HydroCAD Software Solutions LLC

Summary for Link 153L: P9 Channel

Inflow Area = 5.480 ac, 9.12% Impervious, Inflow Depth = 2.96" for 25 yr Model City event

Inflow = 21.41 cfs @ 12.03 hrs, Volume= 1.350 af

Primary = 21.41 cfs @ 12.03 hrs, Volume= 1.350 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-60.00 hrs, dt= 0.01 hrs

Project: CWM Model City
Project No.: 23785.0000
Subject: RMU-1 LLCP

Prepared by: PTO
Date: 7/15/11

Drainage Channel P9
Worksheet for Trapezoidal Channel

Channel Design (Input)	
Flow Capacity (cfs)	21.41
Base Width (ft)	2.00
Left Side Slope (x:1)	2.00
Right Side Slope (x:1)	2.00
Bed Slope	0.0025
Manning "n"	0.038

Flow Conditions (Output)	
Flowrate from Manning Equation (cfs)	21.42
Required Flow Depth (ft)	1.87
Resulting Flow Velocity (ft/s)	2.00
Resulting Flow Width at Top (ft)	9.46
Resulting Flow Area (ft ²)	10.69
Resulting Wetted Perimeter (ft)	10.34
Resulting Hydraulic Radius (ft)	1.03



Attachment 5

Future Contact Water
Management Features

Calculation Sheet

Client: CWM Chemical Services, LLC

Project Location: Model City, New York

Project: RMU-1 Leachate Level Compliance Plan (LLCP)

Project No.: B0023785.0000

Subject: Future Contact Water Management Features

Prepared By: PTO

Date: November 2011

Reviewed By: BMS

Date: November 2011

Checked By: BMS

Date: November 2011

TASK:

Demonstrate that the future contact water management features envisioned for the post Phase X final cover condition are capable of managing the estimated peak discharges from the 25-year, 24-hour storm.

REFERENCES:

1. Proposed phasing plan presented on Figure 2 entitled *Residuals Management Unit One – Final Cover Phasing Plan*, ARCADIS, August 2011 (revised November 2011).
2. HydroCAD Version 8.5, hydrologic evaluation software, HydroCAD Software Solutions, LLC, 2006.
3. *Engineer-in-Training Reference Manual*, 8th Edition, Lindeburg, Michael R., P.E., pp. A-45, 1992.
4. Leachate Level Compliance Plan for Residuals Management Unit- One, Final Sequence Phase 2, ARCADIS, March 2009 (latest revised date March 2010).

ASSUMPTIONS:

1. Several contact water management features are planned to manage runoff following installation of Phase X final cover. These temporary management features include the following:
 - The Phase XI Final Cover Area Drainage Ditch.
 - The Lower Phase XII Surface Water Diversion Berm (SWDB) Depression.
 - The Middle Phase XII SWDB Depression.
 - The Upper Phase XII SWDB Depression.
2. The Phase XI Final Cover Area Drainage Ditch consists of a ditch excavated into the final waste within the future Phase XI final cover area footprint. The Phase XI Final Cover Area Drainage Ditch will allow contact stormwater runoff to gravity drain to the east side of the landfill. The drainage ditch has a triangular cross section, 2H:1V sideslopes, a 0.5 percent bed slope, and a minimum depth of 1.5 feet. A Manning “n” of 0.025 is assumed based on the ditch surface consisting of bare soil. The Phase XI Final Cover Area Drainage Ditch is deemed acceptable if the hydraulic capacity is equal to or greater than the peak discharge from the 25-year, 24-hour design storm.
3. It is envisioned that the detention Basins J and K will be replaced with depressions along the

Calculation Sheet

alignment of the SWDBs on the eastern face of the landfill. The depths and widths of the depressions will be minimized so that their presence does not prevent achievement of final waste grade in upgradient areas. These depressions will serve as collection points for contact stormwater runoff and will be equipped with pumps and float switches to allow automatic operation once the liquid depth exceeds 1 foot.

4. The liquid elevation in the SWDB depressions is assumed to be 1 foot above the depression low point at the beginning of the design storm. This lower 1 foot of storage is assumed to be provided by small sumps in which the pumps will sit. The Phase XII SWDB depressions are deemed acceptable if the peak discharges resulting from the 25-year, 24-hour design storm can be managed while maintaining a minimum 1 foot of freeboard with respect to the lowest containment elevation.
5. The Lower Phase XII SWDB Depression will manage contact stormwater runoff from the lowermost SWDB in the uncapped portion of the landfill. The Lower Phase XII SWDB Depression is trapezoidal in geometry with a base width of 3.0 feet, 2H:1V sideslopes, a flat (0.0 percent) bed slope, a minimum depth of 4 feet (excluding sump depth), and a length of approximately 360 feet. Stormwater outflow from the Lower SWDB Depression occurs via pumping by means of a Goulds Model 3885 WE15H (or equivalent pump). The pump is operated by a level control and is assumed to turn on once the liquid elevation in the depression is greater than or equal 1 foot above the depression low point. The pump is assumed to discharge stormwater at a rate of 67 gallons per minute (gpm) to the Middle Phase XII SWDB Depression based on hydraulic modeling from Reference 4.
6. The Middle Phase XII SWDB Depression will manage contact stormwater runoff from the middle SWDB in the uncapped portion of the landfill, as well as stormwater pumped from the Upper and Lower Phase XII SWDB Depressions. The Middle Phase XII SWDB Depression is trapezoidal in geometry with a base width of 3.0 feet, 2H:1V sideslopes, a flat (0.0 percent) bed slope, a minimum depth of 4 feet (excluding sump depth), and a length of approximately 360 feet. Stormwater outflow from the Middle Phase XII SWDB Depression occurs via pumping to tank T-165. The pump is operated by a level control and is assumed to turn on once the liquid elevation in the depression is greater than or equal 1 foot above depression low point. The pump is assumed to discharge stormwater at a rate of 1,032 gpm based on hydraulic modeling from Reference 4.
7. The Upper Phase XII SWDB Depression will manage stormwater runoff from the upper SWDB in the uncapped portion of the landfill. The Upper Phase XII SWDB Depression is trapezoidal in geometry with a base width of 12.0 feet, 2H:1V sideslopes, a flat (0.0 percent) bed slope, a minimum depth of 4 feet (excluding sump depth), and a length of approximately 360 feet. Stormwater outflow from the Upper Phase XII SWDB Depression occurs via pumping by means of a Goulds Model 3885 WE15H (or equivalent pump). The pump is operated by a level control and is assumed to turn on once the liquid elevation in the depression is greater than or equal 1 foot above the depression low point. The pump is assumed to discharge stormwater at a rate of 67 gpm to the Middle Phase XII SWDB Depression based on hydraulic modeling from Reference 4.
8. The 25-year, 24-hour estimated peak discharges for future contact water management features are calculated using Reference 2. The watershed for the Phase XI Final Cover Area Drainage Ditch is delineated from Reference 1. The watersheds for the Phase XII SWDB Depressions are delineated based on the anticipated worst-case future watershed conditions. It is noted that the sum of uncapped watershed areas herein is larger than the total uncapped area remaining after Phase X capping because the worst-case watersheds overlap and do not occur at the same point in time. The watershed assumed characteristics for each drainage area are as follows:

Calculation Sheet

- Phase XI Final Cover Area Drainage Ditch
 - o Watershed area= 1.18 acres
 - o CN=90 (uncapped waste)
 - o Time of Concentration = 0.1 hours
- Lower Phase XII SWDB Depression
 - o Watershed area= 1.27 acres
 - o CN=90 (uncapped waste)
 - o Time of Concentration = 0.1 hours
- Middle Phase XII SWDB Depression
 - o Watershed area= 2.91 acres
 - o CN=90 (uncapped waste)
 - o Time of Concentration = 0.1 hours
- Upper Phase XII SWDB Depression
 - o Watershed area= 2.66 acres
 - o CN= 90 (uncapped waste)
 - o Time of Concentration = 0.1 hours

CALCULATIONS:

1. Estimated Peak Discharges

Table 1 below summarizes the watershed acreages and estimated peak discharges from these watersheds to the various future contact water management features during the 25-year, 24-hour storm based on Reference 2. Note that the peak discharges do not include pump related inflows from other features.

Table 1

Interim Drainage Feature	Watershed Area (acres)	CN	Time of Concentration (hours)	Estimated Peak Discharge (cfs)
Phase VII Final Cover Area Drainage Ditch	1.18	90	0.1	5.84
Lower Phase XII SWDB Depression	1.27	90	0.1	6.28
Middle Phase XII SWDB Depression	2.91	90	0.1	14.40
Upper Phase XII SWDB Depression	2.66	90	0.1	13.16

Supporting output from Reference 2 for the determination of estimated peak discharges is included as an attachment to this calculation.

Calculation Sheet

2. Hydraulic Capacity of the Phase XI Final Cover Area Drainage Ditch

Table 2 below summarizes the estimated peak discharges to the Phase XI Final Cover Area Drainage Ditch and the hydraulic capacity of the Phase XI Final Cover Area Drainage Ditch.

Table 2

Future Contact Water Management Feature	25-Year, 24-Hour Estimated Peak Discharge (cfs)	Hydraulic Capacity (cfs)
Phase XI Final Cover Area Drainage Ditch	5.84	14.53

Notes:

1. Capacity obtained from the Manning equation based on the parameters from Assumption 2.

As indicated in Table 2, the hydraulic capacity of Phase XI Final Cover Area Drainage Ditch exceeds the peak discharge from the 25-year, 24-hour storm. Hydraulic capacity calculations for the Phase XI Final Cover Area Drainage Ditch are included as an attachment.

3. Phase XII SWDB Depression Routing and Peak Liquid Elevations

Table 3 below summarizes the estimated peak discharges to the Phase XII SWDB depressions and resultant peak elevation in each.

Table 3

Phase XII SWDB Depression	Peak Inflow (cfs)	Peak Outflow (cfs)	Peak Liquid El. (ft)	Minimum Depression Depth (ft)	Freeboard (ft)
Lower	6.28	0.15	2.55	4.00	1.45
Middle	14.70 ¹	2.30	2.96	4.00	1.04
Upper	13.16	0.15	2.99	4.00	1.01

Notes:

1. Inflow includes of combination of direct inflow from the Middle Phase XII SWDB Depression watershed (14.40 cfs) and inflow from Pumps 1 and 2 (0.30 cfs combined).

As indicated in Table 3, the capacity of the SWDB depressions is adequate to manage the peak discharge from the 25-year, 24-hour storm while maintaining a minimum freeboard of 1 foot. Output from Reference 2 is included as an attachment.

SUMMARY:

Based on the assumptions and calculations above, the hydraulic capacities of the future contact water management features are sufficient to manage the estimated peak discharges from the 25-year, 24-hour storm. It is noted that these calculations are preliminary in nature and should be verified prior to construction of the features to verify their ability to manage runoff from the actual watersheds.



Attachment 1

HydroCAD Output

A-5 calcs*Type II 24-hr Rainfall=4.00"*

Prepared by {enter your company name here}

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11/21/2011

Subcatchment 160S: Lower Stormwater Diversion Depression

Runoff = 6.28 cfs @ 11.97 hrs, Volume= 0.309 af, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Type II 24-hr Rainfall=4.00"

Area (ac)	CN	Description
1.270	90	
1.270		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

A-5 calcs*Type II 24-hr Rainfall=4.00"*

Prepared by {enter your company name here}

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11/21/2011

Subcatchment 159S: Middle Stormwater Diversion Depression

Runoff = 14.40 cfs @ 11.97 hrs, Volume= 0.708 af, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Type II 24-hr Rainfall=4.00"

Area (ac)	CN	Description
2.910	90	
2.910		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

A-5 calcs*Type II 24-hr Rainfall=4.00"*

Prepared by {enter your company name here}

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11/21/2011

Subcatchment 158S: Upper Stormwater Diversion Depression

Runoff = 13.16 cfs @ 11.97 hrs, Volume= 0.647 af, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Type II 24-hr Rainfall=4.00"

Area (ac)	CN	Description
2.660	90	
2.660		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

A-5 calcs

Type II 24-hr Rainfall=4.00"

Prepared by {enter your company name here}

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11/21/2011

Pond 166P: Lower Diversion Berm

Inflow Area = 1.270 ac, Inflow Depth = 2.92"
 Inflow = 6.28 cfs @ 11.97 hrs, Volume= 0.309 af
 Outflow = 0.15 cfs @ 10.57 hrs, Volume= 0.309 af, Atten= 98%, Lag= 0.0 min
 Primary = 0.15 cfs @ 10.57 hrs, Volume= 0.309 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
 Peak Elev= 2.55' @ 14.92 hrs Surf.Area= 0.112 ac Storage= 0.174 af

Plug-Flow detention time= 484.3 min calculated for 0.309 af (100% of inflow)
 Center-of-Mass det. time= 484.3 min (1,279.7 - 795.4)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.374 af	3.00'W x 360.00'L x 4.00'H Prismatic Z=2.0

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	Special & User-Defined Elev. (feet) 0.00 0.01 10.00 Disch. (cfs) 0.000 0.149 0.149

Primary OutFlow Max=0.15 cfs @ 10.57 hrs HW=0.01' (Free Discharge)
 ↳ **1=Special & User-Defined** (Custom Controls 0.15 cfs)

A-5 calcs

Type II 24-hr Rainfall=4.00"

Prepared by {enter your company name here}

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11/21/2011

Pond 164P: Middle Diversion Berm

[85] Warning: Oscillations may require Finer Routing>1

[78] Warning: Submerged Pond 162P Primary device # 1 by 2.96'

[81] Warning: Exceeded Pond 162P by 0.68' @ 12.08 hrs

[78] Warning: Submerged Pond 166P Primary device # 1 by 2.96'

[81] Warning: Exceeded Pond 166P by 0.74' @ 12.10 hrs

Inflow Area = 6.840 ac, Inflow Depth > 2.92"
Inflow = 14.70 cfs @ 11.97 hrs, Volume= 1.663 af
Outflow = 2.30 cfs @ 11.64 hrs, Volume= 1.663 af, Atten= 84%, Lag= 0.0 min
Primary = 2.30 cfs @ 11.64 hrs, Volume= 1.663 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 2.96' @ 12.20 hrs Surf.Area= 0.127 ac Storage= 0.223 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 12.0 min (1,375.3 - 1,363.3)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.374 af	3.00'W x 360.00'L x 4.00'H Prismatic Z=2.0

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	Special & User-Defined Elev. (feet) 0.00 0.01 10.00 Disch. (cfs) 0.000 2.300 2.300

Primary OutFlow Max=2.30 cfs @ 11.64 hrs HW=0.01' (Free Discharge)

↑**1=Special & User-Defined** (Custom Controls 2.30 cfs)

A-5 calcs

Type II 24-hr Rainfall=4.00"

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Pond 162P: Upper Diversion Berm

Inflow Area = 2.660 ac, Inflow Depth = 2.92"
 Inflow = 13.16 cfs @ 11.97 hrs, Volume= 0.647 af
 Outflow = 0.15 cfs @ 9.21 hrs, Volume= 0.646 af, Atten= 99%, Lag= 0.0 min
 Primary = 0.15 cfs @ 9.21 hrs, Volume= 0.646 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
 Peak Elev= 2.99' @ 19.40 hrs Surf.Area= 0.205 ac Storage= 0.453 af

Plug-Flow detention time= 1,231.0 min calculated for 0.646 af (100% of inflow)
 Center-of-Mass det. time= 1,230.0 min (2,025.4 - 795.4)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.678 af	12.00'W x 360.00'L x 4.00'H Prismatic Z=2.0

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	Special & User-Defined Elev. (feet) 0.00 0.01 10.00 Disch. (cfs) 0.000 0.149 0.149

Primary OutFlow Max=0.15 cfs @ 9.21 hrs HW=0.01' (Free Discharge)
 ↳ **1=Special & User-Defined** (Custom Controls 0.15 cfs)



Attachment 2

Phase XI Final Cover Area
Diversion Ditch Calculations

A-5 calcs*Type II 24-hr Rainfall=4.00"*

Prepared by {enter your company name here}

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11/21/2011

Subcatchment 161S: Phase XI temporary diversion ditch

Runoff = 5.84 cfs @ 11.97 hrs, Volume= 0.287 af, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Type II 24-hr Rainfall=4.00"

Area (ac)	CN	Description
1.180	90	
1.180		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Project: CWM LLCP A-5
 Project No.: B0023785.0000
 Subject: Phase XI Final Cover Drainage Ditch

By: PTO Date: November 2011

Manning's Equation Channel Analysis

Channel Design (Input)	
Flow Capacity (cfs)	5.84
Base Width (ft)	0.00
Left Side Slope (x:1)	2.00
Right Side Slope (x:1)	2.00
Bed Slope	0.005
Manning "n"	0.025

Flow Conditions (Output)	
Flowrate from Manning Equation (cfs)	14.53
Required Flow Depth (ft)	1.50
Resulting Flow Velocity (ft/s)	3.23
Resulting Flow Width at Top (ft)	6.00
Resulting Flow Area (ft ²)	4.50
Resulting Wetted Perimeter (ft)	6.71
Resulting Hydraulic Radius (ft)	0.67
Resulting Shear Stress on Bed (psf)	0.47
Resulting Shear Stress on Sideslopes (psf)	0.35
Channel Dimensions	
Channel Depth (ft)	2.00
Resulting Freeboard (ft)	0.50

Appendix B

RMU-1 Leachate Removal,
Storage, and Transfer System
Calculations



Attachment 1

RMU-1 Lift Station to Leachate
Tank Farm



Mr. Jonathan Rizzo
Permitting Manager
CWM Chemical Services, LLC
1550 Balmer Road
Model City, New York 14107

Subject:

Revision to Appendix B-1 of the March 2010 Leachate Level Compliance Plan to Reflect Elimination of Tank T-157 from the RMU-1 Leachate Forcemain System
Model City, New York

Dear Jonathan:

As requested, ARCADIS has revised the existing hydraulic model of the Residuals Management Unit-1 (RMU-1) forcemain from the RMU-1 lift station to tank T-157 located in the former oil/water separator building. This model comprises Appendices B-1 and B-2 of the current Leachate Level Compliance Plan (LLCP; ARCADIS, March 2010) and has been used to demonstrate the adequacy of the RMU-1 lift station to manage storm-related flows from the RMU-1 cells and basins in accordance with permit conditions. Flow from tank T-157 to the leachate tank farm (LTF) has typically not been modeled in previously prepared LLCs because CWM Chemical Services, LLC (CWM) measured the actual flow rate as part of a flow demonstration for the New York State Department of Environmental Conservation. Documentation for this flow demonstration is contained in Appendix B-3 of the March 2010 LLC.

ARCADIS understands that tank T-157 was recently taken out of service because of a leak and, with the leachate flows from RMU-1 diminishing due to ongoing final cover construction, CWM has elected to reroute the RMU-1 forcemain around tank T-157 and its associated pumps. At this time, CWM is evaluating whether to make this reroute permanent or to repair the tank and reestablish the original system. With the recently completed modification, the RMU-1 lift station now delivers flow directly to the tanks in the LTF, rather than to tank T-157 as in the past. Removing the pumps at tank T-157 increases the head demand on the RMU-1 lift station, which results in a diminished flow rate capacity from the RMU-1 lift station. The objective of the model revision was to estimate the flow rate from the RMU-1 lift station following the forcemain rerouting, and compare that flow rate with the worst-case inflows to the lift station.

The existing model from the March 2010 LLC was revised to include the additional existing steel piping from tank T-157 to the northernmost LTF tank (T-103), as well as the new polyvinyl chloride (PVC) pipe installed to reroute the forcemain around tank T-157. Tank T-103 was selected because it is the most distant from the RMU-1

ARCADIS
6723 Towpath Road
P.O. Box 66
Syracuse
New York 13214-0066
Tel 315.446.9120
Fax 315.449.0017
www.arcadis-us.com

Environment

Date:
September 9, 2011

Contact:
Brian M. Stone, P.E.

Phone:
315.671.9445

Email:
brian.stone@arcadis-us.com

Our ref:
B0023729.2011

[Imagine the result](#)

lift station (as measured in terms of pipe length), and thus, represents the pumping scenario with the greatest headloss. The following is a summary of additional components that were added to the existing hydraulic model based on an accounting of pipe and fittings by CWM:

- 20 feet of 6-inch-diameter schedule 40 PVC pipe (newly installed).
- Two 90-degree 6-inch-diameter schedule 40 PVC elbows (newly installed).
- 190 feet of 8-inch-diameter schedule 40 steel pipe (previously existing from tank T-157 to tank T-103 in the LTF).
- Five 90-degree 8-inch-diameter schedule 40 steel elbows (previously existing).
- Three 8-inch-diameter schedule 40 steel tees with 6-inch-diameter branches (previously existing). The tees are located at each LTF tank and allow vertical riser pipe sections leading to the tops of the tanks to connect to the 8-inch-diameter horizontal pipeline from tank T-157. The flow was modeled as passing straight through two of the tees (at tanks T-101 and T-102) and diverging into the 6-inch-diameter branch on the last tee to flow into tank T-103.
- 30 feet of 6-inch-diameter schedule 40 steel pipe (previously existing) that makes up the vertical riser to the top of tank T-103.
- One full port 6-inch-diameter ball valve (previously existing) that controls flow into vertical riser pipe leading to tank T-103. The valve is modeled in the fully open position.
- Two 90-degree 6-inch-diameter schedule 40 steel elbows (previously existing) in the vertical riser pipe leading to tank T-103.

With the inclusion of the above-listed components in the RMU-1 lift station model, a flow rate of approximately 382 gallons per minute (gpm) out of the lift station is predicted. The March 2010 LLCP demonstrated that the RMU-1 lift station capacity was at least 513 gpm (the pump was artificially throttled in the model to yield a flow rate that exactly matched the worst-case inflow). The majority of the decrease is attributable to the additional head required to deliver the flow to the top of tank T-103. Output from our WaterCAD modeling software showing the system elements from the RMU-1 lift station to tank T-103 are included in Attachment 1.

Although the post-modification flow rate capacity from the RMU-1 lift station has been reduced, the predicted flow rate is deemed sufficient to manage the storm-related flows from RMU-1. Phase VII final cover construction is well underway at this time and eliminates all of the perimeter infiltration channels along the western edge of RMU-1 and along a significant portion of the eastern edge of RMU-1. This will allow the primary pump in Cell 9/10 to be replaced from the current ABS JUMBO 30HH (producing approximately 152 gpm per the March 2010 LLCP) to a Goulds WE05HH (estimated to produce approximately 60 gpm based on past LLCP modeling). Leachate that accumulates in Cells 11/13 and 12/14 will continue to be managed by the current ABS JUMBO 30HH (each producing approximately 135 gpm per the March 2010 LLCP). The perimeter infiltration channels in all other cells of RMU-1 are eliminated with the construction of Phase VII and previous phases of final cover. As a result, these cells do not respond to storm events and their leachate generation rates are ignored in accordance with historical LLCP assumptions. The worst-case inflow to the RMU-1 lift station would occur when all three active cells (9/10, 11/13, and 12/14) are pumping simultaneously. The combined inflow to the RMU-1 lift station under this scenario is estimated to be approximately 330 gpm, which is less than the predicted post-modification lift station flow rate capacity of 382 gpm.

The next fill progression design and LLCP currently being prepared by ARCADIS reflects the installation of interim cover around the remaining uncapped perimeter of the landfill, which will eliminate all infiltration channels. As this interim cover construction progresses, the primary pumps in Cells 9/10, 11/13, and 12/14 will be downsized, which will further diminish the inflow to the RMU-1 lift station.

As always, if you have any questions please feel free to contact me at 315.671.9445.

Sincerely,

ARCADIS



Brian M. Stone, P.E.
Senior Engineer

Copies:

Mr. Joseph Molina III, P.E., ARCADIS
Mr. Philip Batten, ARCADIS
Mr. Todd Farnen, ARCADIS

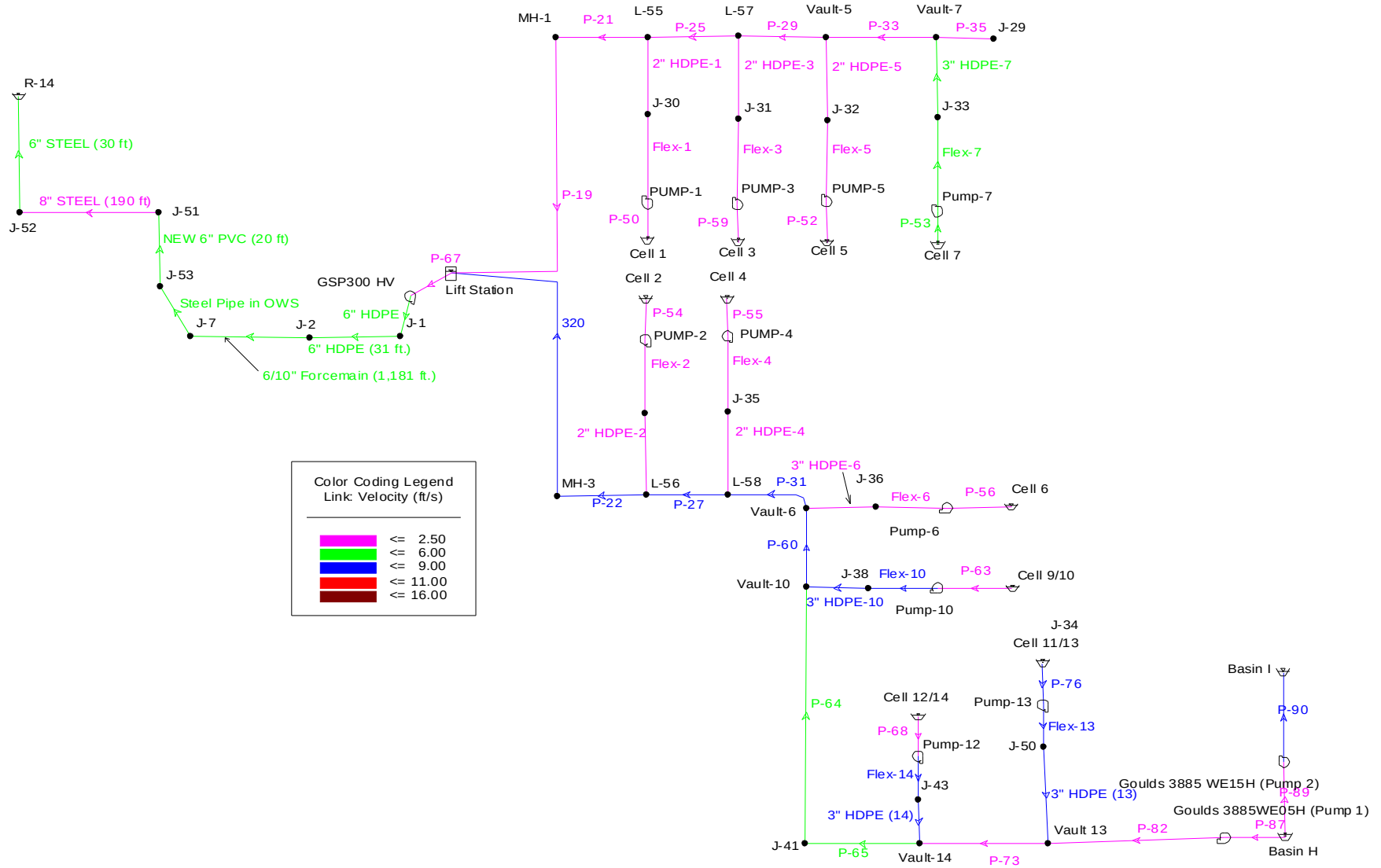


Attachment 1

WaterCAD Output

Scenario: Base

HYDRAULIC MODEL SCHEMATIC
RMU-1 LANDFILL CELL PRIMARY SUMP PUMPS
THROUGH RMU-1 LIFT STATION TO TANK 157
IN OWS BUILDING



Analysis Results

Scenario: Base

Steady State Analysis

Note:

The input data may have been modified since the last calculation was performed.

The calculated results may be outdated.

Title: CWM: RMU-1 Leachate System Evaluation
 Project Engineer: ARCADIS
 Project Date: 09/07/09
 Comments: RMU-1 landfill cell primary pumps through RMU-1 lift station. Landfill cells modeled as constant-head reservoirs.

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Liquid Characteristics			
Liquid	Water at 20C(68F)	Specific Gravity	1.00
Kinematic Viscosity	1.0804e-5 ft ² /s		

Network Inventory			
Pressure Pipes	56	Number of Tanks	1
Number of Reservoirs	13	- Constant Area:	1
Number of Pressure Junctions	30	- Variable Area:	0
Number of Pumps	13	Number of Valves	0
- Constant Power:	0	- FCV's:	0
- One Point (Design Point):	0	- PBV's:	0
- Standard (3 Point):	13	- PRV's:	0

Title: CWM: RMU-1 Leachate System Evaluation
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Project Engineer: ARCADIS
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 Page 1

Analysis Results **Scenario: Base** **Steady State Analysis**

Network Inventory			
- Standard Extended:	0	- PSV's:	0
- Custom Extended:	0	- TCV's:	0
- Multiple Point:	0	- GPV's:	0
Number of Spot Elevations	0		
Pressure Pipes Inventory			
1.93 in	20.00 ft	5.42 in	5,663.00 ft
1.94 in	271.00 ft	6.00 in	95.02 ft
2.00 in	451.00 ft	6.07 in	20.00 ft
2.86 in	116.00 ft	6.07 in	30.00 ft
2.88 in	70.00 ft	7.98 in	190.00 ft
3.00 in	384.00 ft	48.00 in	1.00 ft
Total Length	7,311.02 ft		

Analysis Results

Scenario: Base

Steady State Analysis

Pressure Pipes @ 0.00 hr

Label	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
6" HDPE	Open	382.12	5.31	377.69	377.38	0.12	0.20	0.32	39.46
6" HDPE (31 ft	Open	382.12	5.31	377.38	374.60	0.46	2.32	2.78	89.60
6" STEEL (30 ft	Open	382.12	4.24	351.06	350.00	0.58	0.49	1.06	35.35
6/10" Forcema	Open	382.12	5.31	374.60	356.46	17.47	0.67	18.14	15.36
8" STEEL (19 ft	Open	382.12	2.45	352.38	351.06	0.96	0.36	1.32	6.94
NEW 6" PVC (	Open	382.12	4.24	352.77	352.38	0.18	0.21	0.39	19.44
P-67	Open	382.12	0.07	318.50	318.50	0.00	0.00	0.00	0.00
Steel Pipe in C	Open	382.12	4.34	356.46	352.77	1.83	1.86	3.69	40.99

Pumps @ 0.00 hr

Label	Control Status	Intake Pump Grade (ft)	Discharge Pump Grade (ft)	Discharge (gpm)	Pump Head (ft)	Relative Speed	Calculated Water Power (Hp)
GSP300 HV	On	318.50	377.69	382.12	59.19	0.69	5.71

Pressure Junctions @ 0.00 hr

Label	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
J-1	377.38	24.82	57.38	0.00
J-2	374.60	23.62	54.60	0.00
J-7	356.46	15.77	36.46	0.00
J-51	352.38	14.01	32.38	0.00
J-52	351.06	13.44	31.06	0.00
J-53	352.77	14.18	32.77	0.00

Analysis Results **Scenario: Base** **Steady State Analysis**

Tanks @ 0.00 hr								
Label	Calculated Hydraulic Grade (ft)	Calculated Level (ft)	Pressure (psi)	Calculated Percent Full (%)	Calculated Volume (ft³)	Inflow (gpm)	Outflow (gpm)	Current Status
Lift Station	318.50	1.50	0.65	0.0	0.00	130.25	-130.25	Filling

Reservoirs @ 0.00 hr			
Label	Calculated Hydraulic Grade (ft)	Inflow (gpm)	Outflow (gpm)
R-14	350.00	382.12	-382.12

Detailed Report for Pressure Pipe: 6" HDPE

Note:

The input data may have been modified since the last calculation was performed.

The calculated results may be outdated.

Scenario Summary			
Scenario	Base		
Physical Alternative	Base-Physical		
Active Topology Alternative	Base-Active Topology		
Demand Alternative	Default-Average Daily		
Initial Settings Alternative	Base-Initial Settings		
Operational Alternative	Base-Operational Controls		
Logical Control Set Alternative	<All Logical Controls>		
Age Alternative	Default-Age Scenario		
Constituent Alternative	Default-Constituent		
Trace Alternative	Default-Trace Scenario		
Fire Flow Alternative	Base-Fire Flow		
Capital Cost Alternative	Base-Capital Cost		
Energy Cost Alternative	Base-Energy Cost		
User Data Alternative	Base-User Data		
Global Adjustments Summary			
Demand	<None>	Roughness	<None>
Pipe Characteristics			
Material	HDPE	Hazen- Williams C	155.0
Diameter	5.42 in	Minor Loss Coefficient	0.45
Check Valve?	false	Length	8.00 ft
From Node	GSP300 HV	To Node	J-1
Elevations			
From Elevation	317.00 ft	To Elevation	320.00 ft
Initial Status			
Initial Status	Open		
User Data			
Date Installed		Date Retired	

Title: CWM: RMU-1 Leachate System Evaluation

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Project Engineer: ARCADIS

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Page 1

Detailed Report for Pressure Pipe: 6" HDPE

User Data			
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	382.12	5.31	377.69	377.38	0.12	0.20	0.32	39.46

Detailed Report for Pressure Pipe: 6" HDPE (31 ft.)

Note:

The input data may have been modified since the last calculation was performed.
The calculated results may be outdated.

Scenario Summary			
Scenario	Base		
Physical Alternative	Base-Physical		
Active Topology Alternative	Base-Active Topology		
Demand Alternative	Default-Average Daily		
Initial Settings Alternative	Base-Initial Settings		
Operational Alternative	Base-Operational Controls		
Logical Control Set Alternative	<All Logical Controls>		
Age Alternative	Default-Age Scenario		
Constituent Alternative	Default-Constituent		
Trace Alternative	Default-Trace Scenario		
Fire Flow Alternative	Base-Fire Flow		
Capital Cost Alternative	Base-Capital Cost		
Energy Cost Alternative	Base-Energy Cost		
User Data Alternative	Base-User Data		
Global Adjustments Summary			
Demand	<None>	Roughness	<None>
Pipe Characteristics			
Material	HDPE	Hazen- Williams C	155.0
Diameter	5.42 in	Minor Loss Coefficient	5.29
Check Valve?	false	Length	31.00 ft
From Node	J-1	To Node	J-2
Elevations			
From Elevation	320.00 ft	To Elevation	320.00 ft
Initial Status			
Initial Status	Open		
User Data			
Date Installed		Date Retired	

Detailed Report for Pressure Pipe: 6" HDPE (31 ft.)

User Data			
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	382.12	5.31	377.38	374.60	0.46	2.32	2.78	89.60

Detailed Report for Pressure Pipe: 6" STEEL (30 ft)

Note:

The input data may have been modified since the last calculation was performed.
The calculated results may be outdated.

Scenario Summary			
Scenario	Base		
Physical Alternative	Base-Physical		
Active Topology Alternative	Base-Active Topology		
Demand Alternative	Default-Average Daily		
Initial Settings Alternative	Base-Initial Settings		
Operational Alternative	Base-Operational Controls		
Logical Control Set Alternative	<All Logical Controls>		
Age Alternative	Default-Age Scenario		
Constituent Alternative	Default-Constituent		
Trace Alternative	Default-Trace Scenario		
Fire Flow Alternative	Base-Fire Flow		
Capital Cost Alternative	Base-Capital Cost		
Energy Cost Alternative	Base-Energy Cost		
User Data Alternative	Base-User Data		
Global Adjustments Summary			
Demand	<None>	Roughness	<None>
Pipe Characteristics			
Material	Steel	Hazen- Williams C	100.0
Diameter	6.07 in	Minor Loss Coefficient	1.74
Check Valve?	false	Length	30.00 ft
From Node	J-52	To Node	R-14
Elevations			
From Elevation	320.00 ft	To Elevation	350.00 ft
Initial Status			
Initial Status	Open		
User Data			
Date Installed		Date Retired	

Detailed Report for Pressure Pipe: 6" STEEL (30 ft)

User Data			
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	382.12	4.24	351.06	350.00	0.58	0.49	1.06	35.35

Detailed Report for Pressure Pipe: 6/10" Forcemain (1,181 ft.)

Note:

The input data may have been modified since the last calculation was performed.

The calculated results may be outdated.

Scenario Summary			
Scenario	Base		
Physical Alternative	Base-Physical		
Active Topology Alternative	Base-Active Topology		
Demand Alternative	Default-Average Daily		
Initial Settings Alternative	Base-Initial Settings		
Operational Alternative	Base-Operational Controls		
Logical Control Set Alternative	<All Logical Controls>		
Age Alternative	Default-Age Scenario		
Constituent Alternative	Default-Constituent		
Trace Alternative	Default-Trace Scenario		
Fire Flow Alternative	Base-Fire Flow		
Capital Cost Alternative	Base-Capital Cost		
Energy Cost Alternative	Base-Energy Cost		
User Data Alternative	Base-User Data		
Global Adjustments Summary			
Demand	<None>	Roughness	<None>
Pipe Characteristics			
Material	HDPE	Hazen- Williams C	155.0
Diameter	5.42 in	Minor Loss Coefficient	1.53
Check Valve?	false	Length	1,181.00 ft
From Node	J-2	To Node	J-7
Elevations			
From Elevation	320.00 ft	To Elevation	320.00 ft
Initial Status			
Initial Status	Open		
User Data			
Date Installed		Date Retired	

Detailed Report for Pressure Pipe: 6/10" Forcemain (1,181 ft.)

User Data			
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	382.12	5.31	374.60	356.46	17.47	0.67	18.14	15.36

Detailed Report for Pressure Pipe: 8" STEEL (190 ft)

Note:

The input data may have been modified since the last calculation was performed.

The calculated results may be outdated.

Scenario Summary			
Scenario	Base		
Physical Alternative	Base-Physical		
Active Topology Alternative	Base-Active Topology		
Demand Alternative	Default-Average Daily		
Initial Settings Alternative	Base-Initial Settings		
Operational Alternative	Base-Operational Controls		
Logical Control Set Alternative	<All Logical Controls>		
Age Alternative	Default-Age Scenario		
Constituent Alternative	Default-Constituent		
Trace Alternative	Default-Trace Scenario		
Fire Flow Alternative	Base-Fire Flow		
Capital Cost Alternative	Base-Capital Cost		
Energy Cost Alternative	Base-Energy Cost		
User Data Alternative	Base-User Data		
Global Adjustments Summary			
Demand	<None>	Roughness	<None>
Pipe Characteristics			
Material	Steel	Hazen- Williams C	100.0
Diameter	7.98 in	Minor Loss Coefficient	3.83
Check Valve?	false	Length	190.00 ft
From Node	J-51	To Node	J-52
Elevations			
From Elevation	320.00 ft	To Elevation	320.00 ft
Initial Status			
Initial Status	Open		
User Data			
Date Installed		Date Retired	

Title: CWM: RMU-1 Leachate System Evaluation

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Project Engineer: ARCADIS

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Detailed Report for Pressure Pipe: 8" STEEL (190 ft)

User Data			
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary										
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Hydraulic Grade (ft)	Structure Hydraulic Grade (ft)	Downstream Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	382.12	2.45	352.38		351.06	0.96	0.36	1.32	6.94

Detailed Report for Pump: GSP300 HV

Note:

The input data may have been modified since the last calculation was performed.
The calculated results may be outdated.

Scenario Summary			
Scenario	Base		
Physical Alternative	Base-Physical		
Active Topology Alternative	Base-Active Topology		
Demand Alternative	Default-Average Daily		
Initial Settings Alternative	Base-Initial Settings		
Operational Alternative	Base-Operational Controls		
Logical Control Set Alternative	<All Logical Controls>		
Age Alternative	Default-Age Scenario		
Constituent Alternative	Default-Constituent		
Trace Alternative	Default-Trace Scenario		
Fire Flow Alternative	Base-Fire Flow		
Capital Cost Alternative	Base-Capital Cost		
Energy Cost Alternative	Base-Energy Cost		
User Data Alternative	Base-User Data		
Global Adjustments Summary			
Demand	<None>	Roughness	<None>
Geometric Summary			
Northing	9,757.40 ft	Upstream Pipe	P-67
Easting	11,303.49 ft	Downstream Pipe	6" HDPE
Elevation	317.00 ft		
Pump Definition Summary			
Pump Type	Standard (3 Point)		
Shutoff Head	155.00 ft	Shutoff Discharge	0.00 gpm
Design Head	110.00 ft	Design Discharge	725.00 gpm
Maximum Operating Head	10.00 ft	Maximum Operating Discharge	1,650.00 gpm
Initial Status			
Initial Pump Status	On	Initial Relative Speed Factor	0.69

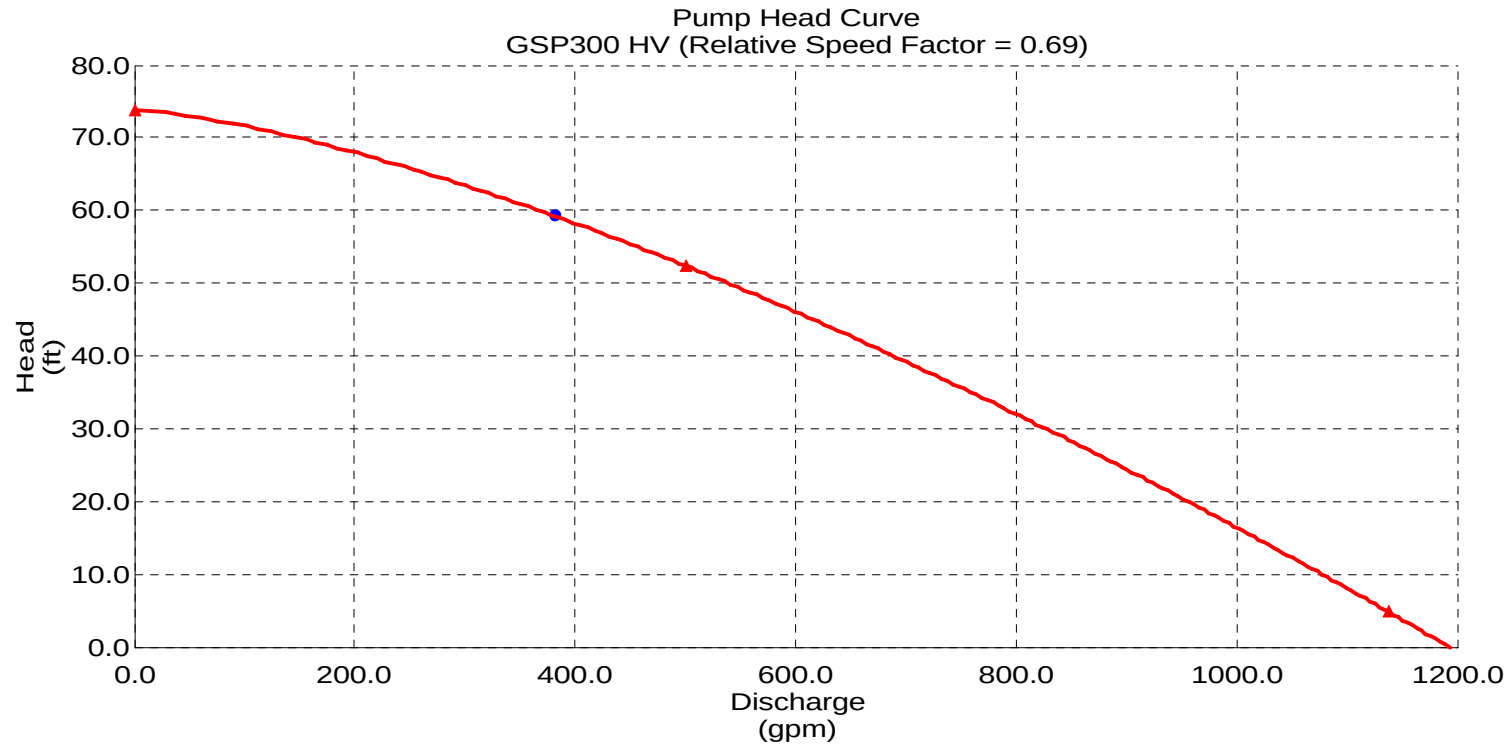
Detailed Report for Pump: GSP300 HV

User Data

Date Installed		Date Retired	
Inspection Date		SCADA ID	
Rated Power	0 Hp	Condition	
Manufacturer		Model	
Serial Number		Metered	false
Existing	false		

Calculated Results Summary

Time (hr)	Control Status	Intake Pump Grade (ft)	Discharge Pump Grade (ft)	Discharge (gpm)	Pump Head (ft)	Relative Speed	Calculated Water Power (Hp)
0.00	On	318.50	377.69	382.12	59.19	0.69	5.71



Detailed Report for Pressure Junction: J-1

Note:

The input data may have been modified since the last calculation was performed.

The calculated results may be outdated.

Scenario Summary			
Scenario	Base		
Physical Alternative	Base-Physical		
Active Topology Alternative	Base-Active Topology		
Demand Alternative	Default-Average Daily		
Initial Settings Alternative	Base-Initial Settings		
Operational Alternative	Base-Operational Controls		
Logical Control Set Alternative	<All Logical Controls>		
Age Alternative	Default-Age Scenario		
Constituent Alternative	Default-Constituent		
Trace Alternative	Default-Trace Scenario		
Fire Flow Alternative	Base-Fire Flow		
Capital Cost Alternative	Base-Capital Cost		
Energy Cost Alternative	Base-Energy Cost		
User Data Alternative	Base-User Data		
Global Adjustments Summary			
Demand	<None>	Roughness	<None>
Geometric Summary			
Northing	9,585.03 ft	Elevation	320.00 ft
Easting	11,262.28 ft	Zone	Zone-1
Demand Summary			
Type	Base Flow (gpm)	Pattern	
Demand	0.00	Fixed	
User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Detailed Report for Pressure Junction: J-1

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	377.38	24.82	57.38	0.00

Detailed Report for Pressure Junction: J-2

Note:

The input data may have been modified since the last calculation was performed.

The calculated results may be outdated.

Scenario Summary			
Scenario	Base		
Physical Alternative	Base-Physical		
Active Topology Alternative	Base-Active Topology		
Demand Alternative	Default-Average Daily		
Initial Settings Alternative	Base-Initial Settings		
Operational Alternative	Base-Operational Controls		
Logical Control Set Alternative	<All Logical Controls>		
Age Alternative	Default-Age Scenario		
Constituent Alternative	Default-Constituent		
Trace Alternative	Default-Trace Scenario		
Fire Flow Alternative	Base-Fire Flow		
Capital Cost Alternative	Base-Capital Cost		
Energy Cost Alternative	Base-Energy Cost		
User Data Alternative	Base-User Data		
Global Adjustments Summary			
Demand	<None>	Roughness	<None>
Geometric Summary			
Northing	9,580.61 ft	Elevation	320.00 ft
Easting	10,873.91 ft	Zone	Zone-1
Demand Summary			
Type	Base Flow (gpm)	Pattern	
Demand	0.00	Fixed	
User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Detailed Report for Pressure Junction: J-2

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	374.60	23.62	54.60	0.00

Detailed Report for Pressure Junction: J-7

Note:

The input data may have been modified since the last calculation was performed.
The calculated results may be outdated.

Scenario Summary			
Scenario	Base		
Physical Alternative	Base-Physical		
Active Topology Alternative	Base-Active Topology		
Demand Alternative	Default-Average Daily		
Initial Settings Alternative	Base-Initial Settings		
Operational Alternative	Base-Operational Controls		
Logical Control Set Alternative	<All Logical Controls>		
Age Alternative	Default-Age Scenario		
Constituent Alternative	Default-Constituent		
Trace Alternative	Default-Trace Scenario		
Fire Flow Alternative	Base-Fire Flow		
Capital Cost Alternative	Base-Capital Cost		
Energy Cost Alternative	Base-Energy Cost		
User Data Alternative	Base-User Data		
Global Adjustments Summary			
Demand	<None>	Roughness	<None>
Geometric Summary			
Northing	9,585.30 ft	Elevation	320.00 ft
Easting	10,368.84 ft	Zone	Zone-1
Demand Summary			
Type	Base Flow (gpm)	Pattern	
Demand	0.00	Fixed	
User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Detailed Report for Pressure Junction: J-7

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	356.46	15.77	36.46	0.00

Detailed Report for Pressure Junction: J-51

Note:

The input data may have been modified since the last calculation was performed.
The calculated results may be outdated.

Scenario Summary			
Scenario	Base		
Physical Alternative	Base-Physical		
Active Topology Alternative	Base-Active Topology		
Demand Alternative	Default-Average Daily		
Initial Settings Alternative	Base-Initial Settings		
Operational Alternative	Base-Operational Controls		
Logical Control Set Alternative	<All Logical Controls>		
Age Alternative	Default-Age Scenario		
Constituent Alternative	Default-Constituent		
Trace Alternative	Default-Trace Scenario		
Fire Flow Alternative	Base-Fire Flow		
Capital Cost Alternative	Base-Capital Cost		
Energy Cost Alternative	Base-Energy Cost		
User Data Alternative	Base-User Data		
Global Adjustments Summary			
Demand	<None>	Roughness	<None>
Geometric Summary			
Northing	10,110.78 ft	Elevation	320.00 ft
Easting	10,232.77 ft	Zone	Zone-1
Demand Summary			
Type	Base Flow (gpm)	Pattern	
Demand	0.00	Fixed	
User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Detailed Report for Pressure Junction: J-51

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	352.38	14.01	32.38	0.00

Detailed Report for Pressure Junction: J-52

Note:

The input data may have been modified since the last calculation was performed.
The calculated results may be outdated.

Scenario Summary			
Scenario	Base		
Physical Alternative	Base-Physical		
Active Topology Alternative	Base-Active Topology		
Demand Alternative	Default-Average Daily		
Initial Settings Alternative	Base-Initial Settings		
Operational Alternative	Base-Operational Controls		
Logical Control Set Alternative	<All Logical Controls>		
Age Alternative	Default-Age Scenario		
Constituent Alternative	Default-Constituent		
Trace Alternative	Default-Trace Scenario		
Fire Flow Alternative	Base-Fire Flow		
Capital Cost Alternative	Base-Capital Cost		
Energy Cost Alternative	Base-Energy Cost		
User Data Alternative	Base-User Data		
Global Adjustments Summary			
Demand	<None>	Roughness	<None>
Geometric Summary			
Northing	10,110.78 ft	Elevation	320.00 ft
Easting	9,637.03 ft	Zone	Zone-1
Demand Summary			
Type	Base Flow (gpm)	Pattern	
Demand	0.00	Fixed	
User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Detailed Report for Pressure Junction: J-52

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	351.06	13.44	31.06	0.00

Detailed Report for Pressure Junction: J-53

Note:

The input data may have been modified since the last calculation was performed.
The calculated results may be outdated.

Scenario Summary			
Scenario	Base		
Physical Alternative	Base-Physical		
Active Topology Alternative	Base-Active Topology		
Demand Alternative	Default-Average Daily		
Initial Settings Alternative	Base-Initial Settings		
Operational Alternative	Base-Operational Controls		
Logical Control Set Alternative	<All Logical Controls>		
Age Alternative	Default-Age Scenario		
Constituent Alternative	Default-Constituent		
Trace Alternative	Default-Trace Scenario		
Fire Flow Alternative	Base-Fire Flow		
Capital Cost Alternative	Base-Capital Cost		
Energy Cost Alternative	Base-Energy Cost		
User Data Alternative	Base-User Data		
Global Adjustments Summary			
Demand	<None>	Roughness	<None>
Geometric Summary			
Northing	9,796.27 ft	Elevation	320.00 ft
Easting	10,239.56 ft	Zone	Zone-1
Demand Summary			
Type	Base Flow (gpm)	Pattern	
Demand	0.00	Fixed	
User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Detailed Report for Pressure Junction: J-53

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	352.77	14.18	32.77	0.00

Detailed Report for Tank: Lift Station

Note:

The input data may have been modified since the last calculation was performed.
The calculated results may be outdated.

Scenario Summary			
Scenario	Base		
Physical Alternative	Base-Physical		
Active Topology Alternative	Base-Active Topology		
Demand Alternative	Default-Average Daily		
Initial Settings Alternative	Base-Initial Settings		
Operational Alternative	Base-Operational Controls		
Logical Control Set Alternative	<All Logical Controls>		
Age Alternative	Default-Age Scenario		
Constituent Alternative	Default-Constituent		
Trace Alternative	Default-Trace Scenario		
Fire Flow Alternative	Base-Fire Flow		
Capital Cost Alternative	Base-Capital Cost		
Energy Cost Alternative	Base-Energy Cost		
User Data Alternative	Base-User Data		
Global Adjustments Summary			
Demand	<None>	Roughness	<None>
Geometric Summary			
Northing	9,851.90 ft	Elevation	317.00 ft
Easting	11,477.43 ft	Zone	Zone-1
Demand Summary			
Type	Base Flow (gpm)	Pattern	
Demand	0.00	Fixed	
Operating Range Summary			
Maximum Elevation	323.00 ft	Maximum Level	6.00 ft
Initial HGL	318.50 ft	Initial Level	1.50 ft
Minimum Elevation	318.50 ft	Minimum Level	1.50 ft
Base Elevation	317.00 ft		

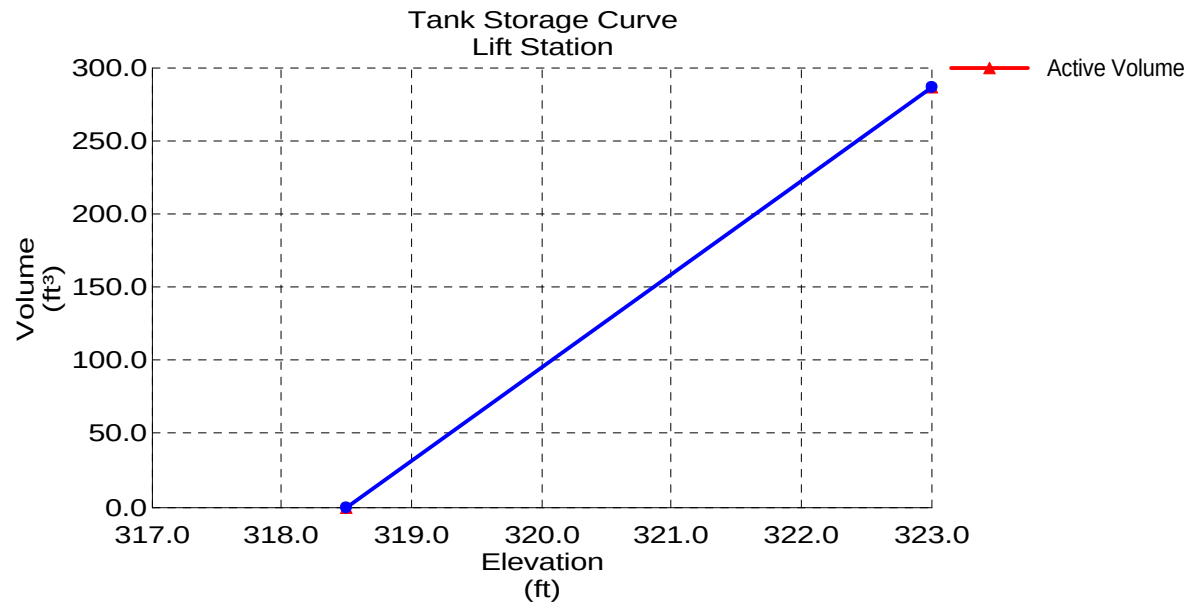
Detailed Report for Tank: Lift Station

Storage			
Section Type	Constant Area	Circular Tank Shape?	true
Diameter	9.00 ft	Average Area	63.6 ft ²
Inactive Volume	0.00 ft ³	Total Active Volume	286.28 ft ³

User Data			
Date Installed		Date Retired	
Inspection Date		SCADA ID	
Lining		Condition	
Metered	false	Clearwell Storage	false
Elevated Tank	false	Existing	false

Calculated Results Summary

Time (hr)	Calculated Hydraulic Grade (ft)	Calculated Level (ft)	Pressure (psi)	Calculated Percent Full (%)	Calculated Volume (ft ³)	Inflow (gpm)	Outflow (gpm)	Current Status
0.00	318.50	1.50	0.65	0.0	0.00	130.25	-130.25	Filling



Detailed Report for Pressure Pipe: NEW 6" PVC (20 ft)

Note:

The input data may have been modified since the last calculation was performed.
The calculated results may be outdated.

Scenario Summary			
Scenario	Base		
Physical Alternative	Base-Physical		
Active Topology Alternative	Base-Active Topology		
Demand Alternative	Default-Average Daily		
Initial Settings Alternative	Base-Initial Settings		
Operational Alternative	Base-Operational Controls		
Logical Control Set Alternative	<All Logical Controls>		
Age Alternative	Default-Age Scenario		
Constituent Alternative	Default-Constituent		
Trace Alternative	Default-Trace Scenario		
Fire Flow Alternative	Base-Fire Flow		
Capital Cost Alternative	Base-Capital Cost		
Energy Cost Alternative	Base-Energy Cost		
User Data Alternative	Base-User Data		
Global Adjustments Summary			
Demand	<None>	Roughness	<None>
Pipe Characteristics			
Material	PVC	Hazen- Williams C	150.0
Diameter	6.07 in	Minor Loss Coefficient	0.74
Check Valve?	false	Length	20.00 ft
From Node	J-53	To Node	J-51
Elevations			
From Elevation	320.00 ft	To Elevation	320.00 ft
Initial Status			
Initial Status	Open		
User Data			
Date Installed		Date Retired	

Detailed Report for Pressure Pipe: NEW 6" PVC (20 ft)

User Data			
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	382.12	4.24	352.77	352.38	0.18	0.21	0.39	19.44

Detailed Report for Pressure Pipe: P-67

Note:

The input data may have been modified since the last calculation was performed.
The calculated results may be outdated.

Scenario Summary			
Scenario	Base		
Physical Alternative	Base-Physical		
Active Topology Alternative	Base-Active Topology		
Demand Alternative	Default-Average Daily		
Initial Settings Alternative	Base-Initial Settings		
Operational Alternative	Base-Operational Controls		
Logical Control Set Alternative	<All Logical Controls>		
Age Alternative	Default-Age Scenario		
Constituent Alternative	Default-Constituent		
Trace Alternative	Default-Trace Scenario		
Fire Flow Alternative	Base-Fire Flow		
Capital Cost Alternative	Base-Capital Cost		
Energy Cost Alternative	Base-Energy Cost		
User Data Alternative	Base-User Data		
Global Adjustments Summary			
Demand	<None>	Roughness	<None>
Pipe Characteristics			
Material	PVC	Hazen- Williams C	150.0
Diameter	48.00 in	Minor Loss Coefficient	0.00
Check Valve?	false	Length	1.00 ft
From Node	Lift Station	To Node	GSP300 HV
Elevations			
From Elevation	317.00 ft	To Elevation	317.00 ft
Initial Status			
Initial Status	Open		
User Data			
Date Installed		Date Retired	

Detailed Report for Pressure Pipe: P-67

User Data			
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	382.12	0.07	318.50	318.50	0.00	0.00	0.00	0.00

Detailed Report for Reservoir: R-14

Note:

The input data may have been modified since the last calculation was performed.
The calculated results may be outdated.

Scenario Summary			
Scenario	Base		
Physical Alternative	Base-Physical		
Active Topology Alternative	Base-Active Topology		
Demand Alternative	Default-Average Daily		
Initial Settings Alternative	Base-Initial Settings		
Operational Alternative	Base-Operational Controls		
Logical Control Set Alternative	<All Logical Controls>		
Age Alternative	Default-Age Scenario		
Constituent Alternative	Default-Constituent		
Trace Alternative	Default-Trace Scenario		
Fire Flow Alternative	Base-Fire Flow		
Capital Cost Alternative	Base-Capital Cost		
Energy Cost Alternative	Base-Energy Cost		
User Data Alternative	Base-User Data		
Global Adjustments Summary			
Demand	<None>	Roughness	<None>
Geometric Summary			
X	9,634.75 ft	Elevation	350.00 ft
Y	10,608.75 ft	Zone	Zone-1
User Data			
Date Installed		Date Retired	
Inspection Date		Condition	
Clearwell Storage	false	Existing	false

Calculated Results Summary			
Time (hr)	Calculated Hydraulic Grade (ft)	Inflow (gpm)	Outflow (gpm)
0.00	350.00	382.12	-382.12

Detailed Report for Pressure Pipe: Steel Pipe in OWS

Note:

The input data may have been modified since the last calculation was performed.
The calculated results may be outdated.

Scenario Summary			
Scenario	Base		
Physical Alternative	Base-Physical		
Active Topology Alternative	Base-Active Topology		
Demand Alternative	Default-Average Daily		
Initial Settings Alternative	Base-Initial Settings		
Operational Alternative	Base-Operational Controls		
Logical Control Set Alternative	<All Logical Controls>		
Age Alternative	Default-Age Scenario		
Constituent Alternative	Default-Constituent		
Trace Alternative	Default-Trace Scenario		
Fire Flow Alternative	Base-Fire Flow		
Capital Cost Alternative	Base-Capital Cost		
Energy Cost Alternative	Base-Energy Cost		
User Data Alternative	Base-User Data		
Global Adjustments Summary			
Demand	<None>	Roughness	<None>
Pipe Characteristics			
Material	Steel	Hazen- Williams C	100.0
Diameter	6.00 in	Minor Loss Coefficient	6.38
Check Valve?	false	Length	90.00 ft
From Node	J-7	To Node	J-53
Elevations			
From Elevation	320.00 ft	To Elevation	320.00 ft
Initial Status			
Initial Status	Open		
User Data			
Date Installed		Date Retired	

Detailed Report for Pressure Pipe: Steel Pipe in OWS

User Data			
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	382.12	4.34	356.46	352.77	1.83	1.86	3.69	40.99



Attachment 2

(Removed)



Attachment 3

(Removed)



Attachment 4

Tank Farm to AWTS at Carbon
Feed Tank (T-3003)

Calculation Sheet

Client: CWM Chemical Services, LLC

Project Location: Model City, New York

Project: RMU-1 Leachate Level Compliance Plan (LLCP)

Project No.: B0023785.0000

Subject: Tank Farm to AWTs at Carbon Feed Tank (T-3003)

Prepared By: BMS/PTO

Date: November 2011

Reviewed By: BMS

Date: November 2011

Checked By: PHB

Date: November 2011

TASK:

Verify that the required flow rate of 176 gallons per minute (gpm) from Leachate Tank Farm (LTF) pump P-105 to Aqueous Waste Treatment Facility (tank T-3003) can be achieved.

REFERENCES:

1. *Leachate Level Compliance Plan For Residuals Management Unit One*, prepared by Golder Associates, dated February, 1997.
2. *Leachate Level Compliance Plan for Residuals Management Unit – One, Final Sequence Phase 2*, prepared by ARCADIS, dated March, 2009 (revised March 2010).
3. *Engineering Report for CWM Chemical Services, LLC Model City Facility, Residuals Management Unit 1*, Earth Tech.
4. WaterCAD for Windows, Version 5.0, pressure network analysis software, Haestad Methods, Inc.
5. *Leachate Level Compliance Plan Pump Flow Rate Verification Report for Pumps P-105 and P-3002A*, CWM Chemical Services, LLC., October, 2001.

ASSUMPTIONS:

1. The analysis was performed assuming the use of an Ingersoll-Dresser HOC3+ variable speed pump. At 3,500 rpm, the pump is rated at 200 gpm at 334 feet of total dynamic head (TDH).

METHODOLOGY:

Information used in previous LLCP evaluations relating to the LTF and associated piping was field verified, modified where necessary, according to Reference 5, and input into the WaterCAD model for evaluation. This information includes manufacturer pump data; pipe lengths, sizes, and types; number and type of fittings; and other relevant components that could potentially affect the performance of the system. WaterCAD output includes flow rates, velocities and headloss through each pump or pipe section.

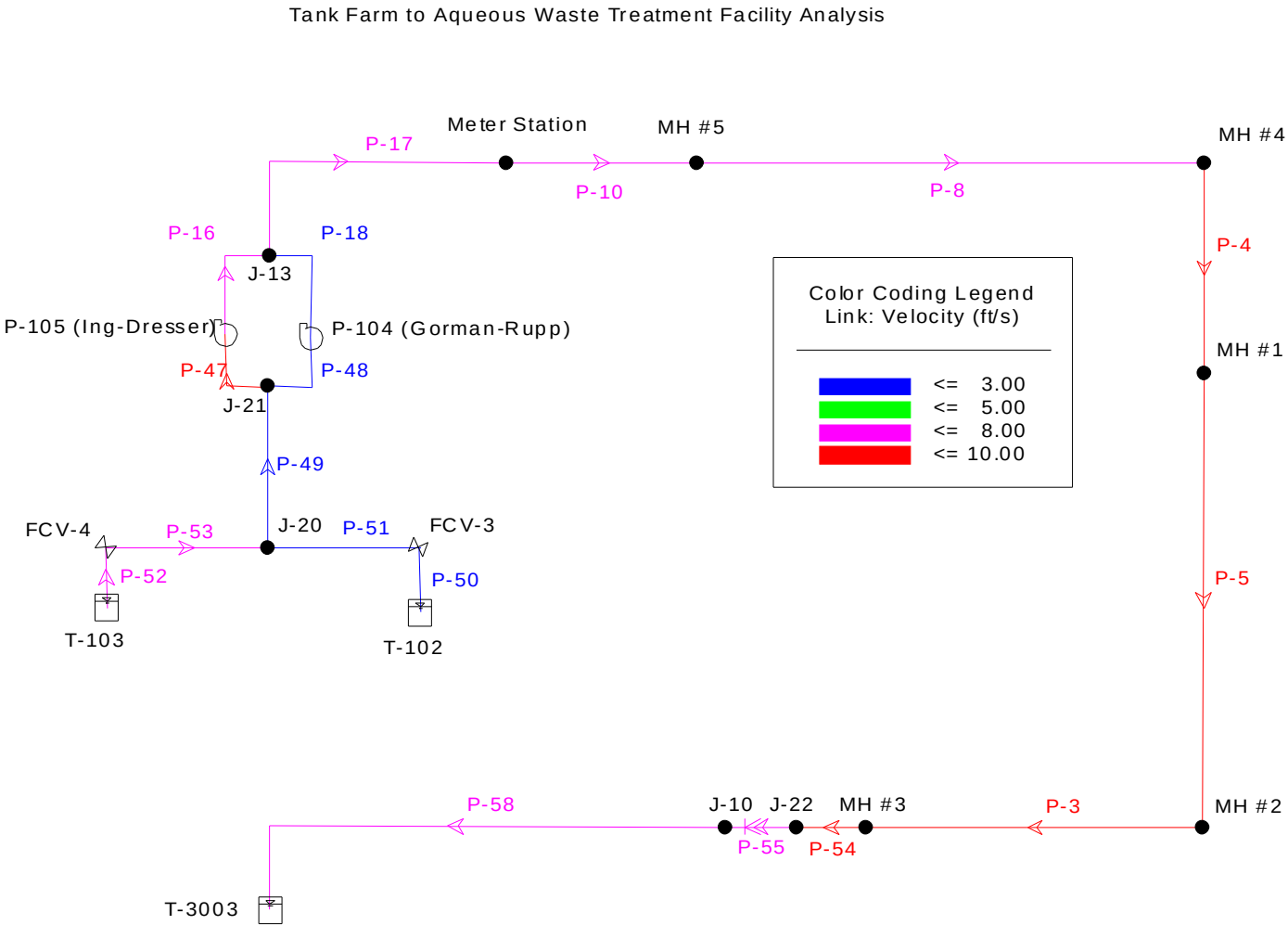
Calculation Sheet

Calculation

A summary of the calculations is presented in the following table.

