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INTERMOUNTAIN
regional landfill

2016 LANDFILL DESIGN MODIFICATIONS

DESIGN ENGINEERING REPORT

Prepared by:
Hansen, Allen & Luce, Inc.

OCTOBER 2016

HANSEN ALLEN & LUCE inc
ENGINEERS

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(HAL Project No.: 373.02.100)

October 2016

INTERMOUNTAIN REGIONAL LANDFILL

LANDFILL DESIGN MODIFICATIONS

(HAL Project No.: 373.02.100)

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October 2016

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CHAPTER 1 - INTRODUCTION

Intermountain Regional Landfill (IRL) is interested in pursuing a more efficient design of their Class V landfill by achieving a better balance between total required cut and fill. With this goal in mind, IRL requested that Hansen, Allen & Luce, Inc. (HAL) perform a complete redesign of the floor and closure cap within the previously approved landfill footprint while maintaining the same maximum height requirement of 100 feet above the existing topography. This report provides a summary of background information associated with the design of the landfill floor and closure cap, proposed design modifications to other associated features, and results from the engineering calculations for the proposed modifications. The engineering calculations are included to provide a basis for approval of a permit modification from the Utah Division of Waste Management and Radiation Control (DWMRC).

The proposed permit modification includes the following design modifications:

1. Floor elevations and leachate collection system, including sumps and leachate withdrawl pipes.
2. Closure cap final grade, including access, benches for runoff and erosion control, downspout drainage piping to remove runoff from the top of the closure cap and benches.

Locations and configurations of some other on-site facilities to support landfill operations were also modified to provide a general concept layout plan regarding the types of facilities needed. These facilities include a potential leachate management pond, parking areas, and soil stockpile areas. The locations, sizes and configurations of these facilities are not critical to the design requirements associated with the landfill and its closure. Therefore, it is understood that the types and locations of proposed support facilities may be modified from those presented herein.

CHAPTER 2 – MODIFIED LANDFILL FLOOR DESIGN

This chapter presents the general layout and design concept of the landfill floor systems, which includes more specific information for the leachate collection and removal system components and runoff/run-on containment. References to the permit drawings in Appendix A, geotechnical report in Appendix B, the original slope stability and settlement analysis completed by HDR in Appendix C, and calculations provided in Appendices D and E should be noted throughout this chapter.

PREVIOUS DESIGN AND CURRENT LANDFILL STATUS

The original design of the landfill was completed by HDR, Inc. and presented in a design engineering report dated November 2010 that was included in the permit application as Part 3. The original capacity of the facility was listed as 27,000,000 cubic yards. As of June of 2016, several cell construction projects covering approximately 20 acres have been completed in the western portion of what was previously referred to as Cell 1 and Cell 2 in the original permit drawings.

GENERAL LAYOUT AND DESIGN

The redesign of the facility consists of a landfill area formed by incised embankments along all sides of the facility with a floor system concept very similar to the previous design. The facility has three main cells with each containing its own leachate collection system, sump and leachate withdrawal system. In order to improve on the previous design concept, the floor elevations were raised to reduce the amount of excavation required. The floor slope was reversed for the undeveloped portion of Cell 1 and taken to the north in order to minimize excavation and provide an accessible location for a leachate sump and withdrawal system. The other two cells function very similarly to the previous design with the only major change being the elevations. Cells 2 and 3 are both similar in design which drain down the center of the cell to a sump located on the far east end of the cell floor. Cell 1 differs because it includes the 20 acre area that has already been developed. Cell 1 needed to be altered because the previous design placed the floor trajectory toward the east which would have made the excavation much deeper.

The overall capacity above the protective soil cover material placed above the lining system is about 28.9 million cubic yards, slightly more than the previous design. This does not include the final cover system. The design modification maintains the previous horizontal footprint and makes grade adjustments to the floor and closure cap that do not increase the overall height above existing topography (100 feet) and actually decreases the maximum height from floor to the top of the closure cap. The slight increase in capacity was not the intent of this modification and also cannot be attributed to either horizontal or vertical expansion. The increase is a byproduct of a change in the geometry of the waste mound that produces a more favorable cut/fill balance while maintaining the original design constraints.

FLOOR ELEVATIONS AND SLOPES

The floor elevations were raised significantly from the previous design to decrease the amount of cut required for the facility. This resulted in the distance to ground water being much greater than the minimum 5 feet as required in R315-302-2(e). The bottom liner has a 2% slope, consistent with the previously approved design and with R315-303-3-3a(ii) that specifies minimum liner slopes. The slope of the leachate collection system piping was set at a minimum of 1% but ranged to as high as 2% in some areas.

As part of the original Technical and Engineering Report completed by HDR in 2010, a slope stability analysis and settlement analysis entitled “Slope Stability and Settlement Evaluation” was completed and included as Appendix C. This evaluation included a review of the site conditions, static, pseudo-static stability and deformation analyses, and settlement and liner strain. The modified design has maximum cut slopes and maximum fill slopes that are equal to or less than those considered for the stability and seismic analyses completed by HDR. Therefore, the geometry of the design is considered acceptable from a stability standpoint based on the previous evaluation, which is found in this report in Appendix C.

The differential settlement and liner strain calculations were updated due to the modification of the overall closure geometry and changes to the leachate collection piping slopes. This update was necessary to ensure that the leachate collection system would maintain a positive slope toward the sump given differential settlement once final waste grade has been reached. A summary of the results are found in Appendix D.

LINING SYSTEM

A composite lining system is proposed for the landfill disposal area consisting of a Geosynthetic Clay Liner (GCL) overlain by a 60-mil HDPE geomembrane liner. This system was approved as part of the permit issued in 2011 and has been used on each landfill construction project to date.

An extra GCL and 60-mil HDPE geomembrane are proposed for placement in the sump areas directly above the GCL and HDPE geomembrane placed across the rest of the cell area. This extra GCL and geomembrane provide added protection against leakage in the sump areas which is the most vulnerable area for leakage to occur. Geosynthetic materials placed on interior slopes of the landfill area will consist of reinforced GCL and textured HDPE geomembrane liner. Geosynthetic materials placed across the cell floor may be unreinforced GCL with a smooth HDPE geomembrane.

Geosynthetic Clay Liner (GCL)

Hydraulic equivalency of the geosynthetic clay liner was included as part of the original permit application and was approved by the Executive Secretary as required by UAC R315-503-3(3)(a)(ii) as stated in the current permit.

HDPE Geomembrane Liner

HDPE geomembrane is proposed for use as the synthetic liner system above the GCL. The floor area will consist of 60-mil smooth HDPE geomembrane and the interior slopes will consist of 60-mil textured HDPE geomembrane to increase slope stability for materials placed on the side slopes above the HDPE geomembrane.

LEACHATE COLLECTION AND REMOVAL SYSTEM (LCRS)

A leachate collection and removal system (LCRS) will be constructed consisting of a geocomposite (geonet bonded to a geotextile) placed directly over the HDPE geomembrane liner. The geocomposite on the floor will be a single sided geocomposite on the floor and a double sided geocomposite on the side slope. Perforated leachate conveyance pipes surrounded by gravel will be placed along the collection areas where the floor surfaces come together with additional conveyance collection pipes provided at specified intervals. The leachate will then be directed to the leachate sumps for removal.

HELP Model

The Environmental Protection Agency's (EPA) Hydrologic Evaluation of Landfill Performance (HELP) model is a quasi-two-dimensional hydrologic computer model used for conducting water balance analyses of landfills, cover systems and other solid waste containment systems. The model accepts weather, soil and design data, and uses solution techniques that account for the effects of surface storage, snowmelt, runoff, infiltration, evapotranspiration, vegetative growth, soil moisture storage, lateral subsurface drainage, leachate recirculation, unsaturated vertical drainage, and leakage through soil, geomembrane and/or composite liners.

The evaporation and solar radiation values for the modeling effort were obtained from default data contained within the HELP model software corresponding to the Salt Lake area. The precipitation and average temperature data used in the model came from the data reported in the Western Regional Climate Center database for Fairfield, Utah.

Five layers were defined in the HELP model corresponding to municipal waste material, soil cover, geocomposite, HDPE geomembrane and GCL to represent the open cell area. An additional three layers were added above the waste consisting of HDPE geomembrane, soil cover material and the erosion protection layer to represent closed portions of the landfill. Model default data were used to define the physical properties of the individual design layers. Leachate quantities were generated for the landfill under the following conditions: no waste, waste thicknesses of 10 feet, 50 feet, 100 feet, 121 feet and at closure. These different depths of waste were used to simulate leachate production at various stages of landfill development. Table 2-1 provides the leachate quantity values generated by the HELP model that were the basis for the LCRS design.

TABLE 2-1
HELP MODEL GENERATED LEACHATE RATES

Waste Height (feet)	Peak Daily Leachate	Annual Average Leachate
	(inch)	(inches)
No Waste	0.204	0.134
10	0.161	0.571
50	0.157	0.571
100	0.160	0.571
121	0.158	0.571
Closure	0.001	0.013

Geocomposite

A geocomposite will be placed above the HDPE liner to collect and convey leachate from the floor area to the leachate conveyance pipes that convey the leachate to the sumps for removal. The geonet component of the geocomposite was designed based on the peak daily leachate rate of 0.162 inches/day. The design of the geonet was completed based upon a one-foot wide section of geonet over the longest flow path for the facility. The longest one-foot wide flow path is 460 feet from the leachate conveyance pipe to the upper end of the surface at its longest reach. This will provide the longest flow path and a typical design that can be applied to all areas of the floor.

The longest flow path for each cell is presented in Table 2-2. "Designing with Geosynthetics", by Robert Koerner, suggest several safety factors that should be applied to the leachate rate to obtain a design capacity for the geocomposite. These safety factors include: 1) creep deformation of the geonet 2) biological clogging of the geonet and 3) chemical clogging of the geonet. Therefore, a total safety factor of 4.5 was used for the design of the geocomposite. Applying this resulting safety factor to the leachate rate gives the design transmissivity requirement presented in Table 2-2.

TABLE 2-2
REQUIRED PROPERTIES FOR GEOCOMPOSITE

Cell	Longest Flow Path	Peak Daily Flow	Transmissivity Requirement
1	426 ft	5.7 ft^3/ft-day	1.38 x 10^{-3} m^2/sec
2	418 ft	5.6 ft^3/ft-day	1.36 x 10^{-3} m^2/sec
3	460 ft	6.2 ft^3/ft-day	1.49 x 10^{-3} m^2/sec

Geotextile Filter Fabric

Geotextile will be used as part of the geocomposite above the HDPE liner and around the leachate conveyance piping on the cell floor in order to provide a filter layer between the soil cover and the LCRS. Gradation properties of the native soil were provided by Applied Geotechnical Engineering Consultants (AGEC) and used for the calculations.

TABLE 2-3
REQUIRED PROPERTIES FOR GEOTEXTILE FILTER FABRIC

Property	Standard
Equivalent Opening	≤ 0.22 mm
Permeability	≥ 1.35x10^{-2} cm/sec
Grab Tensile Strength	≥ 90 lbs

Leachate Conveyance Pipes

The leachate conveyance pipes are designed to be placed along the valley of the cell floors that are formed by the intersection of the planar surfaces of the floor. Additional leachate pipes along the toes at the north and eastern ends as well as along the planar surfaces of the floor at specified spacing are also included to provide for adequate drainage given the assumed limitations of the geocomposite. These leachate collection pipes receive leachate from the geocomposite and convey the leachate to the sumps for removal.

The maximum leachate rate calculated using the HELP model was applied to the maximum width and length of floor area where leachate will be collected in the geocomposite for each planned leachate pipe. The contributing area for each leachate pipe varies due to different factors, including cell layout, especially the difference between Cell 1 and Cells 2 and 3. The peak leachate rate of 0.161 inches/day for the cell floor and 0.124 inches/day for the slopes was applied to each contributing area.

Eighty percent of the maximum flow depth in the pipe was assumed for the actual capacity for each pipe using Manning's equation with a Manning's n roughness value of 0.016. A detailed breakdown of the capacity calculations for each leachate pipe is provided in Appendix E.

Landfill Leachate Withdrawal Pipes

Leachate withdrawal pipes were evaluated for wall crushing, wall buckling, and ring deflection using published procedures. Overburden loadings were determined based on the loading over the low point at the sump at closure. The calculations for the determination of pipe's ability to withstand wall crushing, wall buckling, and deflection are found in Appendix E. It was found that the 24-inch HDPE leachate withdrawal pipes specified in the drawings provide sufficient strength under the ultimate load.

Leachate Pond

Leachate will generally be contained and managed within the landfill where the sumps will be pumped when necessary and the leachate will be either used for dust control or placed in active phases of the landfill where leachate containment is provided. Currently, leachate production levels are far below the levels that would be anticipated according to the HELP model predictions. Leachate production rates will be tracked in order to provide a basis for the sizing of the leachate pond. When management of leachate production levels approaches the capacity of the facility to contain the leachate within lined areas, a leachate pond will be designed to be located in the northeast corner of the property as depicted in the permit drawings.

The leachate pond lining system will include a composite secondary (bottom) lining system constructed of GCL overlain by a 60-mil HDPE membrane. A leak detection and removal system consisting of a geonet, a sump and a leachate withdrawal pipe will be placed above the secondary lining system. A primary (upper) lining system consisting of a 60-mil HDPE geomembrane will be placed above the leak detection system above which the leachate will be stored.

RUNOFF CONTAINMENT

Precipitation runoff from the waste material in open areas of the landfill will be contained and managed within the lined landfill area. Containment areas may be formed on waste surfaces and/or by maintaining waste set-back areas where runoff water will be contained between the top of lined embankment and the waste mound. Sufficient capacity will be maintained in these areas to contain runoff from the 25-year 24-hour precipitation event as required by the regulations.

GROUNDWATER MONITORING WELLS

Groundwater monitoring wells were installed prior to the first construction phase at the facility. This permit modification does not include any modifications to the existing groundwater monitoring wells. Since the landfill footprint has not be modified, no changes to the groundwater monitoring well locations should be required.

GEOTECHNICAL INVESTIGATION

A geotechnical study was completed by Earthtec Testing and Engineering, P.C. dated October 13, 2006. Based on that study, HDR Engineering, Inc., who were responsible for the original permit application submitted in 2010, completed the slope stability, seismicity and settlement evaluations. The proposed design modifications do not go outside of the parameters considered as part of HDR's slope stability and settlement evaluation. The maximum cut slope evaluated by HDR was based on a maximum of 50 feet whereas the modified design has a maximum cut slope of 37 feet. The maximum fill slope evaluation completed by HDR was based on a maximum waste fill height of 130 feet and 100 feet above existing grade (although the design only had 80 feet of height over existing grade) at the toe whereas the modified design has a maximum height of 126 feet and maintains the 100 feet above grade with the same 4H:1V slopes as the original design. The maximum operational fill slope evaluated by HDR was 130 feet at a 3H:1V slope which is consistent with the height of 126 feet achieved under the modified design.

The differential settlement calculations were revised due to the change in the geometry of the closure cap and floor which was completed using the same methodology used in the original evaluation completed by HDR. Those calculations are found in Appendix D.

CHAPTER 3 – MODIFIED CLOSURE DESIGN

This section presents the general layout and design concept for the landfill closure system. The geometry of the closure design was modified in order to offset the airspace capacity lost from below existing grade due to the reconfiguration of the floor elevations. This allows for a more efficient use of the available footprint.

GENERAL LAYOUT AND DESIGN

The final waste mound with the overlying layers of daily cover material provides the subgrade for the final closure system. The final cover system for the modified design is consistent with the final cover system that was approved as part of the original permit application in 2010. The cover system consists of 18 inches of intermediate cover, a textured 60-mil HDPE liner followed by 2 feet of final soil cover. The two feet of cover material includes soil fill and an erosion protection layer consisting of native vegetation. A discussion of the erosion protection measures is provided in Chapter 4.

Closure Slopes

Waste mounding and the overlying closure cap extends up on a 4H:1V slope from the top of the floor embankment slopes around the perimeter of the landfill area. An intermediate bench (25 feet wide) is designed into the 4H:1V slopes to provide for intermediate storm water collection and conveyance necessary for erosion protection on the slopes around the facility. The waste mound and closure cap rise to an elevation of about 100 feet above the top of the west cut slope. The waste mound and closure cap then break grade to a 2 percent slope extending to the east. The north, south and east slopes extend upward on 4H:1V slopes from the top of the incised embankments to intersect with the top surface as it extends east on the 2 percent slope.

Sub-Surface Drainage

Some storm water may infiltrate through the cover system and collect on the surface of the HDPE membrane. A drainage system consisting of a perforated drain pipe will be installed underneath the storm water containment berm on the east side of the top of the waste mound. The drain pipes are placed in drain rock with a geotextile wrap around the drain rock. These pipes are provided to drain water that is conveyed along the HDPE liner before it reaches the side slope. Additional perforated drain pipes will be placed under the intermediate bench located on the 4H:1V slopes and will be conveyed to either the downspout pipes directly or run parallel to the downspouts in a separate solid pipe to the exterior toe of the landfill on the east side.

STORM WATER MANAGEMENT

The storm water management system consists of a 2 percent slope at the top of the landfill that directs precipitation runoff from the top surface of the closure cap toward the east. Runoff is then collected and directed to storm water downspouts using a storm water containment berm that directs water to inlet boxes and into parallel 18-inch storm drain pipes. The downspouts convey the storm water from the top of the closure cap to the exterior toe that discharges into an energy dissipation basin where it will then exit the property to the east.