Pump Type	Nominal Flow Rate [gpm]	Evaluated Flow Rate (with Flow Control) [gpm]	Pump Condition (On/Off)	Head at Pump [ft.]	Total Evaluated Flow to Tank T-3003 [gpm]
Ingersoll- Dresser HOC3+	200 at 334 feet TDH	176	On	344	176

Scenario: Base



Analysis Results

Scenario: Base

Steady State Analysis

Title: Leachate Transfer from Tank Farm to AWT Facility
 Project Engineer: ARCADIS
 Project Date: 03/11/09
 Comments:

Scenario Summary			
Scenario	Base		
Physical Alternative	Base-Physical		
Active Topology Alternative	Base-Active Topology		
Demand Alternative	Default-Average Daily		
Initial Settings Alternative	Base-Initial Settings		
Operational Alternative	Base-Operational Controls		
Logical Control Set Alternative	<All Logical Controls>		
Age Alternative	Default-Age Scenario		
Constituent Alternative	Default-Constituent		
Trace Alternative	Default-Trace Scenario		
Fire Flow Alternative	Base-Fire Flow		
Capital Cost Alternative	Base-Capital Cost		
Energy Cost Alternative	Base-Energy Cost		
User Data Alternative	Base-User Data		
Liquid Characteristics			
Liquid	Water at 20C(68F)	Specific Gravity	1.00
Kinematic Viscosity	1.0804e-5 ft²/s		
Network Inventory			
Pressure Pipes	18	Number of Tanks	3
Number of Reservoirs	0	- Constant Area:	3
Number of Pressure Junctions	11	- Variable Area:	0
Number of Pumps	2	Number of Valves	2
- Constant Power:	0	- FCV's:	2
- One Point (Design Point):	0	- PBV's:	0
- Standard (3 Point):	2	- PRV's:	0
- Standard Extended:	0	- PSV's:	0
- Custom Extended:	0	- TCV's:	0
- Multiple Point:	0	- GPV's:	0
Number of Spot Elevations	0		
Pressure Pipes Inventory			
2.85 in	15.00 ft	3.63 in	409.00 ft
2.86 in	619.00 ft	3.68 in	779.00 ft
3.00 in	58.00 ft	6.00 in	35.00 ft
Total Length	1,915.00 ft		

Analysis Results

Scenario: Base

Steady State Analysis

FCVs @ 0.00 hr

Label	Control Status	From HGL (ft)	To HGL (ft)	Discharge (gpm)	Velocity (ft/s)	Headloss (ft)	Calculated Flow Setting (gpm)
FCV-3	Closed	335.00	193.02	0.00	0.00	0.00	0.00
FCV-4	Throttling	319.88	197.56	176.00	7.99	122.32	176.00

Pressure Junctions @ 0.00 hr

Label	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
J-10	339.29	0.24	0.54	0.00
J-13	522.29	87.52	202.29	0.00
J-20	193.02	-54.94	-126.98	0.00
J-21	192.75	-55.06	-127.25	0.00
J-22	358.86	16.38	37.86	0.00
Meter Station	507.95	80.88	186.95	0.00
MH #1	428.51	46.51	107.51	0.00
MH #2	377.58	24.48	56.58	0.00
MH #3	365.37	19.19	44.37	0.00
MH #4	471.74	65.22	150.74	0.00
MH #5	491.02	73.56	170.02	0.00

Pressure Pipes @ 0.00 hr

Label	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
P-3	Open	176.00	8.79	377.58	365.37	11.77	0.44	12.22	185.11
P-4	Open	176.00	8.79	471.74	428.51	42.81	0.42	43.23	180.13
P-5	Open	176.00	8.79	428.51	377.58	50.48	0.44	50.93	179.95
P-8	Open	176.00	5.31	491.02	471.74	19.12	0.16	19.28	52.69
P-10	Open	176.00	5.31	507.95	491.02	16.77	0.15	16.92	52.72
P-16	Open	176.00	7.99	530.90	522.29	0.98	7.63	8.61	1,229.82
P-17	Open	176.00	5.46	522.29	507.95	9.94	4.40	14.34	80.57
P-18	Open	-0.00	0.00	522.29	522.29	-0.00	0.00	0.00	0.00
P-47	Open	176.00	8.79	192.75	186.74	2.67	3.34	6.01	400.70
P-48	Open	-0.00	0.00	192.75	192.75	-0.00	0.00	0.00	0.00
P-49	Open	-176.00	2.00	192.75	193.02	0.17	0.10	0.27	7.71
P-50	Open	0.00	0.00	335.00	335.00	-0.00	0.00	0.00	0.00
P-51	Open	0.00	0.00	193.02	193.02	-0.00	0.00	0.00	0.00
P-52	Open	176.00	7.99	323.00	319.88	0.70	2.42	3.12	624.84
P-53	Open	176.00	7.99	197.56	193.02	2.12	2.42	4.54	302.50
P-54	Open	176.00	8.85	365.37	358.86	2.72	3.79	6.50	433.66
P-55	Open	176.00	5.46	358.86	339.29	12.89	6.67	19.57	84.70
P-58	Open	176.00	5.31	339.29	329.00	4.80	5.49	10.29	111.89

Analysis Results

Scenario: Base

Steady State Analysis

Pumps @ 0.00 hr

Label	Control Status	Intake Pump Grade (ft)	Discharge Pump Grade (ft)	Discharge (gpm)	Pump Head (ft)	Relative Speed	Calculated Water Power (Hp)
P-104 (Gormai Off		192.75	522.29	0.00	0.00	1.00	0.00
P-105 (Ing-Dre On		186.74	530.90	176.00	344.16	1.00	15.29

Tanks @ 0.00 hr

Label	Calculated Hydraulic Grade (ft)	Calculated Level (ft)	Pressure (psi)	Calculated Percent Full (%)	Calculated Volume (ft³)	Inflow (gpm)	Outflow (gpm)	Current Status
T-102	335.00	16.00	6.92	44.8	19,766.90	-0.00	0.00	Draining
T-103	323.00	4.00	1.73	3.4	1,520.53	-176.00	176.00	Draining
T-3003	329.00	9.21	3.98	91.8	179.14	176.00	-176.00	Filling

Detailed Report for FCV: FCV-3

Scenario Summary							
Scenario	Base						
Physical Alternative	Base-Physical						
Active Topology Alternative	Base-Active Topology						
Demand Alternative	Default-Average Daily						
Initial Settings Alternative	Base-Initial Settings						
Operational Alternative	Base-Operational Controls						
Logical Control Set Alternative	<All Logical Controls>						
Age Alternative	Default-Age Scenario						
Constituent Alternative	Default-Constituent						
Trace Alternative	Default-Trace Scenario						
Fire Flow Alternative	Base-Fire Flow						
Capital Cost Alternative	Base-Capital Cost						
Energy Cost Alternative	Base-Energy Cost						
User Data Alternative	Base-User Data						
Global Adjustments Summary							
Demand	<None>	Roughness	<None>				
Geometric Summary							
X	9,860.15 ft	Upstream Pipe	P-50				
Y	9,932.96 ft	Downstream Pipe	P-51				
Elevation	315.00 ft	Diameter	3.00 in				
Minor Loss Coefficient	0.00						
Initial Status							
Initial Valve Status	Closed	Initial Flow Setting	176.00 gpm				
User Data							
Date Installed		Date Retired					
Inspection Date		SCADA ID					
Condition		Manufacturer					
Model		Serial Number					
Metered	false	Motorized	false				
Clockwise to Close	false	Normally Closed	false				
Existing	false						
Calculated Results Summary							
Time (hr)	Control Status	From HGL (ft)	To HGL (ft)	Discharge (gpm)	Velocity (ft/s)	Headloss (ft)	Calculated Flow Setting (gpm)
0.00	Closed	335.00	193.02	0.00	0.00	0.00	0.00

Detailed Report for FCV: FCV-4

Scenario Summary							
Scenario	Base						
Physical Alternative	Base-Physical						
Active Topology Alternative	Base-Active Topology						
Demand Alternative	Default-Average Daily						
Initial Settings Alternative	Base-Initial Settings						
Operational Alternative	Base-Operational Controls						
Logical Control Set Alternative	<All Logical Controls>						
Age Alternative	Default-Age Scenario						
Constituent Alternative	Default-Constituent						
Trace Alternative	Default-Trace Scenario						
Fire Flow Alternative	Base-Fire Flow						
Capital Cost Alternative	Base-Capital Cost						
Energy Cost Alternative	Base-Energy Cost						
User Data Alternative	Base-User Data						
Global Adjustments Summary							
Demand	<None>	Roughness	<None>				
Geometric Summary							
X	9,778.51 ft	Upstream Pipe	P-52				
Y	9,932.96 ft	Downstream Pipe	P-53				
Elevation	315.00 ft	Diameter	3.00 in				
Minor Loss Coefficient	0.00						
Initial Status							
Initial Valve Status	Active	Initial Flow Setting	176.00 gpm				
User Data							
Date Installed		Date Retired					
Inspection Date		SCADA ID					
Condition		Manufacturer					
Model		Serial Number					
Metered	false	Motorized	false				
Clockwise to Close	false	Normally Closed	false				
Existing	false						
Calculated Results Summary							
Time (hr)	Control Status	From HGL (ft)	To HGL (ft)	Discharge (gpm)	Velocity (ft/s)	Headloss (ft)	Calculated Flow Setting (gpm)
0.00	Throttling	319.88	197.56	176.00	7.99	122.32	176.00

Detailed Report for Pressure Junction: J-10

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	9,940.34 ft	Elevation	338.75 ft
Y	9,860.05 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	339.29	0.24	0.54	0.00

Detailed Report for Pressure Junction: J-13

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	9,821.06 ft	Elevation	320.00 ft
Y	10,009.13 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	522.29	87.52	202.29	0.00

Detailed Report for Pressure Junction: J-20

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	9,820.79 ft	Elevation	320.00 ft
Y	9,932.81 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	193.02	-54.94	-126.98	0.00

Detailed Report for Pressure Junction: J-21

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	9,820.57 ft	Elevation	320.00 ft
Y	9,974.90 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	192.75	-55.06	-127.25	0.00

Detailed Report for Pressure Junction: J-22

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	9,958.59 ft	Elevation	321.00 ft
Y	9,859.87 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	358.86	16.38	37.86	0.00

Detailed Report for Pressure Junction: Meter Station

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	9,882.83 ft	Elevation	321.00 ft
Y	10,033.21 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	507.95	80.88	186.95	0.00

Detailed Report for Pressure Junction: MH #1

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	10,065.16 ft	Elevation	321.00 ft
Y	9,978.35 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	428.51	46.51	107.51	0.00

Detailed Report for Pressure Junction: MH #2

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	10,064.83 ft	Elevation	321.00 ft
Y	9,859.73 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	377.58	24.48	56.58	0.00

Detailed Report for Pressure Junction: MH #3

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	9,977.01 ft	Elevation	321.00 ft
Y	9,859.84 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	365.37	19.19	44.37	0.00

Detailed Report for Pressure Junction: MH #4

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	10,065.18 ft	Elevation	321.00 ft
Y	10,033.18 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	471.74	65.22	150.74	0.00

Detailed Report for Pressure Junction: MH #5

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	9,932.95 ft	Elevation	321.00 ft
Y	10,033.21 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	491.02	73.56	170.02	0.00

Detailed Report for Pressure Pipe: P-3

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	HDPE	Hazen- Williams C	100.0
Diameter	2.86 in	Minor Loss Coefficient	0.37
Check Valve?	false	Length	66.00 ft
From Node	MH #2	To Node	MH #3

Elevations			
From Elevation	321.00 ft	To Elevation	321.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	176.00	8.79	377.58	365.37	11.77	0.44	12.22	185.11

Detailed Report for Pressure Pipe: P-4

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	HDPE	Hazen- Williams C	100.0
Diameter	2.86 in	Minor Loss Coefficient	0.35
Check Valve?	false	Length	240.00 ft
From Node	MH #4	To Node	MH #1

Elevations			
From Elevation	321.00 ft	To Elevation	321.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	176.00	8.79	471.74	428.51	42.81	0.42	43.23	180.13

Detailed Report for Pressure Pipe: P-5

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	HDPE	Hazen- Williams C	100.0
Diameter	2.86 in	Minor Loss Coefficient	0.37
Check Valve?	false	Length	283.00 ft
From Node	MH #1	To Node	MH #2

Elevations			
From Elevation	321.00 ft	To Elevation	321.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	176.00	8.79	428.51	377.58	50.48	0.44	50.93	179.95

Detailed Report for Pressure Pipe: P-8

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	HDPE	Hazen- Williams C	100.0
Diameter	3.68 in	Minor Loss Coefficient	0.37
Check Valve?	false	Length	366.00 ft
From Node	MH #5	To Node	MH #4

Elevations			
From Elevation	321.00 ft	To Elevation	321.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	176.00	5.31	491.02	471.74	19.12	0.16	19.28	52.69

Detailed Report for Pressure Pipe: P-10

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	HDPE	Hazen- Williams C	100.0
Diameter	3.68 in	Minor Loss Coefficient	0.35
Check Valve?	false	Length	321.00 ft
From Node	Meter Station	To Node	MH #5

Elevations			
From Elevation	321.00 ft	To Elevation	321.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	176.00	5.31	507.95	491.02	16.77	0.15	16.92	52.72

Detailed Report for Pressure Pipe: P-16

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	Steel	Hazen- Williams C	100.0
Diameter	3.00 in	Minor Loss Coefficient	7.69
Check Valve?	false	Length	7.00 ft
From Node	P-105 (Ing-Dresser)	To Node	J-13

Elevations			
From Elevation	320.60 ft	To Elevation	320.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	176.00	7.99	530.90	522.29	0.98	7.63	8.61	1,229.82

Detailed Report for Pressure Pipe: P-17

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	HDPE	Hazen- Williams C	100.0
Diameter	3.63 in	Minor Loss Coefficient	9.52
Check Valve?	false	Length	178.00 ft
From Node	J-13	To Node	Meter Station

Elevations			
From Elevation	320.00 ft	To Elevation	321.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	176.00	5.46	522.29	507.95	9.94	4.40	14.34	80.57

Detailed Report for Pressure Pipe: P-18

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	Steel	Hazen- Williams C	100.0
Diameter	3.00 in	Minor Loss Coefficient	6.78
Check Valve?	false	Length	11.00 ft
From Node	P-104 (Gorman-Rupp)	To Node	J-13

Elevations			
From Elevation	320.60 ft	To Elevation	320.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	-0.00	0.00	522.29	522.29	-0.00	0.00	0.00	0.00

Detailed Report for Pressure Pipe: P-47

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	HDPE	Hazen- Williams C	100.0
Diameter	2.86 in	Minor Loss Coefficient	2.78
Check Valve?	false	Length	15.00 ft
From Node	J-21	To Node	P-105 (Ing-Dresser)

Elevations			
From Elevation	320.00 ft	To Elevation	320.60 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	176.00	8.79	192.75	186.74	2.67	3.34	6.01	400.70

Detailed Report for Pressure Pipe: P-48

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	HDPE	Hazen- Williams C	100.0
Diameter	2.86 in	Minor Loss Coefficient	2.78
Check Valve?	false	Length	15.00 ft
From Node	J-21	To Node	P-104 (Gorman-Rupp)

Elevations			
From Elevation	320.00 ft	To Elevation	320.60 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	-0.00	0.00	192.75	192.75	-0.00	0.00	0.00	0.00

Detailed Report for Pressure Pipe: P-49

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	Steel	Hazen- Williams C	100.0
Diameter	6.00 in	Minor Loss Coefficient	1.63
Check Valve?	false	Length	35.00 ft
From Node	J-21	To Node	J-20

Elevations			
From Elevation	320.00 ft	To Elevation	320.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	-176.00	2.00	192.75	193.02	0.17	0.10	0.27	7.71

Detailed Report for Pressure Pipe: P-50

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	Steel	Hazen- Williams C	100.0
Diameter	3.00 in	Minor Loss Coefficient	2.44
Check Valve?	false	Length	6.00 ft
From Node	T-102	To Node	FCV-3

Elevations			
From Elevation	319.00 ft	To Elevation	315.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	0.00	0.00	335.00	335.00	-0.00	0.00	0.00	0.00

Detailed Report for Pressure Pipe: P-51

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	Steel	Hazen- Williams C	100.0
Diameter	3.00 in	Minor Loss Coefficient	2.44
Check Valve?	false	Length	14.00 ft
From Node	FCV-3	To Node	J-20

Elevations			
From Elevation	315.00 ft	To Elevation	320.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	0.00	0.00	193.02	193.02	-0.00	0.00	0.00	0.00

Detailed Report for Pressure Pipe: P-52

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	Steel	Hazen- Williams C	100.0
Diameter	3.00 in	Minor Loss Coefficient	2.44
Check Valve?	false	Length	5.00 ft
From Node	T-103	To Node	FCV-4

Elevations			
From Elevation	319.00 ft	To Elevation	315.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	176.00	7.99	323.00	319.88	0.70	2.42	3.12	624.84

Detailed Report for Pressure Pipe: P-53

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	Steel	Hazen- Williams C	100.0
Diameter	3.00 in	Minor Loss Coefficient	2.44
Check Valve?	false	Length	15.00 ft
From Node	FCV-4	To Node	J-20

Elevations			
From Elevation	315.00 ft	To Elevation	320.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	176.00	7.99	197.56	193.02	2.12	2.42	4.54	302.50

Detailed Report for Pressure Pipe: P-54

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	HDPE	Hazen- Williams C	100.0
Diameter	2.85 in	Minor Loss Coefficient	3.11
Check Valve?	false	Length	15.00 ft
From Node	MH #3	To Node	J-22

Elevations			
From Elevation	321.00 ft	To Elevation	321.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	176.00	8.85	365.37	358.86	2.72	3.79	6.50	433.66

Detailed Report for Pressure Pipe: P-55

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	HDPE	Hazen- Williams C	100.0
Diameter	3.63 in	Minor Loss Coefficient	14.42
Check Valve?	true	Length	231.00 ft
From Node	J-22	To Node	J-10

Elevations			
From Elevation	321.00 ft	To Elevation	338.75 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	176.00	5.46	358.86	339.29	12.89	6.67	19.57	84.70

Detailed Report for Pressure Pipe: P-58

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	HDPE	Hazen- Williams C	100.0
Diameter	3.68 in	Minor Loss Coefficient	12.54
Check Valve?	false	Length	92.00 ft
From Node	J-10	To Node	T-3003

Elevations			
From Elevation	338.75 ft	To Elevation	319.79 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	176.00	5.31	339.29	329.00	4.80	5.49	10.29	111.89

Detailed Report for Pump: P-104 (Gorman-Rupp)

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	9,832.12 ft	Upstream Pipe	P-48
Y	9,987.36 ft	Downstream Pipe	P-18
Elevation	320.60 ft		

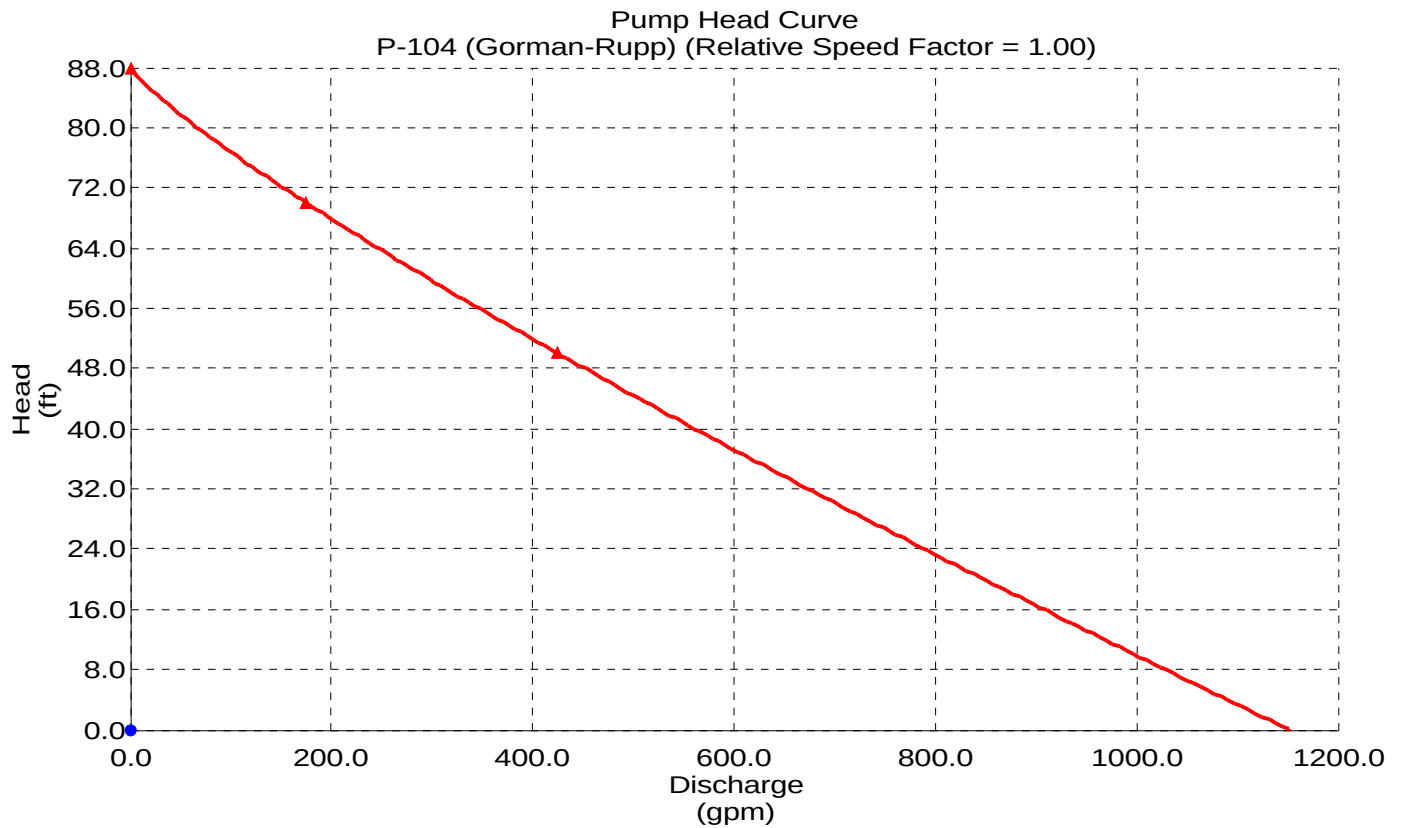
Pump Definition Summary			
Pump Type	Standard (3 Point)		
Shutoff Head	88.00 ft	Shutoff Discharge	0.00 gpm
Design Head	70.00 ft	Design Discharge	175.00 gpm
Maximum Operating Head	50.00 ft	Maximum Operating Discharge	425.00 gpm

Initial Status			
Initial Pump Status	Off	Initial Relative Speed Factor	1.00

User Data			
Date Installed		Date Retired	
Inspection Date		SCADA ID	
Rated Power	0 Hp	Condition	
Manufacturer		Model	
Serial Number		Metered	false
Existing	false		

Calculated Results Summary							
Time (hr)	Control Status	Intake Pump Grade (ft)	Discharge Pump Grade (ft)	Discharge (gpm)	Pump Head (ft)	Relative Speed	Calculated Water Power (Hp)
0.00	Off	192.75	522.29	0.00	0.00	1.00	0.00

Detailed Report for Pump: P-104 (Gorman-Rupp)



Detailed Report for Pump: P-105 (Ing-Dresser)

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	9,809.86 ft	Upstream Pipe	P-47
Y	9,988.38 ft	Downstream Pipe	P-16
Elevation	320.60 ft		

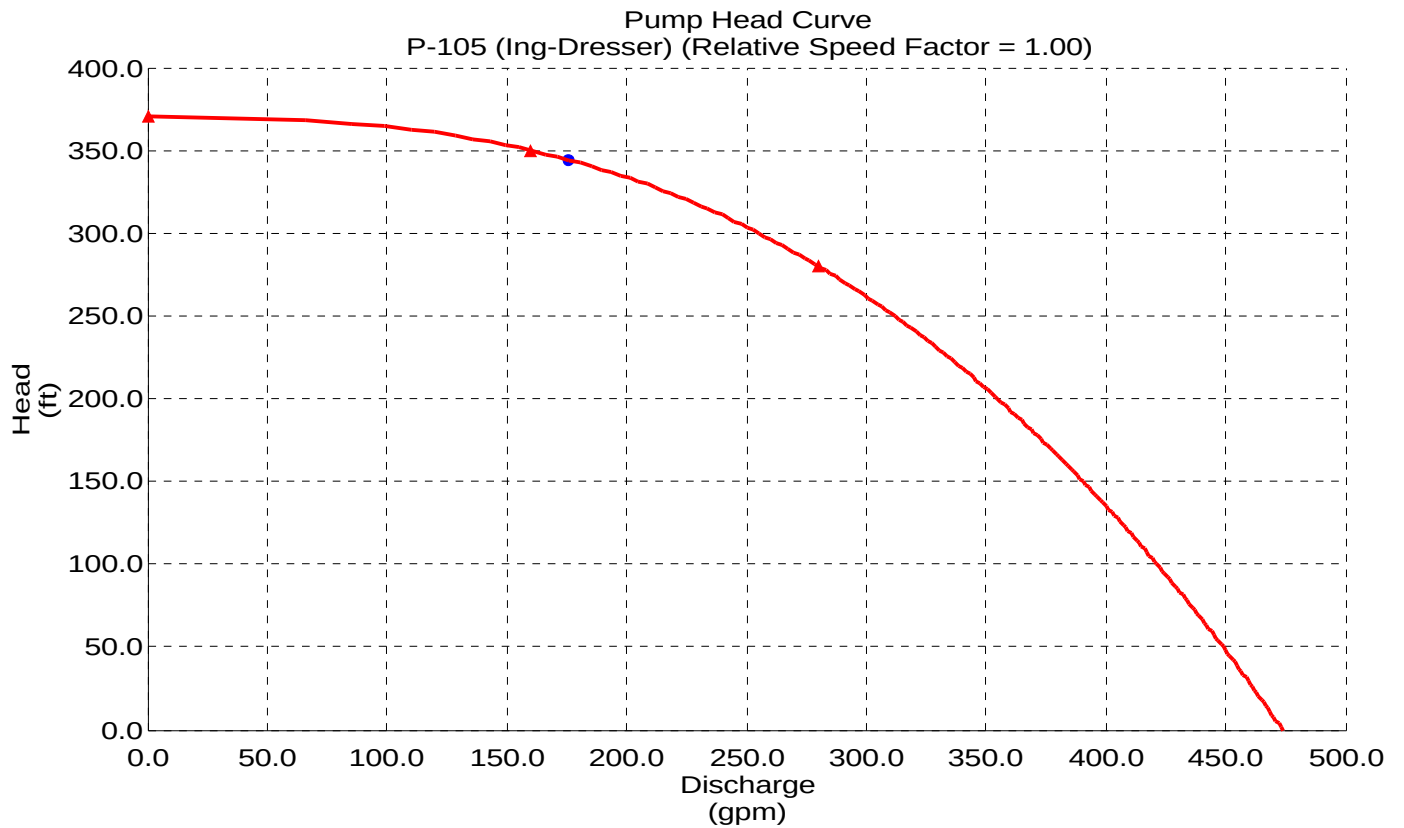
Pump Definition Summary			
Pump Type	Standard (3 Point)		
Shutoff Head	370.00 ft	Shutoff Discharge	0.00 gpm
Design Head	350.00 ft	Design Discharge	160.00 gpm
Maximum Operating Head	280.00 ft	Maximum Operating Discharge	280.00 gpm

Initial Status			
Initial Pump Status	On	Initial Relative Speed Factor	1.00

User Data			
Date Installed		Date Retired	
Inspection Date		SCADA ID	
Rated Power	0 Hp	Condition	
Manufacturer		Model	
Serial Number		Metered	false
Existing	false		

Calculated Results Summary							
Time (hr)	Control Status	Intake Pump Grade (ft)	Discharge Pump Grade (ft)	Discharge (gpm)	Pump Head (ft)	Relative Speed	Calculated Water Power (Hp)
0.00	On	186.74	530.90	176.00	344.16	1.00	15.29

Detailed Report for Pump: P-105 (Ing-Dresser)



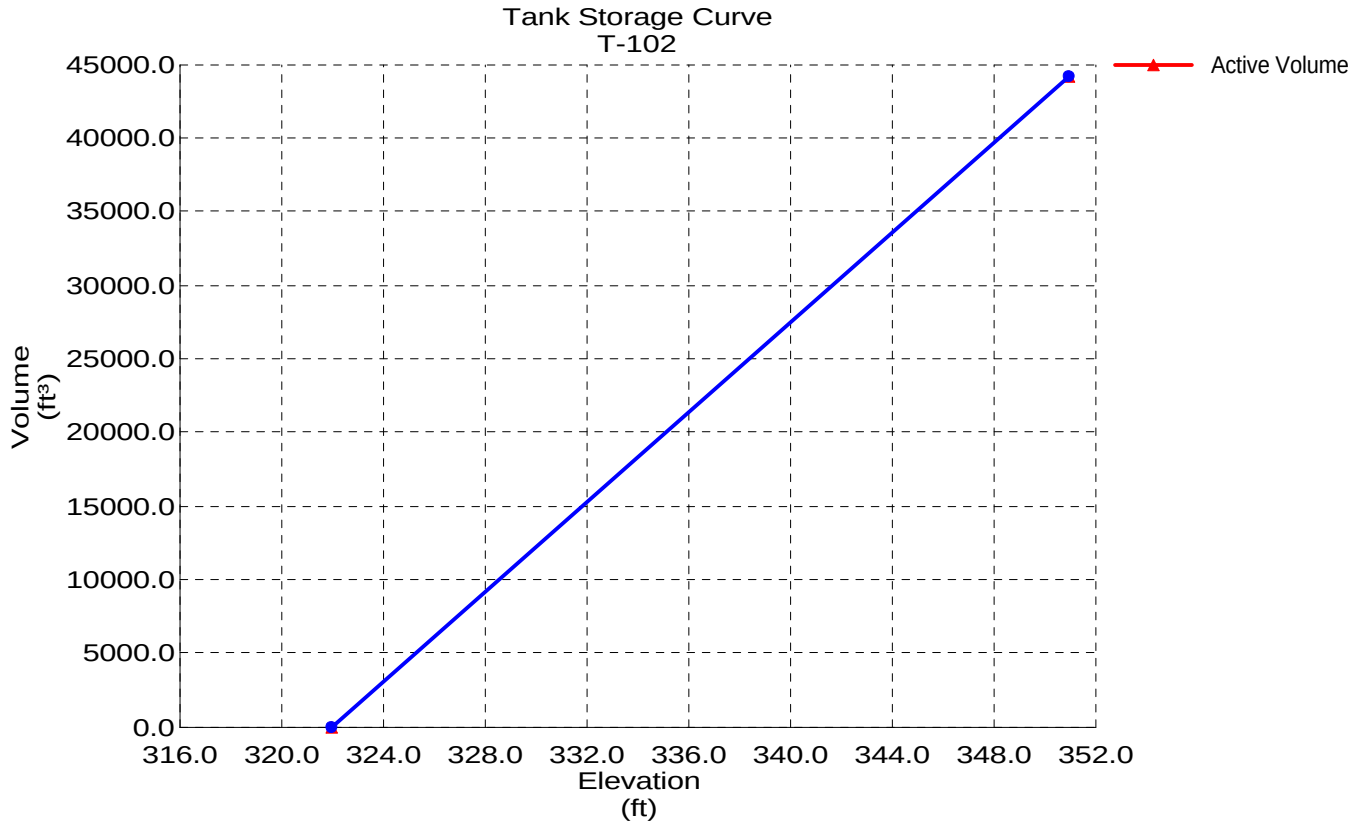
Detailed Report for Tank: T-102

Scenario Summary			
Scenario	Base		
Physical Alternative	Base-Physical		
Active Topology Alternative	Base-Active Topology		
Demand Alternative	Default-Average Daily		
Initial Settings Alternative	Base-Initial Settings		
Operational Alternative	Base-Operational Controls		
Logical Control Set Alternative	<All Logical Controls>		
Age Alternative	Default-Age Scenario		
Constituent Alternative	Default-Constituent		
Trace Alternative	Default-Trace Scenario		
Fire Flow Alternative	Base-Fire Flow		
Capital Cost Alternative	Base-Capital Cost		
Energy Cost Alternative	Base-Energy Cost		
User Data Alternative	Base-User Data		
Global Adjustments Summary			
Demand	<None>	Roughness	<None>
Geometric Summary			
X	9,860.53 ft	Elevation	319.00 ft
Y	9,915.91 ft	Zone	Zone-1
Demand Summary			
Type	Base Flow (gpm)	Pattern	
Demand	0.00	Fixed	
Operating Range Summary			
Maximum Elevation	351.00 ft	Maximum Level	32.00 ft
Initial HGL	335.00 ft	Initial Level	16.00 ft
Minimum Elevation	322.00 ft	Minimum Level	3.00 ft
Base Elevation	319.00 ft		
Storage			
Section Type	Constant Area	Circular Tank Shape?	true
Diameter	44.00 ft	Average Area	1,520.5 ft²
Inactive Volume	0.00 ft³	Total Active Volume	44,095.39 ft³
User Data			
Date Installed		Date Retired	
Inspection Date		SCADA ID	
Lining		Condition	
Metered	false	Clearwell Storage	false
Elevated Tank	false	Existing	false

Detailed Report for Tank: T-102

Calculated Results Summary

Time (hr)	Calculated Hydraulic Grade (ft)	Calculated Level (ft)	Pressure (psi)	Calculated Percent Full (%)	Calculated Volume (ft³)	Inflow (gpm)	Outflow (gpm)	Current Status
0.00	335.00	16.00	6.92	44.8	19,766.90	-0.00	0.00	Draining



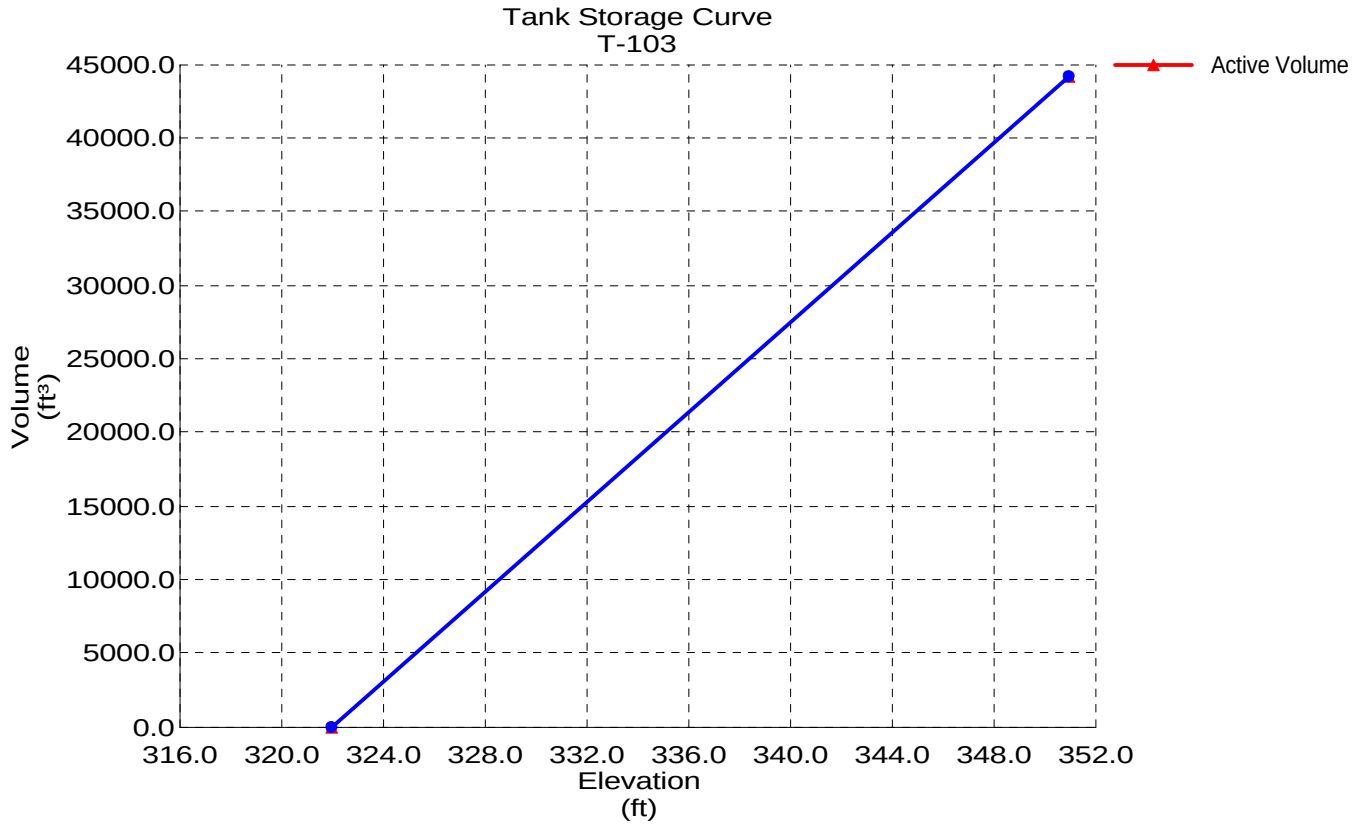
Detailed Report for Tank: T-103

Scenario Summary			
Scenario	Base		
Physical Alternative	Base-Physical		
Active Topology Alternative	Base-Active Topology		
Demand Alternative	Default-Average Daily		
Initial Settings Alternative	Base-Initial Settings		
Operational Alternative	Base-Operational Controls		
Logical Control Set Alternative	<All Logical Controls>		
Age Alternative	Default-Age Scenario		
Constituent Alternative	Default-Constituent		
Trace Alternative	Default-Trace Scenario		
Fire Flow Alternative	Base-Fire Flow		
Capital Cost Alternative	Base-Capital Cost		
Energy Cost Alternative	Base-Energy Cost		
User Data Alternative	Base-User Data		
Global Adjustments Summary			
Demand	<None>	Roughness	<None>
Geometric Summary			
X	9,778.78 ft	Elevation	319.00 ft
Y	9,917.16 ft	Zone	Zone-1
Demand Summary			
Type	Base Flow (gpm)	Pattern	
Demand	0.00	Fixed	
Operating Range Summary			
Maximum Elevation	351.00 ft	Maximum Level	32.00 ft
Initial HGL	323.00 ft	Initial Level	4.00 ft
Minimum Elevation	322.00 ft	Minimum Level	3.00 ft
Base Elevation	319.00 ft		
Storage			
Section Type	Constant Area	Circular Tank Shape?	true
Diameter	44.00 ft	Average Area	1,520.5 ft²
Inactive Volume	0.00 ft³	Total Active Volume	44,095.39 ft³
User Data			
Date Installed	Date Retired		
Inspection Date	SCADA ID		
Lining	Condition		
Metered	false	Clearwell Storage	false
Elevated Tank	false	Existing	false

Detailed Report for Tank: T-103

Calculated Results Summary

Time (hr)	Calculated Hydraulic Grade (ft)	Calculated Level (ft)	Pressure (psi)	Calculated Percent Full (%)	Calculated Volume (ft³)	Inflow (gpm)	Outflow (gpm)	Current Status
0.00	323.00	4.00	1.73	3.4	1,520.53	-176.00	176.00	Draining



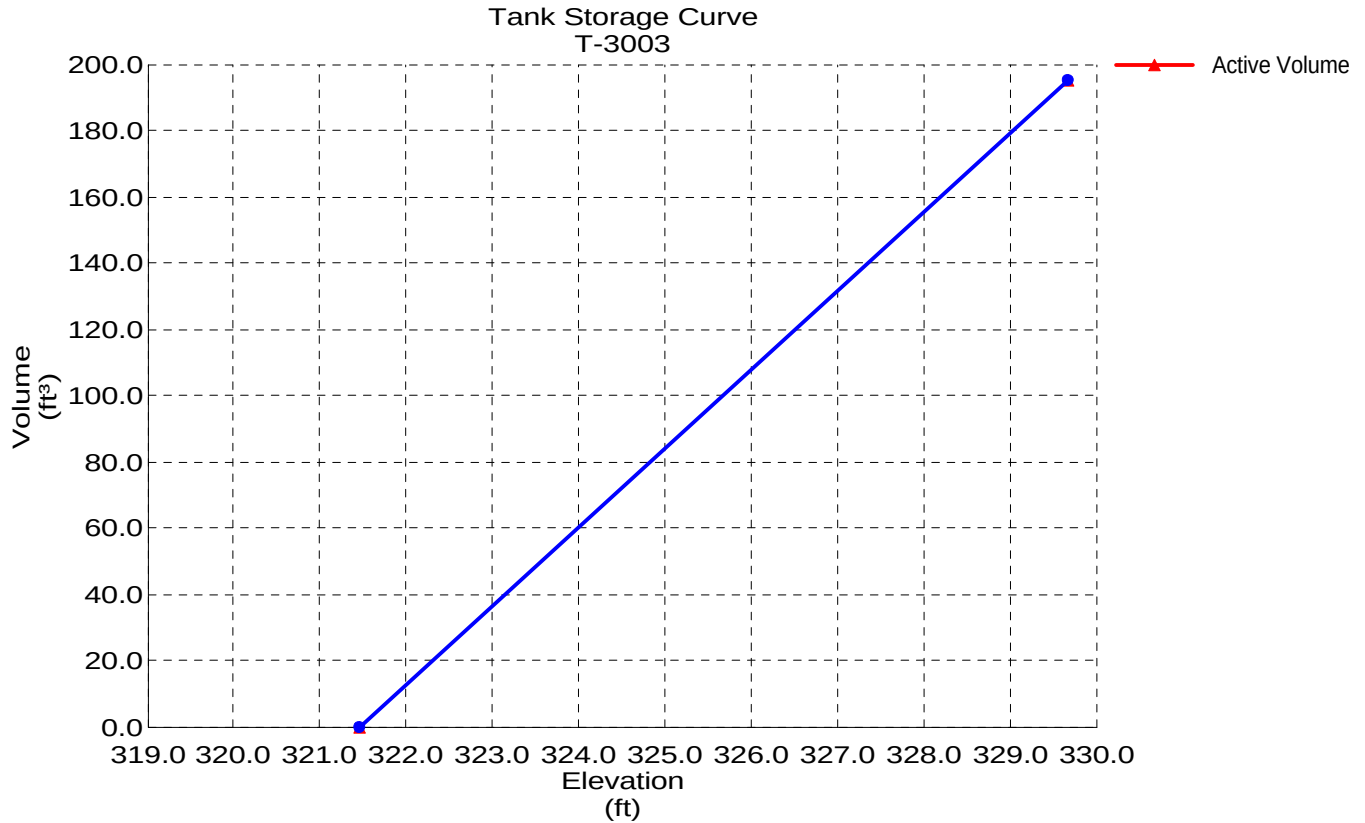
Detailed Report for Tank: T-3003

Scenario Summary			
Scenario	Base		
Physical Alternative	Base-Physical		
Active Topology Alternative	Base-Active Topology		
Demand Alternative	Default-Average Daily		
Initial Settings Alternative	Base-Initial Settings		
Operational Alternative	Base-Operational Controls		
Logical Control Set Alternative	<All Logical Controls>		
Age Alternative	Default-Age Scenario		
Constituent Alternative	Default-Constituent		
Trace Alternative	Default-Trace Scenario		
Fire Flow Alternative	Base-Fire Flow		
Capital Cost Alternative	Base-Capital Cost		
Energy Cost Alternative	Base-Energy Cost		
User Data Alternative	Base-User Data		
Global Adjustments Summary			
Demand	<None>	Roughness	<None>
Geometric Summary			
X	9,821.47 ft	Elevation	319.79 ft
Y	9,838.27 ft	Zone	Zone-1
Demand Summary			
Type	Base Flow (gpm)	Pattern	
Demand	0.00	Fixed	
Operating Range Summary			
Maximum Elevation	329.67 ft	Maximum Level	9.88 ft
Initial HGL	329.00 ft	Initial Level	9.21 ft
Minimum Elevation	321.46 ft	Minimum Level	1.67 ft
Base Elevation	319.79 ft		
Storage			
Section Type	Constant Area	Circular Tank Shape?	true
Diameter	5.50 ft	Average Area	23.8 ft²
Inactive Volume	0.00 ft³	Total Active Volume	195.06 ft³
User Data			
Date Installed		Date Retired	
Inspection Date		SCADA ID	
Lining		Condition	
Metered	false	Clearwell Storage	false
Elevated Tank	false	Existing	false

Detailed Report for Tank: T-3003

Calculated Results Summary

Time (hr)	Calculated Hydraulic Grade (ft)	Calculated Level (ft)	Pressure (psi)	Calculated Percent Full (%)	Calculated Volume (ft³)	Inflow (gpm)	Outflow (gpm)	Current Status
0.00	329.00	9.21	3.98	91.8	179.14	176.00	-176.00	Filling





Attachment 5

Carbon Feed Tank (T-3003) to
Leachate Tank T-58

Calculation Sheet

Client: CWM Chemical Services, LLC

Project Location: Model City, New York

Project: RMU-1 Leachate Level Compliance Plan (LLCP)

Project No.: B0023785.0000

Subject: Carbon Feed Tank (T-3003) to Leachate Tank T-58

Prepared By: BMS/PTO

Date: November 2011

Reviewed By: BMS

Date: November 2011

Checked By: PHB

Date: November 2011

TASK:

Verify that the required flow rate (227 gallons per minute [gpm]) from carbon feed tank T-3003 to leachate tank T-58 will be achieved.

REFERENCES

1. *Leachate Level Compliance Plan For Residuals Management Unit One*, prepared by Golder Associates, dated February, 1997.
2. *Leachate Level Compliance Plan for Residuals Management Unit – One, Final Sequence Phase 2*, prepared by ARCADIS, dated March, 2009 (revised March 2010).
3. *Engineering Report for CWM Chemical Services, LLC Model City Facility, Residuals Management Unit 1*, Earth Tech.
4. WaterCAD for Windows, Version 5.0, pressure network analysis software, Haestad Methods, Inc.
5. *Leachate Level Compliance Plan Pump Flow Rate Verification Report for Pumps P-105 and P-3002A*, CWM Chemical Services, LLC, October, 2001.

ASSUMPTIONS

1. The system runs in series from tank T-3003 through the carbon adsorption system (i.e., through tank T-3007 then through tank T-3008).
2. The analysis assumes the use of an Ingersoll-Dresser HOC3+ variable speed pump. At 3,500 rpm, the pump is rated at 250 gpm at 305 feet of total dynamic head.

METHODOLOGY

Information used in previous LLCP evaluations relating to the AWTS facility was verified, modified where necessary, and input into the WaterCAD model for evaluation. This information includes manufacturer pump data; pipe lengths, sizes and types; number and type of fittings; and other relevant components that could potentially affect the performance of the system. WaterCAD output includes flow rates, velocities and headloss through each pump or pipe section.

Calculation Sheet

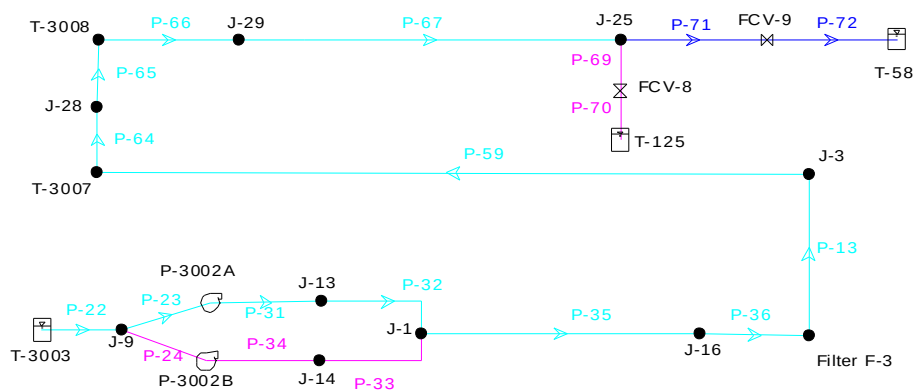
SUMMARY:

A summary of the calculations is presented in the following table.

Pump Type	Nominal Flow Rate [gpm]	Evaluated Flow Rate (with Flow Control) [gpm]	Pump Condition (On/Off)	Head at Pump [ft]	Total Evaluated Flow to Tank T-58 [gpm]
Ingersoll-Dresser HOC3+	250 at 305 feet TDH	227	On	243	227

Scenario: Base

System Runs In Series Through Tank 3007 Then Through Tank 3008



Color Coding Legend
Link: Velocity (ft/s)

	<= 4.000
	<= 6.000
	<= 8.000
	<= 10.000
	<= 12.000

Analysis Results

Scenario: Base

Steady State Analysis

Title: CWM: RMU-1 Leachate System Evaluation
 Project Engineer: ARCADIS
 Project Date: 03/11/09
 Comments:

Scenario Summary			
Scenario	Base		
Physical Alternative	Base-Physical		
Active Topology Alternative	Base-Active Topology		
Demand Alternative	Default-Average Daily		
Initial Settings Alternative	Base-Initial Settings		
Operational Alternative	Base-Operational Controls		
Logical Control Set Alternative	<All Logical Controls>		
Age Alternative	Default-Age Scenario		
Constituent Alternative	Default-Constituent		
Trace Alternative	Default-Trace Scenario		
Fire Flow Alternative	Base-Fire Flow		
Capital Cost Alternative	Base-Capital Cost		
Energy Cost Alternative	Base-Energy Cost		
User Data Alternative	Base-User Data		
Liquid Characteristics			
Liquid	Water at 20C(68F)	Specific Gravity	1.00
Kinematic Viscosity	1.0804e-5 ft²/s		
Network Inventory			
Pressure Pipes	19	Number of Tanks	3
Number of Reservoirs	0	- Constant Area:	3
Number of Pressure Junctions	12	- Variable Area:	0
Number of Pumps	2	Number of Valves	2
- Constant Power:	0	- FCV's:	2
- One Point (Design Point):	0	- PBV's:	0
- Standard (3 Point):	2	- PRV's:	0
- Standard Extended:	0	- PSV's:	0
- Custom Extended:	0	- TCV's:	0
- Multiple Point:	0	- GPV's:	0
Number of Spot Elevations	0		
Pressure Pipes Inventory			
2.00 in	2.00 ft	3.00 in	308.00 ft
2.86 in	20.00 ft	3.68 in	703.00 ft
Total Length	1,033.00 ft		

Analysis Results

Scenario: Base

Steady State Analysis

FCVs @ 0.00 hr

Label	Control Status	From HGL (ft)	To HGL (ft)	Discharge (gpm)	Velocity (ft/s)	Headloss (ft)	Calculated Flow Setting (gpm)
FCV-8	Closed	394.83	320.00	0.00	0.000	0.00	0.00
FCV-9	Inactive	332.08	332.08	227.43	2.581	0.00	0.00

Pressure Junctions @ 0.00 hr

Label	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
Filter F-3	492.97	213.29	492.97	0.00
J-1	545.05	235.82	545.05	0.00
J-3	489.40	211.74	489.40	0.00
J-9	311.44	134.75	311.44	0.00
J-13	550.01	237.96	550.01	0.00
J-14	545.05	235.82	545.05	0.00
J-16	502.31	217.33	502.31	0.00
J-25	394.83	170.82	394.83	0.00
J-28	457.13	197.78	457.13	0.00
J-29	419.42	181.46	419.42	0.00
T-3007	473.90	205.03	473.90	0.00
T-3008	436.19	188.72	436.19	0.00

Pressure Pipes @ 0.00 hr

Label	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
P-13	Open	-227.43	10.323	489.40	492.97	0.22	3.34	3.57	3,569.09
P-22	Open	227.43	10.323	322.00	311.44	5.90	4.65	10.56	406.01
P-23	Open	227.43	10.323	311.44	307.72	0.91	2.82	3.72	930.33
P-24	Open	-0.00	0.000	311.44	311.44	-0.00	0.00	0.00	0.00
P-31	Open	227.43	10.323	550.68	550.01	0.45	0.22	0.67	334.75
P-32	Open	227.43	11.358	550.01	545.05	2.29	2.67	4.96	619.75
P-33	Open	0.00	0.000	545.05	545.05	-0.00	0.00	0.00	0.00
P-34	Open	0.00	0.000	545.05	545.05	-0.00	0.00	0.00	0.00
P-35	Open	227.43	10.323	545.05	502.31	6.56	36.18	42.74	1,473.70
P-36	Open	227.43	10.323	502.31	492.97	0.45	8.89	9.34	4,669.22
P-59	Open	227.43	10.323	489.40	473.90	7.49	8.01	15.51	469.85
P-64	Open	227.43	10.323	473.90	457.13	0.21	16.56	16.77	16,771.06
P-65	Open	227.43	10.323	457.13	436.19	7.03	13.91	20.94	675.50
P-66	Open	227.43	10.323	436.19	419.42	0.21	16.56	16.77	16,771.03
P-67	Open	227.43	10.323	419.42	394.83	13.62	10.96	24.58	409.74
P-69	Open	0.00	0.000	394.83	394.83	0.00	0.00	0.00	0.00
P-70	Open	0.00	0.000	320.00	320.00	0.00	0.00	0.00	0.00
P-71	Open	227.43	6.860	394.83	332.08	58.96	3.79	62.75	89.38
P-72	Open	227.43	6.860	332.08	332.00	0.08	0.00	0.08	83.98

Analysis Results

Scenario: Base

Steady State Analysis

Pumps @ 0.00 hr

Label	Control Status	Intake Pump Grade (ft)	Discharge Pump Grade (ft)	Discharge (gpm)	Pump Head (ft)	Relative Speed	Calculated Water Power (Hp)
P-3002A	On	307.72	550.68	227.43	242.95	0.90	13.95
P-3002B	Off	311.44	545.05	0.00	0.00	1.00	0.00

Tanks @ 0.00 hr

Label	Calculated Hydraulic Grade (ft)	Calculated Level (ft)	Pressure (psi)	Calculated Percent Full (%)	Calculated Volume (ft³)	Inflow (gpm)	Outflow (gpm)	Current Status
T-58	332.00	12.50	5.41	98.2	55,292.03	227.43	-227.43	Filling
T-125	320.00	0.00	0.00	0.0	0.00	0.00	0.00	Empty
T-3003	322.00	2.21	0.96	6.6	12.83	-227.43	227.43	Draining

Detailed Report for FCV: FCV-8

Scenario Summary							
Scenario	Base						
Physical Alternative	Base-Physical						
Active Topology Alternative	Base-Active Topology						
Demand Alternative	Default-Average Daily						
Initial Settings Alternative	Base-Initial Settings						
Operational Alternative	Base-Operational Controls						
Logical Control Set Alternative	<All Logical Controls>						
Age Alternative	Default-Age Scenario						
Constituent Alternative	Default-Constituent						
Trace Alternative	Default-Trace Scenario						
Fire Flow Alternative	Base-Fire Flow						
Capital Cost Alternative	Base-Capital Cost						
Energy Cost Alternative	Base-Energy Cost						
User Data Alternative	Base-User Data						
Global Adjustments Summary							
Demand	<None>	Roughness	<None>				
Geometric Summary							
X	10,068.19 ft	Upstream Pipe	P-69				
Y	10,110.58 ft	Downstream Pipe	P-70				
Elevation	0.00 ft	Diameter	6.00 in				
Minor Loss Coefficient	0.00						
Initial Status							
Initial Valve Status	Closed	Initial Flow Setting	0.00 gpm				
User Data							
Date Installed		Date Retired					
Inspection Date		SCADA ID					
Condition		Manufacturer					
Model		Serial Number					
Metered	false	Motorized	false				
Clockwise to Close	false	Normally Closed	false				
Existing	false						
Calculated Results Summary							
Time (hr)	Control Status	From HGL (ft)	To HGL (ft)	Discharge (gpm)	Velocity (ft/s)	Headloss (ft)	Calculated Flow Setting (gpm)
0.00	Closed	394.83	320.00	0.00	0.000	0.00	0.00

Detailed Report for FCV: FCV-9

Scenario Summary							
Scenario	Base						
Physical Alternative	Base-Physical						
Active Topology Alternative	Base-Active Topology						
Demand Alternative	Default-Average Daily						
Initial Settings Alternative	Base-Initial Settings						
Operational Alternative	Base-Operational Controls						
Logical Control Set Alternative	<All Logical Controls>						
Age Alternative	Default-Age Scenario						
Constituent Alternative	Default-Constituent						
Trace Alternative	Default-Trace Scenario						
Fire Flow Alternative	Base-Fire Flow						
Capital Cost Alternative	Base-Capital Cost						
Energy Cost Alternative	Base-Energy Cost						
User Data Alternative	Base-User Data						
Global Adjustments Summary							
Demand	<None>	Roughness	<None>				
Geometric Summary							
X	10,114.42 ft	Upstream Pipe	P-71				
Y	10,126.46 ft	Downstream Pipe	P-72				
Elevation	0.00 ft	Diameter	6.00 in				
Minor Loss Coefficient	0.00						
Initial Status							
Initial Valve Status	Inactive	Initial Flow Setting	0.00 gpm				
User Data							
Date Installed		Date Retired					
Inspection Date		SCADA ID					
Condition		Manufacturer					
Model		Serial Number					
Metered	false	Motorized	false				
Clockwise to Close	false	Normally Closed	false				
Existing	false						
Calculated Results Summary							
Time (hr)	Control Status	From HGL (ft)	To HGL (ft)	Discharge (gpm)	Velocity (ft/s)	Headloss (ft)	Calculated Flow Setting (gpm)
0.00	Inactive	332.08	332.08	227.43	2.581	0.00	0.00

Detailed Report for Pressure Junction: Filter F-3

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	10,127.60 ft	Elevation	0.00 ft
Y	10,033.21 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	492.97	213.29	492.97	0.00

Detailed Report for Pressure Junction: J-1

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	10,005.59 ft	Elevation	0.00 ft
Y	10,033.66 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	545.05	235.82	545.05	0.00

Detailed Report for Pressure Junction: J-3

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	10,127.80 ft	Elevation	0.00 ft
Y	10,084.32 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	489.40	211.74	489.40	0.00

Detailed Report for Pressure Junction: J-9

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	9,910.75 ft	Elevation	0.00 ft
Y	10,035.08 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	311.44	134.75	311.44	0.00

Detailed Report for Pressure Junction: J-13

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	9,973.94 ft	Elevation	0.00 ft
Y	10,043.76 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	550.01	237.96	550.01	0.00

Detailed Report for Pressure Junction: J-14

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	9,973.37 ft	Elevation	0.00 ft
Y	10,025.17 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	545.05	235.82	545.05	0.00

Detailed Report for Pressure Junction: J-16

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	10,093.35 ft	Elevation	0.00 ft
Y	10,033.62 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	502.31	217.33	502.31	0.00

Detailed Report for Pressure Junction: J-25

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	10,068.12 ft	Elevation	0.00 ft
Y	10,126.35 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	394.83	170.82	394.83	0.00

Detailed Report for Pressure Junction: J-28

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	9,903.16 ft	Elevation	0.00 ft
Y	10,105.06 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	457.13	197.78	457.13	0.00

Detailed Report for Pressure Junction: J-29

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	9,947.81 ft	Elevation	0.00 ft
Y	10,126.75 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	419.42	181.46	419.42	0.00

Detailed Report for Pressure Pipe: P-13

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	Steel	Hazen- Williams C	100.0
Diameter	3.00 in	Minor Loss Coefficient	2.02
Check Valve?	false	Length	1.00 ft
From Node	J-3	To Node	Filter F-3

Elevations			
From Elevation	0.00 ft	To Elevation	0.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	-227.43	10.323	489.40	492.97	0.22	3.34	3.57	3,569.09

Detailed Report for Pressure Pipe: P-22

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	PVC	Hazen- Williams C	100.0
Diameter	3.00 in	Minor Loss Coefficient	2.81
Check Valve?	false	Length	26.00 ft
From Node	T-3003	To Node	J-9

Elevations			
From Elevation	319.79 ft	To Elevation	0.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	227.43	10.323	322.00	311.44	5.90	4.65	10.56	406.01

Detailed Report for Pressure Pipe: P-23

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	Steel	Hazen- Williams C	100.0
Diameter	3.00 in	Minor Loss Coefficient	1.70
Check Valve?	false	Length	4.00 ft
From Node	J-9	To Node	P-3002A

Elevations			
From Elevation	0.00 ft	To Elevation	0.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	227.43	10.323	311.44	307.72	0.91	2.82	3.72	930.33

Detailed Report for Pressure Pipe: P-24

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	Steel	Hazen- Williams C	100.0
Diameter	3.00 in	Minor Loss Coefficient	2.41
Check Valve?	false	Length	4.00 ft
From Node	J-9	To Node	P-3002B

Elevations			
From Elevation	0.00 ft	To Elevation	0.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	-0.00	0.000	311.44	311.44	-0.00	0.00	0.00	0.00

Detailed Report for Pressure Pipe: P-31

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	Steel	Hazen- Williams C	100.0
Diameter	3.00 in	Minor Loss Coefficient	0.13
Check Valve?	false	Length	2.00 ft
From Node	P-3002A	To Node	J-13

Elevations			
From Elevation	0.00 ft	To Elevation	0.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	227.43	10.323	550.68	550.01	0.45	0.22	0.67	334.75

Detailed Report for Pressure Pipe: P-32

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	HDPE	Hazen- Williams C	100.0
Diameter	2.86 in	Minor Loss Coefficient	1.33
Check Valve?	false	Length	8.00 ft
From Node	J-13	To Node	J-1

Elevations			
From Elevation	0.00 ft	To Elevation	0.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	227.43	11.358	550.01	545.05	2.29	2.67	4.96	619.75

Detailed Report for Pressure Pipe: P-33

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	HDPE	Hazen- Williams C	100.0
Diameter	2.86 in	Minor Loss Coefficient	1.33
Check Valve?	false	Length	12.00 ft
From Node	J-1	To Node	J-14

Elevations			
From Elevation	0.00 ft	To Elevation	0.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	0.00	0.000	545.05	545.05	-0.00	0.00	0.00	0.00

Detailed Report for Pressure Pipe: P-34

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	Steel	Hazen- Williams C	100.0
Diameter	2.00 in	Minor Loss Coefficient	0.13
Check Valve?	false	Length	2.00 ft
From Node	J-14	To Node	P-3002B

Elevations			
From Elevation	0.00 ft	To Elevation	0.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	0.00	0.000	545.05	545.05	-0.00	0.00	0.00	0.00

Detailed Report for Pressure Pipe: P-35

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	Steel	Hazen- Williams C	100.0
Diameter	3.00 in	Minor Loss Coefficient	21.85
Check Valve?	false	Length	29.00 ft
From Node	J-1	To Node	J-16

Elevations			
From Elevation	0.00 ft	To Elevation	0.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	227.43	10.323	545.05	502.31	6.56	36.18	42.74	1,473.70

Detailed Report for Pressure Pipe: P-36

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	Steel	Hazen- Williams C	100.0
Diameter	3.00 in	Minor Loss Coefficient	5.37
Check Valve?	false	Length	2.00 ft
From Node	J-16	To Node	Filter F-3

Elevations			
From Elevation	0.00 ft	To Elevation	0.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	227.43	10.323	502.31	492.97	0.45	8.89	9.34	4,669.22

Detailed Report for Pressure Pipe: P-59

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	Steel	Hazen- Williams C	100.0
Diameter	3.00 in	Minor Loss Coefficient	4.84
Check Valve?	false	Length	33.00 ft
From Node	J-3	To Node	T-3007

Elevations			
From Elevation	0.00 ft	To Elevation	0.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	227.43	10.323	489.40	473.90	7.49	8.01	15.51	469.85

Detailed Report for Pressure Pipe: P-64

Scenario Summary									
Scenario		Base							
Physical Alternative		Base-Physical							
Active Topology Alternative		Base-Active Topology							
Demand Alternative		Default-Average Daily							
Initial Settings Alternative		Base-Initial Settings							
Operational Alternative		Base-Operational Controls							
Logical Control Set Alternative		<All Logical Controls>							
Age Alternative		Default-Age Scenario							
Constituent Alternative		Default-Constituent							
Trace Alternative		Default-Trace Scenario							
Fire Flow Alternative		Base-Fire Flow							
Capital Cost Alternative		Base-Capital Cost							
Energy Cost Alternative		Base-Energy Cost							
User Data Alternative		Base-User Data							
Global Adjustments Summary									
Demand		<None>			Roughness			<None>	
Pipe Characteristics									
Material		Steel			Hazen- Williams C			100.0	
Diameter		3.00 in			Minor Loss Coefficient			10.00	
Check Valve?		false			Length			1.00 ft	
From Node		T-3007			To Node			J-28	
Elevations									
From Elevation		0.00 ft			To Elevation			0.00 ft	
Initial Status									
Initial Status		Open							
User Data									
Date Installed				Date Retired					
Inspection Date				Lining					
Pipe Class				Exterior Coating					
Nominal Diameter		0.00 in			Condition				
Skeletonized		false			Metered			false	
Existing		false							
Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	227.43	10.323	473.90	457.13	0.21	16.56	16.77	16,771.06

Detailed Report for Pressure Pipe: P-65

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	Steel	Hazen- Williams C	100.0
Diameter	3.00 in	Minor Loss Coefficient	8.40
Check Valve?	false	Length	31.00 ft
From Node	J-28	To Node	T-3008