The intermediate bench is located on the 4H:1V perimeter slopes of the closure cap primarily to shorten the length of the 4H:1V slope for erosion control purposes. The intermediate bench also provides storm water conveyance that is collected at inlet boxes and to parallel 18-inch diameter downspout pipes located at the northeast and southeast corners. The storm water management system associated with the closure cap is designed for the 25-year 24-hour precipitation event. Design of the storm water management system, including the hydrology, hydraulic design of the downspout pipes and erosion control is presented in more detail in Chapter 4.

STABILITY

The stability of the closure cap design was originally evaluated by HDR based on information provided in a geotechnical investigation completed by EarthTec Engineering. Although the geometry of the closure cap is changed from the original design, the design parameters are all within the values used for the prior evaluation, including maintaining the exterior slopes at 4H:1V and keeping the overall height of the slope within 100 feet vertical from the base of the slope. The maximum cut slope was also maintained below the height contemplated during the previous evaluation. Because the current design is not outside of the parameters used in the original slope stability evaluation, the previous evaluation is incorporated by reference for use in the modified design.

CHAPTER 4 – STORM WATER MANAGEMENT

A diversion channel/berm will be constructed to manage storm water from the tributary area to the west of the facility. A berm on the top of the closure cap as well as an intermediate bench will convey storm water to downspouts that will take the water off the closure cap. A hydrologic analysis was completed in order to determine peak flow rates to use for the design of the channels, downspouts and erosion control.

HYDROLOGY

Hydrologic calculations were completed for the tributary area to the landfill and the closure cap to determine peak runoff for design purposes. The Soil Conservation Service (SCS) curve number methodology was used in conjunction with the Army Corps of Engineers HEC-HMS hydrology model to predict the peak flows.

Off-Site Run-On Storm Water

Storm water that originates from outside of the landfill facility will need to be diverted in order to prevent water from entering the facility and from eroding the base of the closure cap.

Methodology. Storm drainage diversions extending to the north and south on the western edge of the landfill property will collect and convey storm flows around the facility. Tributary areas to the diversions were delineated based on USGS topographical maps.

Curve numbers were determined based on the hydrologic soil type and soil vegetative cover. The hydrologic soil type is a general indication of the soil's infiltration capacity. Soils are assigned a hydrologic soil type of A, B, C or D by the Natural Resource Conservation Service (NRCS). Soils of hydrologic soil type A have the highest infiltration rate, and therefore produce the least amount of runoff. Soils of hydrologic soil type D have the lowest infiltration rate, and therefore produce the highest amount of runoff. Most of the soils within the tributary area are hydrologic soil type C or D with smaller portions of B and A type soils. The soil vegetation cover and conditions were assumed based on information provided from a custom soil resource report for Fairfield-Nephi Area, Utah and Tooele Area, Utah and verified with a field visit. The cover conditions were combined with the hydrologic soil type to produce a curve number based on Table 2-2d of Technical Release 55 "Urban Hydrology of Small Watersheds" (TR-55). The entire tributary area was combined in one subbasin where an area weighted curve number was applied to the total area.

The lag times (T_L), defined as the time to the hydrograph peak, were calculated by using the time of concerntration (T_C) and the equation T_L – $0.6T_C$. The time of concentration was calculated using the criteria found in Worksheet 3 in TR-55.

The SCS Type II distribution was used to model a 24-hour 25-year storm, consistent with the requirement of R315-305-4-3(a). The rainfall amount was taken toward the higher elevations of the tributary area from the "Point Precipitation Frequency Estimates from NOAA Atlas 14".

The magnitude of the area tributary to the landfill site is large enough to warrant the use of a reduction of the precipitation value due to the likelihood of the full amount of the storm affecting the whole region decreases with an increase of tributary area. The factor is based on information from the Salt Lake City Hydrology Manual. According to the manual, a 24-hour event has an areal reduction factor of:

$$ARF = 0.01(100 - 2 * Area^{0.46}) \text{ where}$$

Area = Total Tributary Area, 6.69 mi^2

$$ARF = 0.95$$

This reduction factor was applied to the tributary area for run-on calculation purposes.

Peak Design Flow. Hydrologic calculations presented above were used to generate a peak flow of 61 cubic feet per second (cfs) for the run-on from the tributary area to the west of the facility. The calculations and summary of methodology and results are presented in Appendix F.

On-Site Run-Off Storm Water

Storm water will need to be conveyed off the landfill facility in order to protect the integrity of the closure cap.

Methodology. Delineation of the subbasins from the closure cap, shown in the figure included in Appendix F, was based on the cell closure cap design discussed in Chapter 3. Each subbasin is designed to drain either directly off of the closure cap or to a downspout that conveys flow away from the facility.

A curve number was determined based on the hydrologic soil type C found at the facility and assumed to be used as part of the cover system. The cover type was assumed to be similar to a dirt road in order to account for the period before vegetation becomes fully established. The cover conditions were combined with the hydrologic soil type to produce a curve number of 87 based on Table 2-2a of TR-55.

The lag times for each subbasin were calculated using Worksheet 3 in TR-55 with a minimum lag time of 5 minutes being applied to subbasins where the calculated value was less than 5 minutes.

The SCS Type II Distribution was used with the 25-year 24-hour storm, consistent with the requirement of R315-305-4-3(b). The rainfall amount was taken from the “Point Precipitation Frequency Estimates from NOAA Atlas 14” based on a location defined at the center of the landfill facility. The value of the 25-year 24-year event is 1.74 inches.

Peak Design Flows. The hydrologic analysis presented above was used to generate peak design flows for each of the subbasins defined for the closure cap and for the downspout piping located at points along the east side of the closure cap. The calculations and summary of methodology and results are presented in Appendix F.

HYDRAULIC DESIGN OF CHANNELS

The peak flow rates based on the hydrology discussed above provided the basis for the design of the drainage conveyances. An existing run-on diversion channel on the west side of the property has been constructed based on the design provided in the original design. This channel/berm will be extended to the south as construction of the landfill continues to ensure that run-on is directed around the facility.

DOWNSPOUT DESIGN

Hydrologic calculations for run-off described above were used to design the downspouts. The design is based on a combined peak flows ranging from 23 cfs for the northeast bench downspout to 28.5 cfs for the northeast top downspout.

Downspout sizes were determined used inlet control conditions and selecting the size and head water depth requirement using the orifice equation. Inlet control conditions were assumed because at peak flow supercritical flow in the system on the 4H:1V slopes and the elevation differences between the inlet and outlet ends of the downspout pipes will not allow for outlet conditions to control.

The downspout pipes were sized based on calculations provided in Appendix F. Two 18-inch pipes in parallel are to be installed for each of the four downspout locations. The headwater depth requirements are provided within the inlet boxes below the grating with additional depth and freeboard provided by the grading of the benches and the berm height on the top of the closure cap.

EROSION PROTECTION

Long term options to provide erosion protection generally consist of establishing vegetation or by placing a stone mulch. In this case, the establishment of vegetation is the selected erosion protection method. Procedures presented in “Erosion and Sedimentation in Utah – A Guide for Control”, a Utah-specific publication, were used to determine the adequacy of the vegetative system. The detailed calculations are found in Appendix G. According to the calculations, a native vegetative cover of approximately 30% on the 4H:1V slopes will provide adequate protection against erosion and the top of the closure cap with the 2% slope provides adequate protection due to the minimal slope, although vegetation will be established there as well.

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Western Regional Climate Center website maintained by the Desert Research Institute (www.wrcc.dri.edu)

APPENDIX A

Permit Design Drawings

INTERMOUNTAIN REGIONAL LANDFILL

2016 PERMIT MODIFICATION DRAWINGS

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FILE NAME: PROJECTS\373 - INTERMOUNTAIN REGIONAL LANDFILL\02.100 - LF REDESIGN\CAD\WORKING\G-1 COVER 16 FT NORTH.DWG
FILE DATE: 10.26.2016 09:52:56 (CAH)

GENERAL NOTES

NOTES:

1. COORDINATES PROVIDED ARE BASED ON THE MODIFIED STATE PLANE NAD 83 COORDINATE SYSTEM. (GROUND DATUM)
2. PROMPT NOTIFICATION SHALL BE PROVIDED TO THE STATE HISTORIC PRESERVATION OFFICE UPON DISCOVERY OF ANY ARCHEOLOGICAL OR BURIAL FINDINGS.
3. MONITORING WELLS SHALL BE PROTECTED FROM DAMAGE DURING CONSTRUCTION.
4. ALL AREAS TO BE CLEARED AND GRUBBED OF VEGETATION AND OTHER DEBRIS PRIOR TO FILL PLACEMENT.
5. SUBGRADES FOR FILLS TO BE MOISTURE CONDITIONED AND RECOMPACTED TO 95% OF MAXIMUM DENSITY AS DETERMINED BY ASTM D-698 PRIOR TO FILL PLACEMENT.
6. ALL FILL MATERIAL TO BE COMPACTED TO 95% OF MAXIMUM DENSITY AS DETERMINED BY ASTM D-698.
7. DRAWINGS ARE INTENDED FOR PERMIT PURPOSES ONLY. THEY ARE NOT INTENDED FOR CONSTRUCTION. DETAILED DRAWINGS AND SPECIFICATIONS SHALL BE PROVIDED FOR EACH PHASE OF CONSTRUCTION.