Elevations			
From Elevation	0.00 ft	To Elevation	0.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	227.43	10.323	457.13	436.19	7.03	13.91	20.94	675.50

Detailed Report for Pressure Pipe: P-66

Scenario Summary									
Scenario		Base							
Physical Alternative		Base-Physical							
Active Topology Alternative		Base-Active Topology							
Demand Alternative		Default-Average Daily							
Initial Settings Alternative		Base-Initial Settings							
Operational Alternative		Base-Operational Controls							
Logical Control Set Alternative		<All Logical Controls>							
Age Alternative		Default-Age Scenario							
Constituent Alternative		Default-Constituent							
Trace Alternative		Default-Trace Scenario							
Fire Flow Alternative		Base-Fire Flow							
Capital Cost Alternative		Base-Capital Cost							
Energy Cost Alternative		Base-Energy Cost							
User Data Alternative		Base-User Data							
Global Adjustments Summary									
Demand		<None>			Roughness			<None>	
Pipe Characteristics									
Material		Steel			Hazen- Williams C			100.0	
Diameter		3.00 in			Minor Loss Coefficient			10.00	
Check Valve?		false			Length			1.00 ft	
From Node		T-3008			To Node			J-29	
Elevations									
From Elevation		0.00 ft			To Elevation			0.00 ft	
Initial Status									
Initial Status		Open							
User Data									
Date Installed				Date Retired					
Inspection Date				Lining					
Pipe Class				Exterior Coating					
Nominal Diameter		0.00 in			Condition				
Skeletonized		false			Metered			false	
Existing		false							
Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	227.43	10.323	436.19	419.42	0.21	16.56	16.77	16,771.03

Detailed Report for Pressure Pipe: P-67

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	Steel	Hazen- Williams C	100.0
Diameter	3.00 in	Minor Loss Coefficient	6.62
Check Valve?	false	Length	60.00 ft
From Node	J-29	To Node	J-25

Elevations			
From Elevation	0.00 ft	To Elevation	0.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	227.43	10.323	419.42	394.83	13.62	10.96	24.58	409.74

Detailed Report for Pressure Pipe: P-69

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	PVC	Hazen- Williams C	100.0
Diameter	3.00 in	Minor Loss Coefficient	3.33
Check Valve?	false	Length	113.00 ft
From Node	J-25	To Node	FCV-8

Elevations			
From Elevation	0.00 ft	To Elevation	0.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	0.00	0.000	394.83	394.83	0.00	0.00	0.00	0.00

Detailed Report for Pressure Pipe: P-70

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	PVC	Hazen- Williams C	100.0
Diameter	3.00 in	Minor Loss Coefficient	0.00
Check Valve?	false	Length	1.00 ft
From Node	FCV-8	To Node	T-125

Elevations			
From Elevation	0.00 ft	To Elevation	320.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	0.00	0.000	320.00	320.00	0.00	0.00	0.00	0.00

Detailed Report for Pressure Pipe: P-71

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	HDPE	Hazen- Williams C	100.0
Diameter	3.68 in	Minor Loss Coefficient	5.18
Check Valve?	false	Length	702.00 ft
From Node	J-25	To Node	FCV-9

Elevations			
From Elevation	0.00 ft	To Elevation	0.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	227.43	6.860	394.83	332.08	58.96	3.79	62.75	89.38

Detailed Report for Pressure Pipe: P-72

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	HDPE	Hazen- Williams C	100.0
Diameter	3.68 in	Minor Loss Coefficient	0.00
Check Valve?	false	Length	1.00 ft
From Node	FCV-9	To Node	T-58

Elevations			
From Elevation	0.00 ft	To Elevation	319.50 ft

Initial Status	
Initial Status	Open

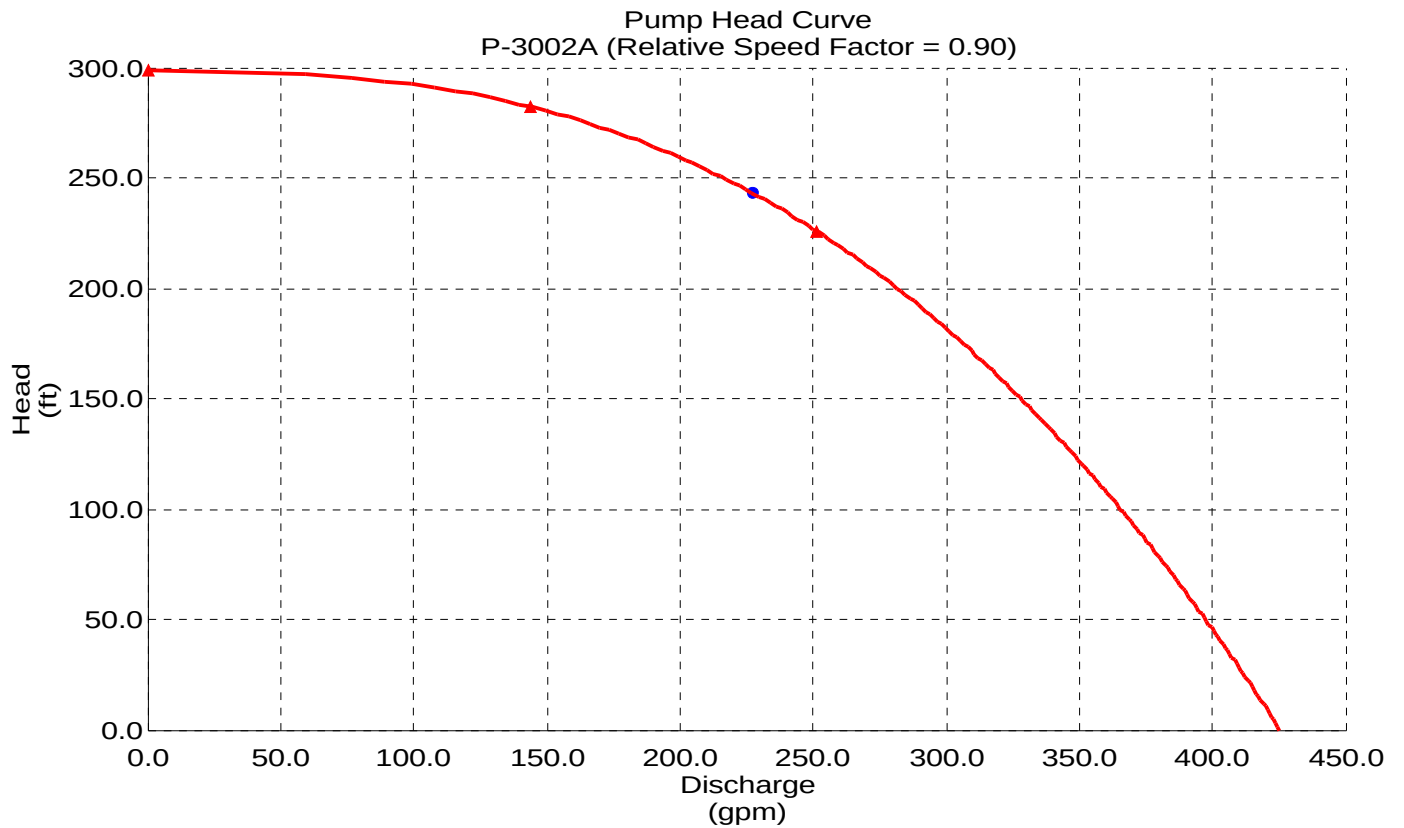
User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	227.43	6.860	332.08	332.00	0.08	0.00	0.08	83.98

Detailed Report for Pump: P-3002A

Scenario Summary							
Scenario	Base						
Physical Alternative	Base-Physical						
Active Topology Alternative	Base-Active Topology						
Demand Alternative	Default-Average Daily						
Initial Settings Alternative	Base-Initial Settings						
Operational Alternative	Base-Operational Controls						
Logical Control Set Alternative	<All Logical Controls>						
Age Alternative	Default-Age Scenario						
Constituent Alternative	Default-Constituent						
Trace Alternative	Default-Trace Scenario						
Fire Flow Alternative	Base-Fire Flow						
Capital Cost Alternative	Base-Capital Cost						
Energy Cost Alternative	Base-Energy Cost						
User Data Alternative	Base-User Data						
Global Adjustments Summary							
Demand	<None>	Roughness	<None>				
Geometric Summary							
X	9,938.56 ft	Upstream Pipe	P-23				
Y	10,043.52 ft	Downstream Pipe	P-31				
Elevation	0.00 ft						
Pump Definition Summary							
Pump Type	Standard (3 Point)						
Shutoff Head	370.00 ft	Shutoff Discharge	0.00 gpm				
Design Head	350.00 ft	Design Discharge	160.00 gpm				
Maximum Operating Head	280.00 ft	Maximum Operating Discharge	280.00 gpm				
Initial Status							
Initial Pump Status	On	Initial Relative Speed Factor	0.90				
User Data							
Date Installed		Date Retired					
Inspection Date		SCADA ID					
Rated Power	0 Hp	Condition					
Manufacturer		Model					
Serial Number		Metered	false				
Existing	false						
Calculated Results Summary							
Time (hr)	Control Status	Intake Pump Grade (ft)	Discharge Pump Grade (ft)	Discharge (gpm)	Pump Head (ft)	Relative Speed	Calculated Water Power (Hp)
0.00	On	307.72	550.68	227.43	242.95	0.90	13.95

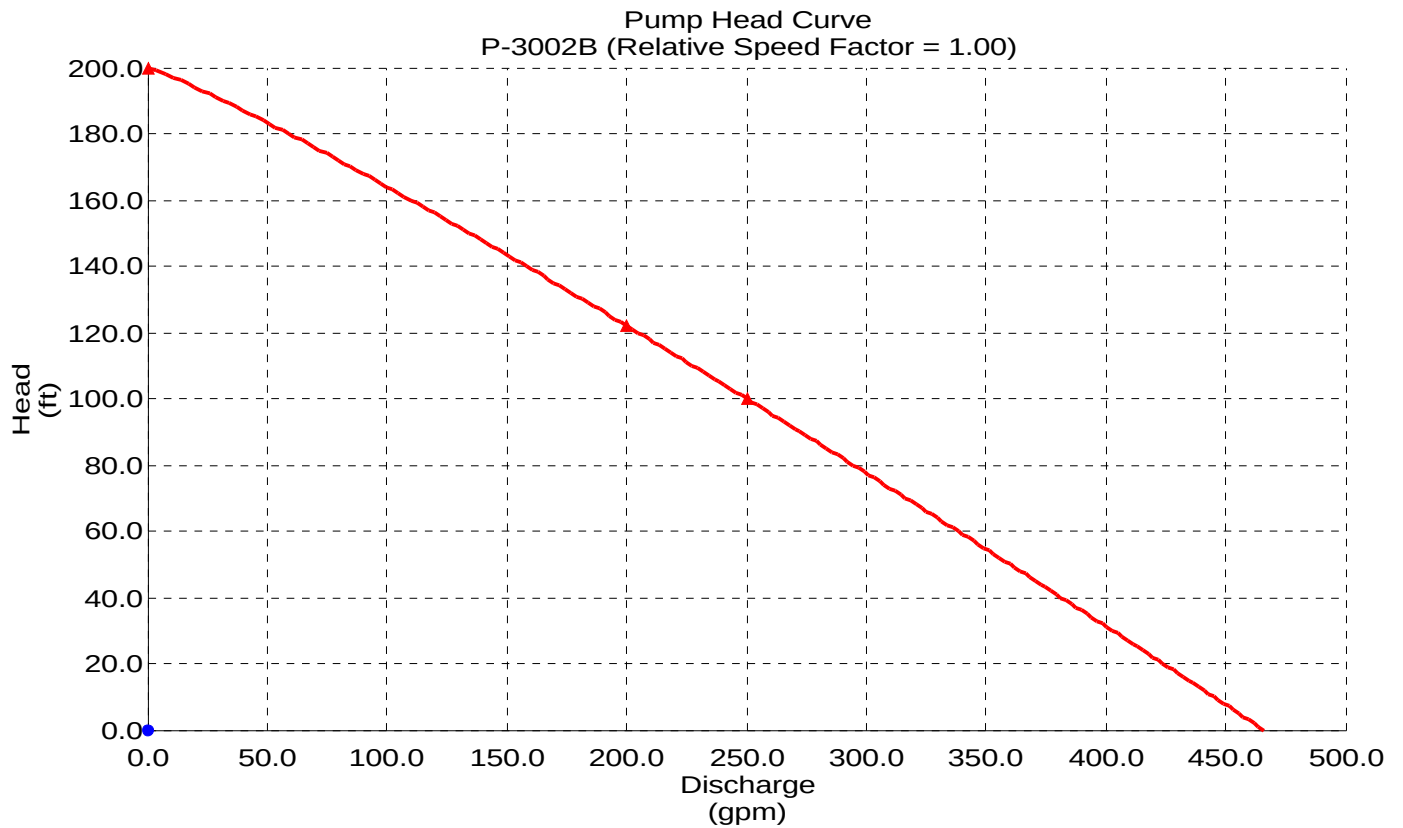
Detailed Report for Pump: P-3002A



Detailed Report for Pump: P-3002B

Scenario Summary							
Scenario	Base						
Physical Alternative	Base-Physical						
Active Topology Alternative	Base-Active Topology						
Demand Alternative	Default-Average Daily						
Initial Settings Alternative	Base-Initial Settings						
Operational Alternative	Base-Operational Controls						
Logical Control Set Alternative	<All Logical Controls>						
Age Alternative	Default-Age Scenario						
Constituent Alternative	Default-Constituent						
Trace Alternative	Default-Trace Scenario						
Fire Flow Alternative	Base-Fire Flow						
Capital Cost Alternative	Base-Capital Cost						
Energy Cost Alternative	Base-Energy Cost						
User Data Alternative	Base-User Data						
Global Adjustments Summary							
Demand	<None>	Roughness	<None>				
Geometric Summary							
X	9,937.28 ft	Upstream Pipe	P-24				
Y	10,024.96 ft	Downstream Pipe	P-34				
Elevation	0.00 ft						
Pump Definition Summary							
Pump Type	Standard (3 Point)						
Shutoff Head	200.00 ft	Shutoff Discharge	0.00 gpm				
Design Head	122.00 ft	Design Discharge	200.00 gpm				
Maximum Operating Head	100.00 ft	Maximum Operating Discharge	250.00 gpm				
Initial Status							
Initial Pump Status	Off	Initial Relative Speed Factor	1.00				
User Data							
Date Installed		Date Retired					
Inspection Date		SCADA ID					
Rated Power	0 Hp	Condition					
Manufacturer		Model					
Serial Number		Metered	false				
Existing	false						
Calculated Results Summary							
Time (hr)	Control Status	Intake Pump Grade (ft)	Discharge Pump Grade (ft)	Discharge (gpm)	Pump Head (ft)	Relative Speed	Calculated Water Power (Hp)
0.00	Off	311.44	545.05	0.00	0.00	1.00	0.00

Detailed Report for Pump: P-3002B



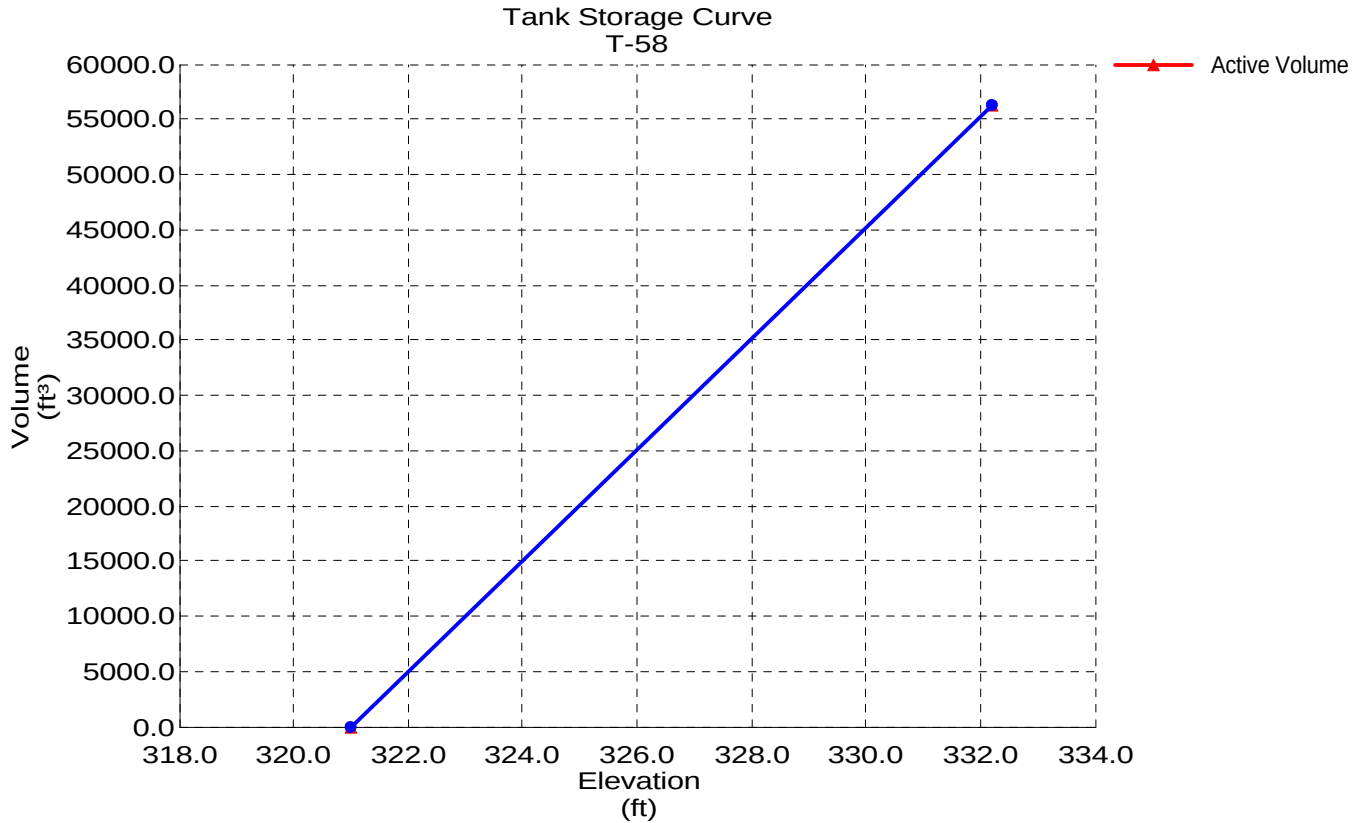
Detailed Report for Tank: T-58

Scenario Summary			
Scenario	Base		
Physical Alternative	Base-Physical		
Active Topology Alternative	Base-Active Topology		
Demand Alternative	Default-Average Daily		
Initial Settings Alternative	Base-Initial Settings		
Operational Alternative	Base-Operational Controls		
Logical Control Set Alternative	<All Logical Controls>		
Age Alternative	Default-Age Scenario		
Constituent Alternative	Default-Constituent		
Trace Alternative	Default-Trace Scenario		
Fire Flow Alternative	Base-Fire Flow		
Capital Cost Alternative	Base-Capital Cost		
Energy Cost Alternative	Base-Energy Cost		
User Data Alternative	Base-User Data		
Global Adjustments Summary			
Demand	<None>	Roughness	<None>
Geometric Summary			
X	10,155.44 ft	Elevation	319.50 ft
Y	10,126.81 ft	Zone	Zone-1
Demand Summary			
Type	Base Flow (gpm)	Pattern	
Demand	0.00	Fixed	
Operating Range Summary			
Maximum Elevation	332.20 ft	Maximum Level	12.70 ft
Initial HGL	332.00 ft	Initial Level	12.50 ft
Minimum Elevation	321.00 ft	Minimum Level	1.50 ft
Base Elevation	319.50 ft		
Storage			
Section Type	Constant Area	Circular Tank Shape?	true
Diameter	80.00 ft	Average Area	5,026.5 ft²
Inactive Volume	0.00 ft³	Total Active Volume	56,297.34 ft³
User Data			
Date Installed		Date Retired	
Inspection Date		SCADA ID	
Lining		Condition	
Metered	false	Clearwell Storage	false
Elevated Tank	false	Existing	false

Detailed Report for Tank: T-58

Calculated Results Summary

Time (hr)	Calculated Hydraulic Grade (ft)	Calculated Level (ft)	Pressure (psi)	Calculated Percent Full (%)	Calculated Volume (ft³)	Inflow (gpm)	Outflow (gpm)	Current Status
0.00	332.00	12.50	5.41	98.2	55,292.03	227.43	-227.43	Filling



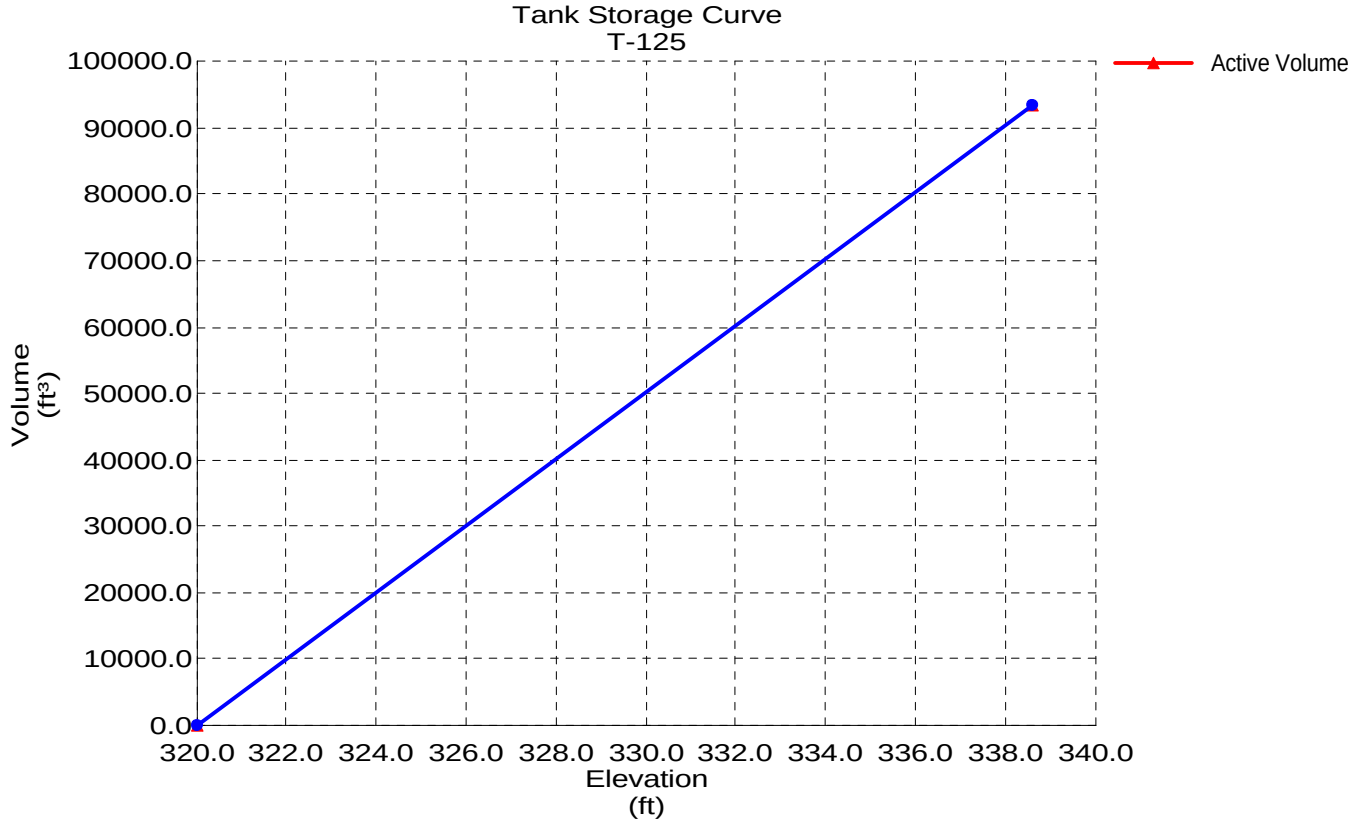
Detailed Report for Tank: T-125

Scenario Summary			
Scenario	Base		
Physical Alternative	Base-Physical		
Active Topology Alternative	Base-Active Topology		
Demand Alternative	Default-Average Daily		
Initial Settings Alternative	Base-Initial Settings		
Operational Alternative	Base-Operational Controls		
Logical Control Set Alternative	<All Logical Controls>		
Age Alternative	Default-Age Scenario		
Constituent Alternative	Default-Constituent		
Trace Alternative	Default-Trace Scenario		
Fire Flow Alternative	Base-Fire Flow		
Capital Cost Alternative	Base-Capital Cost		
Energy Cost Alternative	Base-Energy Cost		
User Data Alternative	Base-User Data		
Global Adjustments Summary			
Demand	<None>	Roughness	<None>
Geometric Summary			
X	10,068.14 ft	Elevation	320.00 ft
Y	10,095.15 ft	Zone	Zone-1
Demand Summary			
Type	Base Flow (gpm)	Pattern	
Demand	0.00	Fixed	
Operating Range Summary			
Maximum Elevation	338.60 ft	Maximum Level	18.60 ft
Initial HGL	320.00 ft	Initial Level	0.00 ft
Minimum Elevation	320.00 ft	Minimum Level	0.00 ft
Base Elevation	320.00 ft		
Storage			
Section Type	Constant Area	Circular Tank Shape?	true
Diameter	80.00 ft	Average Area	5,026.5 ft²
Inactive Volume	0.00 ft³	Total Active Volume	93,493.80 ft³
User Data			
Date Installed		Date Retired	
Inspection Date		SCADA ID	
Lining		Condition	
Metered	false	Clearwell Storage	false
Elevated Tank	false	Existing	false

Detailed Report for Tank: T-125

Calculated Results Summary

Time (hr)	Calculated Hydraulic Grade (ft)	Calculated Level (ft)	Pressure (psi)	Calculated Percent Full (%)	Calculated Volume (ft³)	Inflow (gpm)	Outflow (gpm)	Current Status
0.00	320.00	0.00	0.00	0.0	0.00	0.00	0.00	Empty



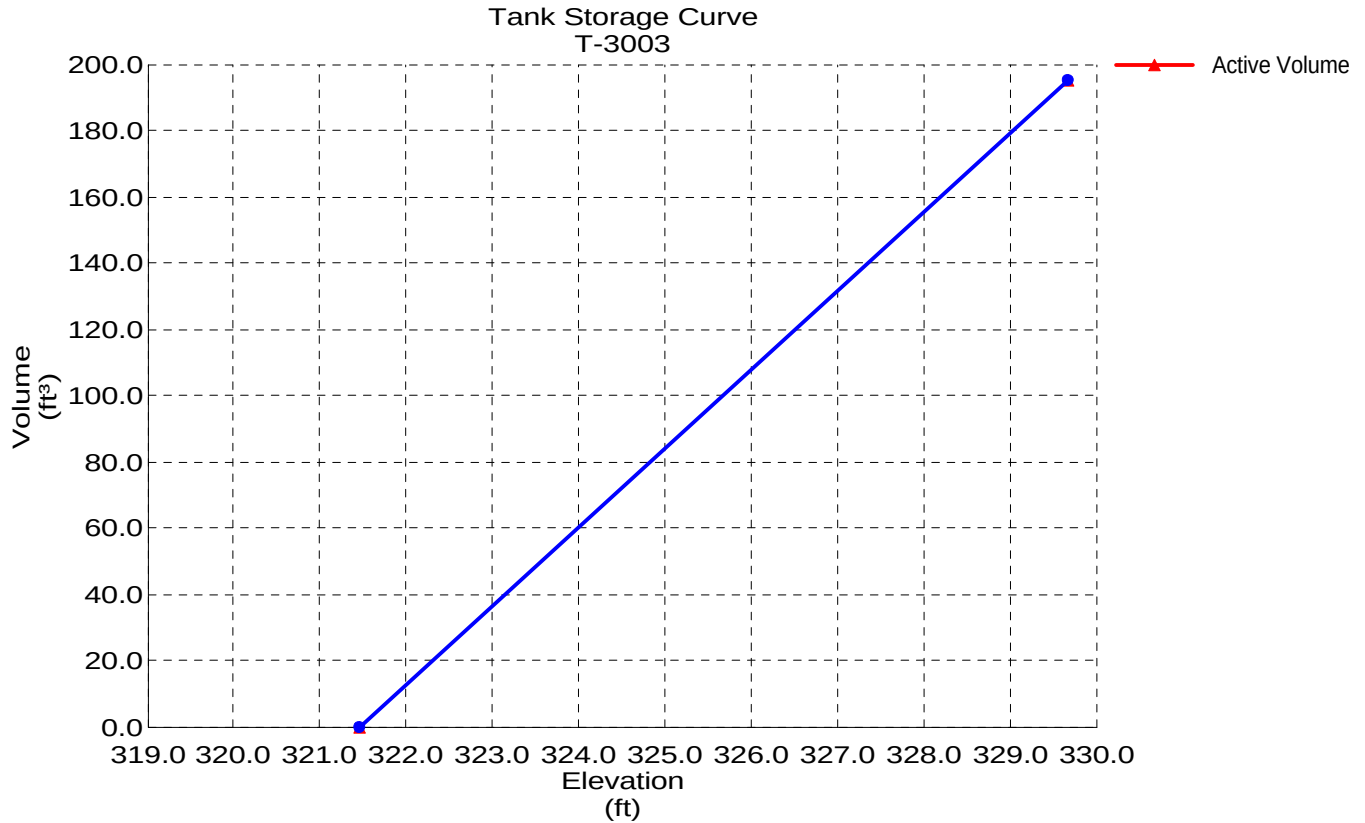
Detailed Report for Tank: T-3003

Scenario Summary			
Scenario	Base		
Physical Alternative	Base-Physical		
Active Topology Alternative	Base-Active Topology		
Demand Alternative	Default-Average Daily		
Initial Settings Alternative	Base-Initial Settings		
Operational Alternative	Base-Operational Controls		
Logical Control Set Alternative	<All Logical Controls>		
Age Alternative	Default-Age Scenario		
Constituent Alternative	Default-Constituent		
Trace Alternative	Default-Trace Scenario		
Fire Flow Alternative	Base-Fire Flow		
Capital Cost Alternative	Base-Capital Cost		
Energy Cost Alternative	Base-Energy Cost		
User Data Alternative	Base-User Data		
Global Adjustments Summary			
Demand	<None>	Roughness	<None>
Geometric Summary			
X	9,885.58 ft	Elevation	319.79 ft
Y	10,034.82 ft	Zone	Zone-1
Demand Summary			
Type	Base Flow (gpm)	Pattern	
Demand	0.00	Fixed	
Operating Range Summary			
Maximum Elevation	329.67 ft	Maximum Level	9.88 ft
Initial HGL	322.00 ft	Initial Level	2.21 ft
Minimum Elevation	321.46 ft	Minimum Level	1.67 ft
Base Elevation	319.79 ft		
Storage			
Section Type	Constant Area	Circular Tank Shape?	true
Diameter	5.50 ft	Average Area	23.8 ft²
Inactive Volume	0.00 ft³	Total Active Volume	195.06 ft³
User Data			
Date Installed		Date Retired	
Inspection Date		SCADA ID	
Lining		Condition	
Metered	false	Clearwell Storage	false
Elevated Tank	false	Existing	false

Detailed Report for Tank: T-3003

Calculated Results Summary

Time (hr)	Calculated Hydraulic Grade (ft)	Calculated Level (ft)	Pressure (psi)	Calculated Percent Full (%)	Calculated Volume (ft³)	Inflow (gpm)	Outflow (gpm)	Current Status
0.00	322.00	2.21	0.96	6.6	12.83	-227.43	227.43	Draining



Detailed Report for Pressure Junction: T-3007

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	9,903.16 ft	Elevation	0.00 ft
Y	10,084.68 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	473.90	205.03	473.90	0.00

Detailed Report for Pressure Junction: T-3008

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	9,903.32 ft	Elevation	0.00 ft
Y	10,126.33 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	436.19	188.72	436.19	0.00



Attachment 6

Carbon Feed Tank (T-3003) to
Leachate Tank T-125

Calculation Sheet

Client: CWM Chemical Services, LLC

Project Location: Model City, New York

Project: RMU-1 Leachate Level Compliance Plan (LLCP)

Project No.: B0023785.0000

Subject: Carbon Feed Tank (T-3003) to Leachate Tank T-125

Prepared By: BMS/PTO

Date: November 2011

Reviewed By: BMS

Date: November 2011

Checked By: PHB

Date: November 2011

TASK:

Verify that the required flow rate (227 gallons per minute [gpm]) from carbon feed tank T-3003 to leachate tank T-125 will be achieved.

REFERENCES:

1. *Leachate Level Compliance Plan For Residuals Management Unit One*, prepared by Golder Associates, dated February, 1997.
2. *Leachate Level Compliance Plan for Residuals Management Unit – One, Final Sequence Phase 2*, prepared by ARCADIS, dated March, 2009 (revised March 2010).
3. *Engineering Report for CWM Chemical Services, LLC Model City Facility, Residuals Management Unit 1*, Earth Tech.
4. WaterCAD for Windows, Version 5.0, pressure network analysis software, Haestad Methods, Inc.
5. *Leachate Level Compliance Plan Pump Flow Rate Verification Report for Pumps P-105 and P-3002A*, CWM Chemical Services, LLC., October, 2001.

ASSUMPTIONS:

1. The system runs in series from tank T-3003 through the carbon adsorption system, (i.e., through tank T-3007 then through tank T-3008.)
2. The analysis assumes the use of an Ingersoll-Dresser HOC3+ variable speed pump. At 3,500 rpm, the pump is rated at 250 gpm at 305 feet of total dynamic head.

METHODOLOGY:

Information used in previous LLCP evaluations relating to the AWTS facility was verified, modified where necessary and input into the WaterCAD model for evaluation. This information includes manufacturer pump data; pipe lengths, sizes and types; number and type of fittings; and other relevant components that could potentially affect the performance of the system. WaterCAD output includes flow rates, velocities and headloss through each pump or pipe section.

Calculation Sheet

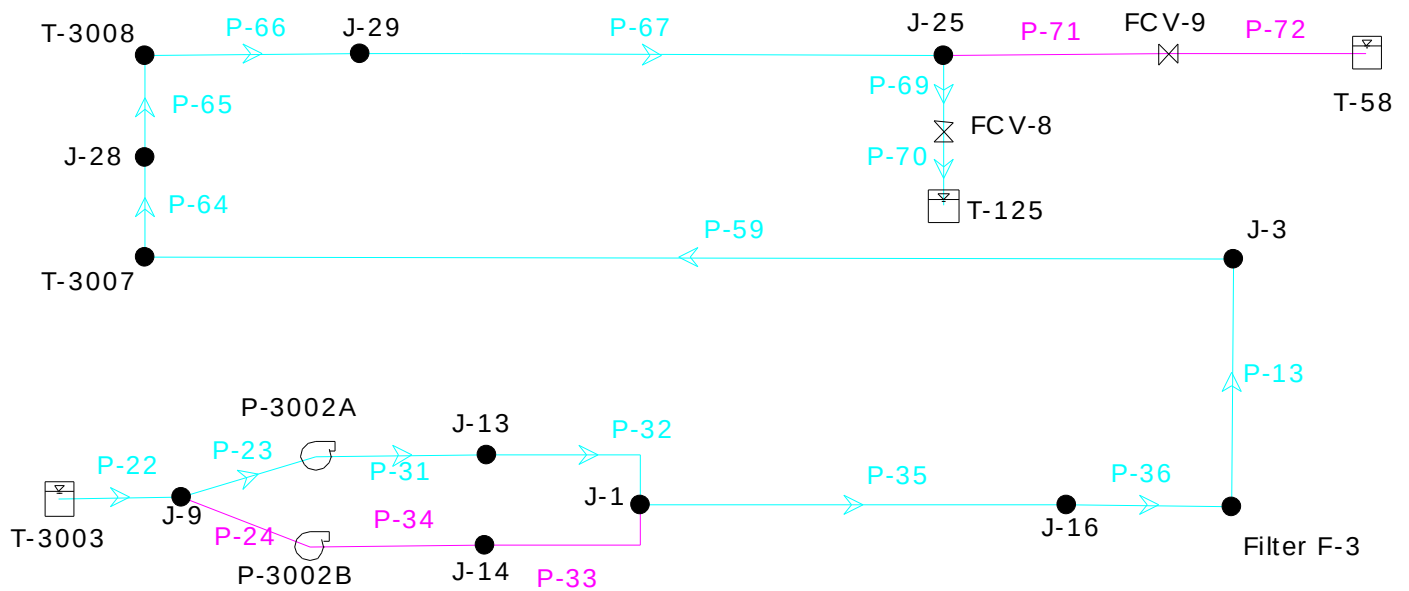
SUMMARY:

A summary of the calculations is presented in the following table.

Pump Type	Nominal Flow Rate (gpm)	Evaluated Flow Rate (with flow control) (gpm)	Pump Condition (On/Off)	Head at Pump (ft.)	Total Evaluated Flow to Tank T-125 (gpm)
Ingersoll-Dresser HOC3+	250 at 305 feet TDH	227	On	199	227

Scenario: Base

System Runs In Series Through Tank 3007 Then Through Tank 3008



Color Coding Legend
Link: Velocity (ft/s)

	<=	4.000
	<=	6.000
	<=	8.000
	<=	10.000
	<=	12.000

Analysis Results

Scenario: Base

Steady State Analysis

Title: CWM: RMU-1 Leachate System Evaluation
 Project Engineer: ARCADIS
 Project Date: 03/11/09
 Comments:

Scenario Summary			
Scenario	Base		
Physical Alternative	Base-Physical		
Active Topology Alternative	Base-Active Topology		
Demand Alternative	Default-Average Daily		
Initial Settings Alternative	Base-Initial Settings		
Operational Alternative	Base-Operational Controls		
Logical Control Set Alternative	<All Logical Controls>		
Age Alternative	Default-Age Scenario		
Constituent Alternative	Default-Constituent		
Trace Alternative	Default-Trace Scenario		
Fire Flow Alternative	Base-Fire Flow		
Capital Cost Alternative	Base-Capital Cost		
Energy Cost Alternative	Base-Energy Cost		
User Data Alternative	Base-User Data		
Liquid Characteristics			
Liquid	Water at 20C(68F)	Specific Gravity	1.00
Kinematic Viscosity	1.0804e-5 ft²/s		
Network Inventory			
Pressure Pipes	19	Number of Tanks	3
Number of Reservoirs	0	- Constant Area:	3
Number of Pressure Junctions	12	- Variable Area:	0
Number of Pumps	2	Number of Valves	2
- Constant Power:	0	- FCV's:	2
- One Point (Design Point):	0	- PBV's:	0
- Standard (3 Point):	2	- PRV's:	0
- Standard Extended:	0	- PSV's:	0
- Custom Extended:	0	- TCV's:	0
- Multiple Point:	0	- GPV's:	0
Number of Spot Elevations	0		
Pressure Pipes Inventory			
2.00 in	2.00 ft	3.00 in	308.00 ft
2.86 in	20.00 ft	3.68 in	703.00 ft
Total Length	1,033.00 ft		

Analysis Results

Scenario: Base

Steady State Analysis

FCVs @ 0.00 hr

Label	Control Status	From HGL (ft)	To HGL (ft)	Discharge (gpm)	Velocity (ft/s)	Headloss (ft)	Calculated Flow Setting (gpm)
FCV-8	Inactive	320.23	320.23	227.23	2.578	0.00	0.00
FCV-9	Closed	351.36	332.00	0.00	0.000	0.00	0.00

Pressure Junctions @ 0.00 hr

Label	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
Filter F-3	449.33	194.40	449.33	0.00
J-1	501.32	216.90	501.32	0.00
J-3	445.77	192.86	445.77	0.00
J-9	311.46	134.75	311.46	0.00
J-13	506.27	219.04	506.27	0.00
J-14	501.32	216.90	501.32	0.00
J-16	458.65	198.44	458.65	0.00
J-25	351.36	152.02	351.36	0.00
J-28	413.55	178.92	413.55	0.00
J-29	375.90	162.64	375.90	0.00
T-3007	430.29	186.17	430.29	0.00
T-3008	392.64	169.88	392.64	0.00

Pressure Pipes @ 0.00 hr

Label	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
P-13	Open	-227.23	10.313	445.77	449.33	0.22	3.34	3.56	3,562.81
P-22	Open	227.23	10.313	322.00	311.46	5.89	4.64	10.54	405.33
P-23	Open	227.23	10.313	311.46	307.75	0.90	2.81	3.71	928.72
P-24	Open	-0.00	0.000	311.46	311.46	-0.00	0.00	0.00	0.00
P-31	Open	227.23	10.313	506.93	506.27	0.45	0.21	0.67	334.20
P-32	Open	227.23	11.348	506.27	501.32	2.29	2.66	4.95	618.70
P-33	Open	0.00	0.000	501.32	501.32	-0.00	0.00	0.00	0.00
P-34	Open	0.00	0.000	501.32	501.32	-0.00	0.00	0.00	0.00
P-35	Open	227.23	10.313	501.32	458.65	6.54	36.12	42.66	1,471.14
P-36	Open	227.23	10.313	458.65	449.33	0.45	8.88	9.32	4,661.04
P-59	Open	227.23	10.313	445.77	430.29	7.48	8.00	15.48	469.06
P-64	Open	227.23	10.313	430.29	413.55	0.21	16.53	16.74	16,741.55
P-65	Open	227.23	10.313	413.55	392.64	7.02	13.89	20.90	674.34
P-66	Open	227.23	10.313	392.64	375.90	0.21	16.53	16.74	16,741.55
P-67	Open	227.23	10.313	375.90	351.36	13.60	10.94	24.54	409.05
P-69	Open	227.23	10.313	351.36	320.23	25.63	5.50	31.13	275.51
P-70	Open	227.23	10.313	320.23	320.00	0.23	0.00	0.23	226.84
P-71	Open	0.00	0.000	351.36	351.36	0.00	0.00	0.00	0.00
P-72	Open	0.00	0.000	332.00	332.00	0.00	0.00	0.00	0.00

Analysis Results

Scenario: Base

Steady State Analysis

Pumps @ 0.00 hr

Label	Control Status	Intake Pump Grade (ft)	Discharge Pump Grade (ft)	Discharge (gpm)	Pump Head (ft)	Relative Speed	Calculated Water Power (Hp)
P-3002A	On	307.75	506.93	227.23	199.19	0.83	11.43
P-3002B	Off	311.46	501.32	0.00	0.00	1.00	0.00

Tanks @ 0.00 hr

Label	Calculated Hydraulic Grade (ft)	Calculated Level (ft)	Pressure (psi)	Calculated Percent Full (%)	Calculated Volume (ft³)	Inflow (gpm)	Outflow (gpm)	Current Status
T-58	332.00	12.50	5.41	98.2	55,292.03	0.00	0.00	Steady
T-125	320.00	0.00	0.00	0.0	0.00	227.23	-227.23	Filling
T-3003	322.00	2.21	0.96	6.6	12.83	-227.23	227.23	Draining

Detailed Report for FCV: FCV-8

Scenario Summary							
Scenario	Base						
Physical Alternative	Base-Physical						
Active Topology Alternative	Base-Active Topology						
Demand Alternative	Default-Average Daily						
Initial Settings Alternative	Base-Initial Settings						
Operational Alternative	Base-Operational Controls						
Logical Control Set Alternative	<All Logical Controls>						
Age Alternative	Default-Age Scenario						
Constituent Alternative	Default-Constituent						
Trace Alternative	Default-Trace Scenario						
Fire Flow Alternative	Base-Fire Flow						
Capital Cost Alternative	Base-Capital Cost						
Energy Cost Alternative	Base-Energy Cost						
User Data Alternative	Base-User Data						
Global Adjustments Summary							
Demand	<None>	Roughness	<None>				
Geometric Summary							
X	10,068.19 ft	Upstream Pipe	P-69				
Y	10,110.58 ft	Downstream Pipe	P-70				
Elevation	0.00 ft	Diameter	6.00 in				
Minor Loss Coefficient	0.00						
Initial Status							
Initial Valve Status	Inactive	Initial Flow Setting	0.00 gpm				
User Data							
Date Installed		Date Retired					
Inspection Date		SCADA ID					
Condition		Manufacturer					
Model		Serial Number					
Metered	false	Motorized	false				
Clockwise to Close	false	Normally Closed	false				
Existing	false						
Calculated Results Summary							
Time (hr)	Control Status	From HGL (ft)	To HGL (ft)	Discharge (gpm)	Velocity (ft/s)	Headloss (ft)	Calculated Flow Setting (gpm)
0.00	Inactive	320.23	320.23	227.23	2.578	0.00	0.00

Detailed Report for FCV: FCV-9

Scenario Summary							
Scenario	Base						
Physical Alternative	Base-Physical						
Active Topology Alternative	Base-Active Topology						
Demand Alternative	Default-Average Daily						
Initial Settings Alternative	Base-Initial Settings						
Operational Alternative	Base-Operational Controls						
Logical Control Set Alternative	<All Logical Controls>						
Age Alternative	Default-Age Scenario						
Constituent Alternative	Default-Constituent						
Trace Alternative	Default-Trace Scenario						
Fire Flow Alternative	Base-Fire Flow						
Capital Cost Alternative	Base-Capital Cost						
Energy Cost Alternative	Base-Energy Cost						
User Data Alternative	Base-User Data						
Global Adjustments Summary							
Demand	<None>	Roughness	<None>				
Geometric Summary							
X	10,114.42 ft	Upstream Pipe	P-71				
Y	10,126.46 ft	Downstream Pipe	P-72				
Elevation	0.00 ft	Diameter	6.00 in				
Minor Loss Coefficient	0.00						
Initial Status							
Initial Valve Status	Closed	Initial Flow Setting	0.00 gpm				
User Data							
Date Installed		Date Retired					
Inspection Date		SCADA ID					
Condition		Manufacturer					
Model		Serial Number					
Metered	false	Motorized	false				
Clockwise to Close	false	Normally Closed	false				
Existing	false						
Calculated Results Summary							
Time (hr)	Control Status	From HGL (ft)	To HGL (ft)	Discharge (gpm)	Velocity (ft/s)	Headloss (ft)	Calculated Flow Setting (gpm)
0.00	Closed	351.36	332.00	0.00	0.000	0.00	0.00

Detailed Report for Pressure Junction: Filter F-3

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	10,127.60 ft	Elevation	0.00 ft
Y	10,033.21 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	449.33	194.40	449.33	0.00

Detailed Report for Pressure Junction: J-1

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	10,005.59 ft	Elevation	0.00 ft
Y	10,033.66 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	501.32	216.90	501.32	0.00

Detailed Report for Pressure Junction: J-3

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	10,127.80 ft	Elevation	0.00 ft
Y	10,084.32 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	445.77	192.86	445.77	0.00

Detailed Report for Pressure Junction: J-9

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	9,910.75 ft	Elevation	0.00 ft
Y	10,035.08 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	311.46	134.75	311.46	0.00

Detailed Report for Pressure Junction: J-13

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	9,973.94 ft	Elevation	0.00 ft
Y	10,043.76 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	506.27	219.04	506.27	0.00

Detailed Report for Pressure Junction: J-14

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	9,973.37 ft	Elevation	0.00 ft
Y	10,025.17 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	501.32	216.90	501.32	0.00

Detailed Report for Pressure Junction: J-16

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	10,093.35 ft	Elevation	0.00 ft
Y	10,033.62 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	458.65	198.44	458.65	0.00

Detailed Report for Pressure Junction: J-25

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	10,068.12 ft	Elevation	0.00 ft
Y	10,126.35 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	351.36	152.02	351.36	0.00

Detailed Report for Pressure Junction: J-28

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	9,903.16 ft	Elevation	0.00 ft
Y	10,105.06 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	413.55	178.92	413.55	0.00

Detailed Report for Pressure Junction: J-29

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	9,947.81 ft	Elevation	0.00 ft
Y	10,126.75 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	375.90	162.64	375.90	0.00

Detailed Report for Pressure Pipe: P-13

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	Steel	Hazen- Williams C	100.0
Diameter	3.00 in	Minor Loss Coefficient	2.02
Check Valve?	false	Length	1.00 ft
From Node	J-3	To Node	Filter F-3

Elevations			
From Elevation	0.00 ft	To Elevation	0.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	-227.23	10.313	445.77	449.33	0.22	3.34	3.56	3,562.81

Detailed Report for Pressure Pipe: P-22

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	PVC	Hazen- Williams C	100.0
Diameter	3.00 in	Minor Loss Coefficient	2.81
Check Valve?	false	Length	26.00 ft
From Node	T-3003	To Node	J-9

Elevations			
From Elevation	319.79 ft	To Elevation	0.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	227.23	10.313	322.00	311.46	5.89	4.64	10.54	405.33

Detailed Report for Pressure Pipe: P-23

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	Steel	Hazen- Williams C	100.0
Diameter	3.00 in	Minor Loss Coefficient	1.70
Check Valve?	false	Length	4.00 ft
From Node	J-9	To Node	P-3002A

Elevations			
From Elevation	0.00 ft	To Elevation	0.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	227.23	10.313	311.46	307.75	0.90	2.81	3.71	928.72

Detailed Report for Pressure Pipe: P-24

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	Steel	Hazen- Williams C	100.0
Diameter	3.00 in	Minor Loss Coefficient	2.41
Check Valve?	false	Length	4.00 ft
From Node	J-9	To Node	P-3002B

Elevations			
From Elevation	0.00 ft	To Elevation	0.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	-0.00	0.000	311.46	311.46	-0.00	0.00	0.00	0.00

Detailed Report for Pressure Pipe: P-31

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	Steel	Hazen- Williams C	100.0
Diameter	3.00 in	Minor Loss Coefficient	0.13
Check Valve?	false	Length	2.00 ft
From Node	P-3002A	To Node	J-13

Elevations			
From Elevation	0.00 ft	To Elevation	0.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	227.23	10.313	506.93	506.27	0.45	0.21	0.67	334.20

Detailed Report for Pressure Pipe: P-32

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	HDPE	Hazen- Williams C	100.0
Diameter	2.86 in	Minor Loss Coefficient	1.33
Check Valve?	false	Length	8.00 ft
From Node	J-13	To Node	J-1

Elevations			
From Elevation	0.00 ft	To Elevation	0.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	227.23	11.348	506.27	501.32	2.29	2.66	4.95	618.70

Detailed Report for Pressure Pipe: P-33

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	HDPE	Hazen- Williams C	100.0
Diameter	2.86 in	Minor Loss Coefficient	1.33
Check Valve?	false	Length	12.00 ft
From Node	J-1	To Node	J-14

Elevations			
From Elevation	0.00 ft	To Elevation	0.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	0.00	0.000	501.32	501.32	-0.00	0.00	0.00	0.00

Detailed Report for Pressure Pipe: P-34

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	Steel	Hazen- Williams C	100.0
Diameter	2.00 in	Minor Loss Coefficient	0.13
Check Valve?	false	Length	2.00 ft
From Node	J-14	To Node	P-3002B

Elevations			
From Elevation	0.00 ft	To Elevation	0.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	0.00	0.000	501.32	501.32	-0.00	0.00	0.00	0.00

Detailed Report for Pressure Pipe: P-35

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	Steel	Hazen- Williams C	100.0
Diameter	3.00 in	Minor Loss Coefficient	21.85
Check Valve?	false	Length	29.00 ft
From Node	J-1	To Node	J-16

Elevations			
From Elevation	0.00 ft	To Elevation	0.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	227.23	10.313	501.32	458.65	6.54	36.12	42.66	1,471.14

Detailed Report for Pressure Pipe: P-36

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	Steel	Hazen- Williams C	100.0
Diameter	3.00 in	Minor Loss Coefficient	5.37
Check Valve?	false	Length	2.00 ft
From Node	J-16	To Node	Filter F-3

Elevations			
From Elevation	0.00 ft	To Elevation	0.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	227.23	10.313	458.65	449.33	0.45	8.88	9.32	4,661.04

Detailed Report for Pressure Pipe: P-59

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	Steel	Hazen- Williams C	100.0
Diameter	3.00 in	Minor Loss Coefficient	4.84
Check Valve?	false	Length	33.00 ft
From Node	J-3	To Node	T-3007

Elevations			
From Elevation	0.00 ft	To Elevation	0.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	227.23	10.313	445.77	430.29	7.48	8.00	15.48	469.06

Detailed Report for Pressure Pipe: P-64

Scenario Summary									
Scenario		Base							
Physical Alternative		Base-Physical							
Active Topology Alternative		Base-Active Topology							
Demand Alternative		Default-Average Daily							
Initial Settings Alternative		Base-Initial Settings							
Operational Alternative		Base-Operational Controls							
Logical Control Set Alternative		<All Logical Controls>							
Age Alternative		Default-Age Scenario							
Constituent Alternative		Default-Constituent							
Trace Alternative		Default-Trace Scenario							
Fire Flow Alternative		Base-Fire Flow							
Capital Cost Alternative		Base-Capital Cost							
Energy Cost Alternative		Base-Energy Cost							
User Data Alternative		Base-User Data							
Global Adjustments Summary									
Demand		<None>			Roughness			<None>	
Pipe Characteristics									
Material		Steel		Hazen- Williams C			100.0		
Diameter		3.00 in		Minor Loss Coefficient			10.00		
Check Valve?		false		Length			1.00 ft		
From Node		T-3007		To Node			J-28		
Elevations									
From Elevation		0.00 ft		To Elevation			0.00 ft		
Initial Status									
Initial Status		Open							
User Data									
Date Installed				Date Retired					
Inspection Date				Lining					
Pipe Class				Exterior Coating					
Nominal Diameter		0.00 in		Condition					
Skeletonized		false		Metered			false		
Existing		false							
Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	227.23	10.313	430.29	413.55	0.21	16.53	16.74	16,741.55

Detailed Report for Pressure Pipe: P-65

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	Steel	Hazen- Williams C	100.0
Diameter	3.00 in	Minor Loss Coefficient	8.40
Check Valve?	false	Length	31.00 ft
From Node	J-28	To Node	T-3008

Elevations			
From Elevation	0.00 ft	To Elevation	0.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	227.23	10.313	413.55	392.64	7.02	13.89	20.90	674.34

Detailed Report for Pressure Pipe: P-66

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	Steel	Hazen- Williams C	100.0
Diameter	3.00 in	Minor Loss Coefficient	10.00
Check Valve?	false	Length	1.00 ft
From Node	T-3008	To Node	J-29

Elevations			
From Elevation	0.00 ft	To Elevation	0.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	227.23	10.313	392.64	375.90	0.21	16.53	16.74	16,741.55

Detailed Report for Pressure Pipe: P-67

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	Steel	Hazen- Williams C	100.0
Diameter	3.00 in	Minor Loss Coefficient	6.62
Check Valve?	false	Length	60.00 ft
From Node	J-29	To Node	J-25

Elevations			
From Elevation	0.00 ft	To Elevation	0.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	227.23	10.313	375.90	351.36	13.60	10.94	24.54	409.05

Detailed Report for Pressure Pipe: P-69

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	PVC	Hazen- Williams C	100.0
Diameter	3.00 in	Minor Loss Coefficient	3.33
Check Valve?	false	Length	113.00 ft
From Node	J-25	To Node	FCV-8

Elevations			
From Elevation	0.00 ft	To Elevation	0.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	227.23	10.313	351.36	320.23	25.63	5.50	31.13	275.51

Detailed Report for Pressure Pipe: P-70

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	PVC	Hazen- Williams C	100.0
Diameter	3.00 in	Minor Loss Coefficient	0.00
Check Valve?	false	Length	1.00 ft
From Node	FCV-8	To Node	T-125

Elevations			
From Elevation	0.00 ft	To Elevation	320.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	227.23	10.313	320.23	320.00	0.23	0.00	0.23	226.84

Detailed Report for Pressure Pipe: P-71

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	HDPE	Hazen- Williams C	100.0
Diameter	3.68 in	Minor Loss Coefficient	5.18
Check Valve?	false	Length	702.00 ft
From Node	J-25	To Node	FCV-9

Elevations			
From Elevation	0.00 ft	To Elevation	0.00 ft

Initial Status	
Initial Status	Open

User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	0.00	0.000	351.36	351.36	0.00	0.00	0.00	0.00

Detailed Report for Pressure Pipe: P-72

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Pipe Characteristics			
Material	HDPE	Hazen- Williams C	100.0
Diameter	3.68 in	Minor Loss Coefficient	0.00
Check Valve?	false	Length	1.00 ft
From Node	FCV-9	To Node	T-58

Elevations			
From Elevation	0.00 ft	To Elevation	319.50 ft

Initial Status	
Initial Status	Open

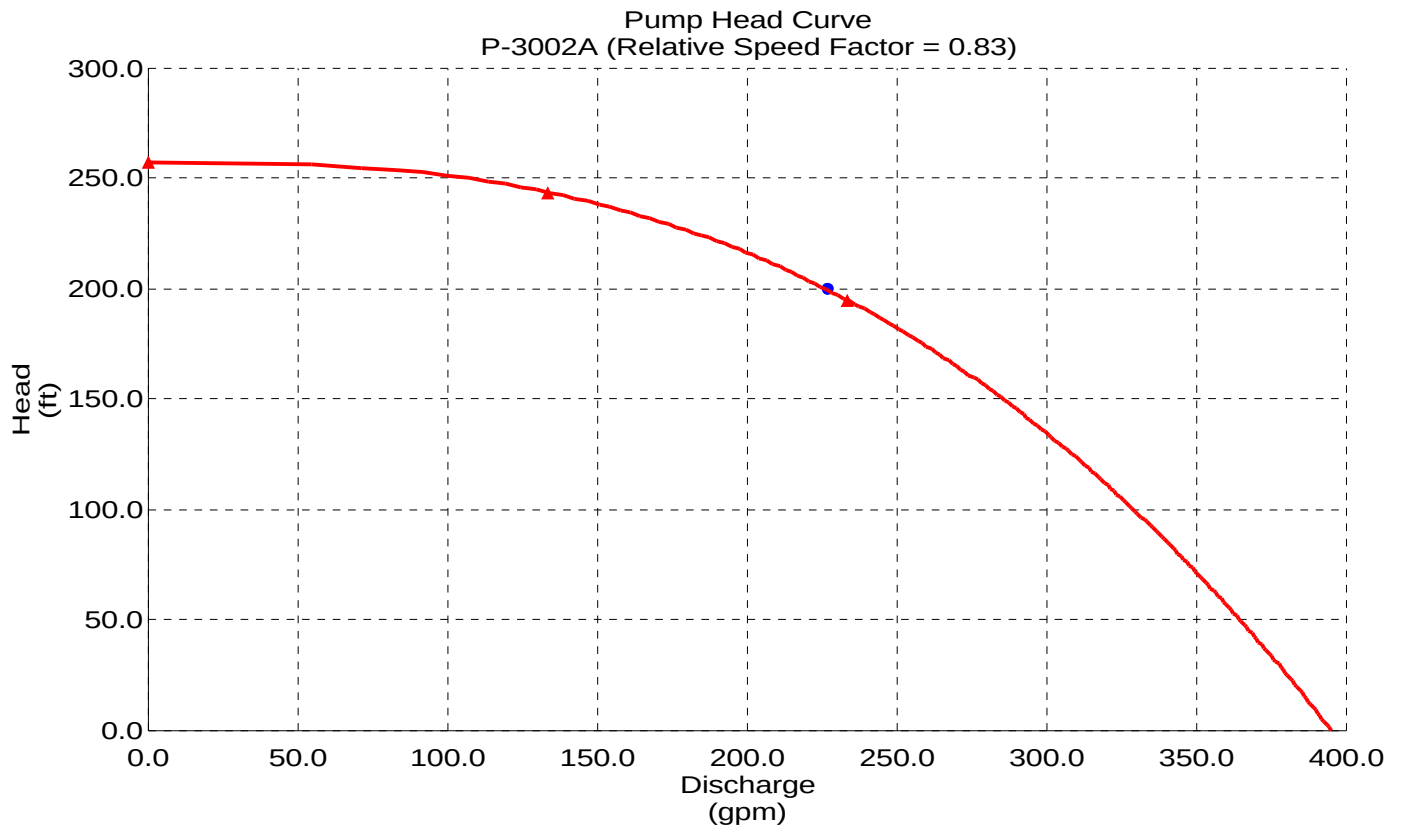
User Data			
Date Installed		Date Retired	
Inspection Date		Lining	
Pipe Class		Exterior Coating	
Nominal Diameter	0.00 in	Condition	
Skeletonized	false	Metered	false
Existing	false		

Calculated Results Summary									
Time (hr)	Control Status	Discharge (gpm)	Velocity (ft/s)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Calculated Friction Headloss (ft)	Calculated Minor Headloss (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
0.00	Open	0.00	0.000	332.00	332.00	0.00	0.00	0.00	0.00

Detailed Report for Pump: P-3002A

Scenario Summary							
Scenario	Base						
Physical Alternative	Base-Physical						
Active Topology Alternative	Base-Active Topology						
Demand Alternative	Default-Average Daily						
Initial Settings Alternative	Base-Initial Settings						
Operational Alternative	Base-Operational Controls						
Logical Control Set Alternative	<All Logical Controls>						
Age Alternative	Default-Age Scenario						
Constituent Alternative	Default-Constituent						
Trace Alternative	Default-Trace Scenario						
Fire Flow Alternative	Base-Fire Flow						
Capital Cost Alternative	Base-Capital Cost						
Energy Cost Alternative	Base-Energy Cost						
User Data Alternative	Base-User Data						
Global Adjustments Summary							
Demand	<None>	Roughness	<None>				
Geometric Summary							
X	9,938.56 ft	Upstream Pipe	P-23				
Y	10,043.52 ft	Downstream Pipe	P-31				
Elevation	0.00 ft						
Pump Definition Summary							
Pump Type	Standard (3 Point)						
Shutoff Head	370.00 ft	Shutoff Discharge	0.00 gpm				
Design Head	350.00 ft	Design Discharge	160.00 gpm				
Maximum Operating Head	280.00 ft	Maximum Operating Discharge	280.00 gpm				
Initial Status							
Initial Pump Status	On	Initial Relative Speed Factor	0.83				
User Data							
Date Installed		Date Retired					
Inspection Date		SCADA ID					
Rated Power	0 Hp	Condition					
Manufacturer		Model					
Serial Number		Metered	false				
Existing	false						
Calculated Results Summary							
Time (hr)	Control Status	Intake Pump Grade (ft)	Discharge Pump Grade (ft)	Discharge (gpm)	Pump Head (ft)	Relative Speed	Calculated Water Power (Hp)
0.00	On	307.75	506.93	227.23	199.19	0.83	11.43

Detailed Report for Pump: P-3002A



Detailed Report for Pump: P-3002B

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	9,937.28 ft	Upstream Pipe	P-24
Y	10,024.96 ft	Downstream Pipe	P-34
Elevation	0.00 ft		

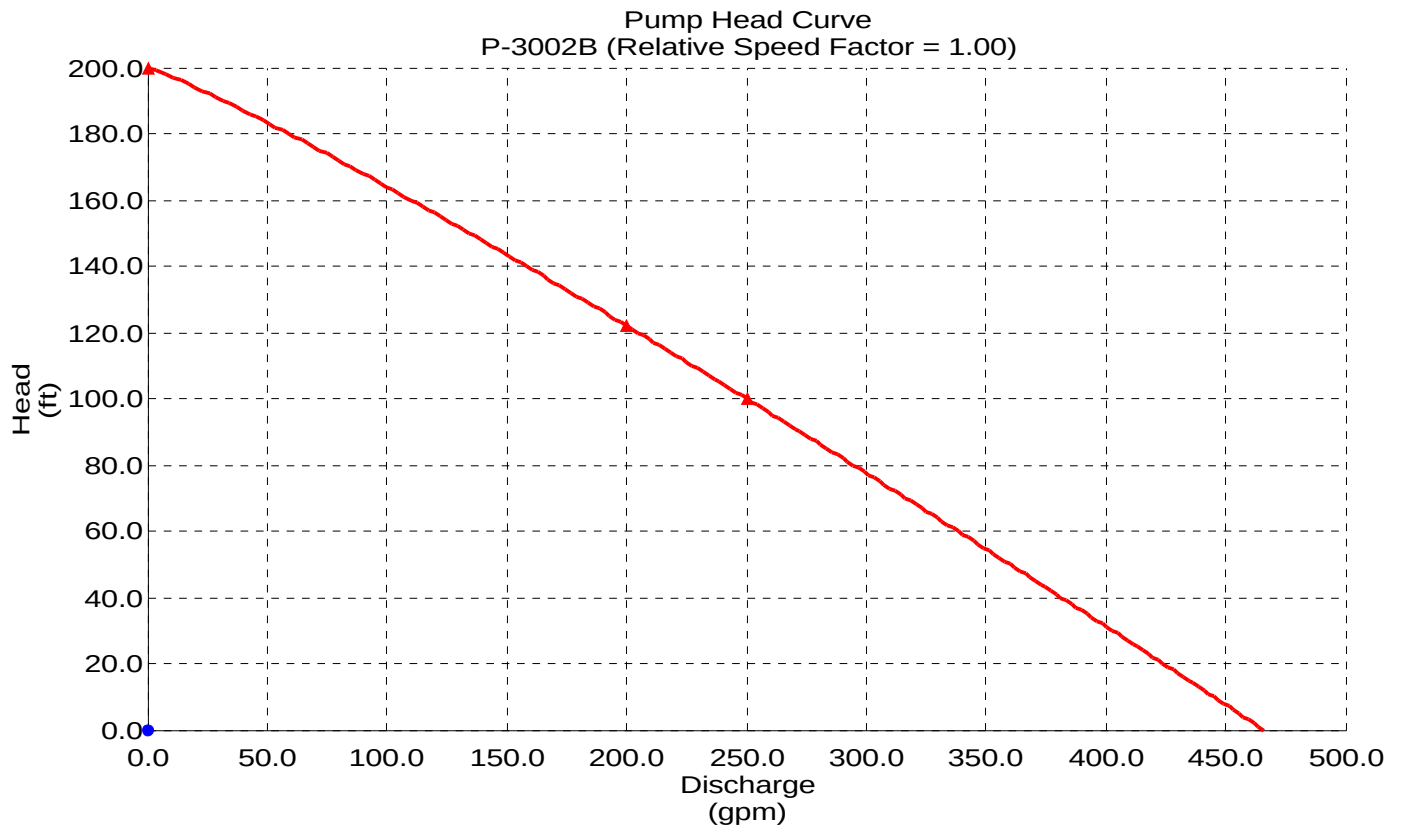
Pump Definition Summary			
Pump Type	Standard (3 Point)		
Shutoff Head	200.00 ft	Shutoff Discharge	0.00 gpm
Design Head	122.00 ft	Design Discharge	200.00 gpm
Maximum Operating Head	100.00 ft	Maximum Operating Discharge	250.00 gpm

Initial Status			
Initial Pump Status	Off	Initial Relative Speed Factor	1.00

User Data			
Date Installed		Date Retired	
Inspection Date		SCADA ID	
Rated Power	0 Hp	Condition	
Manufacturer		Model	
Serial Number		Metered	false
Existing	false		

Calculated Results Summary							
Time (hr)	Control Status	Intake Pump Grade (ft)	Discharge Pump Grade (ft)	Discharge (gpm)	Pump Head (ft)	Relative Speed	Calculated Water Power (Hp)
0.00	Off	311.46	501.32	0.00	0.00	1.00	0.00

Detailed Report for Pump: P-3002B



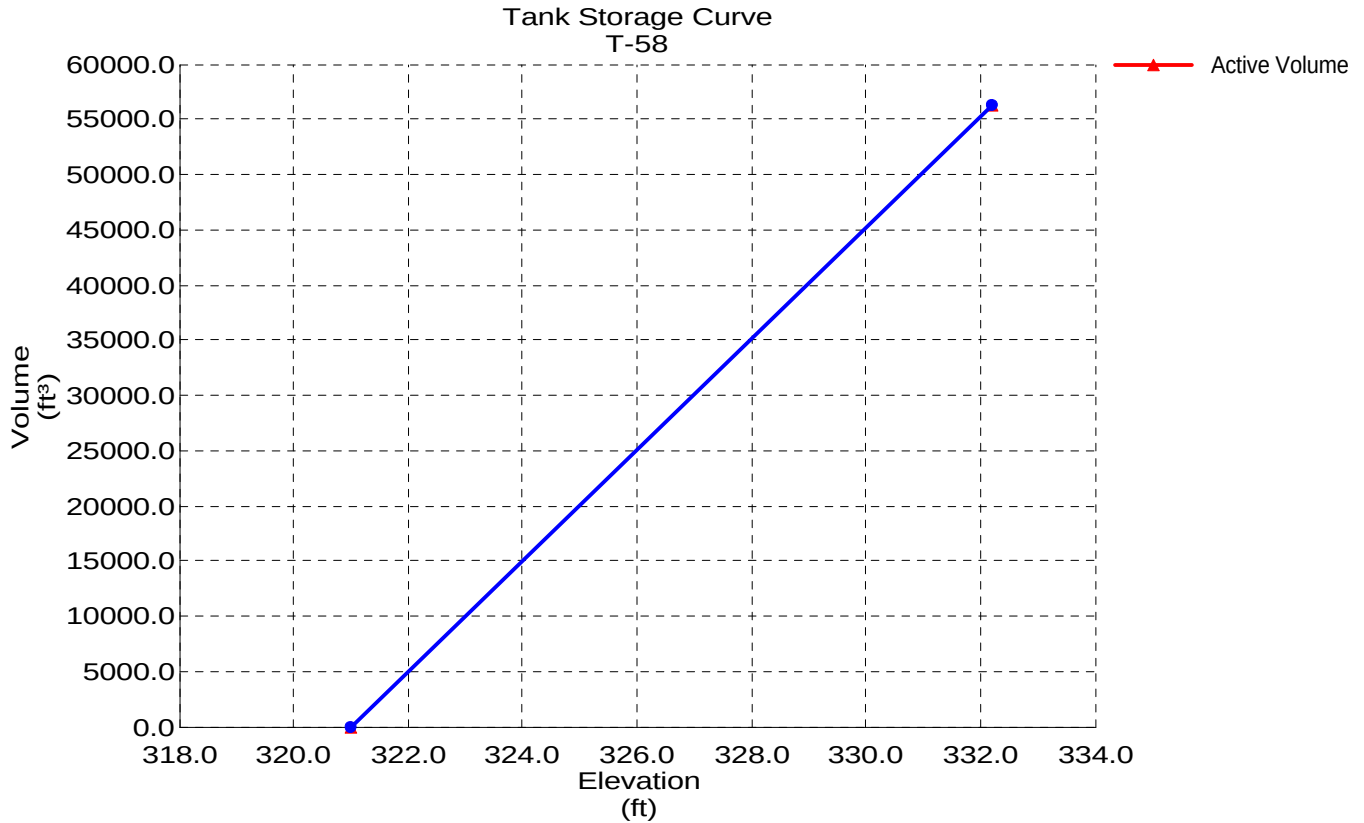
Detailed Report for Tank: T-58

Scenario Summary			
Scenario	Base		
Physical Alternative	Base-Physical		
Active Topology Alternative	Base-Active Topology		
Demand Alternative	Default-Average Daily		
Initial Settings Alternative	Base-Initial Settings		
Operational Alternative	Base-Operational Controls		
Logical Control Set Alternative	<All Logical Controls>		
Age Alternative	Default-Age Scenario		
Constituent Alternative	Default-Constituent		
Trace Alternative	Default-Trace Scenario		
Fire Flow Alternative	Base-Fire Flow		
Capital Cost Alternative	Base-Capital Cost		
Energy Cost Alternative	Base-Energy Cost		
User Data Alternative	Base-User Data		
Global Adjustments Summary			
Demand	<None>	Roughness	<None>
Geometric Summary			
X	10,155.44 ft	Elevation	319.50 ft
Y	10,126.81 ft	Zone	Zone-1
Demand Summary			
Type	Base Flow (gpm)	Pattern	
Demand	0.00	Fixed	
Operating Range Summary			
Maximum Elevation	332.20 ft	Maximum Level	12.70 ft
Initial HGL	332.00 ft	Initial Level	12.50 ft
Minimum Elevation	321.00 ft	Minimum Level	1.50 ft
Base Elevation	319.50 ft		
Storage			
Section Type	Constant Area	Circular Tank Shape?	true
Diameter	80.00 ft	Average Area	5,026.5 ft²
Inactive Volume	0.00 ft³	Total Active Volume	56,297.34 ft³
User Data			
Date Installed		Date Retired	
Inspection Date		SCADA ID	
Lining		Condition	
Metered	false	Clearwell Storage	false
Elevated Tank	false	Existing	false

Detailed Report for Tank: T-58

Calculated Results Summary

Time (hr)	Calculated Hydraulic Grade (ft)	Calculated Level (ft)	Pressure (psi)	Calculated Percent Full (%)	Calculated Volume (ft³)	Inflow (gpm)	Outflow (gpm)	Current Status
0.00	332.00	12.50	5.41	98.2	55,292.03	0.00	0.00	Steady



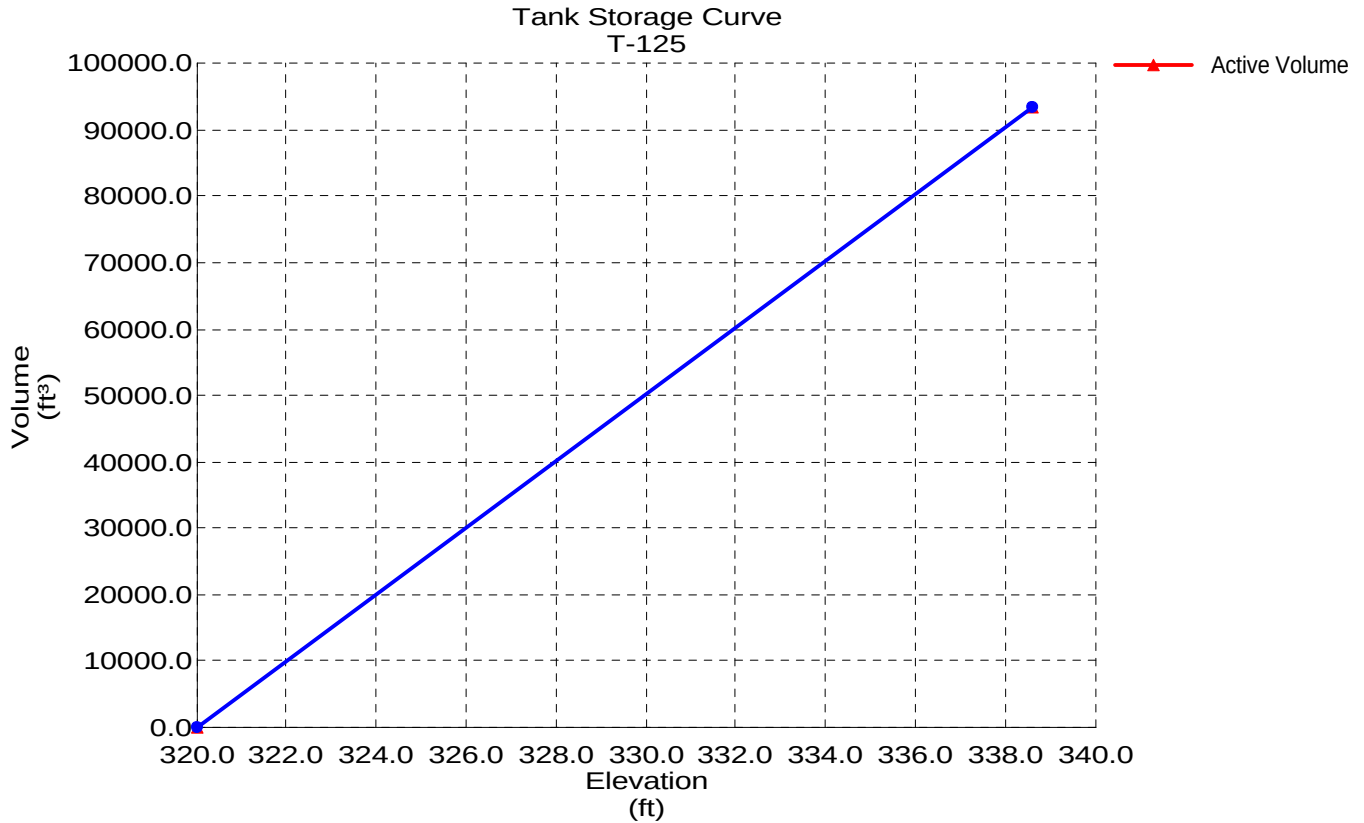
Detailed Report for Tank: T-125

Scenario Summary			
Scenario	Base		
Physical Alternative	Base-Physical		
Active Topology Alternative	Base-Active Topology		
Demand Alternative	Default-Average Daily		
Initial Settings Alternative	Base-Initial Settings		
Operational Alternative	Base-Operational Controls		
Logical Control Set Alternative	<All Logical Controls>		
Age Alternative	Default-Age Scenario		
Constituent Alternative	Default-Constituent		
Trace Alternative	Default-Trace Scenario		
Fire Flow Alternative	Base-Fire Flow		
Capital Cost Alternative	Base-Capital Cost		
Energy Cost Alternative	Base-Energy Cost		
User Data Alternative	Base-User Data		
Global Adjustments Summary			
Demand	<None>	Roughness	<None>
Geometric Summary			
X	10,068.14 ft	Elevation	320.00 ft
Y	10,095.15 ft	Zone	Zone-1
Demand Summary			
Type	Base Flow (gpm)	Pattern	
Demand	0.00	Fixed	
Operating Range Summary			
Maximum Elevation	338.60 ft	Maximum Level	18.60 ft
Initial HGL	320.00 ft	Initial Level	0.00 ft
Minimum Elevation	320.00 ft	Minimum Level	0.00 ft
Base Elevation	320.00 ft		
Storage			
Section Type	Constant Area	Circular Tank Shape?	true
Diameter	80.00 ft	Average Area	5,026.5 ft²
Inactive Volume	0.00 ft³	Total Active Volume	93,493.80 ft³
User Data			
Date Installed	Date Retired		
Inspection Date	SCADA ID		
Lining	Condition		
Metered	false	Clearwell Storage	false
Elevated Tank	false	Existing	false

Detailed Report for Tank: T-125

Calculated Results Summary

Time (hr)	Calculated Hydraulic Grade (ft)	Calculated Level (ft)	Pressure (psi)	Calculated Percent Full (%)	Calculated Volume (ft³)	Inflow (gpm)	Outflow (gpm)	Current Status
0.00	320.00	0.00	0.00	0.0	0.00	227.23	-227.23	Filling



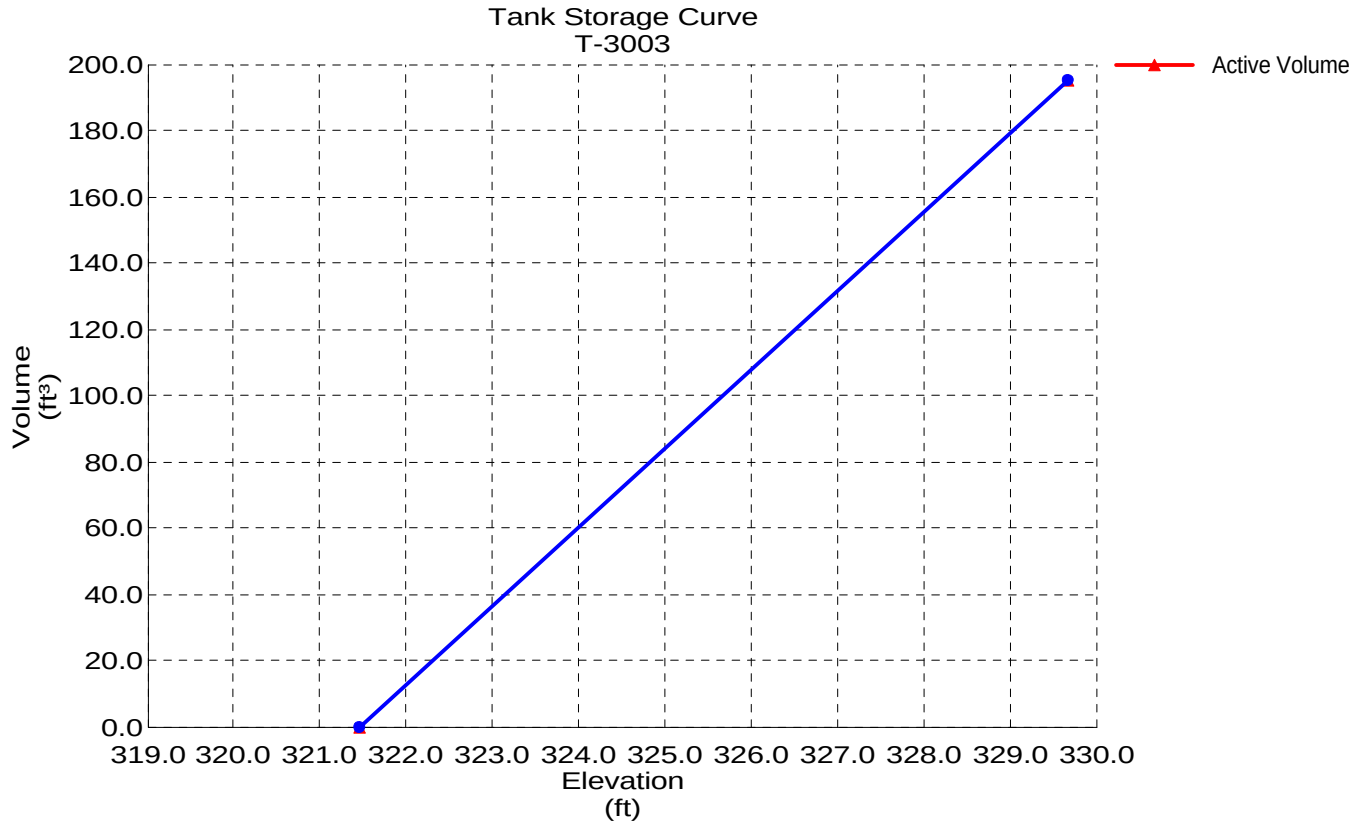
Detailed Report for Tank: T-3003

Scenario Summary			
Scenario	Base		
Physical Alternative	Base-Physical		
Active Topology Alternative	Base-Active Topology		
Demand Alternative	Default-Average Daily		
Initial Settings Alternative	Base-Initial Settings		
Operational Alternative	Base-Operational Controls		
Logical Control Set Alternative	<All Logical Controls>		
Age Alternative	Default-Age Scenario		
Constituent Alternative	Default-Constituent		
Trace Alternative	Default-Trace Scenario		
Fire Flow Alternative	Base-Fire Flow		
Capital Cost Alternative	Base-Capital Cost		
Energy Cost Alternative	Base-Energy Cost		
User Data Alternative	Base-User Data		
Global Adjustments Summary			
Demand	<None>	Roughness	<None>
Geometric Summary			
X	9,885.58 ft	Elevation	319.79 ft
Y	10,034.82 ft	Zone	Zone-1
Demand Summary			
Type	Base Flow (gpm)	Pattern	
Demand	0.00	Fixed	
Operating Range Summary			
Maximum Elevation	329.67 ft	Maximum Level	9.88 ft
Initial HGL	322.00 ft	Initial Level	2.21 ft
Minimum Elevation	321.46 ft	Minimum Level	1.67 ft
Base Elevation	319.79 ft		
Storage			
Section Type	Constant Area	Circular Tank Shape?	true
Diameter	5.50 ft	Average Area	23.8 ft²
Inactive Volume	0.00 ft³	Total Active Volume	195.06 ft³
User Data			
Date Installed	Date Retired		
Inspection Date	SCADA ID		
Lining	Condition		
Metered	false	Clearwell Storage	false
Elevated Tank	false	Existing	false

Detailed Report for Tank: T-3003

Calculated Results Summary

Time (hr)	Calculated Hydraulic Grade (ft)	Calculated Level (ft)	Pressure (psi)	Calculated Percent Full (%)	Calculated Volume (ft³)	Inflow (gpm)	Outflow (gpm)	Current Status
0.00	322.00	2.21	0.96	6.6	12.83	-227.23	227.23	Draining



Detailed Report for Pressure Junction: T-3007

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	9,903.16 ft	Elevation	0.00 ft
Y	10,084.68 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	430.29	186.17	430.29	0.00

Detailed Report for Pressure Junction: T-3008

Scenario Summary	
Scenario	Base
Physical Alternative	Base-Physical
Active Topology Alternative	Base-Active Topology
Demand Alternative	Default-Average Daily
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational Controls
Logical Control Set Alternative	<All Logical Controls>
Age Alternative	Default-Age Scenario
Constituent Alternative	Default-Constituent
Trace Alternative	Default-Trace Scenario
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	9,903.32 ft	Elevation	0.00 ft
Y	10,126.33 ft	Zone	Zone-1

Demand Summary		
Type	Base Flow (gpm)	Pattern
Demand	0.00	Fixed

User Data			
SCADA ID		Sampling Point	false
Hydrant Location	false	Existing	false

Calculated Results Summary				
Time (hr)	Calculated Hydraulic Grade (ft)	Pressure (psi)	Pressure Head (ft)	Demand (Calculated) (gpm)
0.00	392.64	169.88	392.64	0.00



Attachment 7

Tank Farm Storage Capacity
Analysis

Calculation Sheet

Client: CWM Chemical Services, LLC

Project Location: Model City, New York

Project: RMU-1 Leachate Level Compliance Plan (LLCP)

Project No.: B0023785.0000

Subject: Storm Flow Routing Through Leachate Tank Farm Evaluation

Prepared By: PTO

Date: November 2011

Reviewed By: BMS

Date: November 2011

Checked By: BMS

Date: November 2011

TASK

Verify that the leachate tank farm (LTF) capacity is adequate to collect and route leachate and secondary waters from various sources during a 25-year, 24-hour storm event.

REFERENCES

1. *Leachate Level Compliance Plan for Residuals Management Unit One*, prepared by Golder Associates, dated February 1997.
2. *Leachate Level Compliance Plan for Residuals Management Unit – One, Cells 1 through 14*, prepared by ARCADIS, dated March 2009 (revised March 2010).
3. *Engineering Report for CWM Chemical Services, LLC Model City Facility, Residuals Management Unit 1*, Earth Tech.
4. WaterCAD for Windows, Version 5.0, pressure network analysis software, Haestad Methods, Inc.
5. *Leachate Level Compliance Plan Pump Flow Rate Verification Report for Pumps P-105 and P-3002A*, CWM Chemical Services, LLC, October 2001.
6. Proposed grading design for waste fill progression and capping for Cells 1 through 14 presented on Figure 1 entitled *Residuals Management Unit One - Fill Progression and Truck Routes, Cells 1 Through 14 – Final Sequence Phase 3*, ARCADIS, August 2011 (revised November 2011).

ASSUMPTIONS

1. In accordance with the site-specific CWM permit condition, liquid elevations in the tank are such that only 625,000 gallons of storage capacity is available at the beginning of the analysis.
2. Each tank has approximately the same liquid level at the start of the analysis.
3. Flows from SLF 1 through 11 and the groundwater extraction systems may be directed to tank T-101 (worst-case flow option).
4. Storm related inflow to the LTF from the RMU-1 landfill cells is assumed to be zero during the storm event based on the grading configuration depicted in Reference 6, which eliminates all infiltration channels at the cell perimeters. As shown in Reference 6, all stormwater runoff from uncapped

Calculation Sheet

portions of RMU-1 is collected in lined Basins J and K. The majority of this contact water (other than the lower 1 foot in Basin J and the lower 1.5 feet in Basin K) is then pumped to tank T-165 for temporary storage, and then pumped to the LTF via the RMU-1 forcemain. The limited volume of water remaining in Basin K above the permit compliance level (i.e., 0.5 feet above the lower 1 foot) after the storm is assumed to be pumped to tank T-165 once the tank dewatering begins. Thus the only storm-related flow associated with RMU-1 is from tank T-165.

5. Base flow rates from RMU-1 cells are assumed to be 2 gallons per minute (gpm) per cell and are constant throughout the simulation.
6. Inflow to the LTF from tank T-165 is assumed to commence 11 hours after the beginning of the storm event to maintain consistency of inflow commencement time with previous LLCP analyses.
7. Flows from SLF 12 and RMU-1 are directed to tanks T-102 and T-103.
8. Pump run time for tank T-165 (81.7 hours) is determined by dividing the total stormwater runoff volume in the tank (775,201 gallons, based on Attachment 1 to Appendix A of the LLCP plus 9,124 gallons that will be transferred from Basin K following the storm) by the assumed pumping rate of 160 gpm.
9. Flow from secondary containment areas, other than the LTF, is directed to tank T-100 for 24 hours.
10. Based on information presented in Attachment 4 of Appendix B, the maximum outflow from the LTF via pump P-105 is 176 gpm.
11. The capacity of the AWTS is assumed to be 208 gpm (227 gpm with an average downtime of 2 hours per day). At the request of CWM, this analysis is based on a reduced AWTS treatment rate of 193 gpm (210 gpm with an average downtime of 2 hours per day).
12. In accordance with a site-specific permit condition, CWM must pump or ship off site for treatment no less than 200,000 gallons per day (equivalent of 139 gpm) when the available capacity of the LTF is less than 625,000 gallons. This capacity will be provided by LTF pump P-105 (assumed flowrate of 176 gpm).

METHODOLOGY

Inflow

The volume of leachate collected in Basins J and K and tank T-165 is determined in Attachment 1 to Appendix A of the LLCP. Volume and pump run time are presented on Table 4 of this evaluation. The pump used to dewater tank T-165 is assumed to run at 160 gpm, which allows the tank to be dewatered in approximately 81.7 hours. The contribution from tank T-165 begins 11 hours after the start of the design storm event. Initially, tank T-165 contributes to the total inflow to the LTF. As the accumulated leachate in the tank is discharged, the contribution to the LTF is eliminated. As depicted in Table 2 of this evaluation, the contribution from tank T-165 continues until hour 92.7. Flow into tank T-101 is constant and is from the average daily flow rate from the groundwater extraction systems (8 gpm) and a 4,000 gallons per day (2.8 gpm) contribution from SLF 1 through 11. LTF inflows are summarized in Tables 2 and 3 of this evaluation.

Calculation Sheet

Outflow

During the 24-hour period from hours 11 to 35, tanker trucks collect accumulated waters from secondary containment areas around the site and discharge the collected water through tank T-100 and ultimately into the AWTS at an average rate of 77 gpm. Since the AWTS is assumed to be operated at 193 gpm (210 gpm with a 2 hour downtime), 116 gpm can be discharged from the LTF (via pump P-105) during this 24-hour period. After hour 35, leachate will be pumped to the AWTS via pump P-105 at a rate of 176 gpm. LTF outflows are summarized in Table 1 of this evaluation.

Liquid Levels in Tanks

The maximum liquid levels in the leachate tanks are determined based on the diameters of the leachate tanks, the starting liquid levels, the inflow rates and the outflow rates. Table 1 of this evaluation depicts this tabulation and provides notes explaining the development of the table. As shown in the table, the combined maximum liquid level used in the tanks is 59.5 feet.

SUMMARY

This transient mass balance verifies that the volume available in tanks T-102 and T-103 is sufficient to temporarily store estimated peak flows from RMU-1 and other sources during the 25-year, 24-hour storm event.

CWM Chemical Services, LLC
Model City, NY Facility
RMU-1 Leachate Level Compliance Plan - Tank Farm Storage Analysis

Table 1-Storm Flow Routing Through Leachate Tank Farm

Input values in bold font, other values are calculated in the spreadsheet

43.839 Tank Diameter (ft)
1509.424 Tank Plan Area (sqft)
1050000 Total Tank Volume (gal)
31 Maximum Liquid Level to Overflow (ft)

A	B			C	D				E			F		
Time after start of design storm event	Volume in Tanks (gal)			Total Combined Tank Volume Available	Liquid Level (ft)				Inflow to Tank (gpm)			Outflow from Tank (gpm)		
(hrs)	T-102	T-103	T-101	(gal)	T-102	T-103	T-101	Total	T-102	T-103	T-101	T-102	T-103	T-101
11.0	141809	141583	141609	625000	12.6	12.5	12.5	37.7	189	0	10.8	116	0	0
24.0	198749	141583	150033	559636	17.6	12.5	13.3	43.4	189	0	10.8	116	0	0
24.1	199187	141583	150098	559133	17.6	12.5	13.3	43.5	219	0	10.8	116	0	0
35.0	266549	141583	157161	484708	23.6	12.5	13.9	50.1	219	0	10.8	116	0	0
35.1	267167	141583	157226	484025	23.7	12.5	13.9	50.1	219	0	10.8	176	0	0
48.0	300449	141583	165585	442384	26.6	12.5	14.7	53.8	219	0	10.8	176	0	0
48.1	300707	141583	165650	442061	26.6	12.5	14.7	53.8	189	0	10.8	176	0	0
92.7	335495	141583	194550	378372	29.7	12.5	17.2	59.5	189	0	10.8	176	0	0
92.8	335573	141583	194615	378229	29.7	12.5	17.2	59.5	29	0	10.8	176	0	0
120.3	92645	141583	212463	603310	8.2	12.5	18.8	39.6	29	0	10.8	176	0	0

Column A represents the time in hours after the start of the design storm event. To maintain consistency with previous LLCs, the starting time is 11.0 hours.

Column B calculates the volume in each of the tanks. The value in the first row is based on the starting liquid level in each tank. The value on subsequent rows is based on the previous row's volume plus inflow minus outflow during the time elapsed between the previous row and the current row.

Column C calculates the liquid storage volume available in all three tanks by subtracting the total volume stored (Column B) from the total storage volume available in all three tanks (assumed to be 1,050,000 gallons).

Column D represents the liquid height in each tank. The value in the first row represents the assumed liquid height in each tank at the time when design storm flows from RMU-1 cells begin. The value in subsequent rows is calculated from the volume in each tank at that time divided by each tank's area.

Column E represents the flow rate into each tank at the time indicated. The flow into Tank T-102 occurs during and after the design storm event. Flow into tank T-103 is not shown because tank T-102 provides adequate capacity to manage the predicted inflows. Reference Tables 2 and 3 of this spreadsheet file for development of flows into Tank T-102. Flow into Tank T-101 is from the average daily flow rate from the groundwater extraction systems (8 gpm) and a 4000 gpd (2.8 gpm) contribution from SLF 1-11 (worst-case flow option).

Column F represents the flow rate out of each tank at the time indicated. This flow rate is based on the assumed flow to the AWTS bypass (i.e., water treatment building) of 210 gpm as stated in Assumption 11 of this calculation. Assuming a downtime of 2 hours per day, the resulting equivalent flowrate is 193 gpm. Based on a pump test performed by CWM, Tank T-100 can discharge to AWTS bypass at 77 gpm. Assuming the AWTS bypass will process 77 gpm from Tank T-100 for 24 hours (i.e., secondary containment areas), the tank farm will be able to pump to the AWTS bypass at 116 gpm (193 gpm AWTS bypass capacity - 77 gpm tank T-100 flowrate). After the liquid from secondary containment areas is discharged from Tank T-100, the full capacity of the AWTS bypass is available to the LTF. Based on information presented in Attachment 4 of Appendix B, the LTF pump P-105 is capable of operating at 176 gpm. As a result, after flows from the tank T-100 cease, outflow from the LTF is 176 gpm, as limited by pump P-105.

CWM Chemical Services, LLC
Model City, NY Facility
RMU-1 Leachate Level Compliance Plan - Tank Farm Storage Analysis

Table 2 - Leachate Tank Farm Inflow Calculation

Calculate design event flow from Tank T-165, RMU-1 Landfill Cells, and other sources used as input for Table 1							
Time after start of design storm event	Flow from other sources ¹	Flowrate from T-165 ²	Flow rate from T-165 plus other sources				
(hr)	(gpm)	(gpm)	(gpm)				
11.0	29	160	189				
24.0	29	160	189				
24.1	59	160	219				
48.0	59	160	219				
48.1	29	160	189				
92.7	29	160	189				
92.8	29	0	29				
¹	Flow from SLF 12, secondary containment areas and base flow from RMU-1 landfill cells (see Table 3)						
²	Flowrate from tank T-165 is assumed to be 160 gpm. The duration of flow is based on the tank T-165 pumping rate and the stormwater runoff volume pumped from Basin K as determined in the calculation sheet entitled "Detention Basins and Tank T-165 Storage Capacity" dated August 2011, prepared by ARCADIS, as well as the additional 0.5 feet of liquid remaining in Basin K above the permit compliance level.						

CWM Chemical Services, LLC
Model City, NY Facility
RMU-1 Leachate Level Compliance Plan - Tank Farm Storage Analysis

Table 3- Leachate Tank Farm Inflow from Other Sources

Tabulate flows from secondary containment structures and landfill cell base flows (aka "other sources") used as input for Table 2					
Time after start of design storm event	Flow from secondary containment areas ¹	Flow from SLF-12	Base Flow from RMU-1 Landfill Cells 1-14 ²	Total flow rate	
(hr)	(gpm)	(gpm)	(gpm)	(gpm)	
0	0	1.1	28	29	
24.0	0	1.1	28	29	
24.1	30	1.1	28	59	
48.0	30	1.1	28	59	
48.1	0	1.1	28	29	
92.7	0	1.1	28	29	
92.8	0	1.1	28	29	
	¹ Flow from the Leachate Tank Farm secondary containment that is pumped to tanks T-101, T-102, or T-103 (42,765 gallons). All other facility secondary containment liquids are not placed in these tanks and are instead directed to Tank T-100.				
	² Base flows from RMU-1 Cells 1-14 are assumed to be 2 gpm per cell and occur continuously over the duration of the simulation.				

CWM Chemical Services, LLC
Model City, NY Facility
RMU-1 Leachate Level Compliance Plan - Tank Farm Storage Analysis

Table 4- Tank T-165 Pump Run Time

Calculate pump run time						
Watershed	Total Storm Volume [gal] ¹	Pump Rate [gpm] ²	Pump Run Time [hr] ²			
Tank T-165	775,201	160	80.8			
Remaining Volume in Basin K	9,124	160	1.0			
		Total Pump Run Time [hr]	81.7			
¹ Two stormwater runoff volumes are listed. One represents the volume collected in tank T-165 during the design storm (775,201 gallons) and the other represents the volume remaining in Basin K above the permit compliance level (9,124 gallons). The latter volume is assumed to be transferred to tank T-165 and ultimately to the LTF while the tank is being dewatered. The aforementioned volumes are obtained from the calculation sheet entitled "Detention Basins and Tank T-165 Storage Capacity," dated August 2011, prepared by ARCADIS.						
² Pumping rate is assumed to be 160 gpm. The pump run time is based on the pumping rate and the total storm volume.						

CWM Chemical Services, LLC
Model City, NY Facility
RMU-1 Leachate Level Compliance Plan - Tank Farm Storage Analysis

Table 5- Leachate Tank Farm Summary

		Outflow from Leachate Tank Farm			Inflow to AWTS		
Time after start of design storm event	Total Combined Tank Volume Available	Discharge through P-105	Tanker to tank T-100 ¹	Total Outflow	Inflow from P-105	Inflow from T-100	Total Inflow to AWTS
(hrs)	(gal)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)
11.0	625000	116	0	116	116	77	193
24.0	593176	116	0	116	116	77	193
24.1	592931	116	0	116	116	77	193
35.0	551860	116	0	116	116	77	193
35.1	551483	176	0	176	176	0	176
48.0	537706	176	0	176	176	0	176
48.1	537599	176	0	176	176	0	176
92.7	548611	176	0	176	176	0	176
92.8	548636	176	0	176	176	0	176
120.3	625000	176	0	176	176	0	176

Note

1. Tanker transfer from leachate tank farm to tank T-100 is not required.



Attachment 8

Secondary Containment Area
Tanker Transfer Analysis

Calculation Sheet

Client: CWM Chemical Services, LLC

Project Location: Model City, New York

Project: RMU-1 Leachate Level Compliance Plan (LLCP)

Project No.: B0023785.0000

Subject: Secondary Containment Area Tanker Transfer Analysis

Prepared By: BMS/PTO

Date: November 2011

Reviewed By: BMS

Date: November 2011

Checked By: PHB

Date: November 2011

TASK

Estimate the required storage capacity to compensate for the difference between inflow and outflow at tank T-100. Calculate the time required to discharge water collected from site secondary containment areas to tank T-100.

REFERENCES

1. RMU-1 Leachate Level Compliance Plan (LLCP) – Summary of Secondary Containment Stormwater Volumes table (included with this calculation sheet.)

ASSUMPTIONS

1. The secondary containment areas collect 234,799 gallons during the 25-year, 24-hour design storm. Of this total, 100,206 gallons are required to be collected and transferred to tank T-100 within a 24-hour period. Tanker trucks will be used to collect and transfer 64,836 gallons to tank T-100. The balance (35,370 gallons) is pumped directly to tank T-100 through existing piping systems.
2. Three tanker trucks (having capacities of 5,000 gallons, 4,000 gallons and 1,400 gallons) are used to collect and transport site secondary containment waters to tank T-100 (based on discussions with CWM).
3. Each tanker can discharge to tank T-100 at approximately 83 gallons per minute (gpm) (based on discussions with CWM).
4. Tank T-100 outflow begins 1 hour prior to offloading of first full tanker truck at tank T-100.
5. A full tanker truck arrives at tank T-100 at or before the preceding tanker is finished offloading into tank T-100 (i.e., there is no delay between departure of empty tanker trucks and arrival of full tanker trucks at tank T-100).
6. The time to disconnect one tanker truck from tank T-100 and connect the next full truck is 10 minutes.
7. At the end of the 24-hour period all three tanker trucks are empty.
8. Based on discussions with CWM, downtime associated with tanker truck refueling, shift changes, and personnel breaks can be accommodated within the tanker truck cycle time.

CALCULATIONS

Calculation Sheet

1. Required Storage Capacity to Compensate for Difference Between Tank T-100 Inflow and Outflow Rates

Since 100,206 gallons of water from the secondary containment areas must be collected and transferred to tank T-100 within a 24-hour period, an average inflow of 70 gpm (100,206 gallons ÷ 24 hours ÷ 60 minutes) is required at tank T-100. According to recent monitoring of run times at the tank T-100 pump and corresponding levels in tank T-100, the average tank outflow rate is 77 gpm. Since the tank outflow rate exceeds the inflow rate, zero storage capacity within tank T-100 is required to compensate for difference between tank T-100 inflow and outflow rates.

2. Individual and Fleet-Average Tanker Efficiencies

Based on Assumptions 2, 5, and 6, once the first tanker truck arrives at tank T-100, discharge into the tank continues uninterrupted except for the 10-minute period when one truck is disconnected from the tank and the next full truck is connected. The efficiency of each truck is therefore calculated as follows:

$$\begin{aligned} \text{Efficiency} &= \frac{\text{Time to Discharge into Tank T - 100}}{\text{Total Time at Tank T - 100}} \\ &= \frac{\text{Tanker Capacity} / \text{Required Tanker Discharge Rate}}{\text{Tanker Capacity} / \text{Required Tanker Discharge Rate} + 10 \text{ minutes}} \end{aligned}$$

The tanker efficiency can be interpreted as the percentage of the total time at tank T-100 that represents actual discharge into the tank. Tanker efficiencies for the 5,000 gallon, 4,000 gallon and 1,400 gallon trucks are 85.8 percent, 82.8 percent and 62.8 percent, respectively. Supporting calculations are included as an attachment to this calculation sheet.

Because the capacity of the tanker trucks is not equal, the number of round trips made between the site secondary containment areas and tank T-100 is not expected to be the same. In general, the smaller capacity tankers (e.g., the 1,400 and 4,000 gallon tankers) would be expected to make more round trips than the 5,000 gallon tanker because they can fill up and discharge more quickly. A "return frequency" is, therefore, calculated for each truck as follows:

$$\text{Return Frequency} = \frac{I}{I_1 + I_2 + I_3},$$

where,

$$I = \left[\frac{\text{Total Time at Tank T - 100}}{\text{Sum of Total Times at Tank T - 100 for all Tankers}} \right]^{-1}$$

I_1 = I for Tanker No. 1

I_2 = I for Tanker No. 2

I_3 = I for Tanker No. 3

Calculation Sheet

The return frequency for each tanker can be interpreted as the percentage of the total collection and transfer time that is spent at tank T-100. Return frequencies for the 5,000 gallon, 4,000 gallon and 1,400 gallon trucks are 20.7 percent, 25.0 percent and 54.2 percent, respectively. Supporting calculations are included as an attachment to this calculation sheet.

A weighted efficiency of 72.6 percent for the three tankers is calculated based on the efficiency and return frequency for each individual tanker.

3. Required Time to Discharge

The required time to discharge is determined by calculating the total volume of water that is discharged into tank T-100 from the tanker trucks and dividing it by the available discharge time and the fleet-average tanker efficiency determined above. The required time to discharge is calculated as follows:

$$\text{Required Time to Discharge} = \frac{\text{Total Volume to be Discharged}}{(\text{Discharge Rate})(\text{Weighted Tanker Efficiency})}$$

$$\text{Required Time to Discharge} = \frac{64,836 \text{ gal}}{(83 \text{ gpm})(60 \text{ min/hr})(0.726)} = 17.9 \text{ hr}$$

Supporting calculations are included as an attachment to this calculation sheet.

SUMMARY

Because the tank outflow rate exceeds the inflow rate, zero storage capacity within tank T-100 is required to compensate for difference between tank T-100 inflow and outflow rates. The required time to discharge collected water from site secondary containment areas into tank T-100 is 17.9 hours.

ARCADIS

Calculations

Individual Tanker Efficiency and Average Efficiency of Tanker Fleet

Tanker No.	Capacity [gal]	Tanker Discharge Rate [gpm]	Time to Discharge at Tank T-100 [min]	Connect & Disconnect Time at Tank T-100 [min]	Total Time at Tank T-100 [min]	Tanker Efficiency [%]
1	5000	83.0	60.2	10	70.2	85.8
2	4000	83.0	48.2	10	58.2	82.8
3	1400	83.0	16.9	10	26.9	62.8

Tanker No.	Capacity [gal]	Inverse of (Total Time at Tank T-100/Sum of Total Times at Tank T-100 for all Tankers)	Return Frequency at Tank T-100 [%]	Product of Tanker Efficiency and Return Frequency at Tank T-100
1	5000	2.21	20.7	17.8
2	4000	2.67	25.0	20.7
3	1400	5.78	54.2	34.0
Weighted Efficiency of Tanker Fleet [%]:				72.6

<i>Required Tanker Discharge Rate</i>	
Net Volume Requiring Discharge to Tank T-100 via Tanker Trucks:	64,836
Time Available to Discharge to Tank T-100 [hr]:	24
Weighted Tanker Efficiency [%]:	72.6
Tanker Discharge Rate [gpm]:	83.0
Required Time to Discharge [hr]:	17.9

ARCADIS

References

CWM Chemical Services, LLC
Model City, NY Facility
RMU-1 Leachate Level Compliance Plan - Summary of Secondary Containment Stormwater Volumes

Area ID #	Secondary Containment Location	Area (ft ²)	Volume of Stormwater from 4-inch rain event (4 in. = 0.333 ft)							Comments
			Total Accumulated Storage (gallons)	Process Methods						
				Volume Excluded from AWTS Processing (gallons)	Volume Transferred Directly to LTF (gallons)	Volume Transferred Directly to AWTS prior to tank T-100 (gallons)	Volume Transferred to tank T-100 Following LLCPCP Evaluation Period (gallons)	Volume Processed Through Tank T-100		
								Pumped Inflow	Tanker Inflow	
1	Tank T-52	324	808			808				Drains to W/T Building & pumped into T-3009/T-210 (Bypasses W/T)
2	Tank T-58	24952	62214	62214						Pumped back to T-58
3	SLF 1-6 Lift Station Truck Ramp	715	1781				1781			
4	SLF 7/11 Leachate Collection Bldg Truck Ramp	733	1809	1809						Drains to building during 24 hr/25yr storm only
5	SLF 10 Leachate Collection Bldg Truck Ramp	715	1781	1781						Drains to building during 24 hr/25yr storm only
6	SLF 1-11 OWS Bldg Truck Ramp	715	1781	1781						Drains to building during 24 hr/25yr storm only
7	AT East Tank Farm	2612	6446			6446				Pumped back to T-210 or T-230 (Bypasses W/T)
8	AT Front Unloading Ramp and Sump	1050	5231					5231		
9	Solid Separation Bldg Sump	171	426						426	
10	Tanks TA-1 and TA-2	1920	4739	4739						Pumped back to TA-1, TA-2, T-6001 or T-6002 (Stabilization process water)
11	Stabilization Trailer Unloading Pad	442	1101				1101			
12	Stabilization Baghouses 1, 2, & 3	1911	4764				4764			
13	Full Trailer Parking Area	14702	36622						36622	
14	Stabilization Parking Areas (N, W, S)	10500	26156						26156	
15	Drum Warehouse West Ramp	1848	4604				4604			
16	Leachate Tank Farm (T-101, T-102, T-103)	17325	42765		42765					Pumped back to T-101, 102, or 103 (Deducted for gutters on tanks)
17	Tanks T-100 and T-125 Area	12210	30139					30139		Gutters on tanks T-100, 125 (Deducted tank area)
18	Tank T-130	424	1057						1057	
19	Tanks T-3001 and T-3002	119	294						294	
20	Tank T-3003	114	281						281	
Sum			234799	72324	42765	7254	12250	35370	64836	
Calculations: Total Volume Directed to AWTS = Total Accumulated Storage - Volume Excluded from AWTS Processing - Volume Transferred Directly to LTF - Volume Transferred to Tank T-100 Following LLCPCP Evaluation = 107460 gallons										

- Notes
1. AWTS = Aqueous Wastewater Treatment System
 2. LTF = Leachate Tank Farm
 3. AT = Aqueous Treatment
 4. N/A = Not Applicable
 5. Data presented on this table is based on permit and operations information provided by CWM.
 6. Secondary containment stormwater may be discharged directly to site surface drainage features following acceptable sampling results.

Appendix C

Slope Stability Analysis

Calculation Sheet

Client: CWM Chemical Services, LLC

Project Location: Model City, New York

Project: RMU-1 Leachate Level Compliance Plan (LLCP)

Project No.: B0023785.0000

Subject: Fill Progression Slope Stability Analysis

Prepared By: MSG

Date: November 2011

Reviewed By: APC

Date: November 2011

Checked By: BMS

Date: November 2011

OBJECTIVE:

Evaluate the slope stability for the design grades depicted on the figure entitled *RMU-1 Fill Progression and Truck Routes (Cells 1 Through 14) – Final Sequence Phase 3* for sliding and circular failure for static conditions. Maximum landfill height evaluated is 418.5 feet above mean sea level.

REFERENCES:

1. *Engineering Report for CWM Chemical Services, LLC Model City Facility, Residuals Management Unit-1*, EarthTech.
2. SLOPE/W 2007, Version 7.17, Geo-Slope International Ltd. Calgary, Alberta, Canada.
3. Proposed grading design for waste fill progression and capping for Cells 1 through 14 presented on Figure 1, entitled *Residuals Management Unit-1 Fill Progression and Truck Routes, Cells 1 Through 14 – Final Sequence Phase 3*, ARCADIS, August 2011 (revised November 2011).
4. Figure entitled *Glaciolacustrine Silt/Sand Unit Potentiometric Contour Map*, dated May 15, 2001, prepared by Golder Associates, Inc., January 2002.
5. *RCRA Subtitle D (258) Seismic Design Guidance for Municipal Solid Waste Landfill Facilities*, United States Environmental Protection Agency (USEPA), EPA/600/R-95/051, April 1995.
6. Site-Wide Permit, Module VI, Condition E.2.
7. *Shear Strength Evaluation for Slope Stability Analyses Residuals Management Unit One (RMU-1) Model City Treatment, Storage and Disposal Facility, Model City, New York*, Drs. Robert M. Koerner, Robert B. Gilbert, and Timothy D. Stark and Francis T. Adams, March 2001.
8. *Seismic Analysis and Design Considerations for Municipal Solid Waste Landfills*, New York Association for Solid Waste Management, in cooperation with the New York State Department of Environmental Conservation and the USEPA, March 1994.
9. Figure 1 entitled *Top of Glaciolacustrine Clay Unit Contours, CWM Chemical Services L.L.C., Model City, New York*, prepared by Golder Associates, Inc. and dated May 2003.

Calculation Sheet

10. Figure 2 entitled *Thickness Contours of Glaciolacustrine Clay Unit, CWM Chemical Services L.L.C., Model City, New York*, prepared by Golder Associates, Inc. and dated May 2003.

ASSUMPTIONS:

1. The slope stability analyses provided herein have been performed using similar methods and assumptions as past RMU-1 slope stability analyses and are based on the parameters presented in the table below.

Material	Unit Weight	Material Cohesion	Friction Angle
	(pcf)	(psf)	(degrees)
Waste	111	0	30
Granular Operations Layer	135	0	24
Granular Primary Leachate Collection Layer	135	0	24
Textured Primary Liner	58.7	0	15
Granular Secondary Leachate Collection Layer	135	0	24
Textured Secondary Liner	58.7	0	15
Compacted Clay Layer	130	1,000	10
Structural Fill	130	2,000	0
Upper Till	130	800	10
Glaciolacustrine Clay	125	320	10
Glaciolacustrine Silt/Sand	130	0	30
Bedrock	140	2,000	40

pcf – pounds per cubic foot

The material properties in the above table were obtained from Table 2.0 of Reference 6, with the exception of the waste strength. In an October 13, 2009 letter, P.J. Carey & Associates, PC prepared a formal request on behalf of CWM to increase the internal friction angle of RMU-1 waste to 30 degrees. In a November 25, 2009 letter, the NYSDEC indicated acceptance of the increased strength parameters.

Primary Baseline System

A cross-section of the primary baseliner system consists of the following (from top to bottom):

- Operations Layer (included as a separate layer in the analyses provided herein).
- Non-woven Geotextile (included as a separate layer in the analyses provided herein).
- Granular Layer (included as a separate layer in the analyses provided herein).
- Geotextile/Geonet or Geocomposite.
- 80-mil Textured High-Density Polyethylene (HDPE) Liner.

Calculation Sheet

- Compacted Clay Layer (CCL; included as a separate layer in the analyses provided herein).

Secondary Baseline System

The secondary baseliner system consists of the following components (from top to bottom):

- Non-woven Geotextile (included as a separate layer [i.e., interface between CCL/NWGT] in the analyses provided herein).
- Granular Layer (included as a separate layer in the analyses provided herein).
- Geotextile/Geonet or Geocomposite.
- 80-mil Textured HDPE Membrane.
- CCL (included as a separate layer in the analyses provided herein).

Sideslope Liner System

The sideslope liner system consists of the following (from top to bottom):

- Operations Layer (included as a separate layer in the analyses provided herein).
 - Geocomposite.
 - 80-mil Textured HDPE Membrane.
 - Geocomposite.
 - 80-mil Textured HDPE Membrane.
 - CCL (included as a separate layer in the analyses provided herein).
2. Minimum acceptable factor of safety (FOS) is 1.50 for static analyses and 1.00 for seismic analyses.
 3. Cross-section A-A' is taken along a northwest-southeast orientation and is anticipated to represent a critical condition in terms of fill progression stability.
 4. The piezometric elevation in the table below has been applied to all layers below the secondary leachate collection layer. For the purposes of this analysis, the following was assumed for cross-section A-A' based on Reference 4:

Cross-Section	Elevation of Piezometric Surface (fmsl)	Ground Surface Elevation (fmsl)
A-A'	315.5	320.0

fmsl - feet above mean sea level

Calculation Sheet

5. The analysis considered the effects of the two detention basins on the stability of the waste slopes. For the upper basin, referred to as Detention Basin K on Figure 1, a peak surface water level of El. 371.0 was assumed. For the lower basin, referred to as Detention Basin J on Figure 1, a peak surface water level of El. 351.3 was assumed. Both basins are lined. Surface water in the basins was modeled as a surcharge pressure using a unit weight of 62.4 pcf.
6. Per the waste mass stability requirements in Reference 6, the seismic analysis was completed in accordance with the assumptions and methodology presented in EarthTech's Engineering Report for CWM Chemical Services (Reference 1). Accordingly, a horizontal seismic coefficient of 0.055 is used for the pseudo-static analyses, as provided in Reference 1.
7. For the Glaciolacustrine Clay unit, the top elevation of the unit and its thickness is estimated from References 9 and 10, respectively. The top of the Glaciolacustrine Clay unit has been modeled as El. 305 based on the elevation contours of Figure 1. For the thickness of the Glaciolacustrine Clay unit, the contours of Figure 2 indicate that the thickness of this unit increases from the northwestern end of cross-section A-A' to its southeastern end. Figure 2 indicates that the Glaciolacustrine Clay unit is approximately 20-feet-thick at the northwestern end of the cross-section (boring B-72). At the southeastern end, the thickness of the Glaciolacustrine Unit is estimated to be approximately 24 feet based on interpolation between the contours of Figure 2.

CALCULATIONS:

1. Static Evaluation

The slope stability calculations were performed using the SLOPE/W® computer program by Geo-Slope International, Ltd. (Reference 2). Static analyses were performed using the Spencer method, which satisfies both moment and force equilibrium. Circular searches with forced exit and entry locations were performed to evaluate failure surfaces through the waste layer and to evaluate stability of the deeper soil layers below the liner system. Sliding analyses were also completed to evaluate the stability of the liner system. The limits of the exit/entry locations were varied to estimate the critical failure surface and corresponding minimum FOS.

To evaluate a sliding failure of the liner system, the critical failure surface was assumed to occur along the weakest interface, which was presumed to be the compacted clay layer and non-woven geotextile (CCL/NWGT) interface. Thus, the compacted clay layer is modeled as bedrock in order to limit the failure surface at the CCL/NWGT interface.

Calculation Sheet

Several failure surfaces were evaluated for conditions when the detention basins are dry and also when the detention basins contain the anticipated peak water levels (as noted in Assumption 5 above). These conditions were modeled for failures through the waste and through the Glaciolacustrine Clay unit and for the sliding failure of the liner system. The critical factors of safety for these cases are provided in the table below.

Cross-Section A-A'	Static Stability Analysis (FOS)		
	Circular (through Waste)	Circular (through Glaciolacustrine Clay)	Sliding (along CCL)
Basins Empty	1.66	1.76	2.50
Basins Full	3.40	1.75	2.50
Upper Basin Full, Lower Basin Empty	2.17	1.86	2.50

Because the calculated factors of safety are greater than 1.50, the static stability for the fill progression design is acceptable. Detailed output from the analyses, including figures showing the critical failure surface, is provided in Appendices A and B.

2. Seismic Evaluation

Pseudo-static stability analyses were also performed to determine the stability of the fill progression design under the original design seismic event. The pseudo-static static analyses were performed using the Spencer method. Circular searches with forced exit and entry locations were performed to evaluate failure surfaces through the waste layer and to evaluate stability of the deeper soil layers below the liner system. Sliding analyses were also completed to evaluate the stability of the liner system during a seismic event.

It should be noted that the Glaciolacustrine Clay strength was reduced by 20 percent for the circular mode calculation, as recommended in Reference 5 for saturated, normally consolidated clays. For the global analysis, the critical slip surface was first determined assuming no seismic acceleration. This slip surface was then used with the horizontal seismic coefficient equal to 0.055 (Reference 1), and a FOS was determined for this slip surface.

Calculation Sheet

As with the static stability analysis, several failure surfaces were evaluated for conditions when the detention basins are dry and also when the detention basins contain the anticipated peak water levels (as noted in Assumption 5 above). These conditions were modeled for failures through the waste and through the Glaciolacustrine Clay unit and for the sliding failure of the liner system. The critical factors of safety for these cases are provided in the table below.

Cross-Section A-A'	Pseudo-Static Stability Analysis (FOS)		
	Circular (through Waste)	Circular (through Glaciolacustrine Clay)	Sliding (along CCL)
Basins Empty	1.46	1.23	1.96
Basins Full	2.64	1.23	1.97
Upper Basin Full, Lower Basin Empty	1.81	1.29	1.96

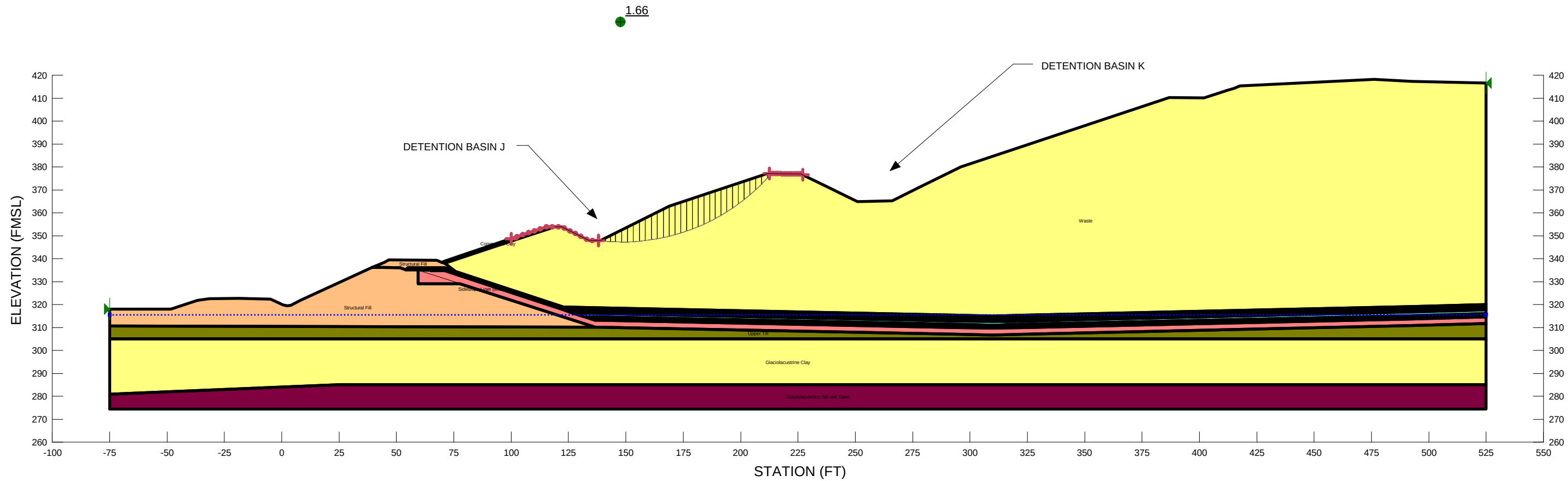
Because the calculated factors of safety are greater than 1.00, the pseudo-static stability for the fill progression design is acceptable. Detailed output from the analyses, including figures showing the critical slip surface, is provided in Attachments C and D.

SUMMARY:

The slope stability evaluation provided herein indicates that acceptable factors of safety (i.e., greater than 1.50 for static and greater than 1.00 for pseudo-static) can be achieved for the revised fill progression design with a maximum landfill elevation of 418.5 feet for both circular and sliding block failure modes.

Appendix A

Static Stability Analysis:
Circular



Name: Lower Waste
Kind: SLOPE/W
Method: Spencer
File Name: STATIC- November 2011.gsz

Section A-A'
Fill Progression Slope Stability Analysis
RMU-1 Leachate Level Compliance Plan
CWM Chemical Services, LLC
Model City, New York

Lower Waste

Report generated using GeoStudio 2007, version 7.17. Copyright © 1991-2010 GEO-SLOPE International Ltd.