INDEX OF DRAWINGS

SECTION & DETAIL IDENTIFICATION

SECTION IDENTIFICATION

SECTION CUT ON DRAWING NO. 6 AND SHOWN ON DRAWING NO. 8
ON DRAWING NO. 6 THIS SECTION IS REFERENCED AS:

2 / 8 — SECTION NUMBER; DRAWING ON WHICH SECTION APPEARS

ON DRAWING NO. 8, THIS SECTION IS IDENTIFIED AS:

SECTION 2 / 6 — SECTION NUMBER; DRAWING FROM WHICH SECTION WAS TAKEN

DETAIL IDENTIFICATION

DETAIL CALL-OUT ON DRAWING NO. 6 AND SHOWN ON DRAWING NO. 8
ON DRAWING NO. 6 THIS DETAIL IS REFERENCED AS:

B / 8 — DETAIL LETTER; DRAWING ON WHICH DETAIL APPEARS

ON DRAWING NO. 8, THIS DETAIL IS IDENTIFIED AS:

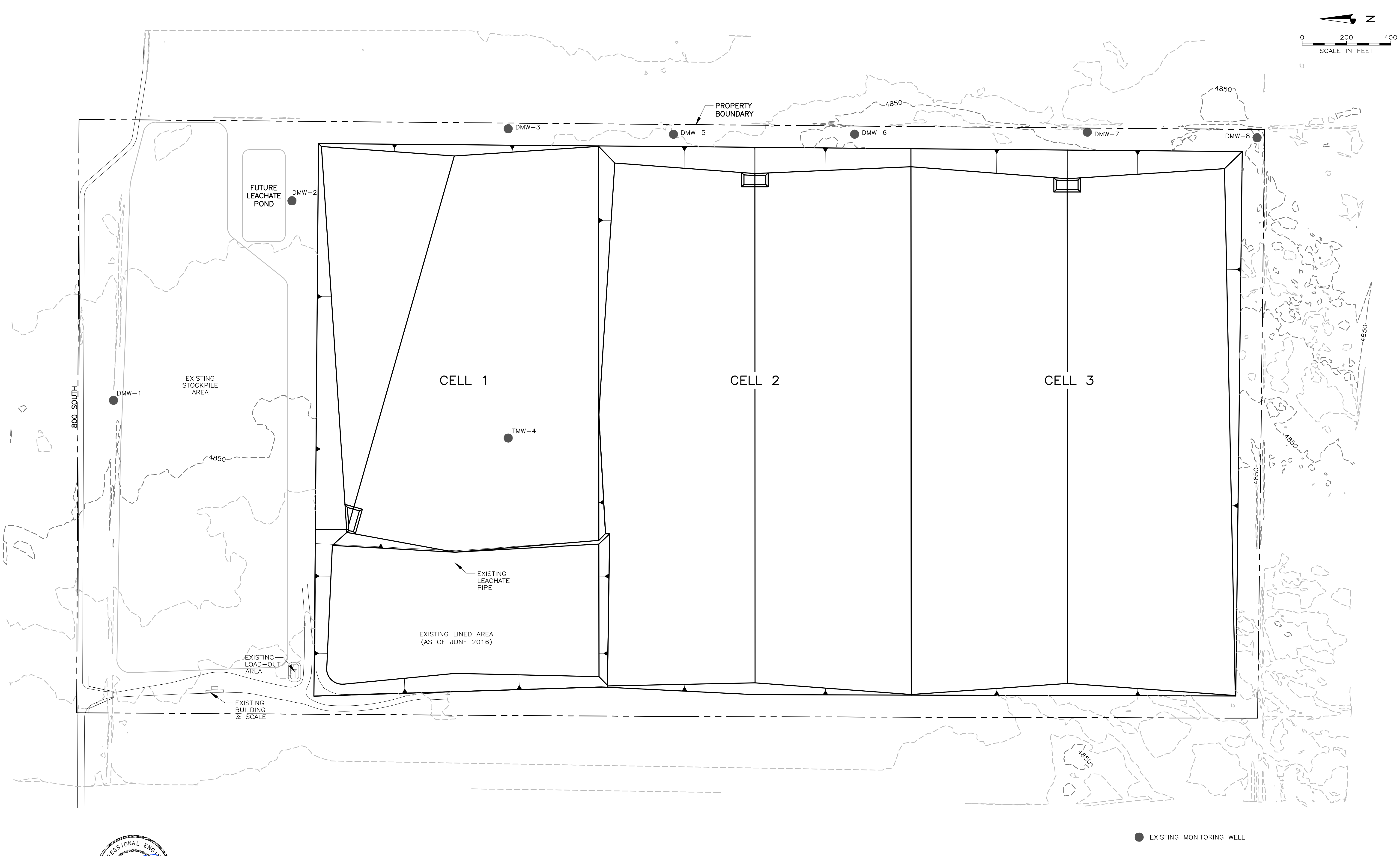
DETAIL B / 6 — DETAIL LETTER; DRAWING FROM WHICH DETAIL WAS TAKEN

NOTES:

1. IF SECTION AND DETAILS ARE SHOWN ON THE SAME DRAWING AS SECTION CUTS AND SECTION OR DETAIL CALL-OUTS DRAWING NUMBER IS REPLACED BY A LINE.
2. DETAIL LETTERS "I" AND "O" NOT USED.

TABLE OF ABBREVIATIONS

C.C.	CENTER TO CENTER	N.	NORTHING COORDINATE
℄	CENTER LINE	N.T.S.	NOT TO SCALE
CLR.	CLEAR	O.C.	ON CENTER
CPE	CORRUGATED POLYETHYLENE	OD	OUTSIDE DIAMETER
DIA.	DIAMETER	OZ.	OUNCE
E.	EASTING COORDINATE	PC	POINT OF CURVE
EL.	ELEVATION	PCPE	PERFORATED CORRUGATED POLYETHYLENE
FL	FLOW LINE	PI	POINT OF INTERSECTION
GCL	GEOSYNTHETIC CLAY LINER	PL	PLATE
HDPE	HIGH DENSITY POLYETHYLENE	PT	POINT OF TANGENT
ID	INSIDE DIAMETER	SCPE	SMOOTH WALL CORRUGATED POLYETHYLENE
INV EL.	INVERT ELEVATION	SDR	STANDARD DIMENSION RATIO
MAX.	MAXIMUM	STA.	STATION
MIN.	MINIMUM	TYP.	TYPICAL



FILE NAME: PROJECTS\373 – INTERMOUNTAIN REGIONAL LANDFILL\02.100 – LF REDESIGN\CAD\WORKING\G-3 SITE PLAN.DWG
FILE DATE: 10.26.2016 10:17:35 (CAH)

HANSEN ALLEN & LUCE INC ENGINEERS

PROFESSIONAL ENGINEER GORDON L. JONES No. 5048470-2202 STATE OF UTAH

PROJECT ENGINEER

DESIGNED TGA	3				
DRAFTED CAH	2				
CHECKED GLJ	1				
DATE OCTOBER 2016	NO.	DATE	REVISIONS	BY	APVD.