File Information

Revision Number: 263
Last Edited By: Giampaolo, Mandy
Date: 11/15/2011
Time: 10:33:57 AM
File Name: STATIC- November 2011.gsz
Directory: C:\Users\mgiampaolo\Documents\ARCADIS Documents\RMU-1\2011 Fill
Progression\Calc in Response to Review Comments\
Last Solved Date: 11/15/2011
Last Solved Time: 10:36:02 AM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Lower Waste

Kind: SLOPE/W
Method: Spencer
Settings
 Apply Phreatic Correction: No
 PWP Conditions Source: Piezometric Line with Ru
Slip Surface
 Direction of movement: Right to Left
 Use Passive Mode: No
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: No
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

operations Layer

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile (2)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Leachate Collection

Model: Mohr-Coulomb
Unit Weight: 135 pcf

Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Sideslope Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Compacted Clay

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion: 1000 psf
Phi: 10 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Secondary Leachate Collection

Model: [Mohr-Coulomb](#)

Unit Weight: [135 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Secondary Liner (textured)

Model: [Mohr-Coulomb](#)

Unit Weight: [58.7 pcf](#)

Cohesion: [0 psf](#)

Phi: [15 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Secondary Compacted Clay

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [1000 psf](#)

Phi: [10 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Structural Fill

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [2000 psf](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Upper Till

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [800 psf](#)

Phi: [10 °](#)

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Ru: 0

Include in PWP: No

Glaciolacustrine Clay

Model: Mohr-Coulomb

Unit Weight: 125 pcf

Cohesion: 320 psf

Phi: 10 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Ru: 0

Include in PWP: No

Glaciolacustrine Silt and Sand

Model: Mohr-Coulomb

Unit Weight: 130 pcf

Cohesion: 0 psf

Phi: 30 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Ru: 0

Include in PWP: No

Slip Surface Entry and Exit

Left Projection: Range

Left-Zone Left Coordinate: (100, 348.75) ft

Left-Zone Right Coordinate: (138, 348) ft

Left-Zone Increment: 15

Right Projection: Range

Right-Zone Left Coordinate: (212.44804, 377.18304) ft

Right-Zone Right Coordinate: (227.1317, 376.63639) ft

Right-Zone Increment: 15

Radius Increments: 5

Slip Surface Limits

Left Coordinate: (-75, 318) ft

Right Coordinate: (525, 416.7) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	-75	315.5
	525	315.5

Seismic Loads

Horz Seismic Load: 0
Vert Seismic Load: 0

Regions

	Material	Points	Area (ft²)
Region 1	Structural Fill	5,42,123,122,121,120,119,118,117,116,41,124,40,39,38,91,92,93,90	2800.853
Region 2	Upper Till	2,5,90,4,83,84,85,86,128,127	2643.4
Region 3	Glaciolacustrine Clay	6,2,127,126,139	12200
Region 4	Glaciolacustrine Silt and Sand	7,6,139,126,125	6100
Region 5	Geotextile (2)	104,87,43,44,45,46,47,136,135,52,51,50,49,48	80.98
Region 6	Primary Leachate Collection	106,104,48,49,50,51,52,135,134,57,56,55,54,53	400.015
Region 7	Primary Liner (textured 1000-2000psf)	102,106,53,54,55,56,57,134,133,62,61,60,59,58	79.5
Region 8	Compacted Clay	100,102,58,59,60,61,62,133,132,67,66,65,64,63	592.695

Region 9	Geotextile	101,100,63,64,65,66,67,132,131,72,71,70,69,68	78.45
Region 10	Secondary Leachate Collection	99,101,68,69,70,71,72,131,130,77,76,75,74,73	390.54
Region 11	operations Layer	38,37,36,107,35,1,34,33,32,31,137,136,47,46,45,44,43,87,88,95,91	472.885
Region 12	Secondary Compacted Clay	91,95,96,94,98,105,103,97,89,78,79,80,81,82,129,128,86,85,84,83,4,90,93,92	1452.252
Region 13	Secondary Liner (textured)	103,102,100,101,99,73,74,75,76,77,130,129,82,81,80,79,78,89,97	79.395
Region 14	Sideslope Liner (textured 1000-2000psf)	96,95,88,87,104,106,102,103,105,98,94	11.54
Region 15	Structural Fill	40,30,29,28,110,27,26,107,36,37,38,39	97.18
Region 16	Waste	26,25,24,23,114,22,21,115,20,19,18,112,17,16,113,15,14,13,12,11,10,9,8,138,137,31,32,33,34,1,35,107	30224.295
Region 17	Compacted Clay	110,109,108,111,24,25,26,27	48.395

Points

	X (ft)	Y (ft)
Point 1	138	318.5
Point 2	-75	305
Point 3	68.5	332.1
Point 4	138	310.2
Point 5	-75	310.7
Point 6	-75	281
Point 7	-75	274.5

Point 8	492.5	417.4
Point 9	476.2	418.3
Point 10	417.7	415.3
Point 11	415	414.3
Point 12	412.5	413.5
Point 13	402	410.1
Point 14	386.9	410.4
Point 15	296	380.1
Point 16	266	365.2
Point 17	251	364.9
Point 18	226.6	376.9
Point 19	211.6	377.2
Point 20	168.9	363
Point 21	138.9	348
Point 22	133.9	348
Point 23	122	354
Point 24	119	354
Point 25	94.8	346
Point 26	71.1	338
Point 27	70	338.4
Point 28	67.5	339.3
Point 29	46.7	339.5
Point 30	44.7	338.5
Point 31	492.5	319.1
Point 32	322.5	315.3
Point 33	309.9	315
Point 34	295.4	315.3
Point 35	122.8	318.9
Point 36	71.1	336
Point 37	55	336.1
Point 38	54	335.1
Point 39	51.5	336
Point 40	39.4	336.3
Point 41	4	319.7
Point 42	-75	314
Point 43	138	317.5

Point 44	295.4	314.3
Point 45	309.9	314
Point 46	322.5	314.3
Point 47	492.5	318.1
Point 48	138	317.3
Point 49	295.4	314.1
Point 50	309.9	313.8
Point 51	322.5	314.1
Point 52	492.5	317.9
Point 53	138	316.3
Point 54	295.4	313.1
Point 55	309.9	312.8
Point 56	322.5	313.1
Point 57	492.5	316.9
Point 58	138	316.1
Point 59	295.4	312.9
Point 60	309.9	312.6
Point 61	322.5	312.9
Point 62	492.5	316.7
Point 63	138	314.6
Point 64	295.4	311.4
Point 65	309.9	311.1
Point 66	322.5	311.4
Point 67	492.5	315.2
Point 68	138	314.4
Point 69	295.4	311.2
Point 70	309.9	310.9
Point 71	322.5	311.2
Point 72	492.5	315
Point 73	138	313.4
Point 74	295.4	310.2
Point 75	309.9	309.9
Point 76	322.5	310.2
Point 77	492.5	314
Point 78	138	313.2
Point 79	295.4	310

Point 80	309.9	309.7
Point 81	322.5	310
Point 82	492.5	313.8
Point 83	295.4	307
Point 84	309.9	306.7
Point 85	322.5	307
Point 86	492.5	310.8
Point 87	122.6	317.9
Point 88	71.1	335
Point 89	136.4	313.2
Point 90	136.6	310.2
Point 91	59.4	335.1
Point 92	59.42601	329.1
Point 93	77.7	329.1
Point 94	71.1	334.8
Point 95	65.1	335
Point 96	65.1	334.8
Point 97	136	313.3
Point 98	122.4	317.8
Point 99	136.2	313.4
Point 100	132.3	314.7
Point 101	132.9	314.5
Point 102	127.5	316.3
Point 103	126.9	316.3
Point 104	123.5	317.6
Point 105	122.9	317.6
Point 106	126.9	316.5
Point 107	75.7	334.5
Point 108	94.8	347
Point 109	71.1	339
Point 110	69.7	338.5
Point 111	115.6	354
Point 112	238.5	371
Point 113	277.6	371
Point 114	127.3	351.3
Point 115	145.5	351.3

Point 116	2.4	319.5
Point 117	0.5	319.9
Point 118	-4.8	322.3
Point 119	-18.8	322.7
Point 120	-31.6	322.5
Point 121	-36.7	321.9
Point 122	-48.3	318
Point 123	-75	318
Point 124	8.1	321.9
Point 125	525	274.5
Point 126	525	285
Point 127	525	305
Point 128	525	311.7
Point 129	525	314.7
Point 130	525	314.9
Point 131	525	315.9
Point 132	525	316.1
Point 133	525	317.6
Point 134	525	317.8
Point 135	525	318.8
Point 136	525	319
Point 137	525	320
Point 138	525	416.7
Point 139	25	285

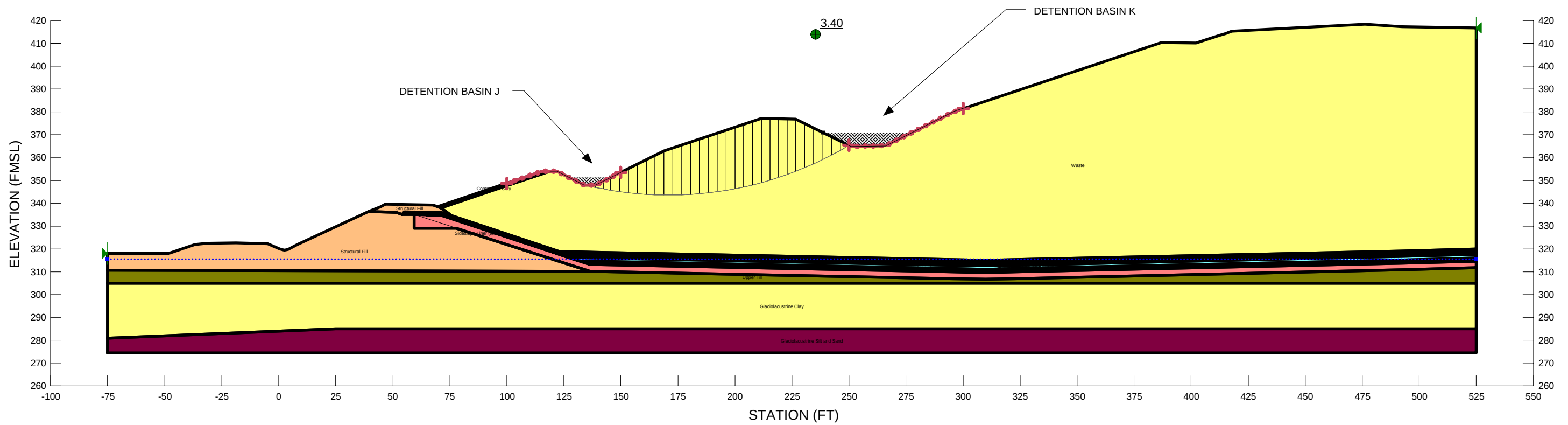
Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	585	1.66	(148.289, 433.275)	85.977	(213.431, 377.163)	(137.325, 348)

Slices of Slip Surface: 585

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	585	138.1126	347.90615	0	13.129902	0	7.6655

2	585	140	347.70575	0	115.81249	0	67.571
3	585	142.2	347.5211	0	285.60819	0	166.52
4	585	144.4	347.39315	0	440.70757	0	256.77
5	585	146.8	347.3208	0	593.94937	0	345.79
6	585	149.4	347.3151	0	743.24566	0	432.35
7	585	152	347.3881	0	875.91347	0	509.12
8	585	154.6	347.54	0	993.00546	0	576.73
9	585	157.2	347.77115	0	1095.4515	0	635.73
10	585	159.8	348.08225	0	1184.0098	0	686.59
11	585	162.4	348.47425	0	1259.3749	0	729.72
12	585	165	348.9482	0	1322.097	0	765.49
13	585	167.6	349.5055	0	1372.7273	0	794.19
14	585	170.1559	350.1355	0	1389.1932	0	803.1
15	585	172.66765	350.8372	0	1373.6531	0	793.53
16	585	175.1794	351.6222	0	1349.6471	0	779.09
17	585	177.6912	352.4929	0	1317.4134	0	759.91
18	585	180.20295	353.45215	0	1277.0796	0	736.11
19	585	182.7147	354.50315	0	1228.8958	0	707.79
20	585	185.2265	355.6496	0	1172.9073	0	675.03
21	585	187.73825	356.89585	0	1109.2639	0	637.92
22	585	190.25	358.2469	0	1038.0479	0	596.51
23	585	192.76175	359.7085	0	959.36612	0	550.88
24	585	195.2735	361.2874	0	873.30275	0	501.07
25	585	197.7853	362.99155	0	779.91745	0	447.13
26	585	200.29705	364.8303	0	679.25686	0	389.13
27	585	202.8088	366.81485	0	571.44352	0	327.12
28	585	205.3206	368.9587	0	456.56252	0	261.17
29	585	207.83235	371.2785	0	334.83518	0	191.4
30	585	210.3441	373.79495	0	206.45282	0	117.95
31	585	212.51555	376.1343	0	69.915448	0	39.914



Name: Lower Waste, both Basins full
Kind: SLOPE/W
Method: Spencer
File Name: STATIC- November 2011.gsz

Section A-A'
Fill Progression Slope Stability Analysis
RMU-1 Leachate Level Compliance Plan
CWM Chemical Services, LLC
Model City, New York

Lower Waste, both Basins full

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File Information

Revision Number: 265
Last Edited By: Giampaolo, Mandy
Date: 11/16/2011
Time: 9:01:54 AM
File Name: STATIC- November 2011.gsz
Directory: C:\Users\mgiampaolo\Documents\ARCADIS Documents\RMU-1\2011 Fill
Progression\Calc in Response to Review Comments\
Last Solved Date: 11/16/2011
Last Solved Time: 9:02:08 AM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Lower Waste, both Basins full

Kind: SLOPE/W
Method: Spencer
Settings
 Apply Phreatic Correction: No
 PWP Conditions Source: Piezometric Line with Ru
Slip Surface
 Direction of movement: Right to Left
 Use Passive Mode: No
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: No
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

operations Layer

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile (2)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Leachate Collection

Model: Mohr-Coulomb
Unit Weight: 135 pcf

Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Sideslope Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Compacted Clay

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion: 1000 psf
Phi: 10 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Secondary Leachate Collection

Model: [Mohr-Coulomb](#)

Unit Weight: [135 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Secondary Liner (textured)

Model: [Mohr-Coulomb](#)

Unit Weight: [58.7 pcf](#)

Cohesion: [0 psf](#)

Phi: [15 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Secondary Compacted Clay

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [1000 psf](#)

Phi: [10 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Structural Fill

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [2000 psf](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Upper Till

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [800 psf](#)

Phi: [10 °](#)

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Ru: 0

Include in PWP: No

Glaciolacustrine Clay

Model: Mohr-Coulomb

Unit Weight: 125 pcf

Cohesion: 320 psf

Phi: 10 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Ru: 0

Include in PWP: No

Glaciolacustrine Silt and Sand

Model: Mohr-Coulomb

Unit Weight: 130 pcf

Cohesion: 0 psf

Phi: 30 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Ru: 0

Include in PWP: No

Slip Surface Entry and Exit

Left Projection: Range

Left-Zone Left Coordinate: (100, 348.75) ft

Left-Zone Right Coordinate: (150, 353.55) ft

Left-Zone Increment: 15

Right Projection: Range

Right-Zone Left Coordinate: (249.99925, 365.38837) ft

Right-Zone Right Coordinate: (300, 381.43333) ft

Right-Zone Increment: 15

Radius Increments: 5

Slip Surface Limits

Left Coordinate: (-75, 318) ft

Right Coordinate: (525, 416.7) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	-75	315.5
	525	315.5

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Vertical

Coordinates

	X (ft)	Y (ft)
	238.5	371
	277.6	371

Surcharge Load 2

Surcharge (Unit Weight): 62.4 pcf
Direction: Vertical

Coordinates

	X (ft)	Y (ft)
	127.3	351.3
	145.5	351.3

Seismic Loads

Horz Seismic Load: 0
Vert Seismic Load: 0

Regions

	Material	Points	Area (ft²)
Regi	Structural	5,42,123,122,121,120,119,118,117,116,41,124,40,39,38,91,92,93,90	2800.8

on 1	Fill		53
Region 2	Upper Till	2,5,90,4,83,84,85,86,128,127	2643.4
Region 3	Glaciolacustrine Clay	6,2,127,126,139	12200
Region 4	Glaciolacustrine Silt and Sand	7,6,139,126,125	6100
Region 5	Geotextile (2)	104,87,43,44,45,46,47,136,135,52,51,50,49,48	80.98
Region 6	Primary Leachate Collection	106,104,48,49,50,51,52,135,134,57,56,55,54,53	400.015
Region 7	Primary Liner (textured 1000-2000psf)	102,106,53,54,55,56,57,134,133,62,61,60,59,58	79.5
Region 8	Compacted Clay	100,102,58,59,60,61,62,133,132,67,66,65,64,63	592.695
Region 9	Geotextile	101,100,63,64,65,66,67,132,131,72,71,70,69,68	78.45
Region 10	Secondary Leachate Collection	99,101,68,69,70,71,72,131,130,77,76,75,74,73	390.54
Region 11	operations Layer	38,37,36,107,35,1,34,33,32,31,137,136,47,46,45,44,43,87,88,95,91	472.885
Region 12	Secondary Compacted Clay	91,95,96,94,98,105,103,97,89,78,79,80,81,82,129,128,86,85,84,83,4,90,93,92	1452.252
Region 13	Secondary Liner (textured)	103,102,100,101,99,73,74,75,76,77,130,129,82,81,80,79,78,89,97	79.395
Region 14	Sideslope Liner (textured 1000-2000psf)	96,95,88,87,104,106,102,103,105,98,94	11.54

Region 15	Structural Fill	40,30,29,28,110,27,26,107,36,37,38,39	97.18
Region 16	Waste	26,25,24,23,114,22,21,115,20,19,18,112,17,16,113,15,14,13,12,11,10,9,8,138,137,31,32,33,34,1,35,107	30224.295
Region 17	Compacted Clay	110,109,108,111,24,25,26,27	48.395

Points

	X (ft)	Y (ft)
Point 1	138	318.5
Point 2	-75	305
Point 3	68.5	332.1
Point 4	138	310.2
Point 5	-75	310.7
Point 6	-75	281
Point 7	-75	274.5
Point 8	492.5	417.4
Point 9	476.2	418.3
Point 10	417.7	415.3
Point 11	415	414.3
Point 12	412.5	413.5
Point 13	402	410.1
Point 14	386.9	410.4
Point 15	296	380.1
Point 16	266	365.2
Point 17	251	364.9
Point 18	226.6	376.9
Point 19	211.6	377.2
Point 20	168.9	363
Point 21	138.9	348
Point 22	133.9	348
Point 23	122	354
Point 24	119	354

Point 25	94.8	346
Point 26	71.1	338
Point 27	70	338.4
Point 28	67.5	339.3
Point 29	46.7	339.5
Point 30	44.7	338.5
Point 31	492.5	319.1
Point 32	322.5	315.3
Point 33	309.9	315
Point 34	295.4	315.3
Point 35	122.8	318.9
Point 36	71.1	336
Point 37	55	336.1
Point 38	54	335.1
Point 39	51.5	336
Point 40	39.4	336.3
Point 41	4	319.7
Point 42	-75	314
Point 43	138	317.5
Point 44	295.4	314.3
Point 45	309.9	314
Point 46	322.5	314.3
Point 47	492.5	318.1
Point 48	138	317.3
Point 49	295.4	314.1
Point 50	309.9	313.8
Point 51	322.5	314.1
Point 52	492.5	317.9
Point 53	138	316.3
Point 54	295.4	313.1
Point 55	309.9	312.8
Point 56	322.5	313.1
Point 57	492.5	316.9
Point 58	138	316.1
Point 59	295.4	312.9
Point 60	309.9	312.6

Point 61	322.5	312.9
Point 62	492.5	316.7
Point 63	138	314.6
Point 64	295.4	311.4
Point 65	309.9	311.1
Point 66	322.5	311.4
Point 67	492.5	315.2
Point 68	138	314.4
Point 69	295.4	311.2
Point 70	309.9	310.9
Point 71	322.5	311.2
Point 72	492.5	315
Point 73	138	313.4
Point 74	295.4	310.2
Point 75	309.9	309.9
Point 76	322.5	310.2
Point 77	492.5	314
Point 78	138	313.2
Point 79	295.4	310
Point 80	309.9	309.7
Point 81	322.5	310
Point 82	492.5	313.8
Point 83	295.4	307
Point 84	309.9	306.7
Point 85	322.5	307
Point 86	492.5	310.8
Point 87	122.6	317.9
Point 88	71.1	335
Point 89	136.4	313.2
Point 90	136.6	310.2
Point 91	59.4	335.1
Point 92	59.42601	329.1
Point 93	77.7	329.1
Point 94	71.1	334.8
Point 95	65.1	335
Point 96	65.1	334.8

Point 97	136	313.3
Point 98	122.4	317.8
Point 99	136.2	313.4
Point 100	132.3	314.7
Point 101	132.9	314.5
Point 102	127.5	316.3
Point 103	126.9	316.3
Point 104	123.5	317.6
Point 105	122.9	317.6
Point 106	126.9	316.5
Point 107	75.7	334.5
Point 108	94.8	347
Point 109	71.1	339
Point 110	69.7	338.5
Point 111	115.6	354
Point 112	238.5	371
Point 113	277.6	371
Point 114	127.3	351.3
Point 115	145.5	351.3
Point 116	2.4	319.5
Point 117	0.5	319.9
Point 118	-4.8	322.3
Point 119	-18.8	322.7
Point 120	-31.6	322.5
Point 121	-36.7	321.9
Point 122	-48.3	318
Point 123	-75	318
Point 124	8.1	321.9
Point 125	525	274.5
Point 126	525	285
Point 127	525	305
Point 128	525	311.7
Point 129	525	314.7
Point 130	525	314.9
Point 131	525	315.9
Point 132	525	316.1

Point 133	525	317.6
Point 134	525	317.8
Point 135	525	318.8
Point 136	525	319
Point 137	525	320
Point 138	525	416.7
Point 139	25	285

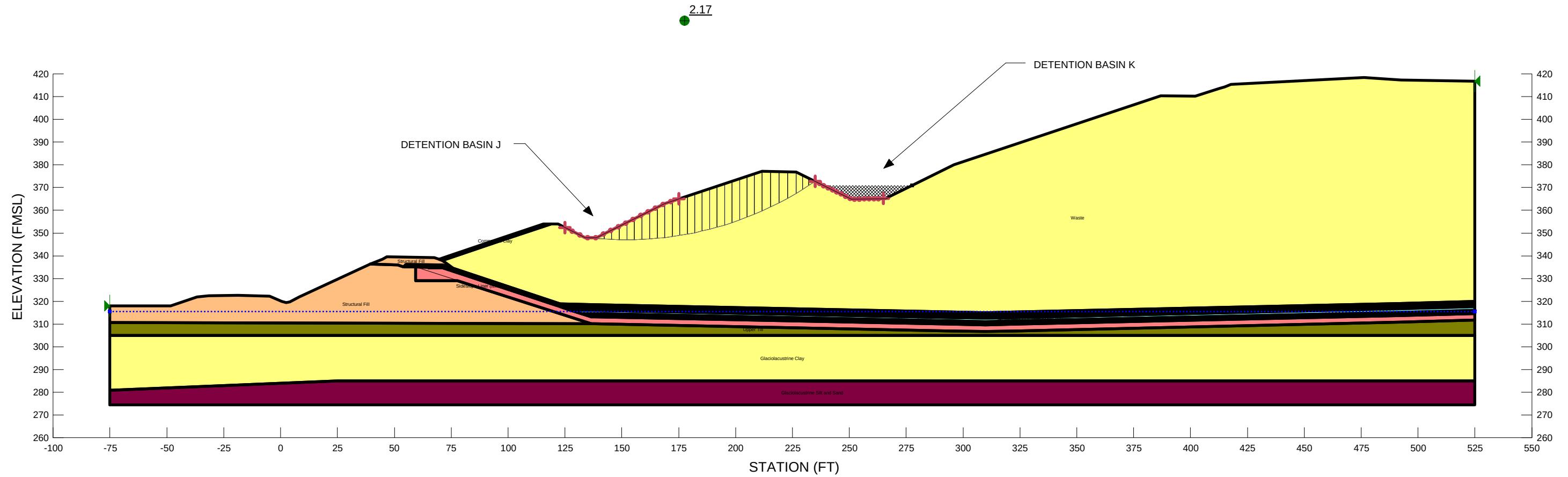
Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	962	3.40	(170.963, 497.699)	154.12	(249.999, 365.388)	(134.315, 348)

Slices of Slip Surface: 962

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	962	136.60745	347.4757	0	294.31406	0	170.05
2	962	140.55	346.61925	0	440.49696	0	254.49
3	962	143.85	345.9922	0	600.81371	0	347.1
4	962	147.45	345.3963	0	828.21407	0	478.45
5	962	151.35	344.84505	0	1118.9548	0	646.36
6	962	155.25	344.39495	0	1392.5	0	804.35
7	962	159.15	344.0452	0	1649.5173	0	952.76
8	962	163.05	343.79505	0	1890.5287	0	1091.9
9	962	166.95	343.644	0	2116.0001	0	1222.1
10	962	170.8409	343.59165	0	2288.7981	0	1321.8
11	962	174.7227	343.6375	0	2410.2917	0	1391.9
12	962	178.60455	343.78125	0	2518.7574	0	1454.5
13	962	182.4864	344.02315	0	2614.37	0	1509.6
14	962	186.3682	344.3637	0	2697.5209	0	1557.5
15	962	190.25	344.80355	0	2767.9931	0	1598.2
16	962	194.1318	345.34355	0	2826.4739	0	1631.8
17	962	198.0136	345.98475	0	2872.6574	0	1658.4
18	962	201.89545	346.7285	0	2906.7794	0	1678.1

19	962	205.7773	347.5763	0	2928.8548	0	1690.8
20	962	209.6591	348.5299	0	2939.1787	0	1696.7
21	962	213.475	349.5715	0	2869.2389	0	1656.1
22	962	217.225	350.6997	0	2720.714	0	1570.4
23	962	220.975	351.9331	0	2563.4493	0	1479.6
24	962	224.725	353.27435	0	2397.565	0	1383.7
25	962	228.58335	354.7719	0	2122.6689	0	1225
26	962	232.55	356.43615	0	1741.1261	0	1004.8
27	962	236.51665	358.23305	0	1353.3653	0	780.96
28	962	240.41655	360.1329	0	1018.9094	0	587.93
29	962	244.24965	362.1366	0	736.2715	0	424.82
30	962	248.0827	364.28055	0	445.77315	0	257.19



Name: Lower Waste, with Basin K full
Kind: SLOPE/W
Method: Spencer
File Name: STATIC- November 2011.gsz

Section A-A'
Fill Progression Slope Stability Analysis
RMU-1 Leachate Level Compliance Plan
CWM Chemical Services, LLC
Model City, New York

Lower Waste, with Basin K full

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File Information

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Time: 10:33:57 AM
File Name: STATIC- November 2011.gsz
Directory: C:\Users\mgiampaolo\Documents\ARCADIS Documents\RMU-1\2011 Fill
Progression\Calc in Response to Review Comments\
Last Solved Date: 11/15/2011
Last Solved Time: 10:36:46 AM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Lower Waste, with Basin K full

Kind: SLOPE/W
Method: Spencer
Settings
 Apply Phreatic Correction: No
 PWP Conditions Source: Piezometric Line with Ru
Slip Surface
 Direction of movement: Right to Left
 Use Passive Mode: No
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: No
Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

operations Layer

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile (2)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Leachate Collection

Model: Mohr-Coulomb
Unit Weight: 135 pcf

Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Sideslope Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Compacted Clay

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion: 1000 psf
Phi: 10 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Secondary Leachate Collection

Model: [Mohr-Coulomb](#)

Unit Weight: [135 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Secondary Liner (textured)

Model: [Mohr-Coulomb](#)

Unit Weight: [58.7 pcf](#)

Cohesion: [0 psf](#)

Phi: [15 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Secondary Compacted Clay

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [1000 psf](#)

Phi: [10 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Structural Fill

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [2000 psf](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Upper Till

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [800 psf](#)

Phi: [10 °](#)

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Ru: 0

Include in PWP: No

Glaciolacustrine Clay

Model: Mohr-Coulomb

Unit Weight: 125 pcf

Cohesion: 320 psf

Phi: 10 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Ru: 0

Include in PWP: No

Glaciolacustrine Silt and Sand

Model: Mohr-Coulomb

Unit Weight: 130 pcf

Cohesion: 0 psf

Phi: 30 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Ru: 0

Include in PWP: No

Slip Surface Entry and Exit

Left Projection: Range

Left-Zone Left Coordinate: (124.99387, 352.47482) ft

Left-Zone Right Coordinate: (175, 365.02857) ft

Left-Zone Increment: 15

Right Projection: Range

Right-Zone Left Coordinate: (234.99877, 372.7359) ft

Right-Zone Right Coordinate: (265, 365.18) ft

Right-Zone Increment: 15

Radius Increments: 5

Slip Surface Limits

Left Coordinate: (-75, 318) ft

Right Coordinate: (525, 416.7) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	-75	315.5
	525	315.5

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	238.5	371
	277.6	371

Seismic Loads

Horz Seismic Load: 0
Vert Seismic Load: 0

Regions

	Material	Points	Area (ft²)
Region 1	Structural Fill	5,42,123,122,121,120,119,118,117,116,41,124,40,39,38,91,92,93,90	2800.853
Region 2	Upper Till	2,5,90,4,83,84,85,86,128,127	2643.4
Region 3	Glaciolacustrine Clay	6,2,127,126,139	12200
Region 4	Glaciolacustrine Silt and Sand	7,6,139,126,125	6100

Region 5	Geotextile (2)	104,87,43,44,45,46,47,136,135,52,51,50,49,48	80.98
Region 6	Primary Leachate Collection	106,104,48,49,50,51,52,135,134,57,56,55,54,53	400.015
Region 7	Primary Liner (textured 1000-2000psf)	102,106,53,54,55,56,57,134,133,62,61,60,59,58	79.5
Region 8	Compacted Clay	100,102,58,59,60,61,62,133,132,67,66,65,64,63	592.695
Region 9	Geotextile	101,100,63,64,65,66,67,132,131,72,71,70,69,68	78.45
Region 10	Secondary Leachate Collection	99,101,68,69,70,71,72,131,130,77,76,75,74,73	390.54
Region 11	operations Layer	38,37,36,107,35,1,34,33,32,31,137,136,47,46,45,44,43,87,88,95,91	472.885
Region 12	Secondary Compacted Clay	91,95,96,94,98,105,103,97,89,78,79,80,81,82,129,128,86,85,84,83,4,90,93,92	1452.252
Region 13	Secondary Liner (textured)	103,102,100,101,99,73,74,75,76,77,130,129,82,81,80,79,78,89,97	79.395
Region 14	Sideslope Liner (textured 1000-2000psf)	96,95,88,87,104,106,102,103,105,98,94	11.54
Region 15	Structural Fill	40,30,29,28,110,27,26,107,36,37,38,39	97.18
Region 16	Waste	26,25,24,23,114,22,21,115,20,19,18,112,17,16,113,15,14,13,12,11,10,9,8,138,137,31,32,33,34,1,35,107	30224.295
Region	Compacted Clay	110,109,108,111,24,25,26,27	48.395

17			

Points

	X (ft)	Y (ft)
Point 1	138	318.5
Point 2	-75	305
Point 3	68.5	332.1
Point 4	138	310.2
Point 5	-75	310.7
Point 6	-75	281
Point 7	-75	274.5
Point 8	492.5	417.4
Point 9	476.2	418.3
Point 10	417.7	415.3
Point 11	415	414.3
Point 12	412.5	413.5
Point 13	402	410.1
Point 14	386.9	410.4
Point 15	296	380.1
Point 16	266	365.2
Point 17	251	364.9
Point 18	226.6	376.9
Point 19	211.6	377.2
Point 20	168.9	363
Point 21	138.9	348
Point 22	133.9	348
Point 23	122	354
Point 24	119	354
Point 25	94.8	346
Point 26	71.1	338
Point 27	70	338.4
Point 28	67.5	339.3
Point 29	46.7	339.5
Point 30	44.7	338.5
Point 31	492.5	319.1

Point 32	322.5	315.3
Point 33	309.9	315
Point 34	295.4	315.3
Point 35	122.8	318.9
Point 36	71.1	336
Point 37	55	336.1
Point 38	54	335.1
Point 39	51.5	336
Point 40	39.4	336.3
Point 41	4	319.7
Point 42	-75	314
Point 43	138	317.5
Point 44	295.4	314.3
Point 45	309.9	314
Point 46	322.5	314.3
Point 47	492.5	318.1
Point 48	138	317.3
Point 49	295.4	314.1
Point 50	309.9	313.8
Point 51	322.5	314.1
Point 52	492.5	317.9
Point 53	138	316.3
Point 54	295.4	313.1
Point 55	309.9	312.8
Point 56	322.5	313.1
Point 57	492.5	316.9
Point 58	138	316.1
Point 59	295.4	312.9
Point 60	309.9	312.6
Point 61	322.5	312.9
Point 62	492.5	316.7
Point 63	138	314.6
Point 64	295.4	311.4
Point 65	309.9	311.1
Point 66	322.5	311.4
Point 67	492.5	315.2

Point 68	138	314.4
Point 69	295.4	311.2
Point 70	309.9	310.9
Point 71	322.5	311.2
Point 72	492.5	315
Point 73	138	313.4
Point 74	295.4	310.2
Point 75	309.9	309.9
Point 76	322.5	310.2
Point 77	492.5	314
Point 78	138	313.2
Point 79	295.4	310
Point 80	309.9	309.7
Point 81	322.5	310
Point 82	492.5	313.8
Point 83	295.4	307
Point 84	309.9	306.7
Point 85	322.5	307
Point 86	492.5	310.8
Point 87	122.6	317.9
Point 88	71.1	335
Point 89	136.4	313.2
Point 90	136.6	310.2
Point 91	59.4	335.1
Point 92	59.42601	329.1
Point 93	77.7	329.1
Point 94	71.1	334.8
Point 95	65.1	335
Point 96	65.1	334.8
Point 97	136	313.3
Point 98	122.4	317.8
Point 99	136.2	313.4
Point 100	132.3	314.7
Point 101	132.9	314.5
Point 102	127.5	316.3
Point 103	126.9	316.3

Point 104	123.5	317.6
Point 105	122.9	317.6
Point 106	126.9	316.5
Point 107	75.7	334.5
Point 108	94.8	347
Point 109	71.1	339
Point 110	69.7	338.5
Point 111	115.6	354
Point 112	238.5	371
Point 113	277.6	371
Point 114	127.3	351.3
Point 115	145.5	351.3
Point 116	2.4	319.5
Point 117	0.5	319.9
Point 118	-4.8	322.3
Point 119	-18.8	322.7
Point 120	-31.6	322.5
Point 121	-36.7	321.9
Point 122	-48.3	318
Point 123	-75	318
Point 124	8.1	321.9
Point 125	525	274.5
Point 126	525	285
Point 127	525	305
Point 128	525	311.7
Point 129	525	314.7
Point 130	525	314.9
Point 131	525	315.9
Point 132	525	316.1
Point 133	525	317.6
Point 134	525	317.8
Point 135	525	318.8
Point 136	525	319
Point 137	525	320
Point 138	525	416.7
Point 139	25	285

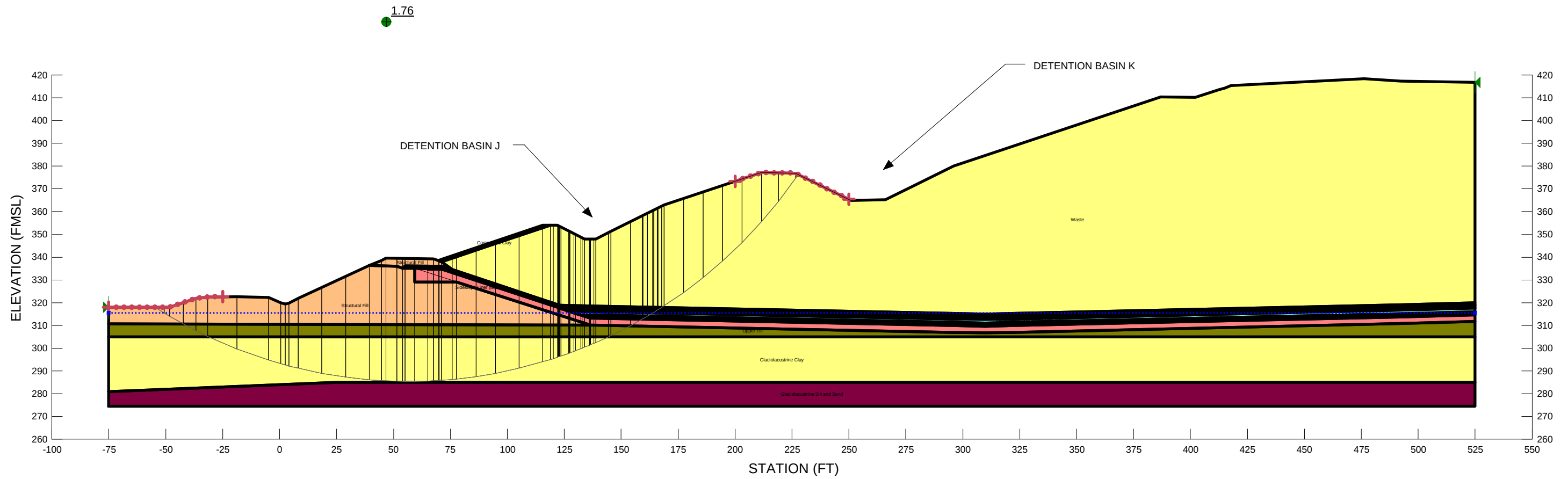
Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	290	2.17	(151.732, 494.804)	147.763	(234.999, 372.736)	(134.92, 348)

Slices of Slip Surface: 290

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	290	136.9101	347.79935	0	25.347449	0	14.68
2	290	140.55	347.4735	0	168.24647	0	97.413
3	290	143.85	347.26015	0	394.98231	0	228.65
4	290	147.17145	347.1204	0	608.26145	0	352.03
5	290	150.5143	347.055	0	808.41264	0	467.77
6	290	153.85715	347.06525	0	994.55522	0	575.38
7	290	157.2	347.1512	0	1167.2425	0	675.14
8	290	160.54285	347.31295	0	1326.8865	0	767.32
9	290	163.8857	347.5508	0	1473.8725	0	852.17
10	290	167.22855	347.86505	0	1608.6466	0	929.89
11	290	170.5423	348.2521	0	1699.8927	0	982.46
12	290	173.8269	348.7113	0	1749.2939	0	1010.8
13	290	177.1115	349.24605	0	1789.1099	0	1033.6
14	290	180.39615	349.8572	0	1819.5296	0	1051
15	290	183.6808	350.5457	0	1840.791	0	1063.1
16	290	186.9654	351.31265	0	1852.9732	0	1069.9
17	290	190.25	352.1594	0	1856.2661	0	1071.6
18	290	193.5346	353.08735	0	1850.7628	0	1068.2
19	290	196.8192	354.09805	0	1836.6086	0	1059.8
20	290	200.10385	355.1933	0	1813.8275	0	1046.5
21	290	203.3885	356.37515	0	1782.5589	0	1028.2
22	290	206.6731	357.6459	0	1742.8254	0	1005.1
23	290	209.9577	359.00795	0	1694.6852	0	977.17
24	290	213.475	360.5746	0	1570.8987	0	905.61
25	290	217.225	362.3643	0	1373.1666	0	791.43
26	290	220.975	364.28625	0	1168.4405	0	673.28

27	290	224.725	366.3464	0	956.80002	0	551.2
28	290	227.9998	368.25545	0	707.86096	0	407.71
29	290	230.7994	369.9858	0	424.7398	0	244.59
30	290	233.599	371.8042	0	141.02218	0	81.195



Name: Global
Kind: SLOPE/W
Method: Spencer
File Name: STATIC- November 2011.gsz

Section A-A'
Fill Progression Slope Stability Analysis
RMU-1 Leachate Level Compliance Plan
CWM Chemical Services, LLC
Model City, New York

Global

Report generated using GeoStudio 2007, version 7.17. Copyright © 1991-2010 GEO-SLOPE International Ltd.

File Information

Revision Number: 263
Last Edited By: Giampaolo, Mandy
Date: 11/15/2011
Time: 10:33:57 AM
File Name: STATIC- November 2011.gsz
Directory: C:\Users\mgiampaolo\Documents\ARCADIS Documents\RMU-1\2011 Fill
Progression\Calc in Response to Review Comments\
Last Solved Date: 11/15/2011
Last Solved Time: 10:34:22 AM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Global

Kind: SLOPE/W
Method: Spencer
Settings
 Apply Phreatic Correction: No
 PWP Conditions Source: Piezometric Line with Ru
Slip Surface
 Direction of movement: Right to Left
 Use Passive Mode: No
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: No
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

operations Layer

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile (2)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Leachate Collection

Model: Mohr-Coulomb
Unit Weight: 135 pcf

Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Sideslope Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Compacted Clay

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion: 1000 psf
Phi: 10 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Secondary Leachate Collection

Model: [Mohr-Coulomb](#)

Unit Weight: [135 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Secondary Liner (textured)

Model: [Mohr-Coulomb](#)

Unit Weight: [58.7 pcf](#)

Cohesion: [0 psf](#)

Phi: [15 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Secondary Compacted Clay

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [1000 psf](#)

Phi: [10 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Structural Fill

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [2000 psf](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Upper Till

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [800 psf](#)

Phi: [10 °](#)

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Ru: 0

Include in PWP: No

Glaciolacustrine Clay

Model: Mohr-Coulomb

Unit Weight: 125 pcf

Cohesion: 320 psf

Phi: 10 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Ru: 0

Include in PWP: No

Glaciolacustrine Silt and Sand

Model: Mohr-Coulomb

Unit Weight: 130 pcf

Cohesion: 0 psf

Phi: 30 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Ru: 0

Include in PWP: No

Slip Surface Entry and Exit

Left Projection: Range

Left-Zone Left Coordinate: (-75, 318) ft

Left-Zone Right Coordinate: (-25, 322.60312) ft

Left-Zone Increment: 15

Right Projection: Range

Right-Zone Left Coordinate: (200, 373.34239) ft

Right-Zone Right Coordinate: (249.99925, 365.38837) ft

Right-Zone Increment: 15

Radius Increments: 10

Slip Surface Limits

Left Coordinate: (-75, 318) ft

Right Coordinate: (525, 416.7) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	-75	315.5
	525	315.5

Seismic Loads

Horz Seismic Load: 0
Vert Seismic Load: 0

Regions

	Material	Points	Area (ft²)
Region 1	Structural Fill	5,42,123,122,121,120,119,118,117,116,41,124,40,39,38,91,92,93,90	2800.853
Region 2	Upper Till	2,5,90,4,83,84,85,86,128,127	2643.4
Region 3	Glaciolacustrine Clay	6,2,127,126,139	12200
Region 4	Glaciolacustrine Silt and Sand	7,6,139,126,125	6100
Region 5	Geotextile (2)	104,87,43,44,45,46,47,136,135,52,51,50,49,48	80.98
Region 6	Primary Leachate Collection	106,104,48,49,50,51,52,135,134,57,56,55,54,53	400.015
Region 7	Primary Liner (textured 1000-2000psf)	102,106,53,54,55,56,57,134,133,62,61,60,59,58	79.5
Region 8	Compacted Clay	100,102,58,59,60,61,62,133,132,67,66,65,64,63	592.695

Region 9	Geotextile	101,100,63,64,65,66,67,132,131,72,71,70,69,68	78.45
Region 10	Secondary Leachate Collection	99,101,68,69,70,71,72,131,130,77,76,75,74,73	390.54
Region 11	operations Layer	38,37,36,107,35,1,34,33,32,31,137,136,47,46,45,44,43,87,88,95,91	472.885
Region 12	Secondary Compacted Clay	91,95,96,94,98,105,103,97,89,78,79,80,81,82,129,128,86,85,84,83,4,90,93,92	1452.252
Region 13	Secondary Liner (textured)	103,102,100,101,99,73,74,75,76,77,130,129,82,81,80,79,78,89,97	79.395
Region 14	Sideslope Liner (textured 1000-2000psf)	96,95,88,87,104,106,102,103,105,98,94	11.54
Region 15	Structural Fill	40,30,29,28,110,27,26,107,36,37,38,39	97.18
Region 16	Waste	26,25,24,23,114,22,21,115,20,19,18,112,17,16,113,15,14,13,12,11,10,9,8,138,137,31,32,33,34,1,35,107	30224.295
Region 17	Compacted Clay	110,109,108,111,24,25,26,27	48.395

Points

	X (ft)	Y (ft)
Point 1	138	318.5
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Point 18	226.6	376.9
Point 19	211.6	377.2
Point 20	168.9	363
Point 21	138.9	348
Point 22	133.9	348
Point 23	122	354
Point 24	119	354
Point 25	94.8	346
Point 26	71.1	338
Point 27	70	338.4
Point 28	67.5	339.3
Point 29	46.7	339.5
Point 30	44.7	338.5
Point 31	492.5	319.1
Point 32	322.5	315.3
Point 33	309.9	315
Point 34	295.4	315.3
Point 35	122.8	318.9
Point 36	71.1	336
Point 37	55	336.1
Point 38	54	335.1
Point 39	51.5	336
Point 40	39.4	336.3
Point 41	4	319.7
Point 42	-75	314
Point 43	138	317.5

Point 44	295.4	314.3
Point 45	309.9	314
Point 46	322.5	314.3
Point 47	492.5	318.1
Point 48	138	317.3
Point 49	295.4	314.1
Point 50	309.9	313.8
Point 51	322.5	314.1
Point 52	492.5	317.9
Point 53	138	316.3
Point 54	295.4	313.1
Point 55	309.9	312.8
Point 56	322.5	313.1
Point 57	492.5	316.9
Point 58	138	316.1
Point 59	295.4	312.9
Point 60	309.9	312.6
Point 61	322.5	312.9
Point 62	492.5	316.7
Point 63	138	314.6
Point 64	295.4	311.4
Point 65	309.9	311.1
Point 66	322.5	311.4
Point 67	492.5	315.2
Point 68	138	314.4
Point 69	295.4	311.2
Point 70	309.9	310.9
Point 71	322.5	311.2
Point 72	492.5	315
Point 73	138	313.4
Point 74	295.4	310.2
Point 75	309.9	309.9
Point 76	322.5	310.2
Point 77	492.5	314
Point 78	138	313.2
Point 79	295.4	310

Point 80	309.9	309.7
Point 81	322.5	310
Point 82	492.5	313.8
Point 83	295.4	307
Point 84	309.9	306.7
Point 85	322.5	307
Point 86	492.5	310.8
Point 87	122.6	317.9
Point 88	71.1	335
Point 89	136.4	313.2
Point 90	136.6	310.2
Point 91	59.4	335.1
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Point 97	136	313.3
Point 98	122.4	317.8
Point 99	136.2	313.4
Point 100	132.3	314.7
Point 101	132.9	314.5
Point 102	127.5	316.3
Point 103	126.9	316.3
Point 104	123.5	317.6
Point 105	122.9	317.6
Point 106	126.9	316.5
Point 107	75.7	334.5
Point 108	94.8	347
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Point 111	115.6	354
Point 112	238.5	371
Point 113	277.6	371
Point 114	127.3	351.3
Point 115	145.5	351.3

Point 116	2.4	319.5
Point 117	0.5	319.9
Point 118	-4.8	322.3
Point 119	-18.8	322.7
Point 120	-31.6	322.5
Point 121	-36.7	321.9
Point 122	-48.3	318
Point 123	-75	318
Point 124	8.1	321.9
Point 125	525	274.5
Point 126	525	285
Point 127	525	305
Point 128	525	311.7
Point 129	525	314.7
Point 130	525	314.9
Point 131	525	315.9
Point 132	525	316.1
Point 133	525	317.6
Point 134	525	317.8
Point 135	525	318.8
Point 136	525	319
Point 137	525	320
Point 138	525	416.7
Point 139	25	285

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	1150	1.76	(56.584, 491.803)	206.394	(227.677, 376.366)	(-54.7304, 318)

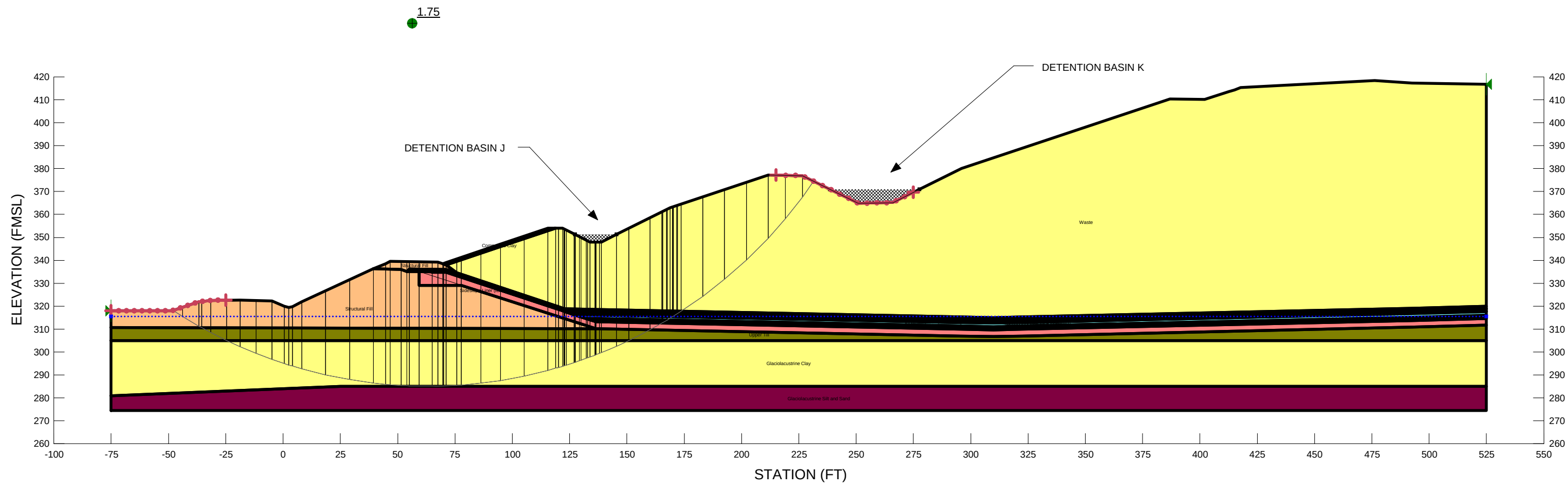
Slices of Slip Surface: 1150

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)

1	1150	-52.72865	316.75	0	1122.4924	0	2000
2	1150	-49.513455	314.77275	0	1366.975	0	2000
3	1150	-45.284885	312.3341	0	1807.7748	0	2000
4	1150	-39.484885	309.15785	395.7566	2097.4814	0	1097
5	1150	-34.15	306.44475	565.05135	2636.5541	0	1161.8
6	1150	-25.2	302.4325	815.40937	3012.4746	0	704.34
7	1150	-11.8	297.2086	1141.3603	3631.6379	0	756.07
8	1150	-2.15	293.96195	1343.9684	3811.4346	0	752.33
9	1150	1.45	292.91185	1409.4787	3733.2165	0	727.19
10	1150	3.2	292.4343	1439.2954	3773.0791	0	729.01
11	1150	6.05	291.7024	1484.963	4022.962	0	764.98
12	1150	13.316665	290.06585	1587.071	4683.9915	0	863.48
13	1150	23.75	288.1061	1709.4041	5533.019	0	991.73
14	1150	34.183335	286.69545	1797.364	6292.6795	0	1110.4
15	1150	42.05	285.93865	1844.635	6799.3026	0	1191.7
16	1150	45.7	285.69875	1859.6086	7014.2257	0	1227.1
17	1150	49.1	285.55885	1868.3329	7067.2239	0	1235.2
18	1150	52.75	285.44855	1875.196	7046.3824	0	1230.5
19	1150	54.5	285.42025	1877.0043	7036.1412	0	1228.5
20	1150	57.213005	285.42195	1876.8734	7012.8293	0	1224.6
21	1150	62.263005	285.5068	1871.5187	6955.4322	0	1215.7
22	1150	66.3	285.64145	1863.1819	6887.355	0	1205.4
23	1150	68.6	285.76215	1855.6652	6800.2639	0	1191.6
24	1150	69.85	285.83595	1851.0313	6736.7082	0	1181.2
25	1150	70.55	285.8829	1848.118	6757.7483	0	1185.5
26	1150	73.4	286.10825	1834.0553	6785.8401	0	1193.1
27	1150	76.7	286.3942	1816.2112	6808.4285	0	1200.4
28	1150	81.975	287.02215	1777.0355	6852.0912	0	1215.3
29	1150	90.525	288.2651	1699.4575	6893.0072	0	1236.7
30	1150	100	290.09725	1585.1381	6879.8358	0	1255.1
31	1150	110.4	292.6215	1427.6551	6800.2053	0	1269.4
32	1150	117.3	294.54975	1307.295	6645.2617	0	1263.6
33	1150	119.54155	295.24645	1263.816	6520.2634	0	1249.3
34	1150	121.04155	295.735	1233.3351	6440.9756	0	1240.8
35	1150	122.2	296.11715	1209.4913	6368.5134	0	1232.2
36	1150	122.5	296.2179	1203.206	6335.8553	0	1227.6

37	1150	122.7	296.28545	1199.0014	6311.406	0	1224
38	1150	122.85	296.33625	1195.8485	6291.5817	0	1221.1
39	1150	123.2	296.4555	1188.3849	6248.6631	0	1214.8
40	1150	125.2	297.15705	1144.6099	6039.5482	0	1185.7
41	1150	127.1	297.829	1102.6728	5842.4201	0	1158.4
42	1150	127.4	297.93825	1095.8283	5805.3114	0	1153
43	1150	128.41335	298.31385	1072.4284	5698.8157	0	1138.3
44	1150	129.61335	298.76135	1044.4887	5574.8155	0	1121.4
45	1150	131.1	299.3344	1008.7454	5419.6604	0	1100.4
46	1150	132.6	299.91785	972.33168	5256.5505	0	1078
47	1150	133.4	300.2372	952.38449	5166.6	0	1065.7
48	1150	134.95	300.86865	912.9964	5057.7137	0	1053.4
49	1150	136.1	301.34135	883.49519	4996.5372	0	1047.8
50	1150	136.3	301.42495	878.26467	4984.197	0	1046.6
51	1150	136.5	301.5088	873.03713	4970.9364	0	1045.2
52	1150	137.3	301.84825	851.85606	4925.3558	0	1040.9
53	1150	138.45	302.34015	821.17499	4859.3242	0	1034.7
54	1150	141.6256	303.7673	732.11271	4807.7646	0	1041.4
55	1150	144.9256	305.27205	638.2274	4689.3869	0	1516.8
56	1150	149.7764	307.70885	486.16858	4595.3649	0	1527.1
57	1150	156.6622	311.32055	260.79432	4398.9665	0	1732.3
58	1150	159.43965	312.8641	164.4792	4465.2278	0	1157.3
59	1150	160.43745	313.44385	0	4265.2977	0	1905.3
60	1150	161.4311	314.02365	0	4411.369	0	1187
61	1150	162.7451	314.81015	0	4240.4113	0	1750.4
62	1150	163.95365	315.5356	0	4203.0309	0	1743.9
63	1150	164.1705	315.66795	0	4346.1084	0	1169.6
64	1150	165.11195	316.2488	0	4146.5076	0	1852.8
65	1150	166.04985	316.82975	0	4297.0889	0	1156.6
66	1150	166.97	317.41105	0	4094.2423	0	1829.7
67	1150	168.31765	318.27045	0	3929.3101	0	2275.9
68	1150	173.17	321.56975	0	3731.9821	0	2162.4
69	1150	181.71	327.7509	0	3345.6418	0	1939.7
70	1150	190.25	334.6393	0	2911.7069	0	1689.3
71	1150	198.79	342.3334	0	2428.4862	0	1410
72	1150	207.33	350.96635	0	1893.6024	0	1100.4

73	1150	215.35	360.05585	0	1248.5653	0	726.16
74	1150	222.85	369.6804	0	509.09077	0	296.34
75	1150	227.1384	375.576	0	71.059587	0	41.67



Name: Global Lower, with Basins full
Kind: SLOPE/W
Method: Spencer
File Name: STATIC- November 2011.gsz

Section A-A'
Fill Progression Slope Stability Analysis
RMU-1 Leachate Level Compliance Plan
CWM Chemical Services, LLC
Model City, New York

Global Lower, with Basins full

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File Information

Revision Number: 269
Last Edited By: Giampaolo, Mandy
Date: 11/17/2011
Time: 12:55:54 PM
File Name: STATIC- November 2011.gsz
Directory: C:\Users\mgiampaolo\Documents\ARCADIS Documents\RMU-1\2011 Fill
Progression\Calc in Response to Review Comments\
Last Solved Date: 11/17/2011
Last Solved Time: 12:56:18 PM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Global Lower, with Basins full

Kind: SLOPE/W
Method: Spencer
Settings
 Apply Phreatic Correction: No
 PWP Conditions Source: Piezometric Line with Ru
Slip Surface
 Direction of movement: Right to Left
 Use Passive Mode: No
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: No
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

operations Layer

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile (2)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Leachate Collection

Model: Mohr-Coulomb
Unit Weight: 135 pcf

Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Sideslope Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Compacted Clay

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion: 1000 psf
Phi: 10 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Secondary Leachate Collection

Model: [Mohr-Coulomb](#)

Unit Weight: [135 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Secondary Liner (textured)

Model: [Mohr-Coulomb](#)

Unit Weight: [58.7 pcf](#)

Cohesion: [0 psf](#)

Phi: [15 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Secondary Compacted Clay

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [1000 psf](#)

Phi: [10 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Structural Fill

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [2000 psf](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Upper Till

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [800 psf](#)

Phi: [10 °](#)

Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1
Ru: 0
Include in PWP: No

Glaciolacustrine Clay

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 320 psf
Phi: 10 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1
Ru: 0
Include in PWP: No

Glaciolacustrine Silt and Sand

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1
Ru: 0
Include in PWP: No

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (-75, 318) ft
Left-Zone Right Coordinate: (-25, 322.60312) ft
Left-Zone Increment: 15
Right Projection: Range
Right-Zone Left Coordinate: (215, 377.132) ft
Right-Zone Right Coordinate: (275, 369.7) ft
Right-Zone Increment: 15
Radius Increments: 10

Slip Surface Limits

Left Coordinate: (-75, 318) ft
Right Coordinate: (525, 416.7) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	-75	315.5
	525	315.5

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Vertical

Coordinates

	X (ft)	Y (ft)
	127.3	351.3
	145.5	351.3

Surcharge Load 2

Surcharge (Unit Weight): 62.4 pcf
Direction: Vertical

Coordinates

	X (ft)	Y (ft)
	238.5	371
	277.6	371

Seismic Loads

Horz Seismic Load: 0
Vert Seismic Load: 0

Regions

	Material	Points	Area (ft²)
Regi	Structural	5,42,123,122,121,120,119,118,117,116,41,124,40,39,38,91,92,93,90	2800.8

on 1	Fill		53
Region 2	Upper Till	2,5,90,4,83,84,85,86,128,127	2643.4
Region 3	Glaciolacustrine Clay	6,2,127,126,139	12200
Region 4	Glaciolacustrine Silt and Sand	7,6,139,126,125	6100
Region 5	Geotextile (2)	104,87,43,44,45,46,47,136,135,52,51,50,49,48	80.98
Region 6	Primary Leachate Collection	106,104,48,49,50,51,52,135,134,57,56,55,54,53	400.015
Region 7	Primary Liner (textured 1000-2000psf)	102,106,53,54,55,56,57,134,133,62,61,60,59,58	79.5
Region 8	Compacted Clay	100,102,58,59,60,61,62,133,132,67,66,65,64,63	592.695
Region 9	Geotextile	101,100,63,64,65,66,67,132,131,72,71,70,69,68	78.45
Region 10	Secondary Leachate Collection	99,101,68,69,70,71,72,131,130,77,76,75,74,73	390.54
Region 11	operations Layer	38,37,36,107,35,1,34,33,32,31,137,136,47,46,45,44,43,87,88,95,91	472.885
Region 12	Secondary Compacted Clay	91,95,96,94,98,105,103,97,89,78,79,80,81,82,129,128,86,85,84,83,4,90,93,92	1452.252
Region 13	Secondary Liner (textured)	103,102,100,101,99,73,74,75,76,77,130,129,82,81,80,79,78,89,97	79.395
Region 14	Sideslope Liner (textured 1000-2000psf)	96,95,88,87,104,106,102,103,105,98,94	11.54

Region 15	Structural Fill	40,30,29,28,110,27,26,107,36,37,38,39	97.18
Region 16	Waste	26,25,24,23,114,22,21,115,20,19,18,112,17,16,113,15,14,13,12,11,10,9,8,138,137,31,32,33,34,1,35,107	30224.295
Region 17	Compacted Clay	110,109,108,111,24,25,26,27	48.395

Points

	X (ft)	Y (ft)
Point 1	138	318.5
Point 2	-75	305
Point 3	68.5	332.1
Point 4	138	310.2
Point 5	-75	310.7
Point 6	-75	281
Point 7	-75	274.5
Point 8	492.5	417.4
Point 9	476.2	418.3
Point 10	417.7	415.3
Point 11	415	414.3
Point 12	412.5	413.5
Point 13	402	410.1
Point 14	386.9	410.4
Point 15	296	380.1
Point 16	266	365.2
Point 17	251	364.9
Point 18	226.6	376.9
Point 19	211.6	377.2
Point 20	168.9	363
Point 21	138.9	348
Point 22	133.9	348
Point 23	122	354
Point 24	119	354

Point 25	94.8	346
Point 26	71.1	338
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Point 39	51.5	336
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Point 51	322.5	314.1
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Point 53	138	316.3
Point 54	295.4	313.1
Point 55	309.9	312.8
Point 56	322.5	313.1
Point 57	492.5	316.9
Point 58	138	316.1
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Point 60	309.9	312.6

Point 61	322.5	312.9
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Point 65	309.9	311.1
Point 66	322.5	311.4
Point 67	492.5	315.2
Point 68	138	314.4
Point 69	295.4	311.2
Point 70	309.9	310.9
Point 71	322.5	311.2
Point 72	492.5	315
Point 73	138	313.4
Point 74	295.4	310.2
Point 75	309.9	309.9
Point 76	322.5	310.2
Point 77	492.5	314
Point 78	138	313.2
Point 79	295.4	310
Point 80	309.9	309.7
Point 81	322.5	310
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Point 91	59.4	335.1
Point 92	59.42601	329.1
Point 93	77.7	329.1
Point 94	71.1	334.8
Point 95	65.1	335
Point 96	65.1	334.8

Point 97	136	313.3
Point 98	122.4	317.8
Point 99	136.2	313.4
Point 100	132.3	314.7
Point 101	132.9	314.5
Point 102	127.5	316.3
Point 103	126.9	316.3
Point 104	123.5	317.6
Point 105	122.9	317.6
Point 106	126.9	316.5
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Point 116	2.4	319.5
Point 117	0.5	319.9
Point 118	-4.8	322.3
Point 119	-18.8	322.7
Point 120	-31.6	322.5
Point 121	-36.7	321.9
Point 122	-48.3	318
Point 123	-75	318
Point 124	8.1	321.9
Point 125	525	274.5
Point 126	525	285
Point 127	525	305
Point 128	525	311.7
Point 129	525	314.7
Point 130	525	314.9
Point 131	525	315.9
Point 132	525	316.1

Point 133	525	317.6
Point 134	525	317.8
Point 135	525	318.8
Point 136	525	319
Point 137	525	320
Point 138	525	416.7
Point 139	25	285

Critical Slip Surfaces

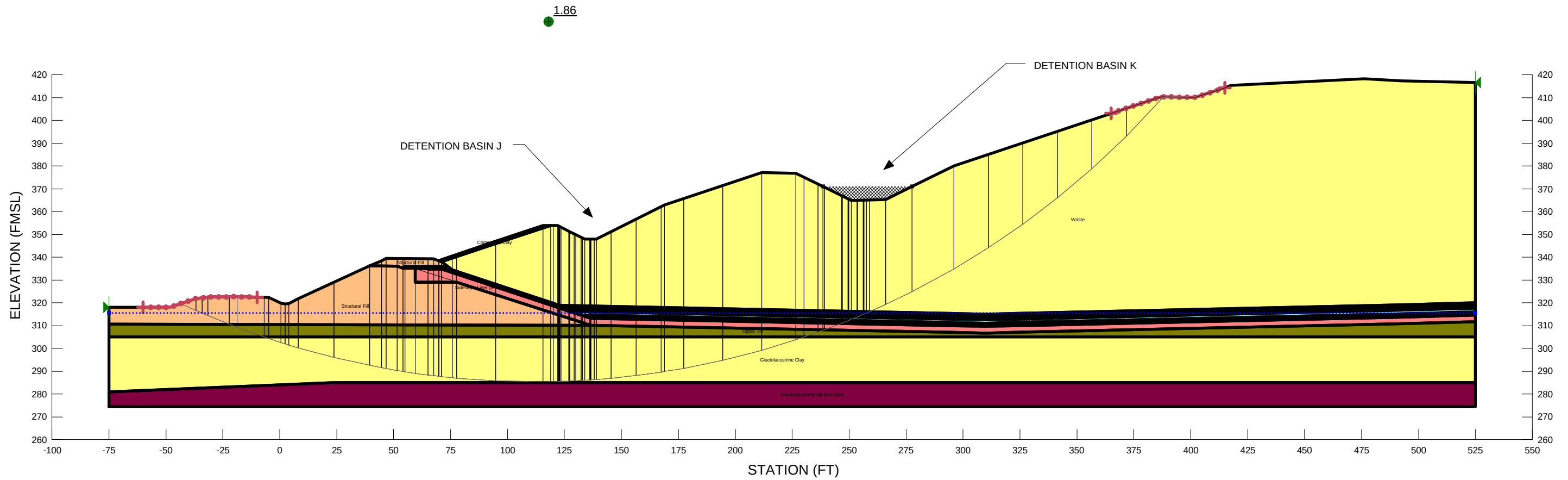
	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	1458	1.75	(63.054, 488.444)	203.339	(231.462, 374.489)	(-47.9909, 318.104)

Slices of Slip Surface: 1458

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1458	-45.940545	316.80195	0	1240.1583	0	2000
2	1458	-40.29512	313.37765	0	1927.5011	0	2000
3	1458	-36.119585	310.93105	0	2402.4715	0	2000
4	1458	-33.569585	309.543	371.72338	2250.1751	0	1131.2
5	1458	-28.13357	306.7396	546.64837	2657.5029	0	1172.2
6	1458	-21.73357	303.654	739.19563	2873.3157	0	696.3
7	1458	-15.3	300.84615	914.40342	3213.1393	0	725.33
8	1458	-8.3	298.07245	1087.4787	3520.009	0	748.91
9	1458	-2.15	295.86335	1225.3313	3595.0009	0	737.86
10	1458	1.45	294.6641	1300.1442	3535.7842	0	714.22
11	1458	3.2	294.1157	1334.3894	3585.3501	0	716.92
12	1458	6.05	293.27055	1387.12	3852.4607	0	754.71
13	1458	13.316665	291.3553	1506.6312	4555.4871	0	857.63
14	1458	23.75	289.0107	1652.9027	5460.8699	0	991.49
15	1458	34.183335	287.2341	1763.8202	6272.6573	0	1115.1
16	1458	42.05	286.21035	1827.6782	6816.1656	0	1199.7
17	1458	45.7	285.84945	1850.1747	7047.6914	0	1236.5

18	1458	49.1	285.5987	1865.8404	7114.8519	0	1245.6
19	1458	52.75	285.37015	1880.1014	7108.4557	0	1242
20	1458	54.5	285.28565	1885.3296	7105.005	0	1240.5
21	1458	57.213005	285.201	1890.6518	7092.1746	0	1237.3
22	1458	62.263005	285.12635	1895.3009	7053.7129	0	1229.7
23	1458	66.3	285.13445	1894.8001	7000.3575	0	1220.4
24	1458	68.6	285.18365	1891.7503	6921.9686	0	1207
25	1458	69.85	285.2187	1889.5437	6862.1641	0	1196.9
26	1458	70.55	285.244	1887.9889	6886.1356	0	1201.4
27	1458	73.4	285.38145	1879.3886	6925.1488	0	1209.8
28	1458	76.7	285.5659	1867.8795	6960.2733	0	1218
29	1458	81.975	286.0328	1838.7677	7023.65	0	1234.3
30	1458	90.525	287.0154	1777.4644	7096.1831	0	1257.9
31	1458	100	288.55955	1681.0449	7117.4226	0	1278.7
32	1458	110.4	290.76615	1543.3686	7074.9962	0	1295.5
33	1458	117.3	292.4822	1436.3086	6944.1472	0	1291.3
34	1458	119.54155	293.1094	1397.1401	6826.3136	0	1277.4
35	1458	121.04155	293.5512	1369.6123	6751.5608	0	1269.1
36	1458	122.2	293.8972	1348.0056	6682.981	0	1260.8
37	1458	122.5	293.98855	1342.3278	6651.1521	0	1256.2
38	1458	122.7	294.0498	1338.5111	6627.5467	0	1252.7
39	1458	122.85	294.09585	1335.6132	6608.007	0	1249.8
40	1458	123.2	294.2041	1328.8683	6566.0902	0	1243.5
41	1458	125.2	294.8427	1289.0122	6362.588	0	1214.7
42	1458	127.1	295.4548	1250.821	6171.0585	0	1187.7
43	1458	127.4	295.55455	1244.5775	6137.5125	0	1182.9
44	1458	128.41335	295.8979	1223.1498	6063.6504	0	1173.6
45	1458	129.61335	296.3072	1197.6238	5978.313	0	1163
46	1458	131.1	296.83265	1164.8539	5870.7977	0	1149.8
47	1458	132.6	297.368	1131.4375	5755.464	0	1135.4
48	1458	133.4	297.66155	1113.1419	5690.7785	0	1127.2
49	1458	134.95	298.2428	1076.8283	5601.2889	0	1117.8
50	1458	136.1	298.6782	1049.6717	5543.0319	0	1112.4
51	1458	136.3	298.7553	1044.8603	5531.4487	0	1111.2
52	1458	136.5	298.83265	1040.0518	5518.9372	0	1109.8
53	1458	137.3	299.14595	1020.4591	5475.8075	0	1105.7

54	1458	138.45	299.60015	992.14852	5413.2858	0	1099.6
55	1458	142.2	301.1745	893.91433	5272.8259	0	1092.2
56	1458	148.13785	303.7846	731.03722	5128.6571	0	1095.4
57	1458	155.43185	307.37545	506.97279	4915.5316	0	1577.4
58	1458	162.6639	311.19855	268.40836	4702.3073	0	1781.8
59	1458	165.4057	312.74285	172.0469	4763.2939	0	1230.3
60	1458	166.3907	313.32285	0	4546.04	0	2024.1
61	1458	167.36115	313.89665	0	4706.1332	0	1261
62	1458	168.20625	314.40625	0	4551.5756	0	1802.5
63	1458	169.4098	315.13825	0	4503.9578	0	1794.1
64	1458	169.9592	315.47555	0	4619.872	0	1237.9
65	1458	170.1156	315.57235	0	4618.825	0	1237.5
66	1458	171.00545	316.129	0	4388.845	0	1954.1
67	1458	171.9313	316.7102	0	4538.0809	0	1216
68	1458	172.83965	317.2917	0	4306.2329	0	1917.3
69	1458	178.3458	321.0482	0	3925.493	0	2266.4
70	1458	187.847	328.01545	0	3481.6951	0	2009.9
71	1458	197.3482	335.89285	0	2976.9588	0	1718.2
72	1458	206.8494	344.83155	0	2408.0623	0	1389.5
73	1458	215.35	353.83075	0	1748.2203	0	1008.4
74	1458	222.85	362.8443	0	1016.095	0	585.83
75	1458	229.031	371.05235	0	320.28134	0	184.57



Name: Global Upper. with Basin K Full
Kind: SLOPE/W
Method: Spencer
File Name: STATIC- November 2011.gsz

Section A-A'
Fill Progression Slope Stability Analysis
RMU-1 Leachate Level Compliance Plan
CWM Chemical Services, LLC
Model City, New York

Global Upper. with Basin K Full

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File Information

Revision Number: 263
Last Edited By: Giampaolo, Mandy
Date: 11/15/2011
Time: 10:33:57 AM
File Name: STATIC- November 2011.gsz
Directory: C:\Users\mgiampaolo\Documents\ARCADIS Documents\RMU-1\2011 Fill
Progression\Calc in Response to Review Comments\
Last Solved Date: 11/15/2011
Last Solved Time: 10:35:08 AM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Global Upper. with Basin K Full

Kind: SLOPE/W
Method: Spencer
Settings
 Apply Phreatic Correction: No
 PWP Conditions Source: Piezometric Line with Ru
Slip Surface
 Direction of movement: Right to Left
 Use Passive Mode: No
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: No
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

operations Layer

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile (2)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Leachate Collection

Model: Mohr-Coulomb
Unit Weight: 135 pcf

Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Sideslope Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Compacted Clay

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion: 1000 psf
Phi: 10 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Secondary Leachate Collection

Model: [Mohr-Coulomb](#)

Unit Weight: [135 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Secondary Liner (textured)

Model: [Mohr-Coulomb](#)

Unit Weight: [58.7 pcf](#)

Cohesion: [0 psf](#)

Phi: [15 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Secondary Compacted Clay

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [1000 psf](#)

Phi: [10 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Structural Fill

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [2000 psf](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Upper Till

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [800 psf](#)

Phi: [10 °](#)

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Ru: 0

Include in PWP: No

Glaciolacustrine Clay

Model: Mohr-Coulomb

Unit Weight: 125 pcf

Cohesion: 320 psf

Phi: 10 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Ru: 0

Include in PWP: No

Glaciolacustrine Silt and Sand

Model: Mohr-Coulomb

Unit Weight: 130 pcf

Cohesion: 0 psf

Phi: 30 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Ru: 0

Include in PWP: No

Slip Surface Entry and Exit

Left Projection: Range

Left-Zone Left Coordinate: (-60, 318) ft

Left-Zone Right Coordinate: (-10, 322.44857) ft

Left-Zone Increment: 15

Right Projection: Range

Right-Zone Left Coordinate: (365, 403.1) ft

Right-Zone Right Coordinate: (415, 414.3) ft

Right-Zone Increment: 15

Radius Increments: 10

Slip Surface Limits

Left Coordinate: (-75, 318) ft

Right Coordinate: (525, 416.7) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	-75	315.5
	525	315.5

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Vertical

Coordinates

	X (ft)	Y (ft)
	238.5	371
	277.6	371

Seismic Loads

Horz Seismic Load: 0
Vert Seismic Load: 0

Regions

	Material	Points	Area (ft²)
Region 1	Structural Fill	5,42,123,122,121,120,119,118,117,116,41,124,40,39,38,91,92,93,90	2800.853
Region 2	Upper Till	2,5,90,4,83,84,85,86,128,127	2643.4
Region 3	Glaciolacustrine Clay	6,2,127,126,139	12200
Region 4	Glaciolacustrine Silt and Sand	7,6,139,126,125	6100

Region 5	Geotextile (2)	104,87,43,44,45,46,47,136,135,52,51,50,49,48	80.98
Region 6	Primary Leachate Collection	106,104,48,49,50,51,52,135,134,57,56,55,54,53	400.015
Region 7	Primary Liner (textured 1000-2000psf)	102,106,53,54,55,56,57,134,133,62,61,60,59,58	79.5
Region 8	Compacted Clay	100,102,58,59,60,61,62,133,132,67,66,65,64,63	592.695
Region 9	Geotextile	101,100,63,64,65,66,67,132,131,72,71,70,69,68	78.45
Region 10	Secondary Leachate Collection	99,101,68,69,70,71,72,131,130,77,76,75,74,73	390.54
Region 11	operations Layer	38,37,36,107,35,1,34,33,32,31,137,136,47,46,45,44,43,87,88,95,91	472.885
Region 12	Secondary Compacted Clay	91,95,96,94,98,105,103,97,89,78,79,80,81,82,129,128,86,85,84,83,4,90,93,92	1452.252
Region 13	Secondary Liner (textured)	103,102,100,101,99,73,74,75,76,77,130,129,82,81,80,79,78,89,97	79.395
Region 14	Sideslope Liner (textured 1000-2000psf)	96,95,88,87,104,106,102,103,105,98,94	11.54
Region 15	Structural Fill	40,30,29,28,110,27,26,107,36,37,38,39	97.18
Region 16	Waste	26,25,24,23,114,22,21,115,20,19,18,112,17,16,113,15,14,13,12,11,10,9,8,138,137,31,32,33,34,1,35,107	30224.295
Region	Compacted Clay	110,109,108,111,24,25,26,27	48.395

17			

Points

	X (ft)	Y (ft)
Point 1	138	318.5
Point 2	-75	305
Point 3	68.5	332.1
Point 4	138	310.2
Point 5	-75	310.7
Point 6	-75	281
Point 7	-75	274.5
Point 8	492.5	417.4
Point 9	476.2	418.3
Point 10	417.7	415.3
Point 11	415	414.3
Point 12	412.5	413.5
Point 13	402	410.1
Point 14	386.9	410.4
Point 15	296	380.1
Point 16	266	365.2
Point 17	251	364.9
Point 18	226.6	376.9
Point 19	211.6	377.2
Point 20	168.9	363
Point 21	138.9	348
Point 22	133.9	348
Point 23	122	354
Point 24	119	354
Point 25	94.8	346
Point 26	71.1	338
Point 27	70	338.4
Point 28	67.5	339.3
Point 29	46.7	339.5
Point 30	44.7	338.5
Point 31	492.5	319.1

Point 32	322.5	315.3
Point 33	309.9	315
Point 34	295.4	315.3
Point 35	122.8	318.9
Point 36	71.1	336
Point 37	55	336.1
Point 38	54	335.1
Point 39	51.5	336
Point 40	39.4	336.3
Point 41	4	319.7
Point 42	-75	314
Point 43	138	317.5
Point 44	295.4	314.3
Point 45	309.9	314
Point 46	322.5	314.3
Point 47	492.5	318.1
Point 48	138	317.3
Point 49	295.4	314.1
Point 50	309.9	313.8
Point 51	322.5	314.1
Point 52	492.5	317.9
Point 53	138	316.3
Point 54	295.4	313.1
Point 55	309.9	312.8
Point 56	322.5	313.1
Point 57	492.5	316.9
Point 58	138	316.1
Point 59	295.4	312.9
Point 60	309.9	312.6
Point 61	322.5	312.9
Point 62	492.5	316.7
Point 63	138	314.6
Point 64	295.4	311.4
Point 65	309.9	311.1
Point 66	322.5	311.4
Point 67	492.5	315.2

Point 68	138	314.4
Point 69	295.4	311.2
Point 70	309.9	310.9
Point 71	322.5	311.2
Point 72	492.5	315
Point 73	138	313.4
Point 74	295.4	310.2
Point 75	309.9	309.9
Point 76	322.5	310.2
Point 77	492.5	314
Point 78	138	313.2
Point 79	295.4	310
Point 80	309.9	309.7
Point 81	322.5	310
Point 82	492.5	313.8
Point 83	295.4	307
Point 84	309.9	306.7
Point 85	322.5	307
Point 86	492.5	310.8
Point 87	122.6	317.9
Point 88	71.1	335
Point 89	136.4	313.2
Point 90	136.6	310.2
Point 91	59.4	335.1
Point 92	59.42601	329.1
Point 93	77.7	329.1
Point 94	71.1	334.8
Point 95	65.1	335
Point 96	65.1	334.8
Point 97	136	313.3
Point 98	122.4	317.8
Point 99	136.2	313.4
Point 100	132.3	314.7
Point 101	132.9	314.5
Point 102	127.5	316.3
Point 103	126.9	316.3

Point 104	123.5	317.6
Point 105	122.9	317.6
Point 106	126.9	316.5
Point 107	75.7	334.5
Point 108	94.8	347
Point 109	71.1	339
Point 110	69.7	338.5
Point 111	115.6	354
Point 112	238.5	371
Point 113	277.6	371
Point 114	127.3	351.3
Point 115	145.5	351.3
Point 116	2.4	319.5
Point 117	0.5	319.9
Point 118	-4.8	322.3
Point 119	-18.8	322.7
Point 120	-31.6	322.5
Point 121	-36.7	321.9
Point 122	-48.3	318
Point 123	-75	318
Point 124	8.1	321.9
Point 125	525	274.5
Point 126	525	285
Point 127	525	305
Point 128	525	311.7
Point 129	525	314.7
Point 130	525	314.9
Point 131	525	315.9
Point 132	525	316.1
Point 133	525	317.6
Point 134	525	317.8
Point 135	525	318.8
Point 136	525	319
Point 137	525	320
Point 138	525	416.7
Point 139	25	285

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	962	1.86	(111.701, 653.246)	367.876	(388.012, 410.378)	(-43.3779, 319.655)

Slices of Slip Surface: 962

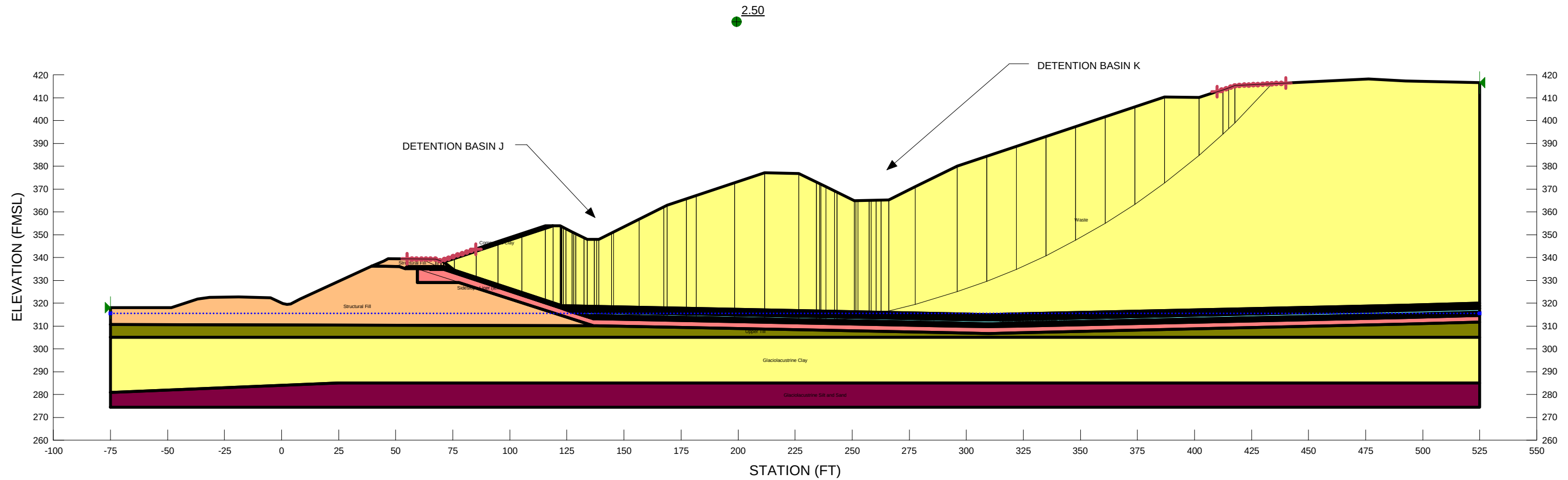
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	962	-40.03897	318.1429	0	1043.3153	0	2000
2	962	-35.40386	316.0655	0	1485.6547	0	2000
3	962	-32.85386	314.9642	0	1667.0572	0	2000
4	962	-26.86206	312.50175	0	2008.1334	0	2000
5	962	-20.46206	309.93525	347.25615	2077.4166	0	1105.1
6	962	-12.831143	307.1477	521.17998	2424.2964	0	1135.5
7	962	-5.831143	304.65235	676.91349	2584.466	0	656.34
8	962	-2.15	303.4422	752.41511	2562.4133	0	639.12
9	962	1.45	302.28125	824.83824	2509.9144	0	617.1
10	962	3.2	301.7359	858.8894	2564.6048	0	620.74
11	962	6.05	300.87435	912.64141	2843.0097	0	660.37
12	962	15.925	298.14915	1082.7144	3841.4462	0	806.42
13	962	31.575	294.2919	1323.4043	5301.5997	0	1021.4
14	962	42.05	292.0342	1464.2717	6203.8316	0	1155.7
15	962	45.7	291.34085	1507.5355	6498.32	0	1199.9
16	962	49.1	290.74405	1544.7808	6625.475	0	1215.8
17	962	52.75	290.12665	1583.3107	6683.6944	0	1219.3
18	962	54.5	289.845	1600.8898	6712.3575	0	1221.3
19	962	57.213005	289.43485	1626.4562	6751.8379	0	1223.7
20	962	62.263005	288.71865	1671.1509	6814.2595	0	1226.8
21	962	66.3	288.18465	1704.494	6844.3561	0	1226.2
22	962	68.6	287.90565	1721.877	6813.6564	0	1217.8
23	962	69.85	287.7587	1731.0548	6779.6969	0	1210.2
24	962	70.55	287.6796	1736.0361	6820.5614	0	1216.5
25	962	73.4	287.37695	1754.8886	6928.011	0	1232.1

26	962	76.7	287.0406	1775.8574	7043.4032	0	1248.7
27	962	86.25	286.3519	1818.8458	7393.9289	0	1303
28	962	105.2	285.5749	1867.3044	8003.5571	0	1401.9
29	962	117.3	285.4169	1877.1942	8267.8654	0	1446.8
30	962	119.54155	285.45435	1874.8933	8226.5084	0	1439.9
31	962	121.04155	285.49025	1872.5988	8204.7447	0	1436.5
32	962	122.2	285.5203	1870.7377	8176.1682	0	1431.8
33	962	122.5	285.52895	1870.1939	8153.9856	0	1428
34	962	122.7	285.5349	1869.8133	8136.359	0	1424.9
35	962	122.85	285.5394	1869.54	8121.764	0	1422.4
36	962	123.2	285.55025	1868.9197	8090.7117	0	1417
37	962	125.2	285.62205	1864.3908	7953.4643	0	1393.6
38	962	127.1	285.6929	1859.9683	7824.8856	0	1371.7
39	962	127.4	285.70555	1859.1545	7798.3879	0	1367.2
40	962	128.41335	285.75135	1856.3292	7729.0538	0	1355.4
41	962	129.61335	285.80685	1852.9158	7649.4623	0	1342
42	962	131.1	285.8842	1848.0084	7549.8971	0	1325.4
43	962	132.6	285.96465	1843.0186	7442.9598	0	1307.4
44	962	133.4	286.01125	1840.0909	7382.9242	0	1297.3
45	962	134.95	286.1073	1834.0885	7338.1599	0	1290.5
46	962	136.1	286.18045	1829.5622	7326.3308	0	1289.2
47	962	136.3	286.1938	1828.6982	7322.5755	0	1288.6
48	962	136.5	286.20725	1827.8824	7317.8154	0	1288
49	962	137.3	286.2628	1824.4238	7307.2434	0	1286.7
50	962	138.45	286.34445	1819.2825	7290.9823	0	1284.8
51	962	142.2	286.6518	1800.1444	7416.1963	0	1310.2
52	962	151.00315	287.5177	1746.1304	7747.3301	0	1378.1
53	962	162.0094	288.8689	1661.7375	8122.3798	0	1459.1
54	962	168.20625	289.73655	1607.6481	8317.4104	0	1503.1
55	962	173.125	290.55995	1556.3	8378.3268	0	1522.9
56	962	185.9125	293.0396	1401.5134	8459.4104	0	1564.4
57	962	203.0375	296.999	1154.4842	8484.6956	0	1612.4
58	962	219.1	301.48415	874.60954	8133.3523	0	1599.9
59	962	228.43195	304.387	693.45945	7621.0137	0	1541.5
60	962	233.31945	306.0704	588.4089	7084.6587	0	1945.4
61	962	237.4375	307.5272	497.48383	6667.7605	0	1888

62	962	238.8129	308.02885	466.20015	6536.3388	0	1870.3
63	962	242.85755	309.5682	370.14468	6209.4276	0	2029.6
64	962	246.8301	311.0874	275.34521	5979.0735	0	1528.3
65	962	248.26105	311.65835	0	5735.9281	0	2553.8
66	962	249.68655	312.2294	0	5764.635	0	1544.6
67	962	250.46095	312.54415	0	5649.1322	0	1996.1
68	962	252.19815	313.2588	0	5541.7014	0	1977.1
69	962	253.62435	313.8493	0	5538.4757	0	1484
70	962	254.98055	314.42175	0	5337.2924	0	2376.2
71	962	256.332	314.99425	0	5399.7086	0	1446.8
72	962	257.0323	315.29485	0	5234.3972	0	2330.5
73	962	258.13705	315.7724	0	5171.0659	0	2302.3
74	962	262.3824	317.6692	0	4862.7726	0	2807.6
75	962	271.8	322.0977	0	4503.0606	0	2599.9
76	962	286.8	329.88355	0	4223.2951	0	2438.5
77	962	303.575	339.4978	0	3886.3687	0	2244.1
78	962	318.725	349.28965	0	3373.2819	0	1948
79	962	333.875	360.19185	0	2782.4986	0	1607
80	962	349.025	372.3343	0	2112.1985	0	1220
81	962	364.175	385.8872	0	1360.4819	0	785.96
82	962	379.325	401.07985	0	525.62513	0	303.75
83	962	387.45575	409.74855	0	46.270248	0	28.253

Appendix B

Static Stability Analysis:
Sliding



Name: Along CCL
Kind: SLOPE/W
Method: Spencer
File Name: STATIC- Sliding November 2011.gsz

Section A-A'
Fill Progression Slope Stability Analysis
RMU-1 Leachate Level Compliance Plan
CWM Chemical Services, LLC
Model City, New York

Along CCL

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File Information

Revision Number: 264
Last Edited By: Giampaolo, Mandy
Date: 11/15/2011
Time: 10:39:14 AM
File Name: STATIC- Sliding November 2011.gsz
Directory: C:\Users\mgiampaolo\Documents\ARCADIS Documents\RMU-1\2011 Fill
Progression\Calc in Response to Review Comments\
Last Solved Date: 11/15/2011
Last Solved Time: 10:39:28 AM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Along CCL

Kind: SLOPE/W
Method: Spencer
Settings
 Apply Phreatic Correction: No
 PWP Conditions Source: Piezometric Line with Ru
Slip Surface
 Direction of movement: Right to Left
 Use Passive Mode: No
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: No
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

operations Layer

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile (2)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Leachate Collection

Model: Mohr-Coulomb
Unit Weight: 135 pcf

Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Sideslope Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Compacted Clay

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion: 1000 psf
Phi: 10 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Secondary Leachate Collection

Model: [Mohr-Coulomb](#)

Unit Weight: [135 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Secondary Liner (textured)

Model: [Mohr-Coulomb](#)

Unit Weight: [58.7 pcf](#)

Cohesion: [0 psf](#)

Phi: [15 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Secondary Compacted Clay

Model: [Bedrock \(Impenetrable\)](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Structural Fill

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [2000 psf](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Upper Till

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [800 psf](#)

Phi: [10 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Glaciolacustrine Clay

Model: [Mohr-Coulomb](#)

Unit Weight: [125 pcf](#)

Cohesion: [320 psf](#)

Phi: [10 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Glaciolacustrine Silt and Sand

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [0 psf](#)

Phi: [30 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(55, 339.42019\) ft](#)

Left-Zone Right Coordinate: [\(85, 343.69198\) ft](#)

Left-Zone Increment: [15](#)

Right Projection: [Range](#)

Right-Zone Left Coordinate: [\(410, 412.69048\) ft](#)

Right-Zone Right Coordinate: [\(440, 416.44359\) ft](#)

Right-Zone Increment: [15](#)

Radius Increments: [5](#)

Slip Surface Limits

Left Coordinate: [\(-75, 318\) ft](#)

Right Coordinate: [\(525, 416.7\) ft](#)

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	-75	315.5
	525	315.5

Seismic Loads

Horz Seismic Load: 0
Vert Seismic Load: 0

Regions

	Material	Points	Area (ft²)
Region 1	Structural Fill	5,42,123,122,121,120,119,118,117,116,41,124,40,39,38,91,92,93,90	2800.853
Region 2	Upper Till	2,5,90,4,83,84,85,86,128,127	2643.4
Region 3	Glaciolacustrine Clay	6,2,127,126,139	12200
Region 4	Glaciolacustrine Silt and Sand	7,6,139,126,125	6100
Region 5	Geotextile (2)	104,87,43,44,45,46,47,136,135,52,51,50,49,48	80.98
Region 6	Primary Leachate Collection	106,104,48,49,50,51,52,135,134,57,56,55,54,53	400.015
Region 7	Primary Liner (textured 1000-2000psf)	102,106,53,54,55,56,57,134,133,62,61,60,59,58	79.5
Region 8	Compacted Clay	100,102,58,59,60,61,62,133,132,67,66,65,64,63	592.695

Region 9	Geotextile	101,100,63,64,65,66,67,132,131,72,71,70,69,68	78.45
Region 10	Secondary Leachate Collection	99,101,68,69,70,71,72,131,130,77,76,75,74,73	390.54
Region 11	operations Layer	38,37,36,107,35,1,34,33,32,31,137,136,47,46,45,44,43,87,88,95,91	472.885
Region 12	Secondary Compacted Clay	91,95,96,94,98,105,103,97,89,78,79,80,81,82,129,128,86,85,84,83,4,90,93,92	1452.252
Region 13	Secondary Liner (textured)	103,102,100,101,99,73,74,75,76,77,130,129,82,81,80,79,78,89,97	79.395
Region 14	Sideslope Liner (textured 1000-2000psf)	96,95,88,87,104,106,102,103,105,98,94	11.54
Region 15	Structural Fill	40,30,29,28,110,27,26,107,36,37,38,39	97.18
Region 16	Waste	26,25,24,23,114,22,21,115,20,19,18,112,17,16,113,15,14,13,12,11,10,9,8,138,137,31,32,33,34,1,35,107	30224.295
Region 17	Compacted Clay	110,109,108,111,24,25,26,27	48.395

Points

	X (ft)	Y (ft)
Point 1	138	318.5
Point 2	-75	305
Point 3	68.5	332.1
Point 4	138	310.2
Point 5	-75	310.7
Point 6	-75	281
Point 7	-75	274.5

Point 8	492.5	417.4
Point 9	476.2	418.3
Point 10	417.7	415.3
Point 11	415	414.3
Point 12	412.5	413.5
Point 13	402	410.1
Point 14	386.9	410.4
Point 15	296	380.1
Point 16	266	365.2
Point 17	251	364.9
Point 18	226.6	376.9
Point 19	211.6	377.2
Point 20	168.9	363
Point 21	138.9	348
Point 22	133.9	348
Point 23	122	354
Point 24	119	354
Point 25	94.8	346
Point 26	71.1	338
Point 27	70	338.4
Point 28	67.5	339.3
Point 29	46.7	339.5
Point 30	44.7	338.5
Point 31	492.5	319.1
Point 32	322.5	315.3
Point 33	309.9	315
Point 34	295.4	315.3
Point 35	122.8	318.9
Point 36	71.1	336
Point 37	55	336.1
Point 38	54	335.1
Point 39	51.5	336
Point 40	39.4	336.3
Point 41	4	319.7
Point 42	-75	314
Point 43	138	317.5

Point 44	295.4	314.3
Point 45	309.9	314
Point 46	322.5	314.3
Point 47	492.5	318.1
Point 48	138	317.3
Point 49	295.4	314.1
Point 50	309.9	313.8
Point 51	322.5	314.1
Point 52	492.5	317.9
Point 53	138	316.3
Point 54	295.4	313.1
Point 55	309.9	312.8
Point 56	322.5	313.1
Point 57	492.5	316.9
Point 58	138	316.1
Point 59	295.4	312.9
Point 60	309.9	312.6
Point 61	322.5	312.9
Point 62	492.5	316.7
Point 63	138	314.6
Point 64	295.4	311.4
Point 65	309.9	311.1
Point 66	322.5	311.4
Point 67	492.5	315.2
Point 68	138	314.4
Point 69	295.4	311.2
Point 70	309.9	310.9
Point 71	322.5	311.2
Point 72	492.5	315
Point 73	138	313.4
Point 74	295.4	310.2
Point 75	309.9	309.9
Point 76	322.5	310.2
Point 77	492.5	314
Point 78	138	313.2
Point 79	295.4	310

Point 80	309.9	309.7
Point 81	322.5	310
Point 82	492.5	313.8
Point 83	295.4	307
Point 84	309.9	306.7
Point 85	322.5	307
Point 86	492.5	310.8
Point 87	122.6	317.9
Point 88	71.1	335
Point 89	136.4	313.2
Point 90	136.6	310.2
Point 91	59.4	335.1
Point 92	59.42601	329.1
Point 93	77.7	329.1
Point 94	71.1	334.8
Point 95	65.1	335
Point 96	65.1	334.8
Point 97	136	313.3
Point 98	122.4	317.8
Point 99	136.2	313.4
Point 100	132.3	314.7
Point 101	132.9	314.5
Point 102	127.5	316.3
Point 103	126.9	316.3
Point 104	123.5	317.6
Point 105	122.9	317.6
Point 106	126.9	316.5
Point 107	75.7	334.5
Point 108	94.8	347
Point 109	71.1	339
Point 110	69.7	338.5
Point 111	115.6	354
Point 112	238.5	371
Point 113	277.6	371
Point 114	127.3	351.3
Point 115	145.5	351.3

Point 116	2.4	319.5
Point 117	0.5	319.9
Point 118	-4.8	322.3
Point 119	-18.8	322.7
Point 120	-31.6	322.5
Point 121	-36.7	321.9
Point 122	-48.3	318
Point 123	-75	318
Point 124	8.1	321.9
Point 125	525	274.5
Point 126	525	285
Point 127	525	305
Point 128	525	311.7
Point 129	525	314.7
Point 130	525	314.9
Point 131	525	315.9
Point 132	525	316.1
Point 133	525	317.6
Point 134	525	317.8
Point 135	525	318.8
Point 136	525	319
Point 137	525	320
Point 138	525	416.7
Point 139	25	285

Critical Slip Surfaces

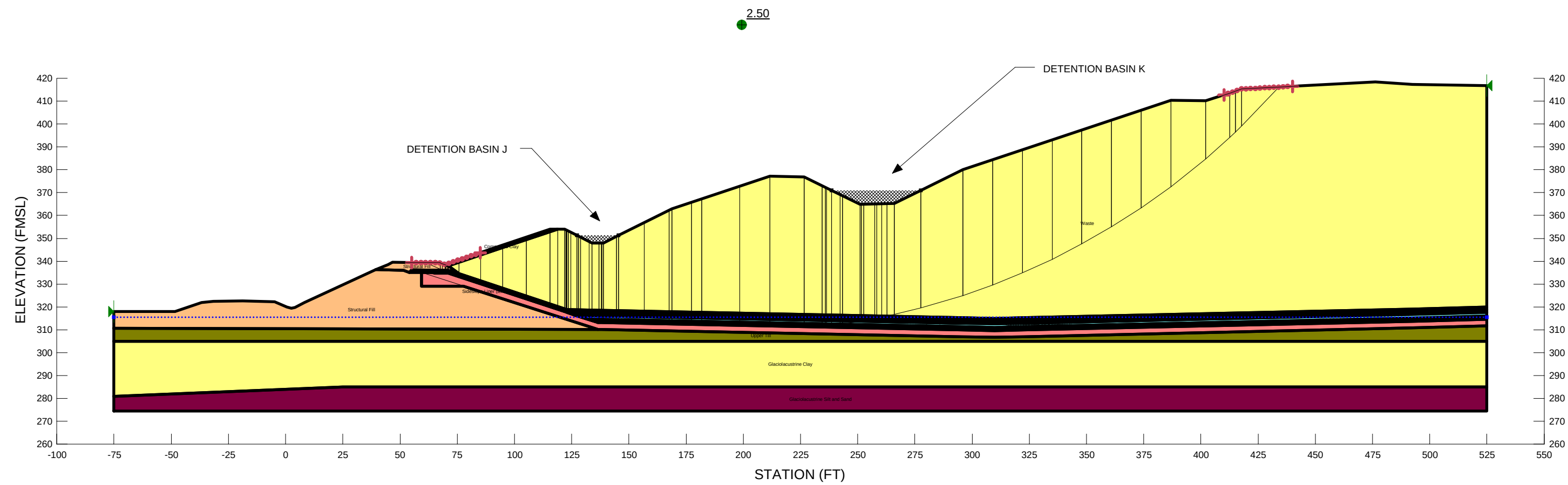
	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	363	2.50	(196.535, 625.458)	316.492	(433.916, 416.132)	(61.1994, 339.361)

Slices of Slip Surface: 363

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)

1	363	64.349725	337.9124	0	768.6028	0	2000
2	363	68.00418	336.24015	0	959.71986	0	2000
3	363	69.10418	335.754	0	479.7942	0	213.95
4	363	69.85	335.4264	0	507.65189	0	226.36
5	363	70.415325	335.18045	0	580.72483	0	258.95
6	363	70.965325	334.9418	0	612.70559	0	164.4
7	363	71.523975	334.7013	0	659.31209	0	176.9
8	363	73.823975	333.8973	0	812.88801	0	218.05
9	363	80.475	331.69325	0	1355.8685	0	363.7
10	363	90.025	328.52855	0	2160.3843	0	579.51
11	363	100	325.223	0	3000.7749	0	804.93
12	363	110.4	321.7766	0	3876.9022	0	1040
13	363	117.3	319.49005	0	4374.0284	0	1173.3
14	363	120.5	318.42965	0	4495.5865	0	1205.9
15	363	122.2	317.8663	0	4553.7269	0	1221.5
16	363	122.49145	317.7634	0	4654.4399	0	1248.7
17	363	122.59145	317.72475	0	4411.1608	0	1183
18	363	122.7	317.6987	0	4405.0522	0	1181.3
19	363	123.15	317.5913	0	4381.6698	0	1175
20	363	124.0224	317.38495	0	4351.0869	0	1166.8
21	363	125.9224	316.9467	0	4436.3337	0	1977
22	363	127.63795	316.556	0	4375.4121	0	1949.9
23	363	128.44715	316.3768	0	4201.2475	0	1126.6
24	363	130.7368	315.8865	0	4220.7688	0	1744.9
25	363	133.2276	315.36275	0	4131.8274	0	1729.2
26	363	135.44465	314.9216	0	4141.0498	0	1730.8
27	363	137.49465	314.52175	0	4077.7922	0	1093.4
28	363	138.077	314.41135	0	4082.8866	0	1094.8
29	363	138.527	314.32735	0	4212.9553	0	1877.3
30	363	141.71625	313.7625	0	4450.9841	0	1983.3
31	363	145.01625	313.1874	144.30482	4578.8991	0	1189
32	363	151.1086	312.96355	158.27664	4755.3396	0	1232.1
33	363	162.11485	312.70975	174.11325	5401.6783	0	1401.1
34	363	168.20625	312.5859	181.84347	5762.772	0	1495.8
35	363	173.125	312.4859	188.07948	5973.6769	0	1550.7
36	363	179.5645	312.355	196.24964	6232.4656	0	1617.9

37	363	190.10375	312.14075	209.62014	6655.8658	0	1727.8
38	363	205.01425	311.8376	228.53708	7255.4525	0	1883.4
39	363	219.1	311.5512	246.40241	7520.4458	0	1949.5
40	363	230.50375	311.31935	260.87306	7308.5947	0	1888.9
41	363	235.10625	311.3258	260.47275	6763.9246	0	1742.4
42	363	236.09	311.4475	0	6726.2373	0	2994.9
43	363	237.4375	311.62185	0	6618.8452	0	2947
44	363	240.36205	312.0207	0	6385.3014	0	2842.9
45	363	242.8188	312.369	0	6179.4402	0	1655.5
46	363	247.20675	313.0722	0	5843.709	0	2030.3
47	363	251.29375	313.7391	0	5534.789	0	1975.8
48	363	252.09095	313.8805	0	5518.7862	0	1478.4
49	363	254.99495	314.42145	0	5445.4103	0	2424.2
50	363	257.8546	314.9633	0	5372.1633	0	1439.1
51	363	259.4138	315.277	0	5327.9227	0	2371.9
52	363	261.61875	315.73215	0	5258.8456	0	2341.1
53	363	264.3618	316.32375	0	5171.1509	0	2985.3
54	363	271.8	318.1035	0	5239.7524	0	3024.8
55	363	286.8	322.2628	0	5470.3273	0	3157.6
56	363	302.49285	327.30925	0	5518.3153	0	3184.9
57	363	315.47855	332.25065	0	5354.7536	0	3090.2
58	363	328.46425	337.86305	0	5127.0888	0	2958.5
59	363	341.45	344.18675	0	4834.7127	0	2789.5
60	363	354.43575	351.27115	0	4476.7046	0	2582.7
61	363	367.42145	359.1771	0	4051.84	0	2337.3
62	363	380.40715	367.98065	0	3558.3712	0	2052.4
63	363	394.45	378.6723	0	2711.762	0	1563.9
64	363	407.25	389.41385	0	1867.4112	0	1076.9
65	363	413.75	395.2801	0	1528.6456	0	881.45
66	363	416.35	397.763	0	1389.3038	0	801.1
67	363	425.8079	407.59895	0	644.57946	0	371.66



Name: Along CCL, both basins full
Kind: SLOPE/W
Method: Spencer
File Name: STATIC- Sliding November 2011.gsz

Section A-A'
Fill Progression Slope Stability Analysis
RMU-1 Leachate Level Compliance Plan
CWM Chemical Services, LLC
Model City, New York

Along CCL, both basins full

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File Information

Revision Number: 264
Last Edited By: Giampaolo, Mandy
Date: 11/15/2011
Time: 10:39:14 AM
File Name: STATIC- Sliding November 2011.gsz
Directory: C:\Users\mgiampaolo\Documents\ARCADIS Documents\RMU-1\2011 Fill
Progression\Calc in Response to Review Comments\
Last Solved Date: 11/15/2011
Last Solved Time: 10:39:36 AM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Along CCL, both basins full

Kind: SLOPE/W
Method: Spencer
Settings
 Apply Phreatic Correction: No
 PWP Conditions Source: Piezometric Line with Ru
Slip Surface
 Direction of movement: Right to Left
 Use Passive Mode: No
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: No
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

operations Layer

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile (2)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Leachate Collection

Model: Mohr-Coulomb
Unit Weight: 135 pcf

Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Sideslope Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Compacted Clay

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion: 1000 psf
Phi: 10 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Secondary Leachate Collection

Model: [Mohr-Coulomb](#)

Unit Weight: [135 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Secondary Liner (textured)

Model: [Mohr-Coulomb](#)

Unit Weight: [58.7 pcf](#)

Cohesion: [0 psf](#)

Phi: [15 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Secondary Compacted Clay

Model: [Bedrock \(Impenetrable\)](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Structural Fill

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [2000 psf](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Upper Till

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [800 psf](#)

Phi: [10 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Glaciolacustrine Clay

Model: [Mohr-Coulomb](#)

Unit Weight: [125 pcf](#)

Cohesion: [320 psf](#)

Phi: [10 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Glaciolacustrine Silt and Sand

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [0 psf](#)

Phi: [30 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(55, 339.42019\) ft](#)

Left-Zone Right Coordinate: [\(85, 343.69198\) ft](#)

Left-Zone Increment: [15](#)

Right Projection: [Range](#)

Right-Zone Left Coordinate: [\(410, 412.69048\) ft](#)

Right-Zone Right Coordinate: [\(440, 416.44359\) ft](#)

Right-Zone Increment: [15](#)

Radius Increments: [5](#)

Slip Surface Limits

Left Coordinate: [\(-75, 318\) ft](#)

Right Coordinate: [\(525, 416.7\) ft](#)

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	-75	315.5
	525	315.5

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Vertical

Coordinates

	X (ft)	Y (ft)
	127.3	351.3
	145.5	351.3

Surcharge Load 2

Surcharge (Unit Weight): 62.4 pcf
Direction: Vertical

Coordinates

	X (ft)	Y (ft)
	238.5	371
	277.6	371

Seismic Loads

Horz Seismic Load: 0
Vert Seismic Load: 0

Regions

	Material	Points	Area (ft²)
Regi	Structural	5,42,123,122,121,120,119,118,117,116,41,124,40,39,38,91,92,93,90	2800.8

on 1	Fill		53
Region 2	Upper Till	2,5,90,4,83,84,85,86,128,127	2643.4
Region 3	Glaciolacustrine Clay	6,2,127,126,139	12200
Region 4	Glaciolacustrine Silt and Sand	7,6,139,126,125	6100
Region 5	Geotextile (2)	104,87,43,44,45,46,47,136,135,52,51,50,49,48	80.98
Region 6	Primary Leachate Collection	106,104,48,49,50,51,52,135,134,57,56,55,54,53	400.015
Region 7	Primary Liner (textured 1000-2000psf)	102,106,53,54,55,56,57,134,133,62,61,60,59,58	79.5
Region 8	Compacted Clay	100,102,58,59,60,61,62,133,132,67,66,65,64,63	592.695
Region 9	Geotextile	101,100,63,64,65,66,67,132,131,72,71,70,69,68	78.45
Region 10	Secondary Leachate Collection	99,101,68,69,70,71,72,131,130,77,76,75,74,73	390.54
Region 11	operations Layer	38,37,36,107,35,1,34,33,32,31,137,136,47,46,45,44,43,87,88,95,91	472.885
Region 12	Secondary Compacted Clay	91,95,96,94,98,105,103,97,89,78,79,80,81,82,129,128,86,85,84,83,4,90,93,92	1452.252
Region 13	Secondary Liner (textured)	103,102,100,101,99,73,74,75,76,77,130,129,82,81,80,79,78,89,97	79.395
Region 14	Sideslope Liner (textured 1000-2000psf)	96,95,88,87,104,106,102,103,105,98,94	11.54

Region 15	Structural Fill	40,30,29,28,110,27,26,107,36,37,38,39	97.18
Region 16	Waste	26,25,24,23,114,22,21,115,20,19,18,112,17,16,113,15,14,13,12,11,10,9,8,138,137,31,32,33,34,1,35,107	30224.295
Region 17	Compacted Clay	110,109,108,111,24,25,26,27	48.395

Points

	X (ft)	Y (ft)
Point 1	138	318.5
Point 2	-75	305
Point 3	68.5	332.1
Point 4	138	310.2
Point 5	-75	310.7
Point 6	-75	281
Point 7	-75	274.5
Point 8	492.5	417.4
Point 9	476.2	418.3
Point 10	417.7	415.3
Point 11	415	414.3
Point 12	412.5	413.5
Point 13	402	410.1
Point 14	386.9	410.4
Point 15	296	380.1
Point 16	266	365.2
Point 17	251	364.9
Point 18	226.6	376.9
Point 19	211.6	377.2
Point 20	168.9	363
Point 21	138.9	348
Point 22	133.9	348
Point 23	122	354
Point 24	119	354

Point 25	94.8	346
Point 26	71.1	338
Point 27	70	338.4
Point 28	67.5	339.3
Point 29	46.7	339.5
Point 30	44.7	338.5
Point 31	492.5	319.1
Point 32	322.5	315.3
Point 33	309.9	315
Point 34	295.4	315.3
Point 35	122.8	318.9
Point 36	71.1	336
Point 37	55	336.1
Point 38	54	335.1
Point 39	51.5	336
Point 40	39.4	336.3
Point 41	4	319.7
Point 42	-75	314
Point 43	138	317.5
Point 44	295.4	314.3
Point 45	309.9	314
Point 46	322.5	314.3
Point 47	492.5	318.1
Point 48	138	317.3
Point 49	295.4	314.1
Point 50	309.9	313.8
Point 51	322.5	314.1
Point 52	492.5	317.9
Point 53	138	316.3
Point 54	295.4	313.1
Point 55	309.9	312.8
Point 56	322.5	313.1
Point 57	492.5	316.9
Point 58	138	316.1
Point 59	295.4	312.9
Point 60	309.9	312.6

Point 61	322.5	312.9
Point 62	492.5	316.7
Point 63	138	314.6
Point 64	295.4	311.4
Point 65	309.9	311.1
Point 66	322.5	311.4
Point 67	492.5	315.2
Point 68	138	314.4
Point 69	295.4	311.2
Point 70	309.9	310.9
Point 71	322.5	311.2
Point 72	492.5	315
Point 73	138	313.4
Point 74	295.4	310.2
Point 75	309.9	309.9
Point 76	322.5	310.2
Point 77	492.5	314
Point 78	138	313.2
Point 79	295.4	310
Point 80	309.9	309.7
Point 81	322.5	310
Point 82	492.5	313.8
Point 83	295.4	307
Point 84	309.9	306.7
Point 85	322.5	307
Point 86	492.5	310.8
Point 87	122.6	317.9
Point 88	71.1	335
Point 89	136.4	313.2
Point 90	136.6	310.2
Point 91	59.4	335.1
Point 92	59.42601	329.1
Point 93	77.7	329.1
Point 94	71.1	334.8
Point 95	65.1	335
Point 96	65.1	334.8

Point 97	136	313.3
Point 98	122.4	317.8
Point 99	136.2	313.4
Point 100	132.3	314.7
Point 101	132.9	314.5
Point 102	127.5	316.3
Point 103	126.9	316.3
Point 104	123.5	317.6
Point 105	122.9	317.6
Point 106	126.9	316.5
Point 107	75.7	334.5
Point 108	94.8	347
Point 109	71.1	339
Point 110	69.7	338.5
Point 111	115.6	354
Point 112	238.5	371
Point 113	277.6	371
Point 114	127.3	351.3
Point 115	145.5	351.3
Point 116	2.4	319.5
Point 117	0.5	319.9
Point 118	-4.8	322.3
Point 119	-18.8	322.7
Point 120	-31.6	322.5
Point 121	-36.7	321.9
Point 122	-48.3	318
Point 123	-75	318
Point 124	8.1	321.9
Point 125	525	274.5
Point 126	525	285
Point 127	525	305
Point 128	525	311.7
Point 129	525	314.7
Point 130	525	314.9
Point 131	525	315.9
Point 132	525	316.1

Point 133	525	317.6
Point 134	525	317.8
Point 135	525	318.8
Point 136	525	319
Point 137	525	320
Point 138	525	416.7
Point 139	25	285

Critical Slip Surfaces

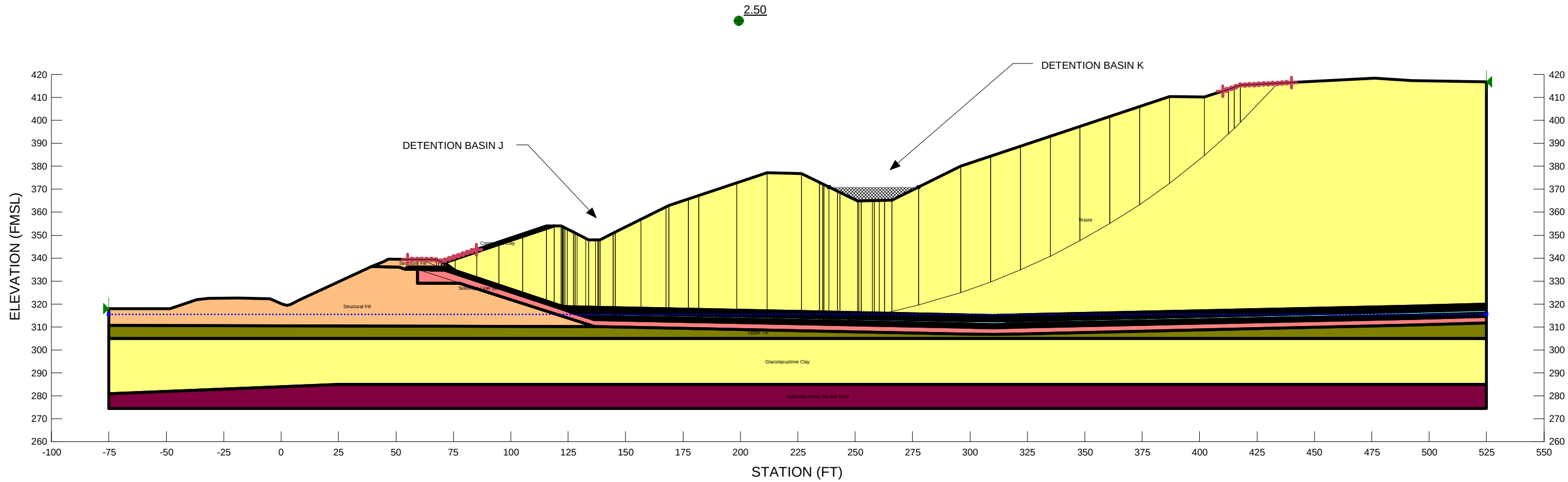
	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	363	2.50	(196.535, 625.458)	316.492	(433.916, 416.132)	(61.1994, 339.361)

Slices of Slip Surface: 363

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	363	64.349725	337.9124	0	767.46355	0	2000
2	363	68.00418	336.24015	0	958.63236	0	2000
3	363	69.10418	335.754	0	479.60216	0	213.86
4	363	69.85	335.4264	0	507.43807	0	226.27
5	363	70.415325	335.18045	0	580.49295	0	258.84
6	363	70.965325	334.9418	0	612.5352	0	164.35
7	363	71.523975	334.7013	0	659.12791	0	176.85
8	363	73.823975	333.8973	0	812.71092	0	218
9	363	80.475	331.69325	0	1355.5703	0	363.62
10	363	90.025	328.52855	0	2159.9867	0	579.38
11	363	100	325.223	0	3000.136	0	804.75
12	363	110.4	321.7766	0	3876.0808	0	1039.7
13	363	117.3	319.49005	0	4372.9117	0	1173
14	363	120.5	318.42965	0	4494.3209	0	1205.6
15	363	122.2	317.8663	0	4552.5404	0	1221.2
16	363	122.49145	317.7634	0	4653.2216	0	1248.4
17	363	122.59145	317.72475	0	4410.3645	0	1182.7

18	363	122.7	317.6987	0	4404.2743	0	1181.1
19	363	123.15	317.5913	0	4380.975	0	1174.8
20	363	124.0224	317.38495	0	4350.3415	0	1166.6
21	363	125.9224	316.9467	0	4435.2723	0	1976.6
22	363	127.63795	316.556	0	4386.3867	0	1954.8
23	363	128.44715	316.3768	0	4239.6874	0	1136.9
24	363	130.7368	315.8865	0	4335.0763	0	1765.1
25	363	133.2276	315.36275	0	4328.987	0	1764
26	363	135.44465	314.9216	0	4360.2034	0	1769.5
27	363	137.49465	314.52175	0	4300.0918	0	1153
28	363	138.077	314.41135	0	4305.0594	0	1154.3
29	363	138.527	314.32735	0	4441.3344	0	1979
30	363	141.71625	313.7625	0	4580.9028	0	2041.2
31	363	145.01625	313.1874	144.30482	4594.5024	0	1193.2
32	363	151.1086	312.96355	158.27664	4755.0722	0	1232
33	363	162.11485	312.70975	174.11325	5401.3079	0	1401
34	363	168.20625	312.5859	181.84347	5762.4117	0	1495.7
35	363	173.125	312.4859	188.07948	5973.322	0	1550.6
36	363	179.5645	312.355	196.24964	6232.2399	0	1617.7
37	363	190.10375	312.14075	209.62014	6655.8658	0	1727.7
38	363	205.01425	311.8376	228.53708	7254.9971	0	1883.2
39	363	219.1	311.5512	246.40241	7519.7792	0	1949.4
40	363	230.50375	311.31935	260.87306	7308.0825	0	1888.8
41	363	235.10625	311.3258	260.47275	6763.8536	0	1742.4
42	363	236.09	311.4475	0	6726.0632	0	2994.8
43	363	237.4375	311.62185	0	6618.3786	0	2946.9
44	363	240.36205	312.0207	0	6440.8812	0	2867.7
45	363	242.8188	312.369	0	6307.9481	0	1690
46	363	247.20675	313.0722	0	6101.4604	0	2075.7
47	363	251.29375	313.7391	0	5903.272	0	2040.8
48	363	252.09095	313.8805	0	5886.2295	0	1576.9
49	363	254.99495	314.42145	0	5808.1374	0	2585.7
50	363	257.8546	314.9633	0	5730.742	0	1535.2
51	363	259.4138	315.277	0	5683.8303	0	2530.3
52	363	261.61875	315.73215	0	5611.384	0	2497.9
53	363	264.3618	316.32375	0	5518.16	0	3185.8

54	363	271.8	318.1035	0	5410.7349	0	3123.5
55	363	286.8	322.2628	0	5470.8482	0	3157.8
56	363	302.49285	327.30925	0	5518.7507	0	3185.1
57	363	315.47855	332.25065	0	5355.3245	0	3090.5
58	363	328.46425	337.86305	0	5127.7188	0	2958.9
59	363	341.45	344.18675	0	4835.4657	0	2789.9
60	363	354.43575	351.27115	0	4477.5054	0	2583.1
61	363	367.42145	359.1771	0	4052.6825	0	2337.8
62	363	380.40715	367.98065	0	3559.1859	0	2052.9
63	363	394.45	378.6723	0	2712.4852	0	1564.3
64	363	407.25	389.41385	0	1867.9796	0	1077.2
65	363	413.75	395.2801	0	1529.1402	0	881.75
66	363	416.35	397.763	0	1389.7567	0	801.37
67	363	425.8079	407.59895	0	644.79186	0	371.79



Name: Along CCL, with Basin K full
Kind: SLOPE/W
Method: Spencer
File Name: STATIC- Sliding November 2011.gsz

Section A-A'
Fill Progression Slope Stability Analysis
RMU-1 Leachate Level Compliance Plan
CWM Chemical Services, LLC
Model City, New York

Along CCL, with Basin K full

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File Information

Revision Number: 264
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File Name: STATIC- Sliding November 2011.gsz
Directory: C:\Users\mgiampaolo\Documents\ARCADIS Documents\RMU-1\2011 Fill
Progression\Calc in Response to Review Comments\
Last Solved Date: 11/15/2011
Last Solved Time: 10:39:50 AM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Along CCL, with Basin K full

Kind: SLOPE/W
Method: Spencer
Settings
 Apply Phreatic Correction: No
 PWP Conditions Source: Piezometric Line with Ru
Slip Surface
 Direction of movement: Right to Left
 Use Passive Mode: No
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: No
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

operations Layer

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile (2)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Leachate Collection

Model: Mohr-Coulomb
Unit Weight: 135 pcf

Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Sideslope Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Compacted Clay

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion: 1000 psf
Phi: 10 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Secondary Leachate Collection

Model: [Mohr-Coulomb](#)

Unit Weight: [135 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Secondary Liner (textured)

Model: [Mohr-Coulomb](#)

Unit Weight: [58.7 pcf](#)

Cohesion: [0 psf](#)

Phi: [15 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Secondary Compacted Clay

Model: [Bedrock \(Impenetrable\)](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Structural Fill

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [2000 psf](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Upper Till

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [800 psf](#)

Phi: [10 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Glaciolacustrine Clay

Model: [Mohr-Coulomb](#)

Unit Weight: [125 pcf](#)

Cohesion: [320 psf](#)

Phi: [10 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Glaciolacustrine Silt and Sand

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [0 psf](#)

Phi: [30 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(55, 339.42019\) ft](#)

Left-Zone Right Coordinate: [\(85, 343.69198\) ft](#)

Left-Zone Increment: [15](#)

Right Projection: [Range](#)

Right-Zone Left Coordinate: [\(410, 412.69048\) ft](#)

Right-Zone Right Coordinate: [\(440, 416.44359\) ft](#)

Right-Zone Increment: [15](#)

Radius Increments: [5](#)

Slip Surface Limits

Left Coordinate: [\(-75, 318\) ft](#)

Right Coordinate: [\(525, 416.7\) ft](#)

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	-75	315.5
	525	315.5

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	238.5	371
	277.6	371

Seismic Loads

Horz Seismic Load: 0
Vert Seismic Load: 0

Regions

	Material	Points	Area (ft²)
Region 1	Structural Fill	5,42,123,122,121,120,119,118,117,116,41,124,40,39,38,91,92,93,90	2800.853
Region 2	Upper Till	2,5,90,4,83,84,85,86,128,127	2643.4
Region 3	Glaciolacustrine Clay	6,2,127,126,139	12200
Region 4	Glaciolacustrine Silt and Sand	7,6,139,126,125	6100

Region 5	Geotextile (2)	104,87,43,44,45,46,47,136,135,52,51,50,49,48	80.98
Region 6	Primary Leachate Collection	106,104,48,49,50,51,52,135,134,57,56,55,54,53	400.015
Region 7	Primary Liner (textured 1000-2000psf)	102,106,53,54,55,56,57,134,133,62,61,60,59,58	79.5
Region 8	Compacted Clay	100,102,58,59,60,61,62,133,132,67,66,65,64,63	592.695
Region 9	Geotextile	101,100,63,64,65,66,67,132,131,72,71,70,69,68	78.45
Region 10	Secondary Leachate Collection	99,101,68,69,70,71,72,131,130,77,76,75,74,73	390.54
Region 11	operations Layer	38,37,36,107,35,1,34,33,32,31,137,136,47,46,45,44,43,87,88,95,91	472.885
Region 12	Secondary Compacted Clay	91,95,96,94,98,105,103,97,89,78,79,80,81,82,129,128,86,85,84,83,4,90,93,92	1452.252
Region 13	Secondary Liner (textured)	103,102,100,101,99,73,74,75,76,77,130,129,82,81,80,79,78,89,97	79.395
Region 14	Sideslope Liner (textured 1000-2000psf)	96,95,88,87,104,106,102,103,105,98,94	11.54
Region 15	Structural Fill	40,30,29,28,110,27,26,107,36,37,38,39	97.18
Region 16	Waste	26,25,24,23,114,22,21,115,20,19,18,112,17,16,113,15,14,13,12,11,10,9,8,138,137,31,32,33,34,1,35,107	30224.295
Region	Compacted Clay	110,109,108,111,24,25,26,27	48.395

17		

Points

	X (ft)	Y (ft)
Point 1	138	318.5
Point 2	-75	305
Point 3	68.5	332.1
Point 4	138	310.2
Point 5	-75	310.7
Point 6	-75	281
Point 7	-75	274.5
Point 8	492.5	417.4
Point 9	476.2	418.3
Point 10	417.7	415.3
Point 11	415	414.3
Point 12	412.5	413.5
Point 13	402	410.1
Point 14	386.9	410.4
Point 15	296	380.1
Point 16	266	365.2
Point 17	251	364.9
Point 18	226.6	376.9
Point 19	211.6	377.2
Point 20	168.9	363
Point 21	138.9	348
Point 22	133.9	348
Point 23	122	354
Point 24	119	354
Point 25	94.8	346
Point 26	71.1	338
Point 27	70	338.4
Point 28	67.5	339.3
Point 29	46.7	339.5
Point 30	44.7	338.5
Point 31	492.5	319.1

Point 32	322.5	315.3
Point 33	309.9	315
Point 34	295.4	315.3
Point 35	122.8	318.9
Point 36	71.1	336
Point 37	55	336.1
Point 38	54	335.1
Point 39	51.5	336
Point 40	39.4	336.3
Point 41	4	319.7
Point 42	-75	314
Point 43	138	317.5
Point 44	295.4	314.3
Point 45	309.9	314
Point 46	322.5	314.3
Point 47	492.5	318.1
Point 48	138	317.3
Point 49	295.4	314.1
Point 50	309.9	313.8
Point 51	322.5	314.1
Point 52	492.5	317.9
Point 53	138	316.3
Point 54	295.4	313.1
Point 55	309.9	312.8
Point 56	322.5	313.1
Point 57	492.5	316.9
Point 58	138	316.1
Point 59	295.4	312.9
Point 60	309.9	312.6
Point 61	322.5	312.9
Point 62	492.5	316.7
Point 63	138	314.6
Point 64	295.4	311.4
Point 65	309.9	311.1
Point 66	322.5	311.4
Point 67	492.5	315.2

Point 68	138	314.4
Point 69	295.4	311.2
Point 70	309.9	310.9
Point 71	322.5	311.2
Point 72	492.5	315
Point 73	138	313.4
Point 74	295.4	310.2
Point 75	309.9	309.9
Point 76	322.5	310.2
Point 77	492.5	314
Point 78	138	313.2
Point 79	295.4	310
Point 80	309.9	309.7
Point 81	322.5	310
Point 82	492.5	313.8
Point 83	295.4	307
Point 84	309.9	306.7
Point 85	322.5	307
Point 86	492.5	310.8
Point 87	122.6	317.9
Point 88	71.1	335
Point 89	136.4	313.2
Point 90	136.6	310.2
Point 91	59.4	335.1
Point 92	59.42601	329.1
Point 93	77.7	329.1
Point 94	71.1	334.8
Point 95	65.1	335
Point 96	65.1	334.8
Point 97	136	313.3
Point 98	122.4	317.8
Point 99	136.2	313.4
Point 100	132.3	314.7
Point 101	132.9	314.5
Point 102	127.5	316.3
Point 103	126.9	316.3

Point 104	123.5	317.6
Point 105	122.9	317.6
Point 106	126.9	316.5
Point 107	75.7	334.5
Point 108	94.8	347
Point 109	71.1	339
Point 110	69.7	338.5
Point 111	115.6	354
Point 112	238.5	371
Point 113	277.6	371
Point 114	127.3	351.3
Point 115	145.5	351.3
Point 116	2.4	319.5
Point 117	0.5	319.9
Point 118	-4.8	322.3
Point 119	-18.8	322.7
Point 120	-31.6	322.5
Point 121	-36.7	321.9
Point 122	-48.3	318
Point 123	-75	318
Point 124	8.1	321.9
Point 125	525	274.5
Point 126	525	285
Point 127	525	305
Point 128	525	311.7
Point 129	525	314.7
Point 130	525	314.9
Point 131	525	315.9
Point 132	525	316.1
Point 133	525	317.6
Point 134	525	317.8
Point 135	525	318.8
Point 136	525	319
Point 137	525	320
Point 138	525	416.7
Point 139	25	285

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	363	2.50	(196.535, 625.458)	316.492	(433.916, 416.132)	(61.1994, 339.361)

Slices of Slip Surface: 363

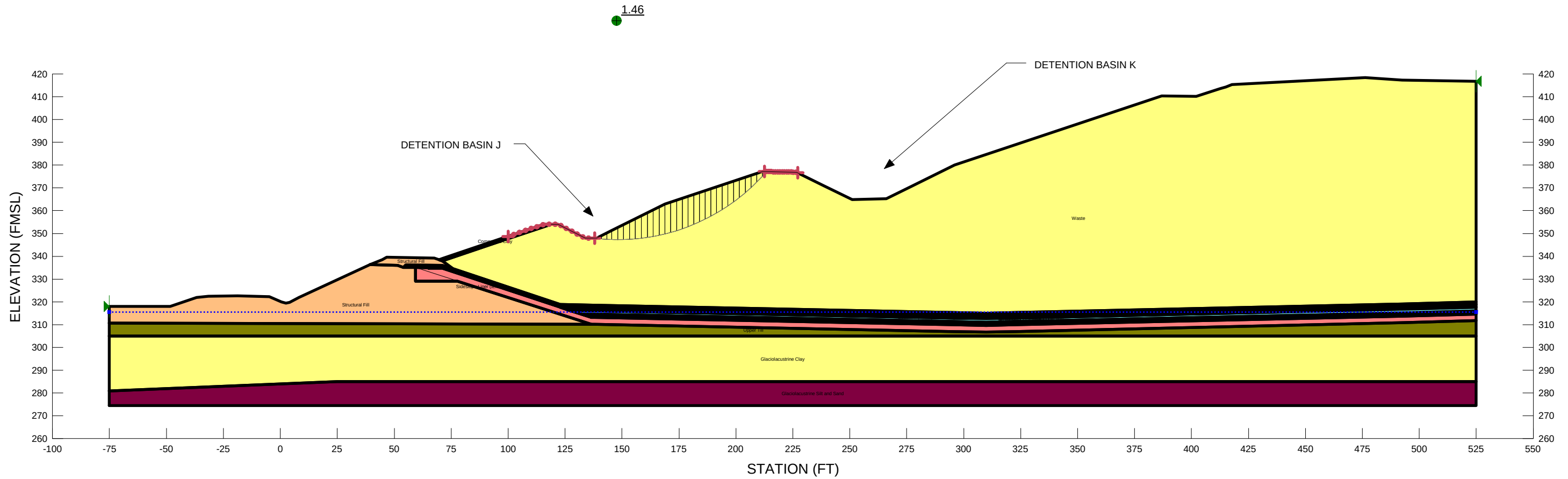
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	363	64.349725	337.9124	0	769.16521	0	2000
2	363	68.00418	336.24015	0	960.26361	0	2000
3	363	69.10418	335.754	0	479.85565	0	213.97
4	363	69.85	335.4264	0	507.71299	0	226.39
5	363	70.415325	335.18045	0	580.79107	0	258.98
6	363	70.965325	334.9418	0	612.73967	0	164.41
7	363	71.523975	334.7013	0	659.35542	0	176.91
8	363	73.823975	333.8973	0	812.91331	0	218.06
9	363	80.475	331.69325	0	1355.9679	0	363.72
10	363	90.025	328.52855	0	2160.5831	0	579.55
11	363	100	325.223	0	3000.9575	0	804.97
12	363	110.4	321.7766	0	3877.1761	0	1040
13	363	117.3	319.49005	0	4374.0284	0	1173.3
14	363	120.5	318.42965	0	4495.5865	0	1205.9
15	363	122.2	317.8663	0	4553.9642	0	1221.5
16	363	122.49145	317.7634	0	4654.6938	0	1248.8
17	363	122.59145	317.72475	0	4411.3314	0	1183
18	363	122.7	317.6987	0	4405.2467	0	1181.4
19	363	123.15	317.5913	0	4381.8088	0	1175.1
20	363	124.0224	317.38495	0	4351.2732	0	1166.9
21	363	125.9224	316.9467	0	4436.6875	0	1977.2
22	363	127.63795	316.556	0	4375.8453	0	1950.1
23	363	128.44715	316.3768	0	4201.4547	0	1126.7
24	363	130.7368	315.8865	0	4221.0378	0	1745
25	363	133.2276	315.36275	0	4132.1188	0	1729.2

26	363	135.44465	314.9216	0	4141.3674	0	1730.9
27	363	137.49465	314.52175	0	4077.8894	0	1093.4
28	363	138.077	314.41135	0	4083.0781	0	1094.8
29	363	138.527	314.32735	0	4213.2188	0	1877.5
30	363	141.71625	313.7625	0	4451.3338	0	1983.4
31	363	145.01625	313.1874	144.30482	4579.1031	0	1189.1
32	363	151.1086	312.96355	158.27664	4755.4287	0	1232.2
33	363	162.11485	312.70975	174.11325	5401.771	0	1401.1
34	363	168.20625	312.5859	181.84347	5762.9161	0	1495.8
35	363	173.125	312.4859	188.07948	5973.7952	0	1550.7
36	363	179.5645	312.355	196.24964	6232.6914	0	1617.9
37	363	190.10375	312.14075	209.62014	6656.4663	0	1727.8
38	363	205.01425	311.8376	228.53708	7255.6043	0	1883.4
39	363	219.1	311.5512	246.40241	7520.4458	0	1949.6
40	363	230.50375	311.31935	260.87306	7308.7228	0	1889
41	363	235.10625	311.3258	260.47275	6763.9956	0	1742.5
42	363	236.09	311.4475	0	6726.2373	0	2994.9
43	363	237.4375	311.62185	0	6618.8452	0	2947
44	363	240.36205	312.0207	0	6435.8285	0	2865.5
45	363	242.8188	312.369	0	6296.137	0	1686.8
46	363	247.20675	313.0722	0	6077.78	0	2071.5
47	363	251.29375	313.7391	0	5904.6132	0	2041
48	363	252.09095	313.8805	0	5887.5006	0	1577.2
49	363	254.99495	314.42145	0	5809.5703	0	2586.4
50	363	257.8546	314.9633	0	5731.9173	0	1535.5
51	363	259.4138	315.277	0	5685.1666	0	2530.9
52	363	261.61875	315.73215	0	5612.2698	0	2498.5
53	363	264.3618	316.32375	0	5519.3525	0	3186.5
54	363	271.8	318.1035	0	5426.5604	0	3132.8
55	363	286.8	322.2628	0	5470.3273	0	3157.5
56	363	302.49285	327.30925	0	5518.0976	0	3184.8
57	363	315.47855	332.25065	0	5354.5395	0	3090.1
58	363	328.46425	337.86305	0	5126.8088	0	2958.3
59	363	341.45	344.18675	0	4834.4389	0	2789.3
60	363	354.43575	351.27115	0	4476.4376	0	2582.5
61	363	367.42145	359.1771	0	4051.516	0	2337.1

62	363	380.40715	367.98065	0	3558.0578	0	2052.2
63	363	394.45	378.6723	0	2711.5036	0	1563.7
64	363	407.25	389.41385	0	1867.1981	0	1076.7
65	363	413.75	395.2801	0	1528.442	0	881.35
66	363	416.35	397.763	0	1389.1439	0	801
67	363	425.8079	407.59895	0	644.4945	0	371.61

Appendix C

Pseudo-static Stability Analysis:
Circular



Name: Lower Waste
Kind: SLOPE/W
Method: Spencer
File Name: SEISMIC- November 2011.gsz

Section A-A'
Fill Progression Slope Stability Analysis
RMU-1 Leachate Level Compliance Plan
CWM Chemical Services, LLC
Model City, New York

Lower Waste

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File Information

Revision Number: 281
Last Edited By: Giampaolo, Mandy
Date: 11/16/2011
Time: 9:34:16 AM
File Name: SEISMIC- November 2011.gsz
Directory: C:\Users\mgiampaolo\Documents\ARCADIS Documents\RMU-1\2011 Fill
Progression\Calc in Response to Review Comments\
Last Solved Date: 11/16/2011
Last Solved Time: 9:36:18 AM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Lower Waste

Kind: SLOPE/W
Method: Spencer
Settings
 Apply Phreatic Correction: No
 PWP Conditions Source: Piezometric Line with Ru
Slip Surface
 Direction of movement: Right to Left
 Use Passive Mode: No
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: No
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

operations Layer

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile (2)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Leachate Collection

Model: Mohr-Coulomb
Unit Weight: 135 pcf

Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Sideslope Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Compacted Clay

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion: 1000 psf
Phi: 10 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Secondary Leachate Collection

Model: [Mohr-Coulomb](#)

Unit Weight: [135 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Secondary Liner (textured)

Model: [Mohr-Coulomb](#)

Unit Weight: [58.7 pcf](#)

Cohesion: [0 psf](#)

Phi: [15 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Secondary Compacted Clay

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [1000 psf](#)

Phi: [10 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Structural Fill

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [2000 psf](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Upper Till

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [800 psf](#)

Phi: [10 °](#)

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Ru: 0

Include in PWP: No

Glaciolacustrine Clay

Model: Mohr-Coulomb

Unit Weight: 125 pcf

Cohesion: 256 psf

Phi: 8 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Ru: 0

Include in PWP: No

Glaciolacustrine Silt and Sand

Model: Mohr-Coulomb

Unit Weight: 130 pcf

Cohesion: 0 psf

Phi: 30 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Ru: 0

Include in PWP: No

Slip Surface Entry and Exit

Left Projection: Range

Left-Zone Left Coordinate: (100, 348.75) ft

Left-Zone Right Coordinate: (138, 348) ft

Left-Zone Increment: 15

Right Projection: Range

Right-Zone Left Coordinate: (212.44804, 377.18304) ft

Right-Zone Right Coordinate: (227.1317, 376.63639) ft

Right-Zone Increment: 15

Radius Increments: 5

Slip Surface Limits

Left Coordinate: (-75, 318) ft

Right Coordinate: (525, 416.7) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	-75	315.5
	525	315.5

Seismic Loads

Horz Seismic Load: 0.055
Vert Seismic Load: 0
Ignore seismic load in strength: Yes

Regions

	Material	Points	Area (ft²)
Region 1	Structural Fill	5,42,123,122,121,120,119,118,117,116,41,124,40,39,38,91,92,93,90	2800.853
Region 2	Upper Till	2,5,90,4,83,84,85,86,128,127	2643.4
Region 3	Glaciolacustrine Clay	6,2,127,126,139	12200
Region 4	Glaciolacustrine Silt and Sand	7,6,139,126,125	6100
Region 5	Geotextile (2)	104,87,43,44,45,46,47,136,135,52,51,50,49,48	80.98
Region 6	Primary Leachate Collection	106,104,48,49,50,51,52,135,134,57,56,55,54,53	400.015
Region 7	Primary Liner (textured 1000-2000psf)	102,106,53,54,55,56,57,134,133,62,61,60,59,58	79.5
Region	Compacte	100,102,58,59,60,61,62,133,132,67,66,65,64,63	592.69

on 8	d Clay		5
Regi on 9	Geotextile	101,100,63,64,65,66,67,132,131,72,71,70,69,68	78.45
Regi on 10	Secondary Leachate Collection	99,101,68,69,70,71,72,131,130,77,76,75,74,73	390.54
Regi on 11	operation s Layer	38,37,36,107,35,1,34,33,32,31,137,136,47,46,45,44,43,87,88,95,91	472.88 5
Regi on 12	Secondary Compacte d Clay	91,95,96,94,98,105,103,97,89,78,79,80,81,82,129,128,86,85,84,83,4 ,90,93,92	1452.2 52
Regi on 13	Secondary Liner (textured)	103,102,100,101,99,73,74,75,76,77,130,129,82,81,80,79,78,89,97	79.395
Regi on 14	Sideslope Liner (textured 1000- 2000psf)	96,95,88,87,104,106,102,103,105,98,94	11.54
Regi on 15	Structural Fill	40,30,29,28,110,27,26,107,36,37,38,39	97.18
Regi on 16	Waste	26,25,24,23,114,22,21,115,20,19,18,112,17,16,113,15,14,13,12,11,1 0,9,8,138,137,31,32,33,34,1,35,107	30224. 295
Regi on 17	Compacte d Clay	110,109,108,111,24,25,26,27	48.395