SCALE AS SHOWN

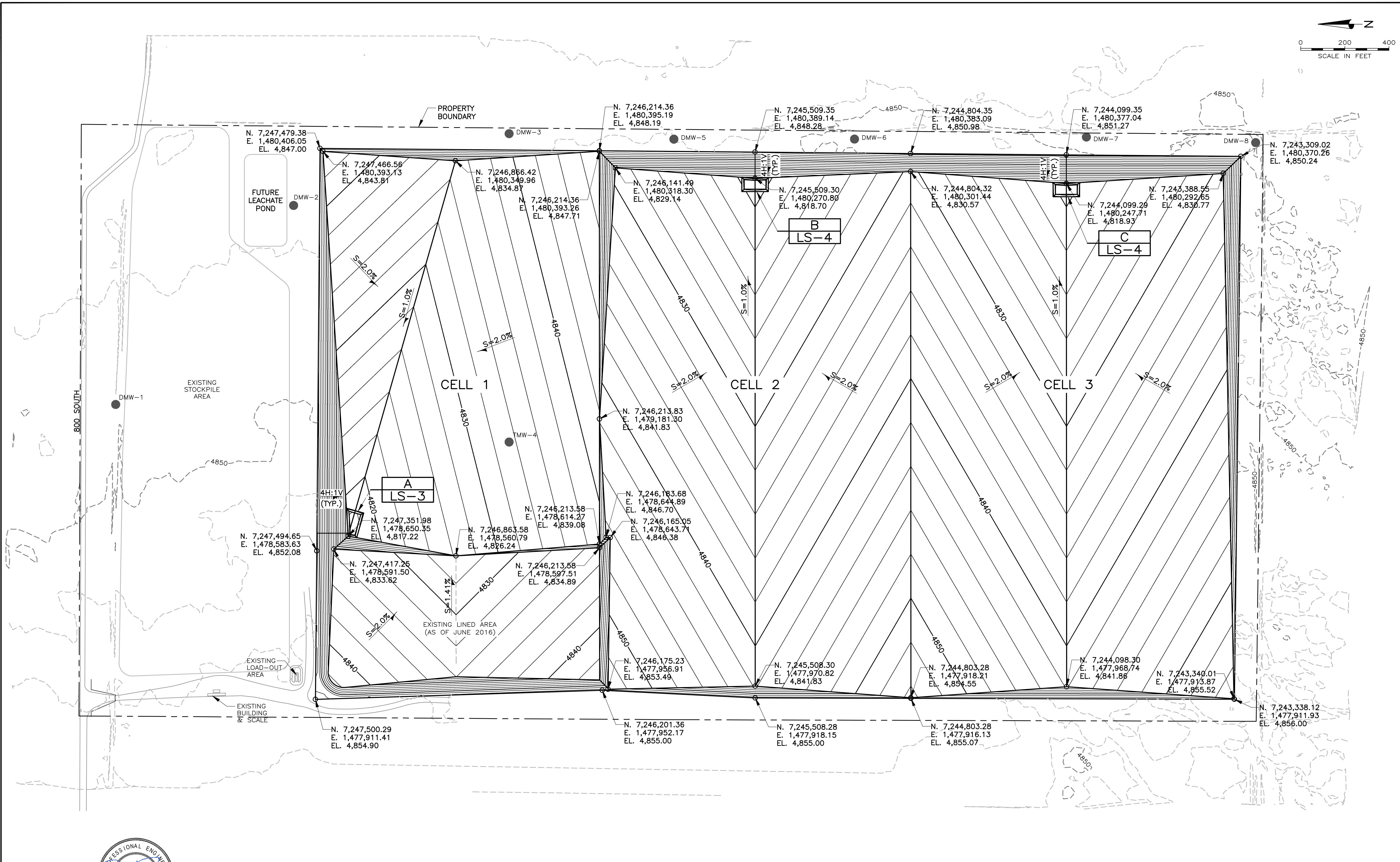
INTERMOUNTAIN regional landfill

2016 PERMIT MODIFICATION
GENERAL
OVERALL SITE PLAN

SHEET G-3

373-02-100

10/07



FILE NAME: PROJECTS\373 - INTERMOUNTAIN REGIONAL LANDFILL\02.100 - LF REDESIGN\CAD\WORKING\LF-1 FLOOR PLAN.DWG
FILE DATE: 10.26.2016 10:19:47 (CAH)

10/07

HANSEN ALLEN & LUCE inc
ENGINEERS

PROFESSIONAL ENGINEER
GORDON L. JONES
No. 5048470-2202
10/26/2016
STATE OF UTAH
PROJECT ENGINEER

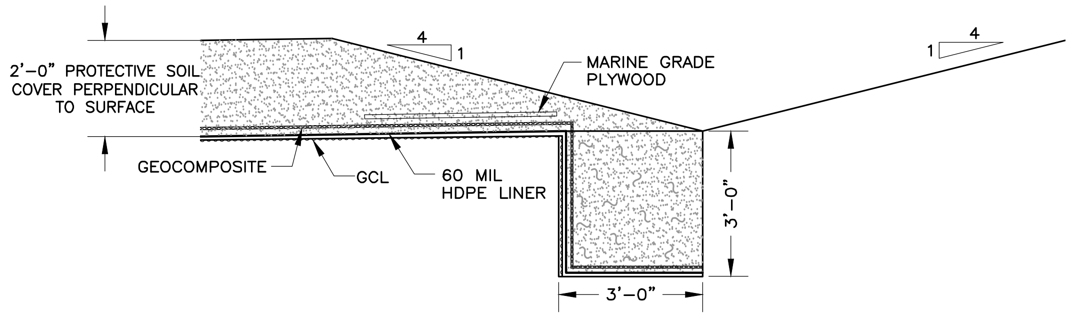
DESIGNED TGA	3				
DRAFTED CAH	2				
CHECKED GLJ	1				
DATE OCTOBER 2016	NO.	DATE	REVISIONS	BY	APVD.

SCALE
AS SHOWN

INTERMOUNTAIN
regional landfill

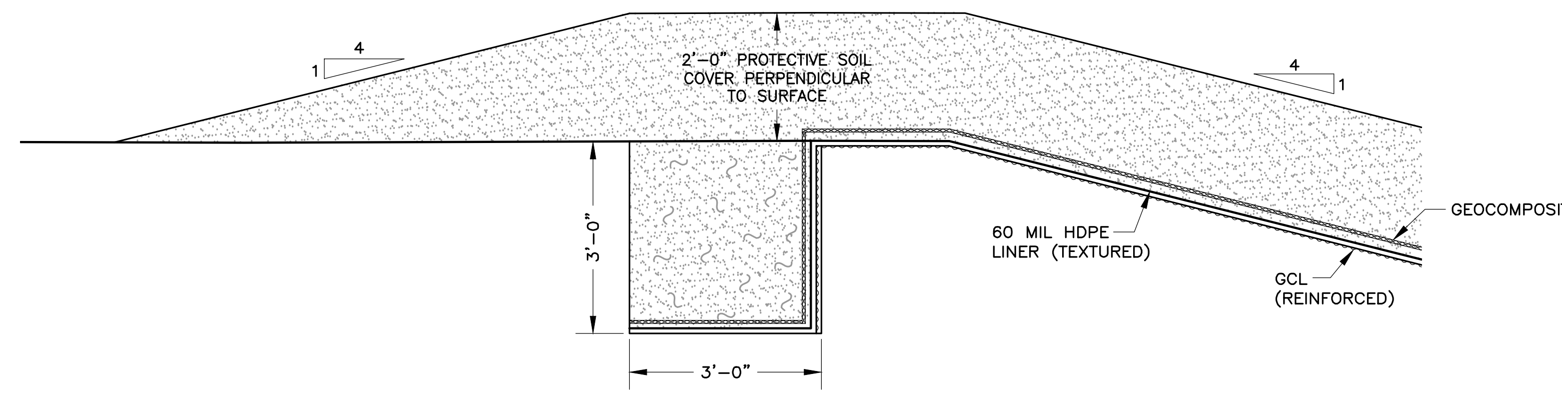
2016 PERMIT MODIFICATION
LANDFILL
CELL FLOOR PLAN

SHEET
LF-1
373-02-100



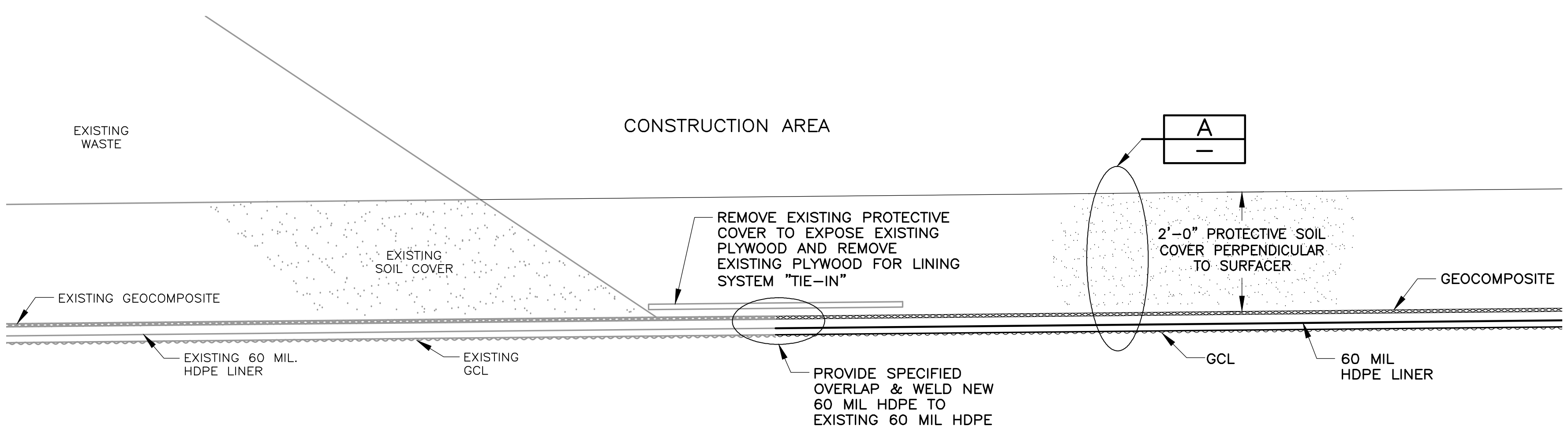
TYPICAL FLOOR LINER TERMINATION TRENCH

N.T.S.



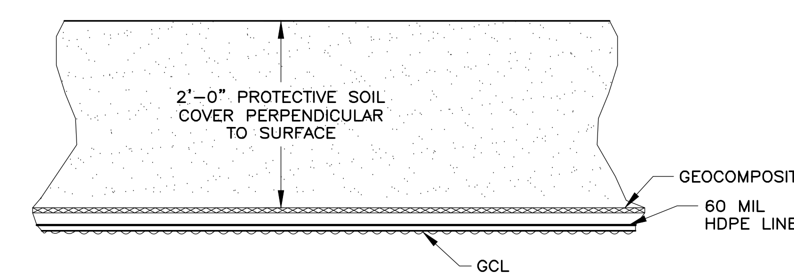
TYPICAL TOP SLOPE SECTION

N.T.S.



TYPICAL "TIE–IN" SECTION

N.T.S.



TYPICAL CELL FLOOR LINER SYSTEM SECTION | A / —

N.T.S.

FILE NAME: PROJECTS\373 – INTERMOUNTAIN REGIONAL LANDFILL\02.100 – LF REDESIGN\CAD\WORKING\LF-2 LINER TIE IN DETAILS.DWG
FILE DATE: 10:26:2016 10:21:21 (CAH)

HANSEN ALLEN & LUCE INC ENGINEERS

PROFESSIONAL ENGINEER GORDON L. JONES No. 5048470-2202 10/26/2016 STATE OF UTAH

PROJECT ENGINEER

DESIGNED	TGA	3				
DRAFTED	CAH	2				
CHECKED	GLJ	1				
DATE	OCTOBER 2016	NO.	DATE	REVISIONS	BY	APVD.

SCALE: AS SHOWN

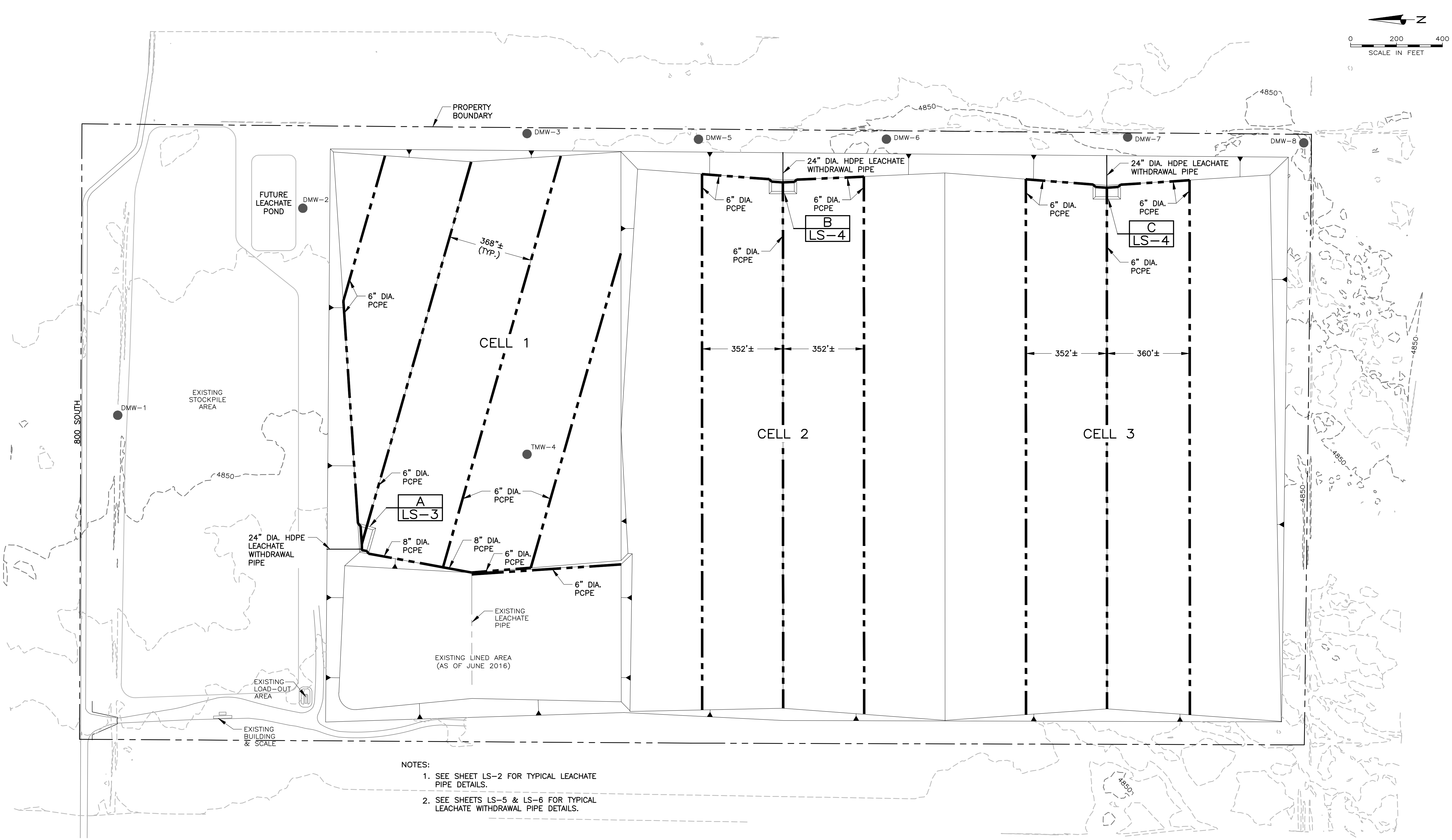
INTERMOUNTAIN regional landfill

2016 PERMIT MODIFICATION
LANDFILL
LINER "TIE–IN" DETAILS

SHEET LF–2

373–02–100

10/07



NOTES:

1. SEE SHEET LS-2 FOR TYPICAL LEACHATE PIPE DETAILS.
2. SEE SHEETS LS-5 & LS-6 FOR TYPICAL LEACHATE WITHDRAWAL PIPE DETAILS.

FILE NAME: PROJECTS\373 - INTERMOUNTAIN REGIONAL LANDFILL\02.100 - LF REDESIGN\CAD\WORKING\LS-1 LEACHATE PLAN.DWG
FILE DATE: 10.26.2016 11:00:47 (CAH)

HANSEN ALLEN & LUCE inc ENGINEERS

PROFESSIONAL ENGINEER No. 5048470-2202 GORDON L. JONES 10/26/2016 STATE OF UTAH

PROJECT ENGINEER

DESIGNED TGA	3			
DRAFTED CAH	2			
CHECKED GLJ	1			
DATE OCTOBER 2016	NO.	DATE	REVISIONS	BY APVD.

SCALE: AS SHOWN

INTERMOUNTAIN regional landfill

2016 PERMIT MODIFICATION
LCRS
LEACHATE PIPE PLAN

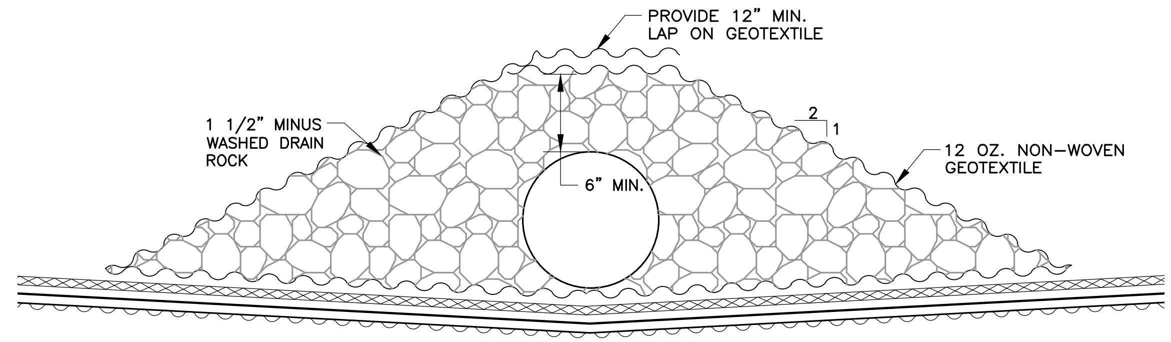
SHEET LS-1

373-02-100

10/07

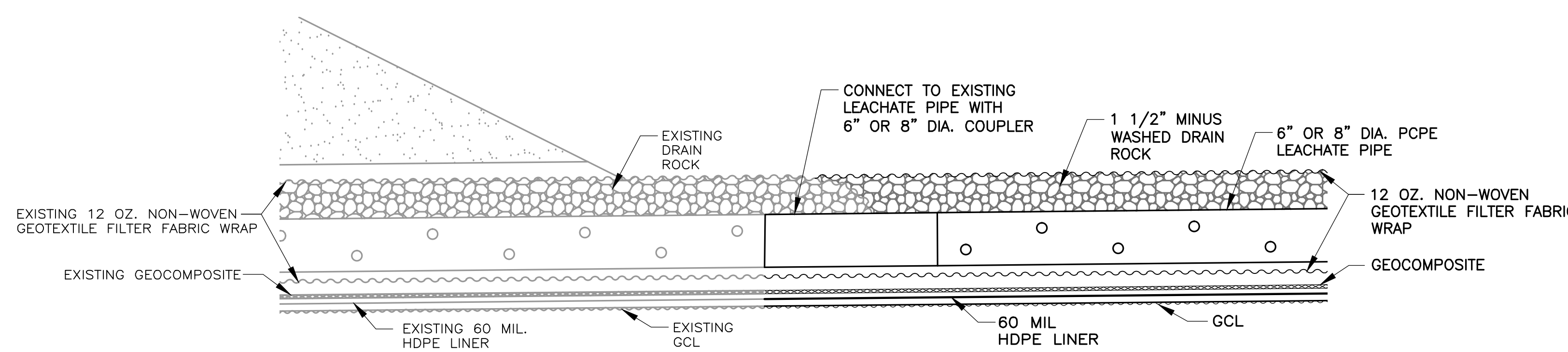
NOTES:

1. 1 1/2" MINUS WASHED DRAIN ROCK TO BE PLACED AROUND ALL PCPE PIPE AND CPE PIPE MATERIALS. A MINIMUM COVER OF 6 INCHES TO BE PROVIDED OVER PIPES.
2. PCPE REFERS TO PERFORATED CORRUGATED POLYETHYLENE PIPE.
3. FLOOR CONFIGURATION ALONG LEACHATE PIPE ALIGNMENT WILL VARY.