Points

	X (ft)	Y (ft)
Point 1	138	318.5
Point 2	-75	305
Point 3	68.5	332.1
Point 4	138	310.2
Point 5	-75	310.7
Point 6	-75	281

Point 7	-75	274.5
Point 8	492.5	417.4
Point 9	476.2	418.3
Point 10	417.7	415.3
Point 11	415	414.3
Point 12	412.5	413.5
Point 13	402	410.1
Point 14	386.9	410.4
Point 15	296	380.1
Point 16	266	365.2
Point 17	251	364.9
Point 18	226.6	376.9
Point 19	211.6	377.2
Point 20	168.9	363
Point 21	138.9	348
Point 22	133.9	348
Point 23	122	354
Point 24	119	354
Point 25	94.8	346
Point 26	71.1	338
Point 27	70	338.4
Point 28	67.5	339.3
Point 29	46.7	339.5
Point 30	44.7	338.5
Point 31	492.5	319.1
Point 32	322.5	315.3
Point 33	309.9	315
Point 34	295.4	315.3
Point 35	122.8	318.9
Point 36	71.1	336
Point 37	55	336.1
Point 38	54	335.1
Point 39	51.5	336
Point 40	39.4	336.3
Point 41	4	319.7
Point 42	-75	314

Point 43	138	317.5
Point 44	295.4	314.3
Point 45	309.9	314
Point 46	322.5	314.3
Point 47	492.5	318.1
Point 48	138	317.3
Point 49	295.4	314.1
Point 50	309.9	313.8
Point 51	322.5	314.1
Point 52	492.5	317.9
Point 53	138	316.3
Point 54	295.4	313.1
Point 55	309.9	312.8
Point 56	322.5	313.1
Point 57	492.5	316.9
Point 58	138	316.1
Point 59	295.4	312.9
Point 60	309.9	312.6
Point 61	322.5	312.9
Point 62	492.5	316.7
Point 63	138	314.6
Point 64	295.4	311.4
Point 65	309.9	311.1
Point 66	322.5	311.4
Point 67	492.5	315.2
Point 68	138	314.4
Point 69	295.4	311.2
Point 70	309.9	310.9
Point 71	322.5	311.2
Point 72	492.5	315
Point 73	138	313.4
Point 74	295.4	310.2
Point 75	309.9	309.9
Point 76	322.5	310.2
Point 77	492.5	314
Point 78	138	313.2

Point 79	295.4	310
Point 80	309.9	309.7
Point 81	322.5	310
Point 82	492.5	313.8
Point 83	295.4	307
Point 84	309.9	306.7
Point 85	322.5	307
Point 86	492.5	310.8
Point 87	122.6	317.9
Point 88	71.1	335
Point 89	136.4	313.2
Point 90	136.6	310.2
Point 91	59.4	335.1
Point 92	59.42601	329.1
Point 93	77.7	329.1
Point 94	71.1	334.8
Point 95	65.1	335
Point 96	65.1	334.8
Point 97	136	313.3
Point 98	122.4	317.8
Point 99	136.2	313.4
Point 100	132.3	314.7
Point 101	132.9	314.5
Point 102	127.5	316.3
Point 103	126.9	316.3
Point 104	123.5	317.6
Point 105	122.9	317.6
Point 106	126.9	316.5
Point 107	75.7	334.5
Point 108	94.8	347
Point 109	71.1	339
Point 110	69.7	338.5
Point 111	115.6	354
Point 112	238.5	371
Point 113	277.6	371
Point 114	127.3	351.3

Point 115	145.5	351.3
Point 116	2.4	319.5
Point 117	0.5	319.9
Point 118	-4.8	322.3
Point 119	-18.8	322.7
Point 120	-31.6	322.5
Point 121	-36.7	321.9
Point 122	-48.3	318
Point 123	-75	318
Point 124	8.1	321.9
Point 125	525	274.5
Point 126	525	285
Point 127	525	305
Point 128	525	311.7
Point 129	525	314.7
Point 130	525	314.9
Point 131	525	315.9
Point 132	525	316.1
Point 133	525	317.6
Point 134	525	317.8
Point 135	525	318.8
Point 136	525	319
Point 137	525	320
Point 138	525	416.7
Point 139	25	285

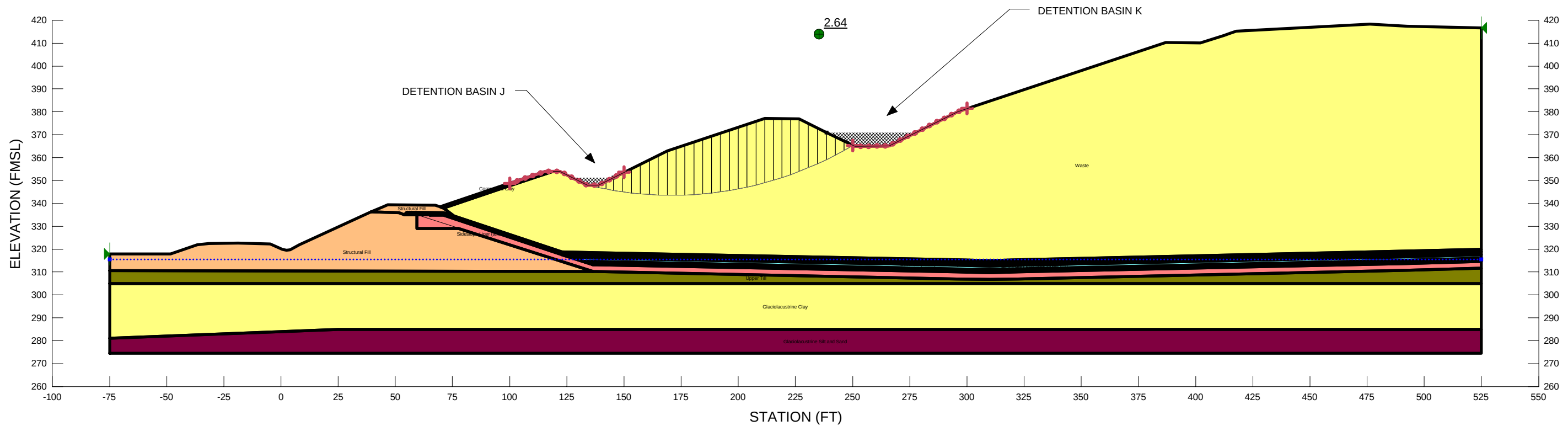
Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	585	1.46	(148.289, 433.275)	85.977	(213.431, 377.163)	(137.325, 348)

Slices of Slip Surface: 585

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)

1	585	138.1126	347.90615	0	13.676587	0	7.6655
2	585	140	347.70575	0	120.23271	0	67.571
3	585	142.2	347.5211	0	295.38811	0	166.52
4	585	144.4	347.39315	0	454.12564	0	256.77
5	585	146.8	347.3208	0	609.60087	0	345.79
6	585	149.4	347.3151	0	759.62891	0	432.35
7	585	152	347.3881	0	891.55273	0	509.12
8	585	154.6	347.54	0	1006.6992	0	576.73
9	585	157.2	347.77115	0	1106.1627	0	635.73
10	585	159.8	348.08225	0	1190.9086	0	686.59
11	585	162.4	348.47425	0	1261.8031	0	729.72
12	585	165	348.9482	0	1319.5315	0	765.49
13	585	167.6	349.5055	0	1364.8193	0	794.19
14	585	170.1559	350.1355	0	1375.9481	0	803.1
15	585	172.66765	350.8372	0	1355.4803	0	793.53
16	585	175.1794	351.6222	0	1326.807	0	779.09
17	585	177.6912	352.4929	0	1290.1778	0	759.91
18	585	180.20295	353.45215	0	1245.916	0	736.11
19	585	182.7147	354.50315	0	1194.166	0	707.79
20	585	185.2265	355.6496	0	1135.1957	0	675.03
21	585	187.73825	356.89585	0	1069.1862	0	637.92
22	585	190.25	358.2469	0	996.28132	0	596.51
23	585	192.76175	359.7085	0	916.70945	0	550.88
24	585	195.2735	361.2874	0	830.59447	0	501.07
25	585	197.7853	362.99155	0	738.12221	0	447.13
26	585	200.29705	364.8303	0	639.50569	0	389.13
27	585	202.8088	366.81485	0	534.9684	0	327.12
28	585	205.3206	368.9587	0	424.80838	0	261.17
29	585	207.83235	371.2785	0	309.42319	0	191.4
30	585	210.3441	373.79495	0	189.30627	0	117.95
31	585	212.51555	376.1343	0	63.6354	0	39.914



Name: Lower Waste, both Basins full
Kind: SLOPE/W
Method: Spencer
File Name: SEISMIC- November 2011.gsz

Section A-A'
Fill Progression Slope Stability Analysis
RMU-1 Leachate Level Compliance Plan
CWM Chemical Services, LLC
Model City, New York

Lower Waste, both Basins full

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File Information

Revision Number: 282
Last Edited By: Giampaolo, Mandy
Date: 11/16/2011
Time: 9:43:49 AM
File Name: SEISMIC- November 2011.gsz
Directory: C:\Users\mgiampaolo\Documents\ARCADIS Documents\RMU-1\2011 Fill
Progression\Calc in Response to Review Comments\
Last Solved Date: 11/16/2011
Last Solved Time: 9:44:02 AM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Lower Waste, both Basins full

Kind: SLOPE/W
Method: Spencer
Settings
 Apply Phreatic Correction: No
 PWP Conditions Source: Piezometric Line with Ru
Slip Surface
 Direction of movement: Right to Left
 Use Passive Mode: No
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: No
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

operations Layer

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile (2)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Leachate Collection

Model: Mohr-Coulomb
Unit Weight: 135 pcf

Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Sideslope Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Compacted Clay

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion: 1000 psf
Phi: 10 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Secondary Leachate Collection

Model: [Mohr-Coulomb](#)

Unit Weight: [135 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Secondary Liner (textured)

Model: [Mohr-Coulomb](#)

Unit Weight: [58.7 pcf](#)

Cohesion: [0 psf](#)

Phi: [15 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Secondary Compacted Clay

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [1000 psf](#)

Phi: [10 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Structural Fill

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [2000 psf](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Upper Till

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [800 psf](#)

Phi: [10 °](#)

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Ru: 0

Include in PWP: No

Glaciolacustrine Clay

Model: Mohr-Coulomb

Unit Weight: 125 pcf

Cohesion: 256 psf

Phi: 8 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Ru: 0

Include in PWP: No

Glaciolacustrine Silt and Sand

Model: Mohr-Coulomb

Unit Weight: 130 pcf

Cohesion: 0 psf

Phi: 30 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Ru: 0

Include in PWP: No

Slip Surface Entry and Exit

Left Projection: Range

Left-Zone Left Coordinate: (100, 348.75) ft

Left-Zone Right Coordinate: (150, 353.55) ft

Left-Zone Increment: 15

Right Projection: Range

Right-Zone Left Coordinate: (249.99925, 365.38837) ft

Right-Zone Right Coordinate: (300, 381.43333) ft

Right-Zone Increment: 15

Radius Increments: 5

Slip Surface Limits

Left Coordinate: (-75, 318) ft

Right Coordinate: (525, 416.7) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	-75	315.5
	525	315.5

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf

Direction: Vertical

Coordinates

	X (ft)	Y (ft)
	238.5	371
	277.6	371

Surcharge Load 2

Surcharge (Unit Weight): 62.4 pcf

Direction: Vertical

Coordinates

	X (ft)	Y (ft)
	127.3	351.3
	145.5	351.3

Seismic Loads

Horz Seismic Load: 0.055

Vert Seismic Load: 0

Ignore seismic load in strength: Yes

Regions

	Material	Points	Area (ft²)

Region 1	Structural Fill	5,42,123,122,121,120,119,118,117,116,41,124,40,39,38,91,92,93,90	2800.853
Region 2	Upper Till	2,5,90,4,83,84,85,86,128,127	2643.4
Region 3	Glaciolacustrine Clay	6,2,127,126,139	12200
Region 4	Glaciolacustrine Silt and Sand	7,6,139,126,125	6100
Region 5	Geotextile (2)	104,87,43,44,45,46,47,136,135,52,51,50,49,48	80.98
Region 6	Primary Leachate Collection	106,104,48,49,50,51,52,135,134,57,56,55,54,53	400.015
Region 7	Primary Liner (textured 1000-2000psf)	102,106,53,54,55,56,57,134,133,62,61,60,59,58	79.5
Region 8	Compacted Clay	100,102,58,59,60,61,62,133,132,67,66,65,64,63	592.695
Region 9	Geotextile	101,100,63,64,65,66,67,132,131,72,71,70,69,68	78.45
Region 10	Secondary Leachate Collection	99,101,68,69,70,71,72,131,130,77,76,75,74,73	390.54
Region 11	operations Layer	38,37,36,107,35,1,34,33,32,31,137,136,47,46,45,44,43,87,88,95,91	472.885
Region 12	Secondary Compacted Clay	91,95,96,94,98,105,103,97,89,78,79,80,81,82,129,128,86,85,84,83,4,90,93,92	1452.252
Region 13	Secondary Liner (textured)	103,102,100,101,99,73,74,75,76,77,130,129,82,81,80,79,78,89,97	79.395
Region 14	Sideslope Liner (textured 1000-	96,95,88,87,104,106,102,103,105,98,94	11.54

	2000psf)		
Region 15	Structural Fill	40,30,29,28,110,27,26,107,36,37,38,39	97.18
Region 16	Waste	26,25,24,23,114,22,21,115,20,19,18,112,17,16,113,15,14,13,12,11,10,9,8,138,137,31,32,33,34,1,35,107	30224.295
Region 17	Compacted Clay	110,109,108,111,24,25,26,27	48.395

Points

	X (ft)	Y (ft)
Point 1	138	318.5
Point 2	-75	305
Point 3	68.5	332.1
Point 4	138	310.2
Point 5	-75	310.7
Point 6	-75	281
Point 7	-75	274.5
Point 8	492.5	417.4
Point 9	476.2	418.3
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Point 15	296	380.1
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Point 17	251	364.9
Point 18	226.6	376.9
Point 19	211.6	377.2
Point 20	168.9	363
Point 21	138.9	348
Point 22	133.9	348
Point 23	122	354

Point 24	119	354
Point 25	94.8	346
Point 26	71.1	338
Point 27	70	338.4
Point 28	67.5	339.3
Point 29	46.7	339.5
Point 30	44.7	338.5
Point 31	492.5	319.1
Point 32	322.5	315.3
Point 33	309.9	315
Point 34	295.4	315.3
Point 35	122.8	318.9
Point 36	71.1	336
Point 37	55	336.1
Point 38	54	335.1
Point 39	51.5	336
Point 40	39.4	336.3
Point 41	4	319.7
Point 42	-75	314
Point 43	138	317.5
Point 44	295.4	314.3
Point 45	309.9	314
Point 46	322.5	314.3
Point 47	492.5	318.1
Point 48	138	317.3
Point 49	295.4	314.1
Point 50	309.9	313.8
Point 51	322.5	314.1
Point 52	492.5	317.9
Point 53	138	316.3
Point 54	295.4	313.1
Point 55	309.9	312.8
Point 56	322.5	313.1
Point 57	492.5	316.9
Point 58	138	316.1
Point 59	295.4	312.9

Point 60	309.9	312.6
Point 61	322.5	312.9
Point 62	492.5	316.7
Point 63	138	314.6
Point 64	295.4	311.4
Point 65	309.9	311.1
Point 66	322.5	311.4
Point 67	492.5	315.2
Point 68	138	314.4
Point 69	295.4	311.2
Point 70	309.9	310.9
Point 71	322.5	311.2
Point 72	492.5	315
Point 73	138	313.4
Point 74	295.4	310.2
Point 75	309.9	309.9
Point 76	322.5	310.2
Point 77	492.5	314
Point 78	138	313.2
Point 79	295.4	310
Point 80	309.9	309.7
Point 81	322.5	310
Point 82	492.5	313.8
Point 83	295.4	307
Point 84	309.9	306.7
Point 85	322.5	307
Point 86	492.5	310.8
Point 87	122.6	317.9
Point 88	71.1	335
Point 89	136.4	313.2
Point 90	136.6	310.2
Point 91	59.4	335.1
Point 92	59.42601	329.1
Point 93	77.7	329.1
Point 94	71.1	334.8
Point 95	65.1	335

Point 96	65.1	334.8
Point 97	136	313.3
Point 98	122.4	317.8
Point 99	136.2	313.4
Point 100	132.3	314.7
Point 101	132.9	314.5
Point 102	127.5	316.3
Point 103	126.9	316.3
Point 104	123.5	317.6
Point 105	122.9	317.6
Point 106	126.9	316.5
Point 107	75.7	334.5
Point 108	94.8	347
Point 109	71.1	339
Point 110	69.7	338.5
Point 111	115.6	354
Point 112	238.5	371
Point 113	277.6	371
Point 114	127.3	351.3
Point 115	145.5	351.3
Point 116	2.4	319.5
Point 117	0.5	319.9
Point 118	-4.8	322.3
Point 119	-18.8	322.7
Point 120	-31.6	322.5
Point 121	-36.7	321.9
Point 122	-48.3	318
Point 123	-75	318
Point 124	8.1	321.9
Point 125	525	274.5
Point 126	525	285
Point 127	525	305
Point 128	525	311.7
Point 129	525	314.7
Point 130	525	314.9
Point 131	525	315.9

Point 132	525	316.1
Point 133	525	317.6
Point 134	525	317.8
Point 135	525	318.8
Point 136	525	319
Point 137	525	320
Point 138	525	416.7
Point 139	25	285

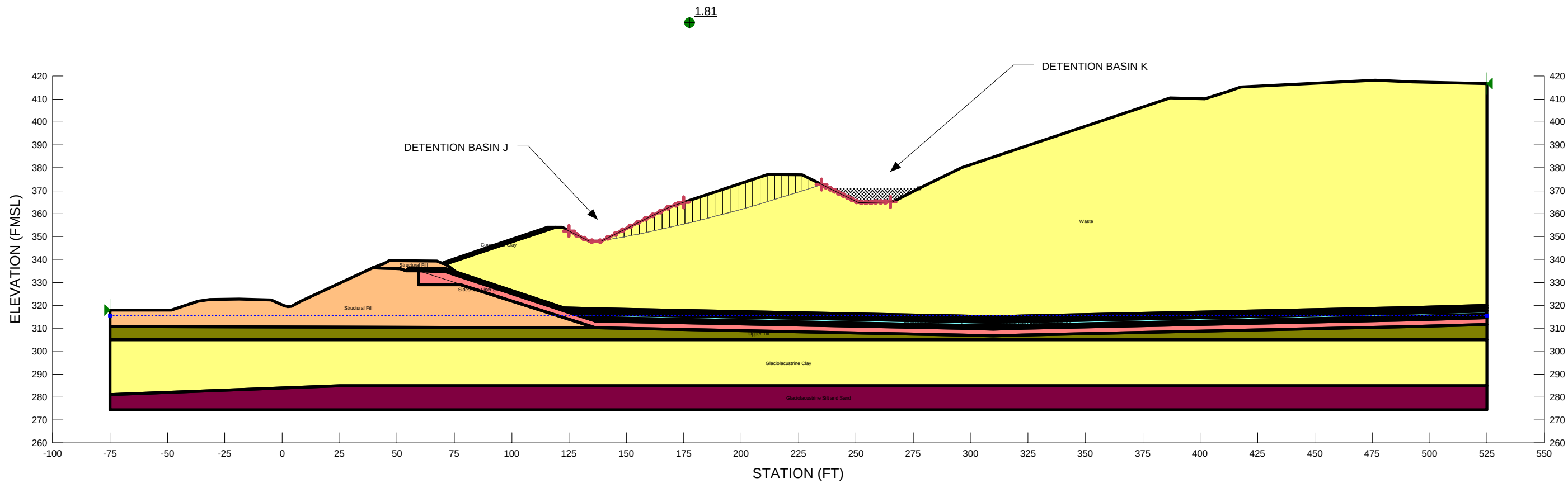
Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	962	2.64	(170.963, 497.699)	154.12	(249.999, 365.388)	(134.315, 348)

Slices of Slip Surface: 962

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	962	136.60745	347.4757	0	316.234	0	170.05
2	962	140.55	346.61925	0	468.30282	0	254.49
3	962	143.85	345.9922	0	633.44815	0	347.1
4	962	147.45	345.3963	0	868.07518	0	478.45
5	962	151.35	344.84505	0	1167.124	0	646.36
6	962	155.25	344.39495	0	1445.5809	0	804.35
7	962	159.15	344.0452	0	1704.4322	0	952.76
8	962	163.05	343.79505	0	1944.5087	0	1091.9
9	962	166.95	343.644	0	2166.5984	0	1222.1
10	962	170.8409	343.59165	0	2333.1072	0	1321.8
11	962	174.7227	343.6375	0	2446.1663	0	1391.9
12	962	178.60455	343.78125	0	2545.0529	0	1454.5
13	962	182.4864	344.02315	0	2630.2972	0	1509.6
14	962	186.3682	344.3637	0	2702.1346	0	1557.5
15	962	190.25	344.80355	0	2760.8367	0	1598.2
16	962	194.1318	345.34355	0	2806.8633	0	1631.8
17	962	198.0136	345.98475	0	2840.4487	0	1658.4

18	962	201.89545	346.7285	0	2861.8578	0	1678.1
19	962	205.7773	347.5763	0	2871.1359	0	1690.8
20	962	209.6591	348.5299	0	2868.3611	0	1696.7
21	962	213.475	349.5715	0	2787.7294	0	1656.1
22	962	217.225	350.6997	0	2632.1941	0	1570.4
23	962	220.975	351.9331	0	2469.0888	0	1479.6
24	962	224.725	353.27435	0	2298.8494	0	1383.7
25	962	228.58335	354.7719	0	2025.6823	0	1225
26	962	232.55	356.43615	0	1653.3337	0	1004.8
27	962	236.51665	358.23305	0	1278.5991	0	780.96
28	962	240.41655	360.1329	0	958.42828	0	587.93
29	962	244.24965	362.1366	0	690.73935	0	424.82
30	962	248.0827	364.28055	0	418.39795	0	257.19



Name: Lower Waste, with Basin K full
Kind: SLOPE/W
Method: Spencer
File Name: SEISMIC- November 2011.gsz

Section A-A'
Fill Progression Slope Stability Analysis
RMU-1 Leachate Level Compliance Plan
CWM Chemical Services, LLC
Model City, New York

Lower Waste, with Basin K full

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File Information

Revision Number: 281
Last Edited By: Giampaolo, Mandy
Date: 11/16/2011
Time: 9:34:16 AM
File Name: SEISMIC- November 2011.gsz
Directory: C:\Users\mgiampaolo\Documents\ARCADIS Documents\RMU-1\2011 Fill
Progression\Calc in Response to Review Comments\
Last Solved Date: 11/16/2011
Last Solved Time: 9:36:46 AM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Lower Waste, with Basin K full

Kind: SLOPE/W
Method: Spencer
Settings
 Apply Phreatic Correction: No
 PWP Conditions Source: Piezometric Line with Ru
Slip Surface
 Direction of movement: Right to Left
 Use Passive Mode: No
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: No
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

operations Layer

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile (2)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Leachate Collection

Model: Mohr-Coulomb
Unit Weight: 135 pcf

Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Sideslope Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Compacted Clay

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion: 1000 psf
Phi: 10 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Secondary Leachate Collection

Model: [Mohr-Coulomb](#)

Unit Weight: [135 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Secondary Liner (textured)

Model: [Mohr-Coulomb](#)

Unit Weight: [58.7 pcf](#)

Cohesion: [0 psf](#)

Phi: [15 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Secondary Compacted Clay

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [1000 psf](#)

Phi: [10 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Structural Fill

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [2000 psf](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Upper Till

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [800 psf](#)

Phi: [10 °](#)

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Ru: 0

Include in PWP: No

Glaciolacustrine Clay

Model: Mohr-Coulomb

Unit Weight: 125 pcf

Cohesion: 256 psf

Phi: 8 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Ru: 0

Include in PWP: No

Glaciolacustrine Silt and Sand

Model: Mohr-Coulomb

Unit Weight: 130 pcf

Cohesion: 0 psf

Phi: 30 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Ru: 0

Include in PWP: No

Slip Surface Entry and Exit

Left Projection: Range

Left-Zone Left Coordinate: (124.99387, 352.47482) ft

Left-Zone Right Coordinate: (175, 365.02857) ft

Left-Zone Increment: 15

Right Projection: Range

Right-Zone Left Coordinate: (234.99877, 372.7359) ft

Right-Zone Right Coordinate: (265, 365.18) ft

Right-Zone Increment: 15

Radius Increments: 5

Slip Surface Limits

Left Coordinate: (-75, 318) ft

Right Coordinate: (525, 416.7) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	-75	315.5
	525	315.5

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf

Direction: Normal

Coordinates

	X (ft)	Y (ft)
	238.5	371
	277.6	371

Seismic Loads

Horz Seismic Load: 0.055

Vert Seismic Load: 0

Ignore seismic load in strength: Yes

Regions

	Material	Points	Area (ft²)
Region 1	Structural Fill	5,42,123,122,121,120,119,118,117,116,41,124,40,39,38,91,92,93,90	2800.853
Region 2	Upper Till	2,5,90,4,83,84,85,86,128,127	2643.4
Region 3	Glaciolacustrine Clay	6,2,127,126,139	12200
Region 4	Glaciolacustrine Silt and Sand	7,6,139,126,125	6100

Region 5	Geotextile (2)	104,87,43,44,45,46,47,136,135,52,51,50,49,48	80.98
Region 6	Primary Leachate Collection	106,104,48,49,50,51,52,135,134,57,56,55,54,53	400.015
Region 7	Primary Liner (textured 1000-2000psf)	102,106,53,54,55,56,57,134,133,62,61,60,59,58	79.5
Region 8	Compacted Clay	100,102,58,59,60,61,62,133,132,67,66,65,64,63	592.695
Region 9	Geotextile	101,100,63,64,65,66,67,132,131,72,71,70,69,68	78.45
Region 10	Secondary Leachate Collection	99,101,68,69,70,71,72,131,130,77,76,75,74,73	390.54
Region 11	operations Layer	38,37,36,107,35,1,34,33,32,31,137,136,47,46,45,44,43,87,88,95,91	472.885
Region 12	Secondary Compacted Clay	91,95,96,94,98,105,103,97,89,78,79,80,81,82,129,128,86,85,84,83,4,90,93,92	1452.252
Region 13	Secondary Liner (textured)	103,102,100,101,99,73,74,75,76,77,130,129,82,81,80,79,78,89,97	79.395
Region 14	Sideslope Liner (textured 1000-2000psf)	96,95,88,87,104,106,102,103,105,98,94	11.54
Region 15	Structural Fill	40,30,29,28,110,27,26,107,36,37,38,39	97.18
Region 16	Waste	26,25,24,23,114,22,21,115,20,19,18,112,17,16,113,15,14,13,12,11,10,9,8,138,137,31,32,33,34,1,35,107	30224.295
Region	Compacted Clay	110,109,108,111,24,25,26,27	48.395

17			

Points

	X (ft)	Y (ft)
Point 1	138	318.5
Point 2	-75	305
Point 3	68.5	332.1
Point 4	138	310.2
Point 5	-75	310.7
Point 6	-75	281
Point 7	-75	274.5
Point 8	492.5	417.4
Point 9	476.2	418.3
Point 10	417.7	415.3
Point 11	415	414.3
Point 12	412.5	413.5
Point 13	402	410.1
Point 14	386.9	410.4
Point 15	296	380.1
Point 16	266	365.2
Point 17	251	364.9
Point 18	226.6	376.9
Point 19	211.6	377.2
Point 20	168.9	363
Point 21	138.9	348
Point 22	133.9	348
Point 23	122	354
Point 24	119	354
Point 25	94.8	346
Point 26	71.1	338
Point 27	70	338.4
Point 28	67.5	339.3
Point 29	46.7	339.5
Point 30	44.7	338.5
Point 31	492.5	319.1

Point 32	322.5	315.3
Point 33	309.9	315
Point 34	295.4	315.3
Point 35	122.8	318.9
Point 36	71.1	336
Point 37	55	336.1
Point 38	54	335.1
Point 39	51.5	336
Point 40	39.4	336.3
Point 41	4	319.7
Point 42	-75	314
Point 43	138	317.5
Point 44	295.4	314.3
Point 45	309.9	314
Point 46	322.5	314.3
Point 47	492.5	318.1
Point 48	138	317.3
Point 49	295.4	314.1
Point 50	309.9	313.8
Point 51	322.5	314.1
Point 52	492.5	317.9
Point 53	138	316.3
Point 54	295.4	313.1
Point 55	309.9	312.8
Point 56	322.5	313.1
Point 57	492.5	316.9
Point 58	138	316.1
Point 59	295.4	312.9
Point 60	309.9	312.6
Point 61	322.5	312.9
Point 62	492.5	316.7
Point 63	138	314.6
Point 64	295.4	311.4
Point 65	309.9	311.1
Point 66	322.5	311.4
Point 67	492.5	315.2

Point 68	138	314.4
Point 69	295.4	311.2
Point 70	309.9	310.9
Point 71	322.5	311.2
Point 72	492.5	315
Point 73	138	313.4
Point 74	295.4	310.2
Point 75	309.9	309.9
Point 76	322.5	310.2
Point 77	492.5	314
Point 78	138	313.2
Point 79	295.4	310
Point 80	309.9	309.7
Point 81	322.5	310
Point 82	492.5	313.8
Point 83	295.4	307
Point 84	309.9	306.7
Point 85	322.5	307
Point 86	492.5	310.8
Point 87	122.6	317.9
Point 88	71.1	335
Point 89	136.4	313.2
Point 90	136.6	310.2
Point 91	59.4	335.1
Point 92	59.42601	329.1
Point 93	77.7	329.1
Point 94	71.1	334.8
Point 95	65.1	335
Point 96	65.1	334.8
Point 97	136	313.3
Point 98	122.4	317.8
Point 99	136.2	313.4
Point 100	132.3	314.7
Point 101	132.9	314.5
Point 102	127.5	316.3
Point 103	126.9	316.3

Point 104	123.5	317.6
Point 105	122.9	317.6
Point 106	126.9	316.5
Point 107	75.7	334.5
Point 108	94.8	347
Point 109	71.1	339
Point 110	69.7	338.5
Point 111	115.6	354
Point 112	238.5	371
Point 113	277.6	371
Point 114	127.3	351.3
Point 115	145.5	351.3
Point 116	2.4	319.5
Point 117	0.5	319.9
Point 118	-4.8	322.3
Point 119	-18.8	322.7
Point 120	-31.6	322.5
Point 121	-36.7	321.9
Point 122	-48.3	318
Point 123	-75	318
Point 124	8.1	321.9
Point 125	525	274.5
Point 126	525	285
Point 127	525	305
Point 128	525	311.7
Point 129	525	314.7
Point 130	525	314.9
Point 131	525	315.9
Point 132	525	316.1
Point 133	525	317.6
Point 134	525	317.8
Point 135	525	318.8
Point 136	525	319
Point 137	525	320
Point 138	525	416.7
Point 139	25	285

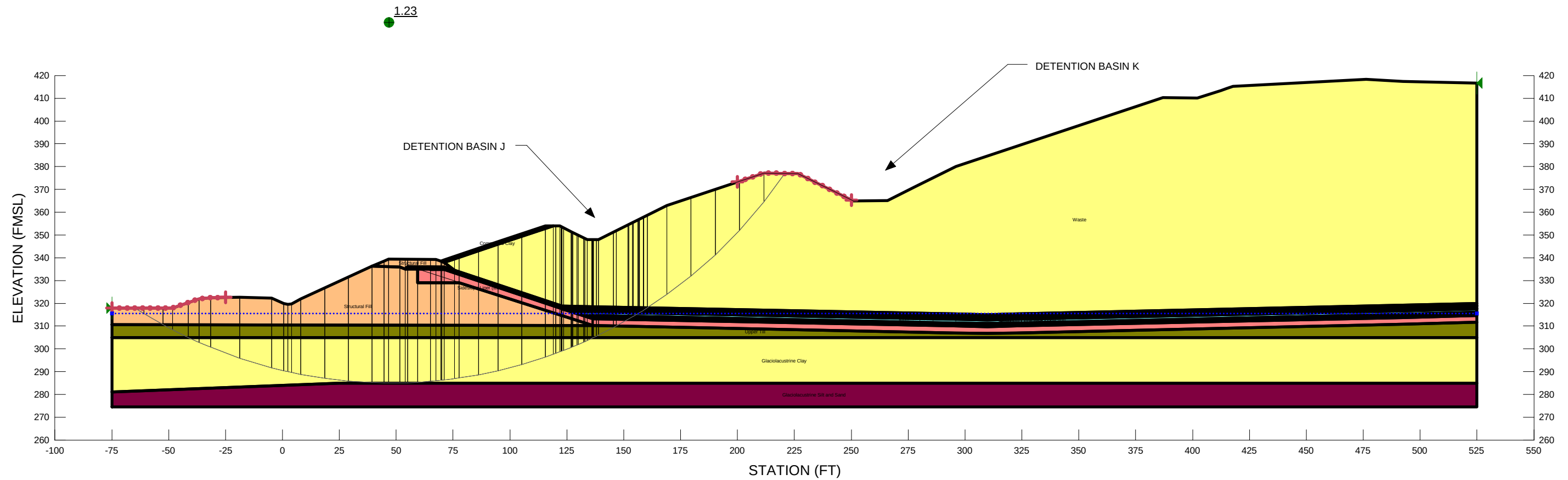
Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	385	1.81	(27.615, 980.806)	642.461	(234.999, 372.736)	(139.072, 348.086)

Slices of Slip Surface: 385

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	385	140.679	348.3733	0	54.932147	0	32.028
2	385	143.893	348.95635	0	163.49092	0	95.351
3	385	147.17145	349.56865	0	271.80835	0	158.57
4	385	150.5143	350.21095	0	379.79865	0	221.63
5	385	153.85715	350.87165	0	485.25735	0	283.27
6	385	157.2	351.5508	0	588.25012	0	343.5
7	385	160.54285	352.2485	0	688.77453	0	402.31
8	385	163.8857	352.96475	0	786.80032	0	459.72
9	385	167.22855	353.69965	0	882.38412	0	515.73
10	385	170.5423	354.44655	0	946.14377	0	553.15
11	385	173.8269	355.2051	0	978.32013	0	572.14
12	385	177.1115	355.98185	0	1008.4614	0	589.94
13	385	180.39615	356.7769	0	1036.5428	0	606.55
14	385	183.6808	357.59025	0	1062.569	0	621.98
15	385	186.9654	358.422	0	1086.5744	0	636.23
16	385	190.25	359.27225	0	1108.5644	0	649.29
17	385	193.5346	360.141	0	1128.5153	0	661.19
18	385	196.8192	361.02835	0	1146.4623	0	671.91
19	385	200.10385	361.93445	0	1162.3825	0	681.46
20	385	203.3885	362.85935	0	1176.3118	0	689.84
21	385	206.6731	363.8031	0	1188.2575	0	697.06
22	385	209.9577	364.76585	0	1198.1974	0	703.11
23	385	213.1	365.7043	0	1152.7293	0	676.64
24	385	216.1	366.61695	0	1052.4239	0	617.93
25	385	219.1	367.54565	0	950.95488	0	558.51
26	385	222.1	368.4904	0	848.36817	0	498.41

27	385	225.1	369.45135	0	744.64623	0	437.6
28	385	227.9998	370.39545	0	577.21096	0	339.29
29	385	230.7994	371.32165	0	346.51944	0	203.75
30	385	233.599	372.2621	0	115.48504	0	67.92



Name: Global
Kind: SLOPE/W
Method: Spencer
File Name: SEISMIC- November 2011.gsz

Section A-A'
Fill Progression Slope Stability Analysis
RMU-1 Leachate Level Compliance Plan
CWM Chemical Services, LLC
Model City, New York

Global

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File Information

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File Name: SEISMIC- November 2011.gsz
Directory: C:\Users\mgiampaolo\Documents\ARCADIS Documents\RMU-1\2011 Fill
Progression\Calc in Response to Review Comments\
Last Solved Date: 11/16/2011
Last Solved Time: 9:34:44 AM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Global

Kind: SLOPE/W
Method: Spencer
Settings
 Apply Phreatic Correction: No
 PWP Conditions Source: Piezometric Line with Ru
Slip Surface
 Direction of movement: Right to Left
 Use Passive Mode: No
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: No
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

operations Layer

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile (2)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Leachate Collection

Model: Mohr-Coulomb
Unit Weight: 135 pcf

Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Sideslope Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Compacted Clay

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion: 1000 psf
Phi: 10 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Secondary Leachate Collection

Model: [Mohr-Coulomb](#)

Unit Weight: [135 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Secondary Liner (textured)

Model: [Mohr-Coulomb](#)

Unit Weight: [58.7 pcf](#)

Cohesion: [0 psf](#)

Phi: [15 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Secondary Compacted Clay

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [1000 psf](#)

Phi: [10 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Structural Fill

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [2000 psf](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Upper Till

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [800 psf](#)

Phi: [10 °](#)

Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1
Ru: 0
Include in PWP: No

Glaciolacustrine Clay

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 256 psf
Phi: 8 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1
Ru: 0
Include in PWP: No

Glaciolacustrine Silt and Sand

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1
Ru: 0
Include in PWP: No

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (-75, 318) ft
Left-Zone Right Coordinate: (-25, 322.60312) ft
Left-Zone Increment: 15
Right Projection: Range
Right-Zone Left Coordinate: (200, 373.34239) ft
Right-Zone Right Coordinate: (250.04079, 365.3681) ft
Right-Zone Increment: 15
Radius Increments: 10

Slip Surface Limits

Left Coordinate: (-75, 318) ft
Right Coordinate: (525, 416.7) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	-75	315.5
	525	315.5

Seismic Loads

Horz Seismic Load: 0.055
Vert Seismic Load: 0
Ignore seismic load in strength: Yes

Regions

	Material	Points	Area (ft²)
Region 1	Structural Fill	5,42,123,122,121,120,119,118,117,116,41,124,40,39,38,91,92,93,90	2800.853
Region 2	Upper Till	2,5,90,4,83,84,85,86,128,127	2643.4
Region 3	Glaciolacustrine Clay	6,2,127,126,139	12200
Region 4	Glaciolacustrine Silt and Sand	7,6,139,126,125	6100
Region 5	Geotextile (2)	104,87,43,44,45,46,47,136,135,52,51,50,49,48	80.98
Region 6	Primary Leachate Collection	106,104,48,49,50,51,52,135,134,57,56,55,54,53	400.015
Region 7	Primary Liner (textured 1000-2000psf)	102,106,53,54,55,56,57,134,133,62,61,60,59,58	79.5
Region	Compacte	100,102,58,59,60,61,62,133,132,67,66,65,64,63	592.69

on 8	d Clay		5
Regi on 9	Geotextile	101,100,63,64,65,66,67,132,131,72,71,70,69,68	78.45
Regi on 10	Secondary Leachate Collection	99,101,68,69,70,71,72,131,130,77,76,75,74,73	390.54
Regi on 11	operation s Layer	38,37,36,107,35,1,34,33,32,31,137,136,47,46,45,44,43,87,88,95,91	472.88 5
Regi on 12	Secondary Compacte d Clay	91,95,96,94,98,105,103,97,89,78,79,80,81,82,129,128,86,85,84,83,4,90,93,92	1452.2 52
Regi on 13	Secondary Liner (textured)	103,102,100,101,99,73,74,75,76,77,130,129,82,81,80,79,78,89,97	79.395
Regi on 14	Sideslope Liner (textured 1000- 2000psf)	96,95,88,87,104,106,102,103,105,98,94	11.54
Regi on 15	Structural Fill	40,30,29,28,110,27,26,107,36,37,38,39	97.18
Regi on 16	Waste	26,25,24,23,114,22,21,115,20,19,18,112,17,16,113,15,14,13,12,11,10,9,8,138,137,31,32,33,34,1,35,107	30224. 295
Regi on 17	Compacte d Clay	110,109,108,111,24,25,26,27	48.395

Points

	X (ft)	Y (ft)
Point 1	138	318.5
Point 2	-75	305
Point 3	68.5	332.1
Point 4	138	310.2
Point 5	-75	310.7
Point 6	-75	281

Point 7	-75	274.5
Point 8	492.5	417.4
Point 9	476.2	418.3
Point 10	417.7	415.3
Point 11	415	414.3
Point 12	412.5	413.5
Point 13	402	410.1
Point 14	386.9	410.4
Point 15	296	380.1
Point 16	266	365.2
Point 17	251	364.9
Point 18	226.6	376.9
Point 19	211.6	377.2
Point 20	168.9	363
Point 21	138.9	348
Point 22	133.9	348
Point 23	122	354
Point 24	119	354
Point 25	94.8	346
Point 26	71.1	338
Point 27	70	338.4
Point 28	67.5	339.3
Point 29	46.7	339.5
Point 30	44.7	338.5
Point 31	492.5	319.1
Point 32	322.5	315.3
Point 33	309.9	315
Point 34	295.4	315.3
Point 35	122.8	318.9
Point 36	71.1	336
Point 37	55	336.1
Point 38	54	335.1
Point 39	51.5	336
Point 40	39.4	336.3
Point 41	4	319.7
Point 42	-75	314

Point 43	138	317.5
Point 44	295.4	314.3
Point 45	309.9	314
Point 46	322.5	314.3
Point 47	492.5	318.1
Point 48	138	317.3
Point 49	295.4	314.1
Point 50	309.9	313.8
Point 51	322.5	314.1
Point 52	492.5	317.9
Point 53	138	316.3
Point 54	295.4	313.1
Point 55	309.9	312.8
Point 56	322.5	313.1
Point 57	492.5	316.9
Point 58	138	316.1
Point 59	295.4	312.9
Point 60	309.9	312.6
Point 61	322.5	312.9
Point 62	492.5	316.7
Point 63	138	314.6
Point 64	295.4	311.4
Point 65	309.9	311.1
Point 66	322.5	311.4
Point 67	492.5	315.2
Point 68	138	314.4
Point 69	295.4	311.2
Point 70	309.9	310.9
Point 71	322.5	311.2
Point 72	492.5	315
Point 73	138	313.4
Point 74	295.4	310.2
Point 75	309.9	309.9
Point 76	322.5	310.2
Point 77	492.5	314
Point 78	138	313.2

Point 79	295.4	310
Point 80	309.9	309.7
Point 81	322.5	310
Point 82	492.5	313.8
Point 83	295.4	307
Point 84	309.9	306.7
Point 85	322.5	307
Point 86	492.5	310.8
Point 87	122.6	317.9
Point 88	71.1	335
Point 89	136.4	313.2
Point 90	136.6	310.2
Point 91	59.4	335.1
Point 92	59.42601	329.1
Point 93	77.7	329.1
Point 94	71.1	334.8
Point 95	65.1	335
Point 96	65.1	334.8
Point 97	136	313.3
Point 98	122.4	317.8
Point 99	136.2	313.4
Point 100	132.3	314.7
Point 101	132.9	314.5
Point 102	127.5	316.3
Point 103	126.9	316.3
Point 104	123.5	317.6
Point 105	122.9	317.6
Point 106	126.9	316.5
Point 107	75.7	334.5
Point 108	94.8	347
Point 109	71.1	339
Point 110	69.7	338.5
Point 111	115.6	354
Point 112	238.5	371
Point 113	277.6	371
Point 114	127.3	351.3

Point 115	145.5	351.3
Point 116	2.4	319.5
Point 117	0.5	319.9
Point 118	-4.8	322.3
Point 119	-18.8	322.7
Point 120	-31.6	322.5
Point 121	-36.7	321.9
Point 122	-48.3	318
Point 123	-75	318
Point 124	8.1	321.9
Point 125	525	274.5
Point 126	525	285
Point 127	525	305
Point 128	525	311.7
Point 129	525	314.7
Point 130	525	314.9
Point 131	525	315.9
Point 132	525	316.1
Point 133	525	317.6
Point 134	525	317.8
Point 135	525	318.8
Point 136	525	319
Point 137	525	320
Point 138	525	416.7
Point 139	25	285

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	600	1.23	(47.702, 493.75)	208.709	(220.714, 377.018)	(-64.8652, 318)

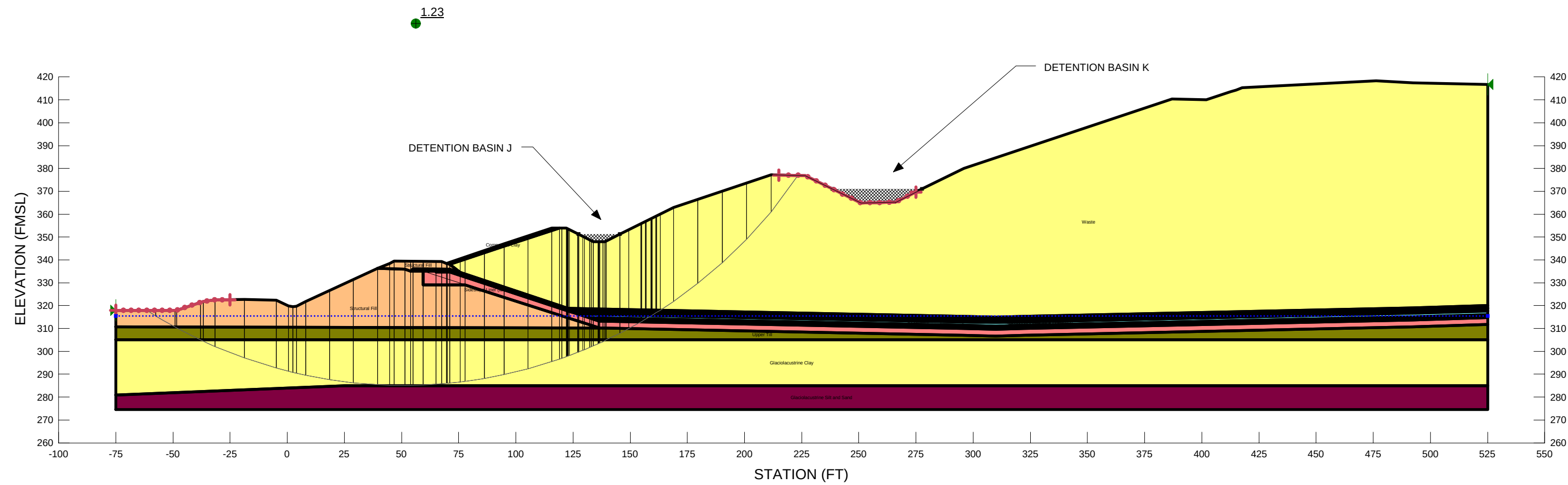
Slices of Slip Surface: 600

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength	Cohesive Strength

						(psf)	(psf)
1	600	-62.86413	316.75	0	1527.0443	0	2000
2	600	-56.662065	313.07335	0	1948.1632	0	2000
3	600	-50.38053	309.53895	371.96644	1773.0294	0	1018.4
4	600	-44.83237	306.7156	548.15262	2317.119	0	1082.9
5	600	-39.03237	303.93425	721.70842	2620.7605	0	511.63
6	600	-34.15	301.7812	856.05839	3047.6631	0	552.55
7	600	-25.2	298.30665	1072.8706	3523.7031	0	589.73
8	600	-11.8	293.83595	1351.8204	4025.2017	0	622.81
9	600	-2.15	291.10055	1522.5315	4130.8058	0	615.48
10	600	1.45	290.2327	1576.69	4028.5376	0	594.34
11	600	3.2	289.8422	1601.063	4055.782	0	595.04
12	600	6.05	289.2501	1638.0031	4282.7985	0	621.97
13	600	13.316665	287.9609	1718.4756	4886.4717	0	696.24
14	600	23.75	286.48635	1810.4748	5657.2695	0	793.19
15	600	34.183335	285.5448	1869.1955	6342.6205	0	883.28
16	600	42.05	285.1343	1894.7764	6795.2421	0	945.1
17	600	45.7	285.0529	1899.9126	6985.6787	0	972.04
18	600	49.1	285.05935	1899.4989	7018.5921	0	977.57
19	600	52.75	285.10565	1896.6054	6977.5598	0	973.07
20	600	54.5	285.1522	1893.6944	6957.3057	0	971.06
21	600	57.213005	285.26945	1886.3755	6919.1329	0	967.35
22	600	62.263005	285.56885	1867.665	6834.2156	0	959.18
23	600	66.3	285.87465	1848.6163	6744.7271	0	950.15
24	600	68.6	286.0927	1835.0043	6646.4295	0	938.71
25	600	69.85	286.2194	1827.125	6576.987	0	930.23
26	600	70.55	286.29595	1822.3451	6593.768	0	933.46
27	600	73.4	286.6419	1800.735	6605.6505	0	938.83
28	600	76.7	287.0676	1774.1737	6609.2688	0	943.87
29	600	81.975	287.9197	1720.9841	6623.0835	0	954.5
30	600	90.525	289.52795	1620.6608	6615.5422	0	969.56
31	600	100	291.7708	1480.6892	6549.0269	0	982.08
32	600	110.4	294.75555	1294.4803	6410.956	0	991.19
33	600	117.3	296.99525	1154.6838	6218.5944	0	985.12
34	600	119.54155	297.79515	1104.7549	6082.7405	0	973.25
35	600	121.04155	298.35345	1069.9342	5996.0664	0	966.1

36	600	122.2	298.7896	1042.7176	5917.9184	0	959.05
37	600	122.5	298.9044	1035.5683	5884.3244	0	955.3
38	600	122.7	298.9813	1030.7734	5859.1381	0	952.41
39	600	122.85	299.0391	1027.1557	5838.8345	0	950.06
40	600	123.2	299.1748	1018.6872	5794.5888	0	945
41	600	125.2	299.9711	968.99876	5577.5528	0	921.35
42	600	127.1	300.73325	921.43716	5373.3931	0	899.18
43	600	127.4	300.8568	913.7305	5335.0622	0	894.84
44	600	128.41335	301.2811	887.27852	5224.72	0	882.93
45	600	129.61335	301.78645	855.72017	5096.0437	0	869.19
46	600	131.1	302.4319	815.43525	4934.8557	0	852.05
47	600	132.6	303.08855	774.47407	4766.1817	0	833.91
48	600	133.4	303.4473	752.08942	4673.2159	0	823.87
49	600	134.95	304.15565	707.88191	4557.2818	0	813.75
50	600	136.1	304.6856	674.83193	4489.7906	0	808.97
51	600	136.3	304.77925	668.9746	4476.566	0	807.93
52	600	136.5	304.8731	663.12157	4462.6204	0	806.8
53	600	136.6847	304.96005	657.71595	4451.2084	0	805.96
54	600	137.3847	305.2928	636.92711	4235.7366	0	1460.1
55	600	138.45	305.8029	605.10241	4163.9251	0	1453.2
56	600	142.2	307.69625	486.95691	4062.0044	0	1457.3
57	600	146.1083	309.69755	362.0717	3974.9602	0	1465.3
58	600	149.3128	311.47	251.47137	3826.3214	0	1661.3
59	600	152.07625	313.0138	155.13853	3954.1765	0	1058
60	600	153.0697	313.5936	0	3702.506	0	1731.8
61	600	154.0591	314.1735	0	3896.2168	0	1085.2
62	600	155.24505	314.8851	0	3659.0062	0	1678.5
63	600	156.449	315.6106	0	3620.0056	0	1671.9
64	600	156.78805	315.818	0	3830.2259	0	1068.2
65	600	157.7263	316.39895	0	3581.1955	0	1680.8
66	600	158.661	316.97995	0	3780.834	0	1055.5
67	600	159.5783	317.5613	0	3528.3438	0	1658.4
68	600	164.62065	320.9411	0	3226.103	0	1995
69	600	174.2375	327.90885	0	2857.2918	0	1785
70	600	184.9125	336.6428	0	2331.4704	0	1475.3
71	600	195.5875	346.67105	0	1747.0419	0	1122.3

72	600	206.2625	358.2853	0	1105.9924	0	723.63
73	600	216.1571	370.77525	0	376.60098	0	251.64



Name: Global Lower, with Basins full
Kind: SLOPE/W
Method: Spencer
File Name: SEISMIC- November 2011.gsz

Section A-A'
Fill Progression Slope Stability Analysis
RMU-1 Leachate Level Compliance Plan
CWM Chemical Services, LLC
Model City, New York

Global Lower, with Basins full

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File Information

Revision Number: 284
Last Edited By: Giampaolo, Mandy
Date: 11/17/2011
Time: 1:25:43 PM
File Name: SEISMIC- November 2011.gsz
Directory: C:\Users\mgiampaolo\Documents\ARCADIS Documents\RMU-1\2011 Fill
Progression\Calc in Response to Review Comments\
Last Solved Date: 11/17/2011
Last Solved Time: 1:26:08 PM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Global Lower, with Basins full

Kind: SLOPE/W
Method: Spencer
Settings
 Apply Phreatic Correction: No
 PWP Conditions Source: Piezometric Line with Ru
Slip Surface
 Direction of movement: Right to Left
 Use Passive Mode: No
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: No
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

operations Layer

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile (2)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Leachate Collection

Model: Mohr-Coulomb
Unit Weight: 135 pcf

Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Sideslope Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Compacted Clay

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion: 1000 psf
Phi: 10 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Secondary Leachate Collection

Model: [Mohr-Coulomb](#)

Unit Weight: [135 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Secondary Liner (textured)

Model: [Mohr-Coulomb](#)

Unit Weight: [58.7 pcf](#)

Cohesion: [0 psf](#)

Phi: [15 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Secondary Compacted Clay

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [1000 psf](#)

Phi: [10 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Structural Fill

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [2000 psf](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Upper Till

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [800 psf](#)

Phi: [10 °](#)

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Ru: 0

Include in PWP: No

Glaciolacustrine Clay

Model: Mohr-Coulomb

Unit Weight: 125 pcf

Cohesion: 256 psf

Phi: 8 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Ru: 0

Include in PWP: No

Glaciolacustrine Silt and Sand

Model: Mohr-Coulomb

Unit Weight: 130 pcf

Cohesion: 0 psf

Phi: 30 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Ru: 0

Include in PWP: No

Slip Surface Entry and Exit

Left Projection: Range

Left-Zone Left Coordinate: (-75, 318) ft

Left-Zone Right Coordinate: (-25, 322.60312) ft

Left-Zone Increment: 15

Right Projection: Range

Right-Zone Left Coordinate: (215, 377.132) ft

Right-Zone Right Coordinate: (275, 369.7) ft

Right-Zone Increment: 15

Radius Increments: 10

Slip Surface Limits

Left Coordinate: (-75, 318) ft

Right Coordinate: (525, 416.7) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	-75	315.5
	525	315.5

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf

Direction: Vertical

Coordinates

	X (ft)	Y (ft)
	127.3	351.3
	145.5	351.3

Surcharge Load 2

Surcharge (Unit Weight): 62.4 pcf

Direction: Vertical

Coordinates

	X (ft)	Y (ft)
	238.5	371
	277.6	371

Seismic Loads

Horz Seismic Load: 0.055

Vert Seismic Load: 0

Ignore seismic load in strength: Yes

Regions

	Material	Points	Area (ft²)

Region 1	Structural Fill	5,42,123,122,121,120,119,118,117,116,41,124,40,39,38,91,92,93,90	2800.853
Region 2	Upper Till	2,5,90,4,83,84,85,86,128,127	2643.4
Region 3	Glaciolacustrine Clay	6,2,127,126,139	12200
Region 4	Glaciolacustrine Silt and Sand	7,6,139,126,125	6100
Region 5	Geotextile (2)	104,87,43,44,45,46,47,136,135,52,51,50,49,48	80.98
Region 6	Primary Leachate Collection	106,104,48,49,50,51,52,135,134,57,56,55,54,53	400.015
Region 7	Primary Liner (textured 1000-2000psf)	102,106,53,54,55,56,57,134,133,62,61,60,59,58	79.5
Region 8	Compacted Clay	100,102,58,59,60,61,62,133,132,67,66,65,64,63	592.695
Region 9	Geotextile	101,100,63,64,65,66,67,132,131,72,71,70,69,68	78.45
Region 10	Secondary Leachate Collection	99,101,68,69,70,71,72,131,130,77,76,75,74,73	390.54
Region 11	operations Layer	38,37,36,107,35,1,34,33,32,31,137,136,47,46,45,44,43,87,88,95,91	472.885
Region 12	Secondary Compacted Clay	91,95,96,94,98,105,103,97,89,78,79,80,81,82,129,128,86,85,84,83,4,90,93,92	1452.252
Region 13	Secondary Liner (textured)	103,102,100,101,99,73,74,75,76,77,130,129,82,81,80,79,78,89,97	79.395
Region 14	Sideslope Liner (textured 1000-	96,95,88,87,104,106,102,103,105,98,94	11.54

	2000psf)		
Region 15	Structural Fill	40,30,29,28,110,27,26,107,36,37,38,39	97.18
Region 16	Waste	26,25,24,23,114,22,21,115,20,19,18,112,17,16,113,15,14,13,12,11,10,9,8,138,137,31,32,33,34,1,35,107	30224.295
Region 17	Compacted Clay	110,109,108,111,24,25,26,27	48.395

Points

	X (ft)	Y (ft)
Point 1	138	318.5
Point 2	-75	305
Point 3	68.5	332.1
Point 4	138	310.2
Point 5	-75	310.7
Point 6	-75	281
Point 7	-75	274.5
Point 8	492.5	417.4
Point 9	476.2	418.3
Point 10	417.7	415.3
Point 11	415	414.3
Point 12	412.5	413.5
Point 13	402	410.1
Point 14	386.9	410.4
Point 15	296	380.1
Point 16	266	365.2
Point 17	251	364.9
Point 18	226.6	376.9
Point 19	211.6	377.2
Point 20	168.9	363
Point 21	138.9	348
Point 22	133.9	348
Point 23	122	354

Point 24	119	354
Point 25	94.8	346
Point 26	71.1	338
Point 27	70	338.4
Point 28	67.5	339.3
Point 29	46.7	339.5
Point 30	44.7	338.5
Point 31	492.5	319.1
Point 32	322.5	315.3
Point 33	309.9	315
Point 34	295.4	315.3
Point 35	122.8	318.9
Point 36	71.1	336
Point 37	55	336.1
Point 38	54	335.1
Point 39	51.5	336
Point 40	39.4	336.3
Point 41	4	319.7
Point 42	-75	314
Point 43	138	317.5
Point 44	295.4	314.3
Point 45	309.9	314
Point 46	322.5	314.3
Point 47	492.5	318.1
Point 48	138	317.3
Point 49	295.4	314.1
Point 50	309.9	313.8
Point 51	322.5	314.1
Point 52	492.5	317.9
Point 53	138	316.3
Point 54	295.4	313.1
Point 55	309.9	312.8
Point 56	322.5	313.1
Point 57	492.5	316.9
Point 58	138	316.1
Point 59	295.4	312.9

Point 60	309.9	312.6
Point 61	322.5	312.9
Point 62	492.5	316.7
Point 63	138	314.6
Point 64	295.4	311.4
Point 65	309.9	311.1
Point 66	322.5	311.4
Point 67	492.5	315.2
Point 68	138	314.4
Point 69	295.4	311.2
Point 70	309.9	310.9
Point 71	322.5	311.2
Point 72	492.5	315
Point 73	138	313.4
Point 74	295.4	310.2
Point 75	309.9	309.9
Point 76	322.5	310.2
Point 77	492.5	314
Point 78	138	313.2
Point 79	295.4	310
Point 80	309.9	309.7
Point 81	322.5	310
Point 82	492.5	313.8
Point 83	295.4	307
Point 84	309.9	306.7
Point 85	322.5	307
Point 86	492.5	310.8
Point 87	122.6	317.9
Point 88	71.1	335
Point 89	136.4	313.2
Point 90	136.6	310.2
Point 91	59.4	335.1
Point 92	59.42601	329.1
Point 93	77.7	329.1
Point 94	71.1	334.8
Point 95	65.1	335

Point 96	65.1	334.8
Point 97	136	313.3
Point 98	122.4	317.8
Point 99	136.2	313.4
Point 100	132.3	314.7
Point 101	132.9	314.5
Point 102	127.5	316.3
Point 103	126.9	316.3
Point 104	123.5	317.6
Point 105	122.9	317.6
Point 106	126.9	316.5
Point 107	75.7	334.5
Point 108	94.8	347
Point 109	71.1	339
Point 110	69.7	338.5
Point 111	115.6	354
Point 112	238.5	371
Point 113	277.6	371
Point 114	127.3	351.3
Point 115	145.5	351.3
Point 116	2.4	319.5
Point 117	0.5	319.9
Point 118	-4.8	322.3
Point 119	-18.8	322.7
Point 120	-31.6	322.5
Point 121	-36.7	321.9
Point 122	-48.3	318
Point 123	-75	318
Point 124	8.1	321.9
Point 125	525	274.5
Point 126	525	285
Point 127	525	305
Point 128	525	311.7
Point 129	525	314.7
Point 130	525	314.9
Point 131	525	315.9

Point 132	525	316.1
Point 133	525	317.6
Point 134	525	317.8
Point 135	525	318.8
Point 136	525	319
Point 137	525	320
Point 138	525	416.7
Point 139	25	285

Critical Slip Surfaces

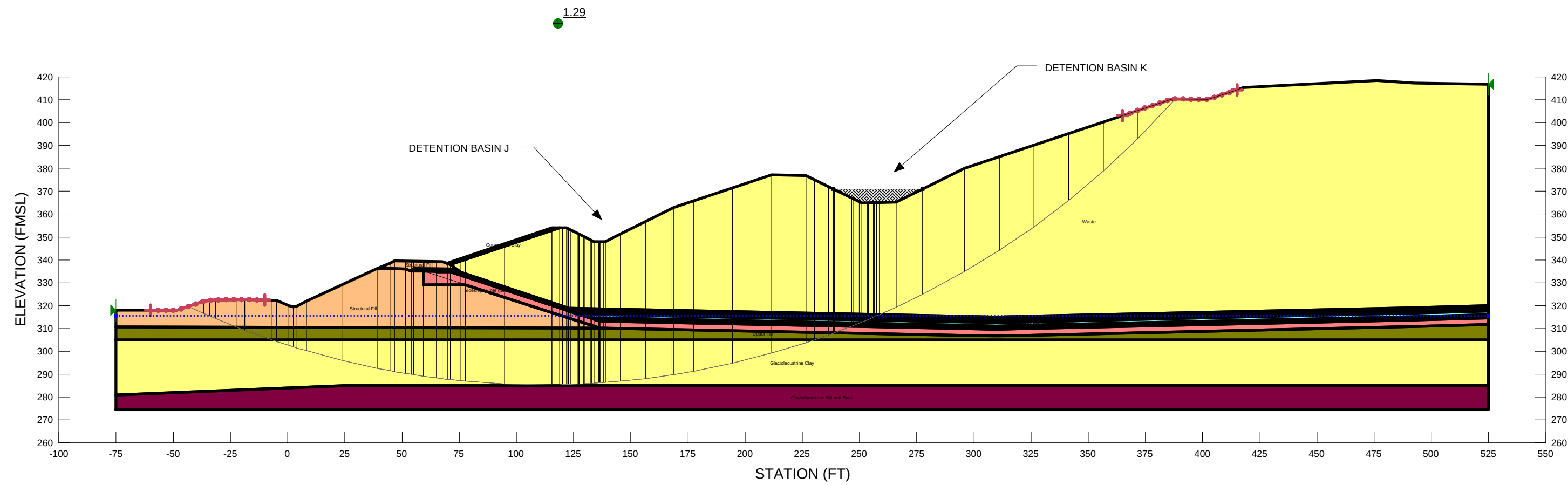
	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	732	1.23	(50.81, 493.47)	208.328	(223.513, 376.962)	(-61.4869, 318)

Slices of Slip Surface: 732

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	732	-59.4841	316.75	0	1530.1853	0	2000
2	732	-53.26819	313.06935	0	1951.3895	0	2000
3	732	-48.67755	310.4335	316.15188	1657.1474	0	1008.2
4	732	-43.127955	307.61415	492.07527	2290.6223	0	1088
5	732	-37.327955	304.7068	673.49461	2609.3218	0	516.79
6	732	-34.15	303.2745	762.87677	2863.7419	0	539.93
7	732	-25.2	299.62585	990.55341	3366.3833	0	579.2
8	732	-11.8	294.90905	1284.853	3903.4708	0	615
9	732	-2.15	292.0052	1466.0772	4031.7033	0	609.31
10	732	1.45	291.0769	1524.0153	3936.8223	0	588.67
11	732	3.2	290.6574	1550.172	3968.0072	0	589.65
12	732	6.05	290.0186	1590.0474	4201.9499	0	617.13
13	732	13.316665	288.6128	1677.7226	4823.3936	0	692.78
14	732	23.75	286.9744	1779.9885	5618.2253	0	791.57
15	732	34.183335	285.873	1848.7132	6326.3251	0	883.35
16	732	42.05	285.34365	1881.7489	6795.3037	0	946.37

17	732	45.7	285.20755	1890.231	6993.395	0	973.85
18	732	49.1	285.1633	1892.9986	7032.471	0	979.8
19	732	52.75	285.15525	1893.5182	6997.6977	0	975.72
20	732	54.5	285.17575	1892.2029	6980.704	0	973.91
21	732	57.213005	285.25265	1887.4452	6947.4461	0	970.52
22	732	62.263005	285.4769	1873.4432	6871.3446	0	962.91
23	732	66.3	285.7226	1858.0922	6788.6558	0	954.32
24	732	68.6	285.90635	1846.6386	6694.5463	0	943.12
25	732	69.85	286.0144	1839.9008	6626.4844	0	934.76
26	732	70.55	286.08055	1835.7931	6644.7838	0	938.08
27	732	73.4	286.3838	1816.8525	6662.0016	0	943.79
28	732	76.7	286.75995	1793.3883	6671.8727	0	949.23
29	732	81.975	287.5321	1745.1593	6695.0006	0	960.49
30	732	90.525	289.0094	1652.9652	6703.1375	0	976.58
31	732	100	291.1038	1522.3077	6654.0345	0	990.23
32	732	110.4	293.9206	1346.5318	6535.3088	0	1000.6
33	732	117.3	296.04595	1213.944	6355.7013	0	995.3
34	732	119.54155	296.80775	1166.3825	6223.7865	0	983.67
35	732	121.04155	297.34025	1133.1819	6139.6034	0	976.68
36	732	122.2	297.75645	1107.191	6063.692	0	969.76
37	732	122.5	297.86605	1100.3735	6030.7169	0	966.03
38	732	122.7	297.93945	1095.7842	6005.4606	0	963.16
39	732	122.85	297.9946	1092.3783	5985.6551	0	960.81
40	732	123.2	298.1242	1084.2474	5941.9659	0	955.78
41	732	125.2	298.8853	1036.7608	5728.3109	0	932.31
42	732	127.1	299.6139	991.29972	5526.917	0	910.31
43	732	127.4	299.73215	983.90598	5491.9251	0	906.41
44	732	128.41335	300.1383	958.57861	5412.1995	0	898.74
45	732	129.61335	300.62205	928.38802	5320.2285	0	890.01
46	732	131.1	301.2404	889.79608	5203.9018	0	879.07
47	732	132.6	301.86965	850.53099	5080.4691	0	867.15
48	732	133.4	302.21365	829.07201	5011.4115	0	860.42
49	732	134.95	302.89315	786.64798	4912.0847	0	852.45
50	732	136.1	303.4016	754.92717	4846.4235	0	847.77
51	732	136.3	303.4915	749.32666	4833.6448	0	846.75
52	732	136.5	303.5816	743.73009	4819.958	0	845.63