TYPICAL LEACHATE CONVEYANCE PIPE WRAP DETAIL

N.T.S.



LEACHATE CONVEYANCE "TIE-IN" DETAIL

N.T.S.

FILE NAME: PROJECTS\373 – INTERMOUNTAIN REGIONAL LANDFILL\02.100 – LF REDESIGN\CAD\WORKING\LS-2 LINER AND LCRS SECTIONS.DWG
FILE DATE: 10.26.2016 11:02:58 (CAH)

HANSEN ALLEN & LUCE INC
ENGINEERS

PROFESSIONAL ENGINEER
GORDON L. JONES
No. 5048470-2202
10/26/2016
STATE OF UTAH

PROJECT ENGINEER

DESIGNED TGA	3				
DRAFTED CAH	2				
CHECKED GLJ	1				
DATE OCTOBER 2016	NO.	DATE	REVISIONS	BY	APVD.

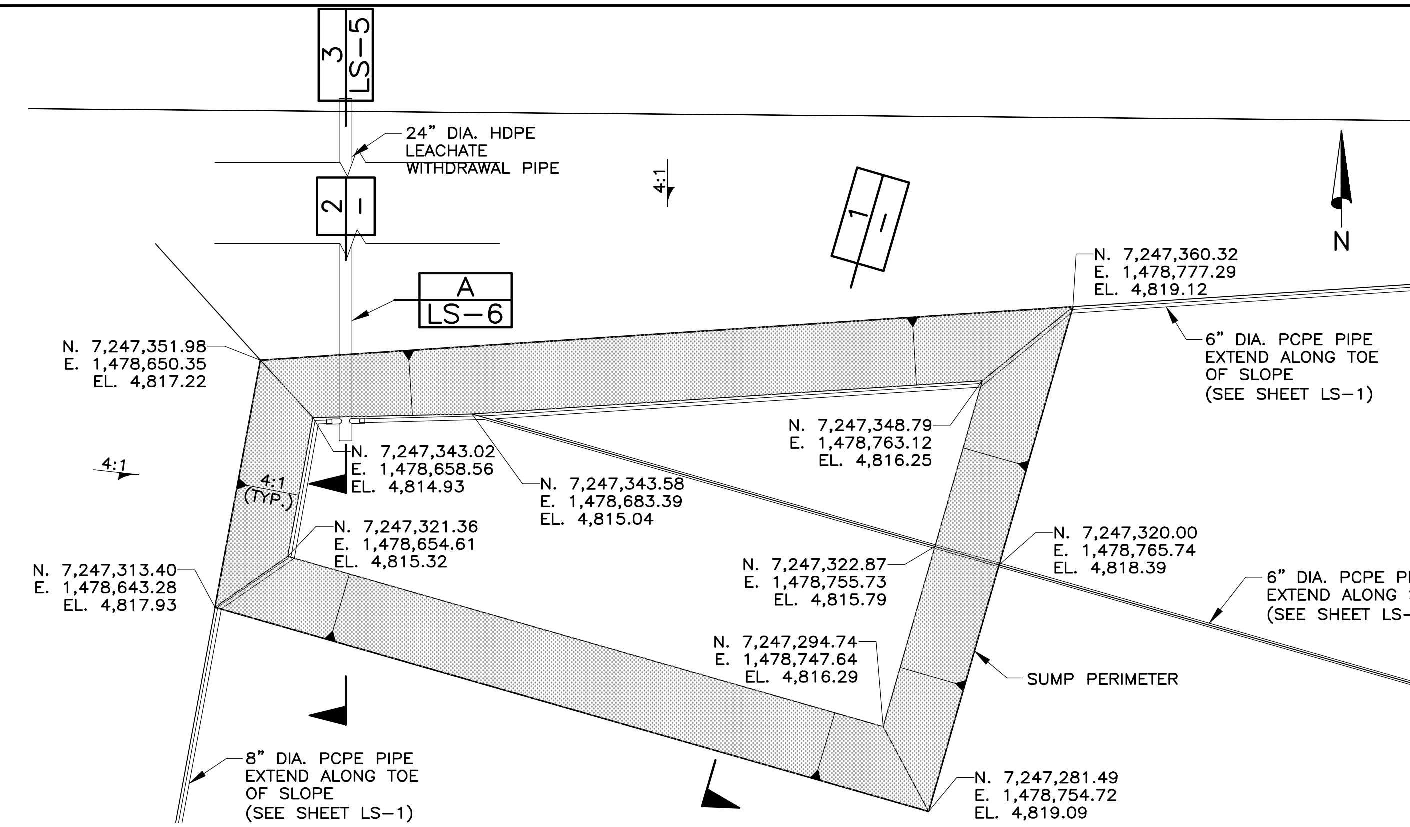
SCALE
AS SHOWN

INTERMOUNTAIN regional landfill

2016 PERMIT MODIFICATION
LCRS
LCRS DETAILS

SHEET
LS-2
373-02-100

10/07



SUMP PLAN VIEW A/LF-1 A/LS-1

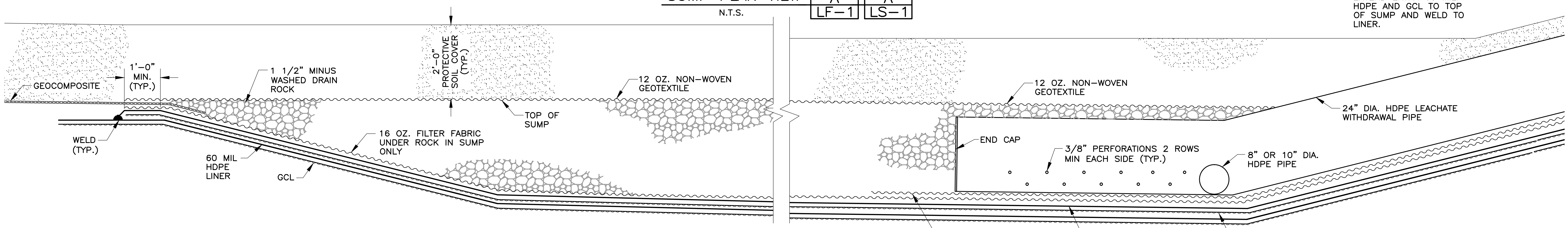
N.T.S.

NOTES:

1. FILL ENTIRE SUMP WITH 1 1/2" MINUS WASHED DRAIN ROCK TO TOP OF SUMP.
2. PCPE REFERS TO PERFORATED CORRUGATED POLYETHYLENE PIPE.
3. SEE SHEET LS-2 FOR PCPE PIPE LCRS DETAILS.

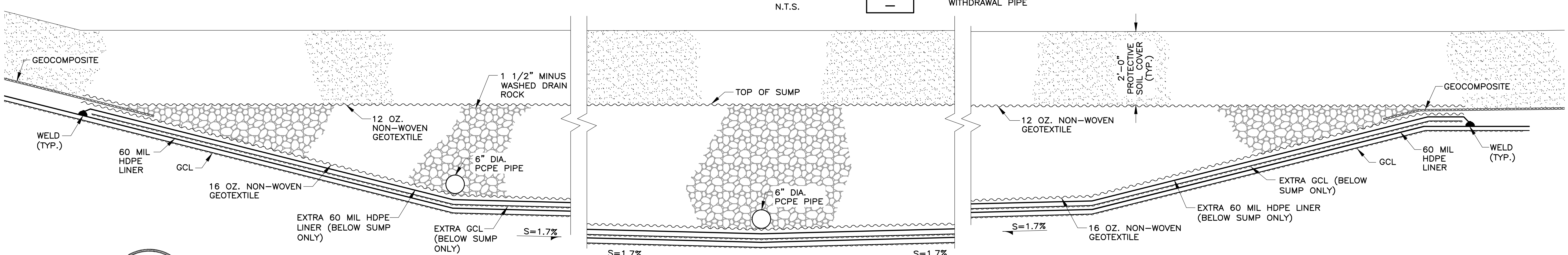
NOTE:

EXTEND EXTRA 60 MIL. HDPE AND GCL TO TOP OF SUMP AND WELD TO LINER.