53	732	137.3	303.94615	720.97374	4771.488	0	842.05
54	732	138.45	304.4743	688.00586	4701.4507	0	836.88
55	732	139.23815	304.8415	665.0889	4660.3216	0	834.38
56	732	142.53815	306.4527	564.54583	4334.5807	0	1491.2
57	732	147.46835	308.93645	409.55737	4146.203	0	1486.8
58	732	152.03925	311.4146	254.93811	3965.2003	0	1685.4
59	732	154.80945	312.9583	158.60358	4088.6109	0	1093.5
60	732	155.8051	313.53805	0	3829.2495	0	1789.5
61	732	156.7967	314.11785	0	4029.7753	0	1121.4
62	732	158.031	314.85725	0	3794.9322	0	1702.7
63	732	159.2374	315.58275	0	3755.4397	0	1696.1
64	732	159.5313	315.76225	0	3962.9848	0	1104.3
65	732	160.47145	316.3431	0	3706.263	0	1737.9
66	732	161.408	316.9241	0	3913.2545	0	1091.5
67	732	162.32705	317.50545	0	3652.7309	0	1715.2
68	732	165.99575	319.9174	0	3384.8382	0	2088.1
69	732	174.2375	325.7734	0	3061.2491	0	1904.4
70	732	184.9125	334.19585	0	2547.6429	0	1604.3
71	732	195.5875	343.8547	0	1974.8025	0	1261.3
72	732	206.2625	355.01225	0	1343.9884	0	873.15
73	732	217.5564	368.9833	0	487.29915	0	323.87



Name: Global Upper. with Basin K Full
Kind: SLOPE/W
Method: Spencer
File Name: SEISMIC- November 2011.gsz

Section A-A'
Fill Progression Slope Stability Analysis
RMU-1 Leachate Level Compliance Plan
CWM Chemical Services, LLC
Model City, New York

Global Upper. with Basin K Full

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File Information

Revision Number: 281
Last Edited By: Giampaolo, Mandy
Date: 11/16/2011
Time: 9:34:16 AM
File Name: SEISMIC- November 2011.gsz
Directory: C:\Users\mgiampaolo\Documents\ARCADIS Documents\RMU-1\2011 Fill
Progression\Calc in Response to Review Comments\
Last Solved Date: 11/16/2011
Last Solved Time: 9:35:28 AM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Global Upper. with Basin K Full

Kind: SLOPE/W
Method: Spencer
Settings
 Apply Phreatic Correction: No
 PWP Conditions Source: Piezometric Line with Ru
Slip Surface
 Direction of movement: Right to Left
 Use Passive Mode: No
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: No
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

operations Layer

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile (2)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Leachate Collection

Model: Mohr-Coulomb
Unit Weight: 135 pcf

Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Sideslope Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Compacted Clay

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion: 1000 psf
Phi: 10 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Secondary Leachate Collection

Model: [Mohr-Coulomb](#)

Unit Weight: [135 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Secondary Liner (textured)

Model: [Mohr-Coulomb](#)

Unit Weight: [58.7 pcf](#)

Cohesion: [0 psf](#)

Phi: [15 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Secondary Compacted Clay

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [1000 psf](#)

Phi: [10 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Structural Fill

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [2000 psf](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Upper Till

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [800 psf](#)

Phi: [10 °](#)

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Ru: 0

Include in PWP: No

Glaciolacustrine Clay

Model: Mohr-Coulomb

Unit Weight: 125 pcf

Cohesion: 256 psf

Phi: 8 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Ru: 0

Include in PWP: No

Glaciolacustrine Silt and Sand

Model: Mohr-Coulomb

Unit Weight: 130 pcf

Cohesion: 0 psf

Phi: 30 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Ru: 0

Include in PWP: No

Slip Surface Entry and Exit

Left Projection: Range

Left-Zone Left Coordinate: (-60, 318) ft

Left-Zone Right Coordinate: (-10, 322.44857) ft

Left-Zone Increment: 15

Right Projection: Range

Right-Zone Left Coordinate: (365, 403.1) ft

Right-Zone Right Coordinate: (415, 414.3) ft

Right-Zone Increment: 15

Radius Increments: 10

Slip Surface Limits

Left Coordinate: (-75, 318) ft

Right Coordinate: (525, 416.7) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	-75	315.5
	525	315.5

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf

Direction: Vertical

Coordinates

	X (ft)	Y (ft)
	238.5	371
	277.6	371

Seismic Loads

Horz Seismic Load: 0.055

Vert Seismic Load: 0

Ignore seismic load in strength: Yes

Regions

	Material	Points	Area (ft²)
Region 1	Structural Fill	5,42,123,122,121,120,119,118,117,116,41,124,40,39,38,91,92,93,90	2800.853
Region 2	Upper Till	2,5,90,4,83,84,85,86,128,127	2643.4
Region 3	Glaciolacustrine Clay	6,2,127,126,139	12200
Region 4	Glaciolacustrine Silt and Sand	7,6,139,126,125	6100

Region 5	Geotextile (2)	104,87,43,44,45,46,47,136,135,52,51,50,49,48	80.98
Region 6	Primary Leachate Collection	106,104,48,49,50,51,52,135,134,57,56,55,54,53	400.015
Region 7	Primary Liner (textured 1000-2000psf)	102,106,53,54,55,56,57,134,133,62,61,60,59,58	79.5
Region 8	Compacted Clay	100,102,58,59,60,61,62,133,132,67,66,65,64,63	592.695
Region 9	Geotextile	101,100,63,64,65,66,67,132,131,72,71,70,69,68	78.45
Region 10	Secondary Leachate Collection	99,101,68,69,70,71,72,131,130,77,76,75,74,73	390.54
Region 11	operations Layer	38,37,36,107,35,1,34,33,32,31,137,136,47,46,45,44,43,87,88,95,91	472.885
Region 12	Secondary Compacted Clay	91,95,96,94,98,105,103,97,89,78,79,80,81,82,129,128,86,85,84,83,4,90,93,92	1452.252
Region 13	Secondary Liner (textured)	103,102,100,101,99,73,74,75,76,77,130,129,82,81,80,79,78,89,97	79.395
Region 14	Sideslope Liner (textured 1000-2000psf)	96,95,88,87,104,106,102,103,105,98,94	11.54
Region 15	Structural Fill	40,30,29,28,110,27,26,107,36,37,38,39	97.18
Region 16	Waste	26,25,24,23,114,22,21,115,20,19,18,112,17,16,113,15,14,13,12,11,10,9,8,138,137,31,32,33,34,1,35,107	30224.295
Region	Compacted Clay	110,109,108,111,24,25,26,27	48.395

17			

Points

	X (ft)	Y (ft)
Point 1	138	318.5
Point 2	-75	305
Point 3	68.5	332.1
Point 4	138	310.2
Point 5	-75	310.7
Point 6	-75	281
Point 7	-75	274.5
Point 8	492.5	417.4
Point 9	476.2	418.3
Point 10	417.7	415.3
Point 11	415	414.3
Point 12	412.5	413.5
Point 13	402	410.1
Point 14	386.9	410.4
Point 15	296	380.1
Point 16	266	365.2
Point 17	251	364.9
Point 18	226.6	376.9
Point 19	211.6	377.2
Point 20	168.9	363
Point 21	138.9	348
Point 22	133.9	348
Point 23	122	354
Point 24	119	354
Point 25	94.8	346
Point 26	71.1	338
Point 27	70	338.4
Point 28	67.5	339.3
Point 29	46.7	339.5
Point 30	44.7	338.5
Point 31	492.5	319.1

Point 32	322.5	315.3
Point 33	309.9	315
Point 34	295.4	315.3
Point 35	122.8	318.9
Point 36	71.1	336
Point 37	55	336.1
Point 38	54	335.1
Point 39	51.5	336
Point 40	39.4	336.3
Point 41	4	319.7
Point 42	-75	314
Point 43	138	317.5
Point 44	295.4	314.3
Point 45	309.9	314
Point 46	322.5	314.3
Point 47	492.5	318.1
Point 48	138	317.3
Point 49	295.4	314.1
Point 50	309.9	313.8
Point 51	322.5	314.1
Point 52	492.5	317.9
Point 53	138	316.3
Point 54	295.4	313.1
Point 55	309.9	312.8
Point 56	322.5	313.1
Point 57	492.5	316.9
Point 58	138	316.1
Point 59	295.4	312.9
Point 60	309.9	312.6
Point 61	322.5	312.9
Point 62	492.5	316.7
Point 63	138	314.6
Point 64	295.4	311.4
Point 65	309.9	311.1
Point 66	322.5	311.4
Point 67	492.5	315.2

Point 68	138	314.4
Point 69	295.4	311.2
Point 70	309.9	310.9
Point 71	322.5	311.2
Point 72	492.5	315
Point 73	138	313.4
Point 74	295.4	310.2
Point 75	309.9	309.9
Point 76	322.5	310.2
Point 77	492.5	314
Point 78	138	313.2
Point 79	295.4	310
Point 80	309.9	309.7
Point 81	322.5	310
Point 82	492.5	313.8
Point 83	295.4	307
Point 84	309.9	306.7
Point 85	322.5	307
Point 86	492.5	310.8
Point 87	122.6	317.9
Point 88	71.1	335
Point 89	136.4	313.2
Point 90	136.6	310.2
Point 91	59.4	335.1
Point 92	59.42601	329.1
Point 93	77.7	329.1
Point 94	71.1	334.8
Point 95	65.1	335
Point 96	65.1	334.8
Point 97	136	313.3
Point 98	122.4	317.8
Point 99	136.2	313.4
Point 100	132.3	314.7
Point 101	132.9	314.5
Point 102	127.5	316.3
Point 103	126.9	316.3

Point 104	123.5	317.6
Point 105	122.9	317.6
Point 106	126.9	316.5
Point 107	75.7	334.5
Point 108	94.8	347
Point 109	71.1	339
Point 110	69.7	338.5
Point 111	115.6	354
Point 112	238.5	371
Point 113	277.6	371
Point 114	127.3	351.3
Point 115	145.5	351.3
Point 116	2.4	319.5
Point 117	0.5	319.9
Point 118	-4.8	322.3
Point 119	-18.8	322.7
Point 120	-31.6	322.5
Point 121	-36.7	321.9
Point 122	-48.3	318
Point 123	-75	318
Point 124	8.1	321.9
Point 125	525	274.5
Point 126	525	285
Point 127	525	305
Point 128	525	311.7
Point 129	525	314.7
Point 130	525	314.9
Point 131	525	315.9
Point 132	525	316.1
Point 133	525	317.6
Point 134	525	317.8
Point 135	525	318.8
Point 136	525	319
Point 137	525	320
Point 138	525	416.7
Point 139	25	285

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	962	1.29	(111.701, 653.246)	367.876	(388.012, 410.378)	(-43.3779, 319.655)

Slices of Slip Surface: 962

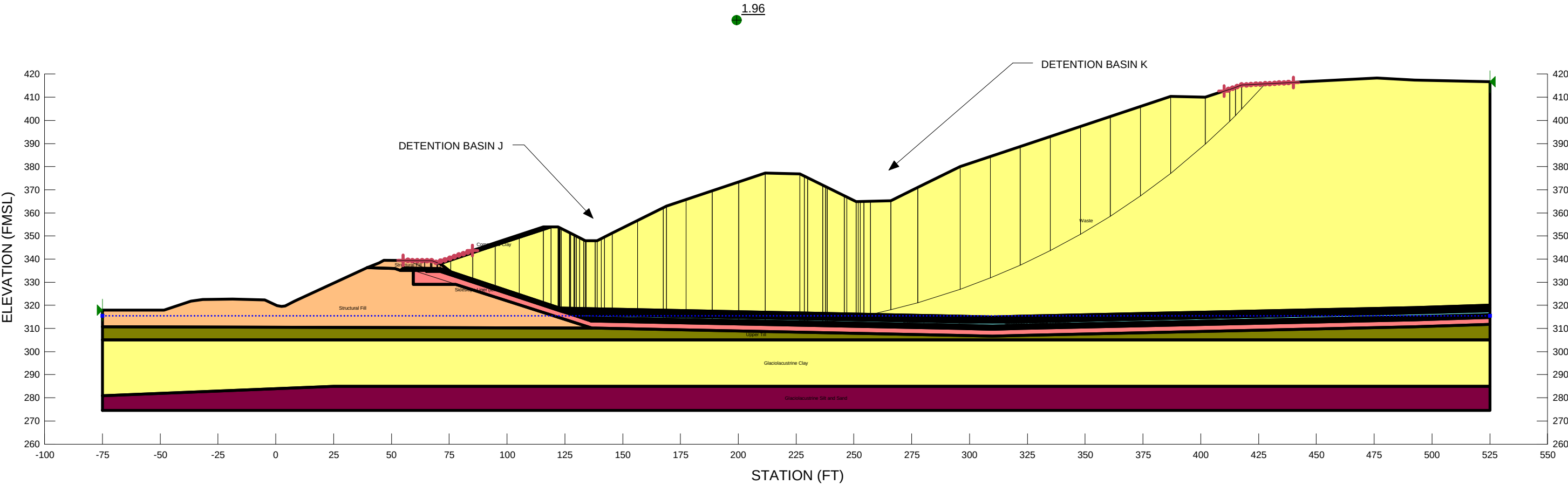
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	962	-40.03897	318.1429	0	1338.6498	0	2000
2	962	-35.40386	316.0655	0	1768.48	0	2000
3	962	-32.85386	314.9642	0	1943.5433	0	2000
4	962	-26.86206	312.50175	0	2270.7099	0	2000
5	962	-20.46206	309.93525	347.25615	2209.3958	0	1107
6	962	-12.831143	307.1477	521.17998	2549.7006	0	1137
7	962	-5.831143	304.65235	676.91349	2590.3015	0	518.23
8	962	-2.15	303.4422	752.41511	2567.0781	0	504.78
9	962	1.45	302.28125	824.83824	2513.6804	0	487.54
10	962	3.2	301.7359	858.8894	2567.77	0	490.46
11	962	6.05	300.87435	912.64141	2845.1124	0	521.74
12	962	15.925	298.14915	1082.7144	3839.1018	0	637.21
13	962	31.575	294.2919	1323.4043	5291.4969	0	807.68
14	962	42.05	292.0342	1464.2717	6188.084	0	914.42
15	962	45.7	291.34085	1507.5355	6480.1201	0	949.66
16	962	49.1	290.74405	1544.7808	6606.1773	0	962.49
17	962	52.75	290.12665	1583.3107	6663.1632	0	965.52
18	962	54.5	289.845	1600.8898	6691.0202	0	967.19
19	962	57.213005	289.43485	1626.4562	6729.4934	0	969.33
20	962	62.263005	288.71865	1671.1509	6790.1586	0	972.19
21	962	66.3	288.18465	1704.494	6818.7203	0	972.04
22	962	68.6	287.90565	1721.877	6787.4743	0	965.51
23	962	69.85	287.7587	1731.0548	6753.5346	0	959.6
24	962	70.55	287.6796	1736.0361	6794.0019	0	964.66
25	962	73.4	287.37695	1754.8886	6900.1199	0	977.25

26	962	76.7	287.0406	1775.8574	7014.037	0	990.68
27	962	86.25	286.3519	1818.8458	7360.092	0	1034.4
28	962	105.2	285.5749	1867.3044	7961.2561	0	1114.6
29	962	117.3	285.4169	1877.1942	8220.518	0	1151.3
30	962	119.54155	285.45435	1874.8933	8178.6923	0	1146
31	962	121.04155	285.49025	1872.5988	8156.7668	0	1143.4
32	962	122.2	285.5203	1870.7377	8127.9379	0	1139.8
33	962	122.5	285.52895	1870.1939	8106.0063	0	1136.8
34	962	122.7	285.5349	1869.8133	8088.3804	0	1134.3
35	962	122.85	285.5394	1869.54	8073.4862	0	1132.3
36	962	123.2	285.55025	1868.9197	8042.5685	0	1128.1
37	962	125.2	285.62205	1864.3908	7905.5554	0	1109.7
38	962	127.1	285.6929	1859.9683	7777.1775	0	1092.4
39	962	127.4	285.70555	1859.1545	7750.4316	0	1088.8
40	962	128.41335	285.75135	1856.3292	7681.4753	0	1079.5
41	962	129.61335	285.80685	1852.9158	7601.9025	0	1069
42	962	131.1	285.8842	1848.0084	7502.8793	0	1055.8
43	962	132.6	285.96465	1843.0186	7395.8693	0	1041.6
44	962	133.4	286.01125	1840.0909	7336.1058	0	1033.7
45	962	134.95	286.1073	1834.0885	7291.1112	0	1028.4
46	962	136.1	286.18045	1829.5622	7278.9354	0	1027.4
47	962	136.3	286.1938	1828.6982	7275.1818	0	1027
48	962	136.5	286.20725	1827.8824	7270.9223	0	1026.5
49	962	137.3	286.2628	1824.4238	7259.5023	0	1025.5
50	962	138.45	286.34445	1819.2825	7243.331	0	1024.1
51	962	142.2	286.6518	1800.1444	7366.5195	0	1044.6
52	962	151.00315	287.5177	1746.1304	7692.8567	0	1099.4
53	962	162.0094	288.8689	1661.7375	8061.8073	0	1164.9
54	962	168.20625	289.73655	1607.6481	8253.3153	0	1200.5
55	962	173.125	290.55995	1556.3	8311.9349	0	1216.7
56	962	185.9125	293.0396	1401.5134	8387.3473	0	1251
57	962	203.0375	296.999	1154.4842	8405.5051	0	1290.8
58	962	219.1	301.48415	874.60954	8051.1006	0	1282.1
59	962	228.43195	304.387	693.45945	7539.482	0	1236
60	962	233.31945	306.0704	588.4089	6938.873	0	1945.1
61	962	237.4375	307.5272	497.48383	6522.2612	0	1887.5

62	962	238.8129	308.02885	466.20015	6391.0401	0	1869.7
63	962	242.85755	309.5682	370.14468	6053.5785	0	2028.1
64	962	246.8301	311.0874	275.34521	5848.3338	0	1528.6
65	962	248.26105	311.65835	0	5548.2933	0	2544
66	962	249.68655	312.2294	0	5632.0762	0	1544.5
67	962	250.46095	312.54415	0	5490.0404	0	1994.1
68	962	252.19815	313.2588	0	5382.0338	0	1975.1
69	962	253.62435	313.8493	0	5406.9974	0	1483.9
70	962	254.98055	314.42175	0	5151.5587	0	2366.7
71	962	256.332	314.99425	0	5268.5357	0	1446.7
72	962	257.0323	315.29485	0	5048.6512	0	2321
73	962	258.13705	315.7724	0	4985.7013	0	2292.8
74	962	262.3824	317.6692	0	4640.1041	0	2787.6
75	962	271.8	322.0977	0	4277.2091	0	2580.4
76	962	286.8	329.88355	0	3981.5679	0	2418.7
77	962	303.575	339.4978	0	3632.687	0	2224.2
78	962	318.725	349.28965	0	3126.7492	0	1929.4
79	962	333.875	360.19185	0	2555.6381	0	1590.6
80	962	349.025	372.3343	0	1920.3959	0	1206.7
81	962	364.175	385.8872	0	1222.8452	0	776.75
82	962	379.325	401.07985	0	466.28182	0	299.94
83	962	387.45575	409.74855	0	39.973202	0	27.637

Appendix D

Pseudo-static Stability Analysis:
Sliding



Name: Along CCL
Kind: SLOPE/W
Method: Spencer
File Name: SEISMIC- Sliding November 2011.gsz

Section A-A'
Fill Progression Slope Stability Analysis
RMU-1 Leachate Level Compliance Plan
CWM Chemical Services, LLC
Model City, New York

Along CCL

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File Information

Revision Number: 268
Last Edited By: Giampaolo, Mandy
Date: 11/16/2011
Time: 9:28:41 AM
File Name: SEISMIC- Sliding November 2011.gsz
Directory: C:\Users\mgiampaolo\Documents\ARCADIS Documents\RMU-1\2011 Fill
Progression\Calc in Response to Review Comments\
Last Solved Date: 11/16/2011
Last Solved Time: 9:28:52 AM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Along CCL

Kind: SLOPE/W
Method: Spencer
Settings
 Apply Phreatic Correction: No
 PWP Conditions Source: Piezometric Line with Ru
Slip Surface
 Direction of movement: Right to Left
 Use Passive Mode: No
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: No
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

operations Layer

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile (2)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Leachate Collection

Model: Mohr-Coulomb
Unit Weight: 135 pcf

Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Sideslope Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Compacted Clay

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion: 1000 psf
Phi: 10 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Secondary Leachate Collection

Model: [Mohr-Coulomb](#)

Unit Weight: [135 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Secondary Liner (textured)

Model: [Mohr-Coulomb](#)

Unit Weight: [58.7 pcf](#)

Cohesion: [0 psf](#)

Phi: [15 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Secondary Compacted Clay

Model: [Bedrock \(Impenetrable\)](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Structural Fill

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [2000 psf](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Upper Till

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [800 psf](#)

Phi: [10 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Glaciolacustrine Clay

Model: [Mohr-Coulomb](#)

Unit Weight: [125 pcf](#)

Cohesion: [320 psf](#)

Phi: [10 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Glaciolacustrine Silt and Sand

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [0 psf](#)

Phi: [30 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(55, 339.42019\) ft](#)

Left-Zone Right Coordinate: [\(85, 343.69198\) ft](#)

Left-Zone Increment: [15](#)

Right Projection: [Range](#)

Right-Zone Left Coordinate: [\(410, 412.69048\) ft](#)

Right-Zone Right Coordinate: [\(440, 416.44359\) ft](#)

Right-Zone Increment: [15](#)

Radius Increments: [5](#)

Slip Surface Limits

Left Coordinate: [\(-75, 318\) ft](#)

Right Coordinate: [\(525, 416.7\) ft](#)

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	-75	315.5
	525	315.5

Seismic Loads

Horz Seismic Load: 0.055
Vert Seismic Load: 0
Ignore seismic load in strength: Yes

Regions

	Material	Points	Area (ft²)
Region 1	Structural Fill	5,42,123,122,121,120,119,118,117,116,41,124,40,39,38,91,92,93,90	2800.853
Region 2	Upper Till	2,5,90,4,83,84,85,86,128,127	2643.4
Region 3	Glaciolacustrine Clay	6,2,127,126,139	12200
Region 4	Glaciolacustrine Silt and Sand	7,6,139,126,125	6100
Region 5	Geotextile (2)	104,87,43,44,45,46,47,136,135,52,51,50,49,48	80.98
Region 6	Primary Leachate Collection	106,104,48,49,50,51,52,135,134,57,56,55,54,53	400.015
Region 7	Primary Liner (textured 1000-2000psf)	102,106,53,54,55,56,57,134,133,62,61,60,59,58	79.5
Region	Compacte	100,102,58,59,60,61,62,133,132,67,66,65,64,63	592.69

on 8	d Clay		5
Regi on 9	Geotextile	101,100,63,64,65,66,67,132,131,72,71,70,69,68	78.45
Regi on 10	Secondary Leachate Collection	99,101,68,69,70,71,72,131,130,77,76,75,74,73	390.54
Regi on 11	operation s Layer	38,37,36,107,35,1,34,33,32,31,137,136,47,46,45,44,43,87,88,95,91	472.88 5
Regi on 12	Secondary Compacte d Clay	91,95,96,94,98,105,103,97,89,78,79,80,81,82,129,128,86,85,84,83,4 ,90,93,92	1452.2 52
Regi on 13	Secondary Liner (textured)	103,102,100,101,99,73,74,75,76,77,130,129,82,81,80,79,78,89,97	79.395
Regi on 14	Sideslope Liner (textured 1000- 2000psf)	96,95,88,87,104,106,102,103,105,98,94	11.54
Regi on 15	Structural Fill	40,30,29,28,110,27,26,107,36,37,38,39	97.18
Regi on 16	Waste	26,25,24,23,114,22,21,115,20,19,18,112,17,16,113,15,14,13,12,11,1 0,9,8,138,137,31,32,33,34,1,35,107	30224. 295
Regi on 17	Compacte d Clay	110,109,108,111,24,25,26,27	48.395

Points

	X (ft)	Y (ft)
Point 1	138	318.5
Point 2	-75	305
Point 3	68.5	332.1
Point 4	138	310.2
Point 5	-75	310.7
Point 6	-75	281

Point 7	-75	274.5
Point 8	492.5	417.4
Point 9	476.2	418.3
Point 10	417.7	415.3
Point 11	415	414.3
Point 12	412.5	413.5
Point 13	402	410.1
Point 14	386.9	410.4
Point 15	296	380.1
Point 16	266	365.2
Point 17	251	364.9
Point 18	226.6	376.9
Point 19	211.6	377.2
Point 20	168.9	363
Point 21	138.9	348
Point 22	133.9	348
Point 23	122	354
Point 24	119	354
Point 25	94.8	346
Point 26	71.1	338
Point 27	70	338.4
Point 28	67.5	339.3
Point 29	46.7	339.5
Point 30	44.7	338.5
Point 31	492.5	319.1
Point 32	322.5	315.3
Point 33	309.9	315
Point 34	295.4	315.3
Point 35	122.8	318.9
Point 36	71.1	336
Point 37	55	336.1
Point 38	54	335.1
Point 39	51.5	336
Point 40	39.4	336.3
Point 41	4	319.7
Point 42	-75	314

Point 43	138	317.5
Point 44	295.4	314.3
Point 45	309.9	314
Point 46	322.5	314.3
Point 47	492.5	318.1
Point 48	138	317.3
Point 49	295.4	314.1
Point 50	309.9	313.8
Point 51	322.5	314.1
Point 52	492.5	317.9
Point 53	138	316.3
Point 54	295.4	313.1
Point 55	309.9	312.8
Point 56	322.5	313.1
Point 57	492.5	316.9
Point 58	138	316.1
Point 59	295.4	312.9
Point 60	309.9	312.6
Point 61	322.5	312.9
Point 62	492.5	316.7
Point 63	138	314.6
Point 64	295.4	311.4
Point 65	309.9	311.1
Point 66	322.5	311.4
Point 67	492.5	315.2
Point 68	138	314.4
Point 69	295.4	311.2
Point 70	309.9	310.9
Point 71	322.5	311.2
Point 72	492.5	315
Point 73	138	313.4
Point 74	295.4	310.2
Point 75	309.9	309.9
Point 76	322.5	310.2
Point 77	492.5	314
Point 78	138	313.2

Point 79	295.4	310
Point 80	309.9	309.7
Point 81	322.5	310
Point 82	492.5	313.8
Point 83	295.4	307
Point 84	309.9	306.7
Point 85	322.5	307
Point 86	492.5	310.8
Point 87	122.6	317.9
Point 88	71.1	335
Point 89	136.4	313.2
Point 90	136.6	310.2
Point 91	59.4	335.1
Point 92	59.42601	329.1
Point 93	77.7	329.1
Point 94	71.1	334.8
Point 95	65.1	335
Point 96	65.1	334.8
Point 97	136	313.3
Point 98	122.4	317.8
Point 99	136.2	313.4
Point 100	132.3	314.7
Point 101	132.9	314.5
Point 102	127.5	316.3
Point 103	126.9	316.3
Point 104	123.5	317.6
Point 105	122.9	317.6
Point 106	126.9	316.5
Point 107	75.7	334.5
Point 108	94.8	347
Point 109	71.1	339
Point 110	69.7	338.5
Point 111	115.6	354
Point 112	238.5	371
Point 113	277.6	371
Point 114	127.3	351.3

Point 115	145.5	351.3
Point 116	2.4	319.5
Point 117	0.5	319.9
Point 118	-4.8	322.3
Point 119	-18.8	322.7
Point 120	-31.6	322.5
Point 121	-36.7	321.9
Point 122	-48.3	318
Point 123	-75	318
Point 124	8.1	321.9
Point 125	525	274.5
Point 126	525	285
Point 127	525	305
Point 128	525	311.7
Point 129	525	314.7
Point 130	525	314.9
Point 131	525	315.9
Point 132	525	316.1
Point 133	525	317.6
Point 134	525	317.8
Point 135	525	318.8
Point 136	525	319
Point 137	525	320
Point 138	525	416.7
Point 139	25	285

Critical Slip Surfaces

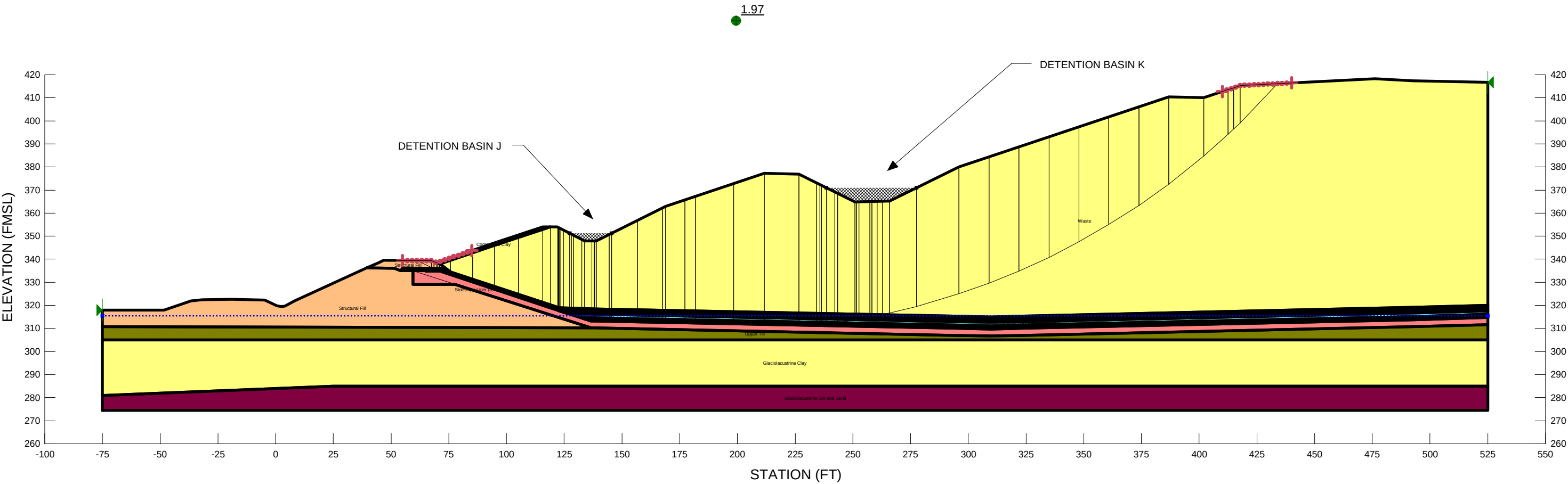
	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	153	1.96	(191.651, 624.066)	314.877	(427.832, 415.82)	(57.0665, 339.4)

Slices of Slip Surface: 153

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength	Cohesive Strength

						(psf)	h (psf)
1	153	60.739855	337.7209	0	1043.3234	0	2000
2	153	65.60537	335.52075	0	655.03467	0	274.39
3	153	67.029545	334.9	0	698.56962	0	179.59
4	153	67.38079	334.8	0	587.96242	0	157.55
5	153	68.6	334.8	0	534.68182	0	143.28
6	153	69.85	334.8	0	488.66667	0	130.95
7	153	70.55	334.8	0	521.81818	0	139.83
8	153	73.4	334.0378	0	806.7688	0	209.55
9	153	80.475	331.69325	0	1400.4976	0	363.75
10	153	90.025	328.52855	0	2231.4528	0	579.6
11	153	100	325.223	0	3099.532	0	805.04
12	153	110.4	321.7766	0	4004.5016	0	1040.1
13	153	117.3	319.49005	0	4517.8099	0	1173.4
14	153	120.5	318.42965	0	4643.3511	0	1206
15	153	122.2	317.8663	0	4703.4691	0	1221.6
16	153	122.5	317.76	0	4842.47	0	1248.9
17	153	122.7	317.68	0	4835.5064	0	1247.2
18	153	122.85	317.62	0	4829.0999	0	1245.5
19	153	123.2	317.5025	0	4656.58	0	1210.2
20	153	125.2	316.8525	0	4618.1095	0	1200.2
21	153	127.1	316.23405	-45.805079	4593.0917	0	1193.2
22	153	127.4	316.13515	-39.634262	4580.6504	0	1190
23	153	128.2123	315.8674	-22.923985	4566.0636	0	1186.2
24	153	129.12565	315.5663	-4.1356339	4552.5277	0	1182.7
25	153	129.61335	315.4055	5.8971094	4544.9154	0	1179.1
26	153	130.6243	315.16405	20.962722	4284.0809	0	1121.3
27	153	132.2085	314.8518	0	4369.8071	0	1749.1
28	153	133.4842	314.60835	0	4164.0676	0	1096.8
29	153	134.04965	314.50235	0	4142.7516	0	1091.4
30	153	136.09965	314.1339	0	4359.6773	0	1885.4
31	153	138.45	313.71615	0	4404.8589	0	1906.6
32	153	139.777	313.4925	0	4483.5308	0	1941.7
33	153	141.3609	313.23165	141.54458	4414.3307	0	1128.4
34	153	143.7839	313.0824	150.85757	4321.7017	0	1116.1
35	153	151.00315	312.93565	160.01243	4750.2298	0	1228.4

36	153	162.0094	312.7119	173.97434	5403.8145	0	1399.5
37	153	168.20625	312.5859	181.84347	5771.7791	0	1495.9
38	153	173.125	312.4859	188.07948	5983.0241	0	1550.7
39	153	183.05835	312.28395	200.68254	6382.9415	0	1654.3
40	153	194.475	312.05185	215.16714	6842.5252	0	1773.5
41	153	205.89165	311.81975	229.65173	7302.1088	0	1892.6
42	153	219.1	311.5512	246.40241	7531.7768	0	1949.6
43	153	227.57785	311.37885	257.15992	7478.6642	0	1932.5
44	153	229.26665	311.44455	253.06539	6995.5362	0	1827
45	153	233.2336	311.9639	0	6759.2498	0	3026
46	153	237.0914	312.48545	0	6393.0526	0	1734.6
47	153	238.0966	312.63335	0	6339.518	0	2129.9
48	153	242.2235	313.29945	0	6006.519	0	2071.6
49	153	246.45445	313.9951	0	5657.6128	0	1539
50	153	248.98095	314.45865	0	5485.3034	0	2468.9
51	153	251.39835	314.9095	0	5302.6927	0	2388.7
52	153	252.25865	315.0771	0	5259.9681	0	1433.1
53	153	253.54935	315.33385	0	5248.7614	0	2366.1
54	153	255.76655	315.78875	0	5176.4313	0	2335.3
55	153	261.5775	317.0849	0	5005.8408	0	2925.6
56	153	271.8	319.6192	0	4962.0516	0	2911.9
57	153	286.8	324.064	0	5128.3566	0	3027.9
58	153	302.49285	329.42445	0	5111.9381	0	3038.2
59	153	315.47855	334.6449	0	4901.5457	0	2929.7
60	153	328.46425	340.55605	0	4630.1806	0	2784
61	153	341.45	347.2023	0	4298.3894	0	2600.6
62	153	354.43575	354.6382	0	3906.1156	0	2378.9
63	153	367.42145	362.93145	0	3453.5011	0	2118.2
64	153	380.40715	372.1671	0	2940.2974	0	1817.4
65	153	394.45	383.3943	0	2103.9694	0	1312.6
66	153	407.25	394.6909	0	1287.3511	0	810.85
67	153	413.75	400.86945	0	958.75978	0	607.11
68	153	416.35	403.4885	0	824.42316	0	523.23
69	153	422.76575	410.34165	0	370.95885	0	236.85



Name: Along CCL, both basins full
Kind: SLOPE/W
Method: Spencer
File Name: SEISMIC- Sliding November 2011.gsz

Section A-A'
Fill Progression Slope Stability Analysis
RMU-1 Leachate Level Compliance Plan
CWM Chemical Services, LLC
Model City, New York

Along CCL, both basins full

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File Information

Revision Number: 268
Last Edited By: Giampaolo, Mandy
Date: 11/16/2011
Time: 9:28:41 AM
File Name: SEISMIC- Sliding November 2011.gsz
Directory: C:\Users\mgiampaolo\Documents\ARCADIS Documents\RMU-1\2011 Fill
Progression\Calc in Response to Review Comments\
Last Solved Date: 11/16/2011
Last Solved Time: 9:29:00 AM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Along CCL, both basins full

Kind: SLOPE/W
Method: Spencer
Settings
 Apply Phreatic Correction: No
 PWP Conditions Source: Piezometric Line with Ru
Slip Surface
 Direction of movement: Right to Left
 Use Passive Mode: No
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: No
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

operations Layer

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile (2)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Leachate Collection

Model: Mohr-Coulomb
Unit Weight: 135 pcf

Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Sideslope Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Compacted Clay

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion: 1000 psf
Phi: 10 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Secondary Leachate Collection

Model: [Mohr-Coulomb](#)

Unit Weight: [135 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Secondary Liner (textured)

Model: [Mohr-Coulomb](#)

Unit Weight: [58.7 pcf](#)

Cohesion: [0 psf](#)

Phi: [15 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Secondary Compacted Clay

Model: [Bedrock \(Impenetrable\)](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Structural Fill

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [2000 psf](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Upper Till

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [800 psf](#)

Phi: [10 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Glaciolacustrine Clay

Model: [Mohr-Coulomb](#)

Unit Weight: [125 pcf](#)

Cohesion: [320 psf](#)

Phi: [10 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Glaciolacustrine Silt and Sand

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [0 psf](#)

Phi: [30 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(55, 339.42019\) ft](#)

Left-Zone Right Coordinate: [\(85, 343.69198\) ft](#)

Left-Zone Increment: [15](#)

Right Projection: [Range](#)

Right-Zone Left Coordinate: [\(410, 412.69048\) ft](#)

Right-Zone Right Coordinate: [\(440, 416.44359\) ft](#)

Right-Zone Increment: [15](#)

Radius Increments: [5](#)

Slip Surface Limits

Left Coordinate: [\(-75, 318\) ft](#)

Right Coordinate: [\(525, 416.7\) ft](#)

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	-75	315.5
	525	315.5

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf

Direction: Vertical

Coordinates

	X (ft)	Y (ft)
	127.3	351.3
	145.5	351.3

Surcharge Load 2

Surcharge (Unit Weight): 62.4 pcf

Direction: Vertical

Coordinates

	X (ft)	Y (ft)
	238.5	371
	277.6	371

Seismic Loads

Horz Seismic Load: 0.055

Vert Seismic Load: 0

Ignore seismic load in strength: Yes

Regions

	Material	Points	Area (ft²)

Region 1	Structural Fill	5,42,123,122,121,120,119,118,117,116,41,124,40,39,38,91,92,93,90	2800.853
Region 2	Upper Till	2,5,90,4,83,84,85,86,128,127	2643.4
Region 3	Glaciolacustrine Clay	6,2,127,126,139	12200
Region 4	Glaciolacustrine Silt and Sand	7,6,139,126,125	6100
Region 5	Geotextile (2)	104,87,43,44,45,46,47,136,135,52,51,50,49,48	80.98
Region 6	Primary Leachate Collection	106,104,48,49,50,51,52,135,134,57,56,55,54,53	400.015
Region 7	Primary Liner (textured 1000-2000psf)	102,106,53,54,55,56,57,134,133,62,61,60,59,58	79.5
Region 8	Compacted Clay	100,102,58,59,60,61,62,133,132,67,66,65,64,63	592.695
Region 9	Geotextile	101,100,63,64,65,66,67,132,131,72,71,70,69,68	78.45
Region 10	Secondary Leachate Collection	99,101,68,69,70,71,72,131,130,77,76,75,74,73	390.54
Region 11	operations Layer	38,37,36,107,35,1,34,33,32,31,137,136,47,46,45,44,43,87,88,95,91	472.885
Region 12	Secondary Compacted Clay	91,95,96,94,98,105,103,97,89,78,79,80,81,82,129,128,86,85,84,83,4,90,93,92	1452.252
Region 13	Secondary Liner (textured)	103,102,100,101,99,73,74,75,76,77,130,129,82,81,80,79,78,89,97	79.395
Region 14	Sideslope Liner (textured 1000-	96,95,88,87,104,106,102,103,105,98,94	11.54

	2000psf)		
Region 15	Structural Fill	40,30,29,28,110,27,26,107,36,37,38,39	97.18
Region 16	Waste	26,25,24,23,114,22,21,115,20,19,18,112,17,16,113,15,14,13,12,11,10,9,8,138,137,31,32,33,34,1,35,107	30224.295
Region 17	Compacted Clay	110,109,108,111,24,25,26,27	48.395

Points

	X (ft)	Y (ft)
Point 1	138	318.5
Point 2	-75	305
Point 3	68.5	332.1
Point 4	138	310.2
Point 5	-75	310.7
Point 6	-75	281
Point 7	-75	274.5
Point 8	492.5	417.4
Point 9	476.2	418.3
Point 10	417.7	415.3
Point 11	415	414.3
Point 12	412.5	413.5
Point 13	402	410.1
Point 14	386.9	410.4
Point 15	296	380.1
Point 16	266	365.2
Point 17	251	364.9
Point 18	226.6	376.9
Point 19	211.6	377.2
Point 20	168.9	363
Point 21	138.9	348
Point 22	133.9	348
Point 23	122	354

Point 24	119	354
Point 25	94.8	346
Point 26	71.1	338
Point 27	70	338.4
Point 28	67.5	339.3
Point 29	46.7	339.5
Point 30	44.7	338.5
Point 31	492.5	319.1
Point 32	322.5	315.3
Point 33	309.9	315
Point 34	295.4	315.3
Point 35	122.8	318.9
Point 36	71.1	336
Point 37	55	336.1
Point 38	54	335.1
Point 39	51.5	336
Point 40	39.4	336.3
Point 41	4	319.7
Point 42	-75	314
Point 43	138	317.5
Point 44	295.4	314.3
Point 45	309.9	314
Point 46	322.5	314.3
Point 47	492.5	318.1
Point 48	138	317.3
Point 49	295.4	314.1
Point 50	309.9	313.8
Point 51	322.5	314.1
Point 52	492.5	317.9
Point 53	138	316.3
Point 54	295.4	313.1
Point 55	309.9	312.8
Point 56	322.5	313.1
Point 57	492.5	316.9
Point 58	138	316.1
Point 59	295.4	312.9

Point 60	309.9	312.6
Point 61	322.5	312.9
Point 62	492.5	316.7
Point 63	138	314.6
Point 64	295.4	311.4
Point 65	309.9	311.1
Point 66	322.5	311.4
Point 67	492.5	315.2
Point 68	138	314.4
Point 69	295.4	311.2
Point 70	309.9	310.9
Point 71	322.5	311.2
Point 72	492.5	315
Point 73	138	313.4
Point 74	295.4	310.2
Point 75	309.9	309.9
Point 76	322.5	310.2
Point 77	492.5	314
Point 78	138	313.2
Point 79	295.4	310
Point 80	309.9	309.7
Point 81	322.5	310
Point 82	492.5	313.8
Point 83	295.4	307
Point 84	309.9	306.7
Point 85	322.5	307
Point 86	492.5	310.8
Point 87	122.6	317.9
Point 88	71.1	335
Point 89	136.4	313.2
Point 90	136.6	310.2
Point 91	59.4	335.1
Point 92	59.42601	329.1
Point 93	77.7	329.1
Point 94	71.1	334.8
Point 95	65.1	335

Point 96	65.1	334.8
Point 97	136	313.3
Point 98	122.4	317.8
Point 99	136.2	313.4
Point 100	132.3	314.7
Point 101	132.9	314.5
Point 102	127.5	316.3
Point 103	126.9	316.3
Point 104	123.5	317.6
Point 105	122.9	317.6
Point 106	126.9	316.5
Point 107	75.7	334.5
Point 108	94.8	347
Point 109	71.1	339
Point 110	69.7	338.5
Point 111	115.6	354
Point 112	238.5	371
Point 113	277.6	371
Point 114	127.3	351.3
Point 115	145.5	351.3
Point 116	2.4	319.5
Point 117	0.5	319.9
Point 118	-4.8	322.3
Point 119	-18.8	322.7
Point 120	-31.6	322.5
Point 121	-36.7	321.9
Point 122	-48.3	318
Point 123	-75	318
Point 124	8.1	321.9
Point 125	525	274.5
Point 126	525	285
Point 127	525	305
Point 128	525	311.7
Point 129	525	314.7
Point 130	525	314.9
Point 131	525	315.9

Point 132	525	316.1
Point 133	525	317.6
Point 134	525	317.8
Point 135	525	318.8
Point 136	525	319
Point 137	525	320
Point 138	525	416.7
Point 139	25	285

Critical Slip Surfaces

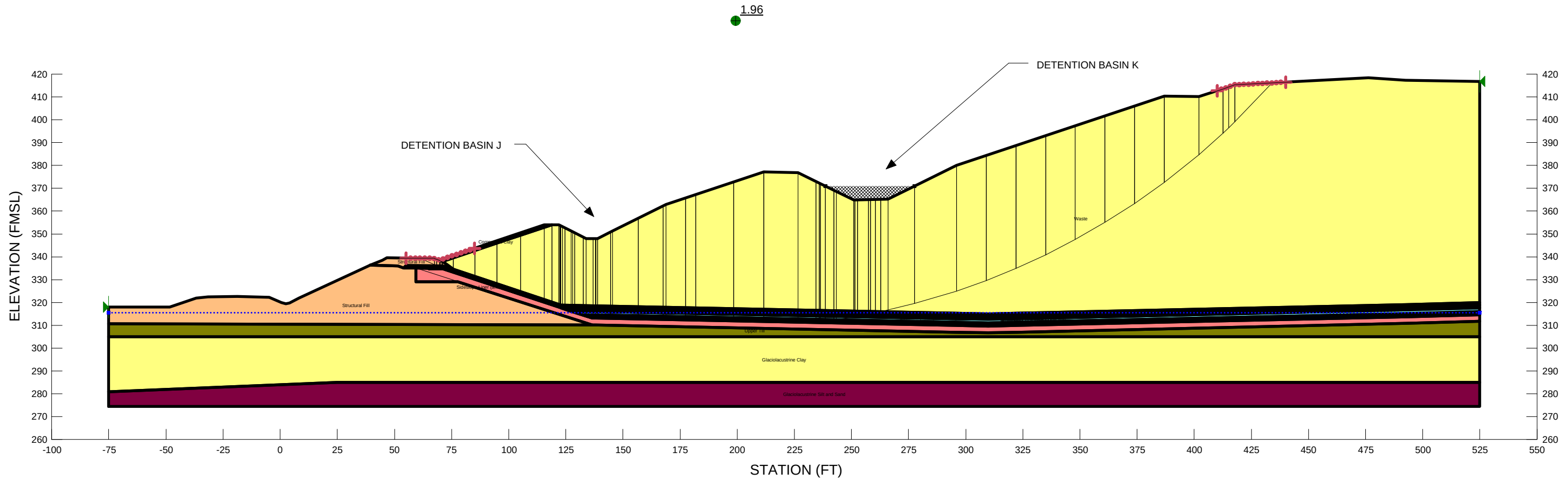
	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	363	1.97	(196.535, 625.458)	316.492	(433.916, 416.132)	(61.1994, 339.361)

Slices of Slip Surface: 363

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	363	64.349725	337.9124	0	1010.8155	0	2000
2	363	68.00418	336.24015	0	1199.0608	0	2000
3	363	69.10418	335.754	0	510.45875	0	213.86
4	363	69.85	335.4264	0	539.87843	0	226.27
5	363	70.415325	335.18045	0	617.4052	0	258.84
6	363	70.965325	334.9418	0	639.15086	0	164.35
7	363	71.523975	334.7013	0	687.63255	0	176.85
8	363	73.823975	333.8973	0	839.09796	0	218
9	363	80.475	331.69325	0	1399.603	0	363.62
10	363	90.025	328.52855	0	2230.1607	0	579.38
11	363	100	325.223	0	3097.6153	0	804.75
12	363	110.4	321.7766	0	4001.9459	0	1039.7
13	363	117.3	319.49005	0	4515.018	0	1173
14	363	120.5	318.42965	0	4640.5034	0	1205.6
15	363	122.2	317.8663	0	4700.6213	0	1221.2
16	363	122.49145	317.7634	0	4838.9627	0	1248.4

17	363	122.59145	317.72475	0	4511.8914	0	1182.7
18	363	122.7	317.6987	0	4505.5019	0	1181.1
19	363	123.15	317.5913	0	4480.89	0	1174.8
20	363	124.0224	317.38495	0	4448.3512	0	1166.6
21	363	125.9224	316.9467	0	4595.8988	0	1976.6
22	363	127.63795	316.556	0	4542.1976	0	1954.8
23	363	128.44715	316.3768	0	4329.208	0	1136.9
24	363	130.7368	315.8865	0	4471.7073	0	1765.1
25	363	133.2276	315.36275	0	4462.2482	0	1764
26	363	135.44465	314.9216	0	4490.4251	0	1769.5
27	363	137.49465	314.52175	0	4380.1857	0	1153
28	363	138.077	314.41135	0	4384.4979	0	1154.3
29	363	138.527	314.32735	0	4581.6828	0	1979
30	363	141.71625	313.7625	0	4718.3404	0	2041.2
31	363	145.01625	313.1874	144.30482	4663.2384	0	1193.2
32	363	151.1086	312.96355	158.27664	4764.0733	0	1232
33	363	162.11485	312.70975	174.11325	5409.0874	0	1401
34	363	168.20625	312.5859	181.84347	5770.7703	0	1495.7
35	363	173.125	312.4859	188.07948	5981.9592	0	1550.6
36	363	179.5645	312.355	196.24964	6241.2695	0	1617.7
37	363	190.10375	312.14075	209.62014	6665.4737	0	1727.7
38	363	205.01425	311.8376	228.53708	7265.4721	0	1883.2
39	363	219.1	311.5512	246.40241	7530.4437	0	1949.4
40	363	230.50375	311.31935	260.87306	7318.3269	0	1888.8
41	363	235.10625	311.3258	260.47275	6689.2765	0	1742.4
42	363	236.09	311.4475	0	6694.2101	0	2994.8
43	363	237.4375	311.62185	0	6584.3137	0	2946.9
44	363	240.36205	312.0207	0	6401.5233	0	2867.7
45	363	242.8188	312.369	0	6229.0967	0	1690
46	363	247.20675	313.0722	0	6033.1517	0	2075.7
47	363	251.29375	313.7391	0	5832.3583	0	2040.8
48	363	252.09095	313.8805	0	5800.9686	0	1576.9
49	363	254.99495	314.42145	0	5747.9558	0	2585.7
50	363	257.8546	314.9633	0	5638.6398	0	1535.2
51	363	259.4138	315.277	0	5616.1232	0	2530.3
52	363	261.61875	315.73215	0	5540.0791	0	2497.9

53	363	264.3618	316.32375	0	5460.9214	0	3185.8
54	363	271.8	318.1035	0	5336.3801	0	3123.5
55	363	286.8	322.2628	0	5360.4207	0	3157.8
56	363	302.49285	327.30925	0	5372.031	0	3185.1
57	363	315.47855	332.25065	0	5183.776	0	3090.5
58	363	328.46425	337.86305	0	4934.6042	0	2958.9
59	363	341.45	344.18675	0	4625.0317	0	2789.9
60	363	354.43575	351.27115	0	4255.0849	0	2583.1
61	363	367.42145	359.1771	0	3824.9411	0	2337.8
62	363	380.40715	367.98065	0	3334.3318	0	2052.9
63	363	394.45	378.6723	0	2518.6957	0	1564.3
64	363	407.25	389.41385	0	1718.9931	0	1077.2
65	363	413.75	395.2801	0	1400.2063	0	881.75
66	363	416.35	397.763	0	1269.929	0	801.37
67	363	425.8079	407.59895	0	584.30147	0	371.79



Name: Along CCL, with Basin K full
Kind: SLOPE/W
Method: Spencer
File Name: SEISMIC- Sliding November 2011.gsz

Section A-A'
Fill Progression Slope Stability Analysis
RMU-1 Leachate Level Compliance Plan
CWM Chemical Services, LLC
Model City, New York

Along CCL, with Basin K full

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File Information

Revision Number: 268
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Date: 11/16/2011
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File Name: SEISMIC- Sliding November 2011.gsz
Directory: C:\Users\mgiampaolo\Documents\ARCADIS Documents\RMU-1\2011 Fill
Progression\Calc in Response to Review Comments\
Last Solved Date: 11/16/2011
Last Solved Time: 9:29:14 AM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Along CCL, with Basin K full

Kind: SLOPE/W
Method: Spencer
Settings
 Apply Phreatic Correction: No
 PWP Conditions Source: Piezometric Line with Ru
Slip Surface
 Direction of movement: Right to Left
 Use Passive Mode: No
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: No
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Waste

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

operations Layer

Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile (2)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Leachate Collection

Model: Mohr-Coulomb
Unit Weight: 135 pcf

Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Sideslope Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Primary Liner (textured 1000-2000psf)

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Compacted Clay

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion: 1000 psf
Phi: 10 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Geotextile

Model: Mohr-Coulomb
Unit Weight: 58.7 pcf
Cohesion: 0 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0
Include in PWP: No

Secondary Leachate Collection

Model: [Mohr-Coulomb](#)

Unit Weight: [135 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Secondary Liner (textured)

Model: [Mohr-Coulomb](#)

Unit Weight: [58.7 pcf](#)

Cohesion: [0 psf](#)

Phi: [15 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Secondary Compacted Clay

Model: [Bedrock \(Impenetrable\)](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Structural Fill

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [2000 psf](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Ru: [0](#)

Include in PWP: [No](#)

Upper Till

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [800 psf](#)

Phi: [10 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Glaciolacustrine Clay

Model: [Mohr-Coulomb](#)

Unit Weight: [125 pcf](#)

Cohesion: [320 psf](#)

Phi: [10 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Glaciolacustrine Silt and Sand

Model: [Mohr-Coulomb](#)

Unit Weight: [130 pcf](#)

Cohesion: [0 psf](#)

Phi: [30 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Ru: [0](#)

Include in PWP: [No](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(55, 339.42019\) ft](#)

Left-Zone Right Coordinate: [\(85, 343.69198\) ft](#)

Left-Zone Increment: [15](#)

Right Projection: [Range](#)

Right-Zone Left Coordinate: [\(410, 412.69048\) ft](#)

Right-Zone Right Coordinate: [\(440, 416.44359\) ft](#)

Right-Zone Increment: [15](#)

Radius Increments: [5](#)

Slip Surface Limits

Left Coordinate: [\(-75, 318\) ft](#)

Right Coordinate: [\(525, 416.7\) ft](#)

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	-75	315.5
	525	315.5

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf

Direction: Normal

Coordinates

	X (ft)	Y (ft)
	238.5	371
	277.6	371

Seismic Loads

Horz Seismic Load: 0.055

Vert Seismic Load: 0

Ignore seismic load in strength: Yes

Regions

	Material	Points	Area (ft²)
Region 1	Structural Fill	5,42,123,122,121,120,119,118,117,116,41,124,40,39,38,91,92,93,90	2800.853
Region 2	Upper Till	2,5,90,4,83,84,85,86,128,127	2643.4
Region 3	Glaciolacustrine Clay	6,2,127,126,139	12200
Region 4	Glaciolacustrine Silt and Sand	7,6,139,126,125	6100

Region 5	Geotextile (2)	104,87,43,44,45,46,47,136,135,52,51,50,49,48	80.98
Region 6	Primary Leachate Collection	106,104,48,49,50,51,52,135,134,57,56,55,54,53	400.015
Region 7	Primary Liner (textured 1000-2000psf)	102,106,53,54,55,56,57,134,133,62,61,60,59,58	79.5
Region 8	Compacted Clay	100,102,58,59,60,61,62,133,132,67,66,65,64,63	592.695
Region 9	Geotextile	101,100,63,64,65,66,67,132,131,72,71,70,69,68	78.45
Region 10	Secondary Leachate Collection	99,101,68,69,70,71,72,131,130,77,76,75,74,73	390.54
Region 11	operations Layer	38,37,36,107,35,1,34,33,32,31,137,136,47,46,45,44,43,87,88,95,91	472.885
Region 12	Secondary Compacted Clay	91,95,96,94,98,105,103,97,89,78,79,80,81,82,129,128,86,85,84,83,4,90,93,92	1452.252
Region 13	Secondary Liner (textured)	103,102,100,101,99,73,74,75,76,77,130,129,82,81,80,79,78,89,97	79.395
Region 14	Sideslope Liner (textured 1000-2000psf)	96,95,88,87,104,106,102,103,105,98,94	11.54
Region 15	Structural Fill	40,30,29,28,110,27,26,107,36,37,38,39	97.18
Region 16	Waste	26,25,24,23,114,22,21,115,20,19,18,112,17,16,113,15,14,13,12,11,10,9,8,138,137,31,32,33,34,1,35,107	30224.295
Region	Compacted Clay	110,109,108,111,24,25,26,27	48.395

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Points

	X (ft)	Y (ft)
Point 1	138	318.5
Point 2	-75	305
Point 3	68.5	332.1
Point 4	138	310.2
Point 5	-75	310.7
Point 6	-75	281
Point 7	-75	274.5
Point 8	492.5	417.4
Point 9	476.2	418.3
Point 10	417.7	415.3
Point 11	415	414.3
Point 12	412.5	413.5
Point 13	402	410.1
Point 14	386.9	410.4
Point 15	296	380.1
Point 16	266	365.2
Point 17	251	364.9
Point 18	226.6	376.9
Point 19	211.6	377.2
Point 20	168.9	363
Point 21	138.9	348
Point 22	133.9	348
Point 23	122	354
Point 24	119	354
Point 25	94.8	346
Point 26	71.1	338
Point 27	70	338.4
Point 28	67.5	339.3
Point 29	46.7	339.5
Point 30	44.7	338.5
Point 31	492.5	319.1

Point 32	322.5	315.3
Point 33	309.9	315
Point 34	295.4	315.3
Point 35	122.8	318.9
Point 36	71.1	336
Point 37	55	336.1
Point 38	54	335.1
Point 39	51.5	336
Point 40	39.4	336.3
Point 41	4	319.7
Point 42	-75	314
Point 43	138	317.5
Point 44	295.4	314.3
Point 45	309.9	314
Point 46	322.5	314.3
Point 47	492.5	318.1
Point 48	138	317.3
Point 49	295.4	314.1
Point 50	309.9	313.8
Point 51	322.5	314.1
Point 52	492.5	317.9
Point 53	138	316.3
Point 54	295.4	313.1
Point 55	309.9	312.8
Point 56	322.5	313.1
Point 57	492.5	316.9
Point 58	138	316.1
Point 59	295.4	312.9
Point 60	309.9	312.6
Point 61	322.5	312.9
Point 62	492.5	316.7
Point 63	138	314.6
Point 64	295.4	311.4
Point 65	309.9	311.1
Point 66	322.5	311.4
Point 67	492.5	315.2

Point 68	138	314.4
Point 69	295.4	311.2
Point 70	309.9	310.9
Point 71	322.5	311.2
Point 72	492.5	315
Point 73	138	313.4
Point 74	295.4	310.2
Point 75	309.9	309.9
Point 76	322.5	310.2
Point 77	492.5	314
Point 78	138	313.2
Point 79	295.4	310
Point 80	309.9	309.7
Point 81	322.5	310
Point 82	492.5	313.8
Point 83	295.4	307
Point 84	309.9	306.7
Point 85	322.5	307
Point 86	492.5	310.8
Point 87	122.6	317.9
Point 88	71.1	335
Point 89	136.4	313.2
Point 90	136.6	310.2
Point 91	59.4	335.1
Point 92	59.42601	329.1
Point 93	77.7	329.1
Point 94	71.1	334.8
Point 95	65.1	335
Point 96	65.1	334.8
Point 97	136	313.3
Point 98	122.4	317.8
Point 99	136.2	313.4
Point 100	132.3	314.7
Point 101	132.9	314.5
Point 102	127.5	316.3
Point 103	126.9	316.3

Point 104	123.5	317.6
Point 105	122.9	317.6
Point 106	126.9	316.5
Point 107	75.7	334.5
Point 108	94.8	347
Point 109	71.1	339
Point 110	69.7	338.5
Point 111	115.6	354
Point 112	238.5	371
Point 113	277.6	371
Point 114	127.3	351.3
Point 115	145.5	351.3
Point 116	2.4	319.5
Point 117	0.5	319.9
Point 118	-4.8	322.3
Point 119	-18.8	322.7
Point 120	-31.6	322.5
Point 121	-36.7	321.9
Point 122	-48.3	318
Point 123	-75	318
Point 124	8.1	321.9
Point 125	525	274.5
Point 126	525	285
Point 127	525	305
Point 128	525	311.7
Point 129	525	314.7
Point 130	525	314.9
Point 131	525	315.9
Point 132	525	316.1
Point 133	525	317.6
Point 134	525	317.8
Point 135	525	318.8
Point 136	525	319
Point 137	525	320
Point 138	525	416.7
Point 139	25	285

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	363	1.96	(196.535, 625.458)	316.492	(433.916, 416.132)	(61.1994, 339.361)

Slices of Slip Surface: 363

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	363	64.349725	337.9124	0	1013.3103	0	2000
2	363	68.00418	336.24015	0	1201.5076	0	2000
3	363	69.10418	335.754	0	510.8505	0	213.97
4	363	69.85	335.4264	0	540.27553	0	226.39
5	363	70.415325	335.18045	0	617.86895	0	258.98
6	363	70.965325	334.9418	0	639.49165	0	164.41
7	363	71.523975	334.7013	0	687.97924	0	176.91
8	363	73.823975	333.8973	0	839.45215	0	218.06
9	363	80.475	331.69325	0	1400.1994	0	363.72
10	363	90.025	328.52855	0	2231.0553	0	579.55
11	363	100	325.223	0	3098.8019	0	804.97
12	363	110.4	321.7766	0	4003.6801	0	1040
13	363	117.3	319.49005	0	4516.9724	0	1173.3
14	363	120.5	318.42965	0	4642.4018	0	1205.9
15	363	122.2	317.8663	0	4702.5198	0	1221.5
16	363	122.49145	317.7634	0	4841.2978	0	1248.8
17	363	122.59145	317.72475	0	4513.3703	0	1183
18	363	122.7	317.6987	0	4506.9605	0	1181.4
19	363	123.15	317.5913	0	4482.2797	0	1175.1
20	363	124.0224	317.38495	0	4449.7486	0	1166.9
21	363	125.9224	316.9467	0	4598.0216	0	1977.2
22	363	127.63795	316.556	0	4531.8006	0	1950.1
23	363	128.44715	316.3768	0	4290.1464	0	1126.7
24	363	130.7368	315.8865	0	4355.2482	0	1745
25	363	133.2276	315.36275	0	4260.9356	0	1729.2

26	363	135.44465	314.9216	0	4266.5073	0	1730.9
27	363	137.49465	314.52175	0	4151.5681	0	1093.4
28	363	138.077	314.41135	0	4156.0722	0	1094.8
29	363	138.527	314.32735	0	4344.2107	0	1877.5
30	363	141.71625	313.7625	0	4583.8754	0	1983.4
31	363	145.01625	313.1874	144.30482	4647.7371	0	1189.1
32	363	151.1086	312.96355	158.27664	4764.6972	0	1232.2
33	363	162.11485	312.70975	174.11325	5409.8283	0	1401.1
34	363	168.20625	312.5859	181.84347	5771.4909	0	1495.8
35	363	173.125	312.4859	188.07948	5982.7875	0	1550.7
36	363	179.5645	312.355	196.24964	6241.9467	0	1617.9
37	363	190.10375	312.14075	209.62014	6666.0742	0	1727.8
38	363	205.01425	311.8376	228.53708	7266.3829	0	1883.4
39	363	219.1	311.5512	246.40241	7531.1102	0	1949.6
40	363	230.50375	311.31935	260.87306	7319.2232	0	1889
41	363	235.10625	311.3258	260.47275	6689.3476	0	1742.5
42	363	236.09	311.4475	0	6694.7323	0	2994.9
43	363	237.4375	311.62185	0	6584.7804	0	2947
44	363	240.36205	312.0207	0	6395.4068	0	2865.5
45	363	242.8188	312.369	0	6213.709	0	1686.8
46	363	247.20675	313.0722	0	6002.4453	0	2071.5
47	363	251.29375	313.7391	0	5834.2024	0	2041
48	363	252.09095	313.8805	0	5802.6308	0	1577.2
49	363	254.99495	314.42145	0	5749.7981	0	2586.4
50	363	257.8546	314.9633	0	5640.2425	0	1535.5
51	363	259.4138	315.277	0	5617.905	0	2530.9
52	363	261.61875	315.73215	0	5541.8506	0	2498.5
53	363	264.3618	316.32375	0	5462.7101	0	3186.5
54	363	271.8	318.1035	0	5357.2296	0	3132.8
55	363	286.8	322.2628	0	5359.8998	0	3157.5
56	363	302.49285	327.30925	0	5371.4505	0	3184.8
57	363	315.47855	332.25065	0	5182.991	0	3090.1
58	363	328.46425	337.86305	0	4933.6243	0	2958.3
59	363	341.45	344.18675	0	4623.7995	0	2789.3
60	363	354.43575	351.27115	0	4253.817	0	2582.5
61	363	367.42145	359.1771	0	3823.5801	0	2337.1

62	363	380.40715	367.98065	0	3332.8905	0	2052.2
63	363	394.45	378.6723	0	2517.5074	0	1563.7
64	363	407.25	389.41385	0	1718.0695	0	1076.7
65	363	413.75	395.2801	0	1399.3918	0	881.35
66	363	416.35	397.763	0	1269.1563	0	801
67	363	425.8079	407.59895	0	583.91916	0	371.61