SUMP CROSS SECTION 2/–

N.T.S.



SUMP CROSS SECTION 1/–

N.T.S.

FILE NAME: PROJECTS\373 – INTERMOUNTAIN REGIONAL LANDFILL\02.100 – LF REDESIGN\CAD\WORKING\LS-3 SUMP PLAN.DWG
FILE DATE: 10:26:2016 11:07:43 (CAH)

HANSEN ALLEN & LUCE INC ENGINEERS

PROFESSIONAL ENGINEER No. 5048470-2202 GORDON L. JONES 10/26/2016 STATE OF UTAH

PROJECT ENGINEER

DESIGNED	TGA	3				
DRAFTED	CAH	2				
CHECKED	GLJ	1				
DATE	OCTOBER 2016	NO.	DATE	REVISIONS	BY	APVD.

SCALE: AS SHOWN

INTERMOUNTAIN regional landfill

2016 PERMIT MODIFICATION
LCRS
SUMP PLAN & SECTIONS

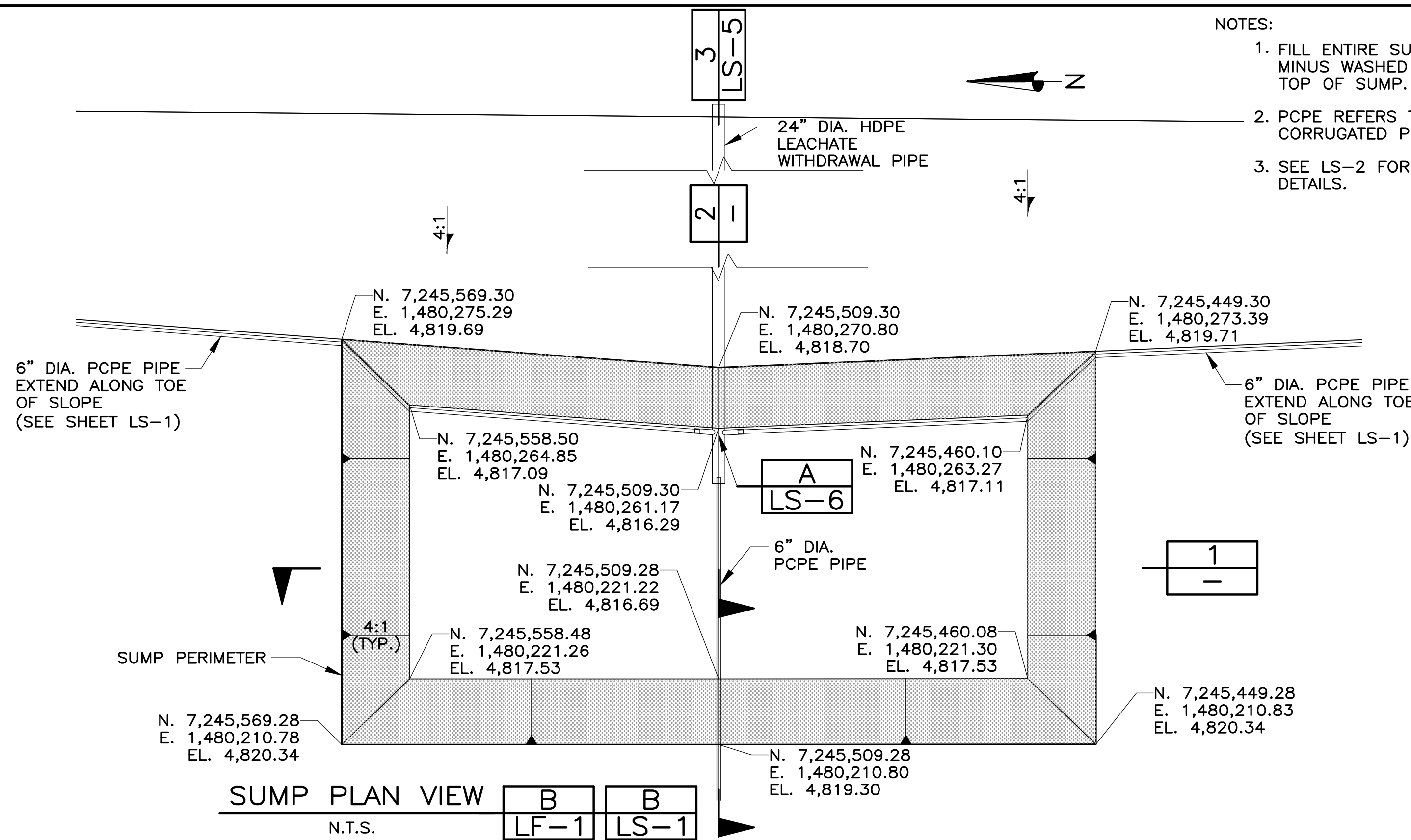
SHEET LS-3

373-02-100

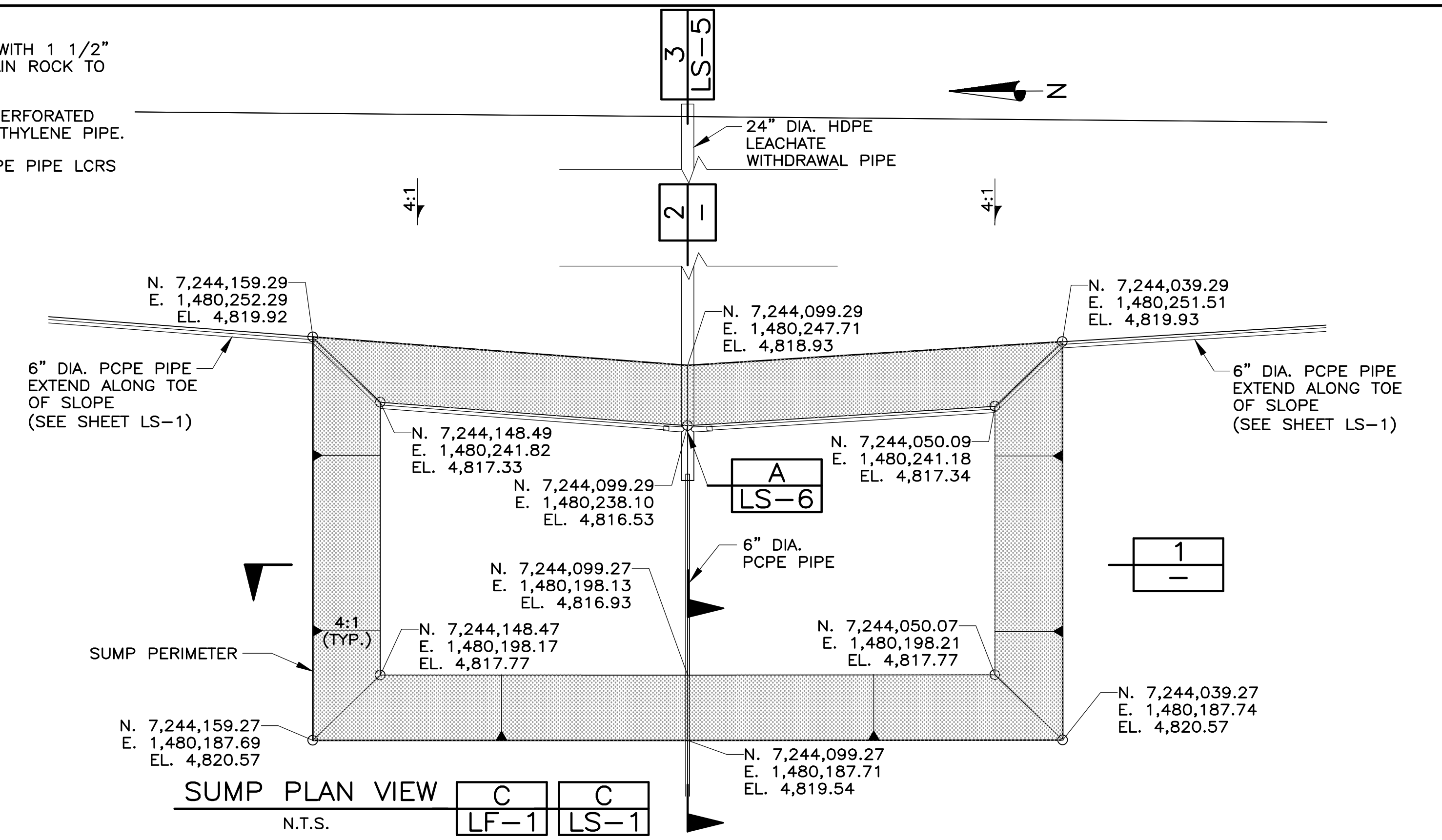
10/07

NOTES:

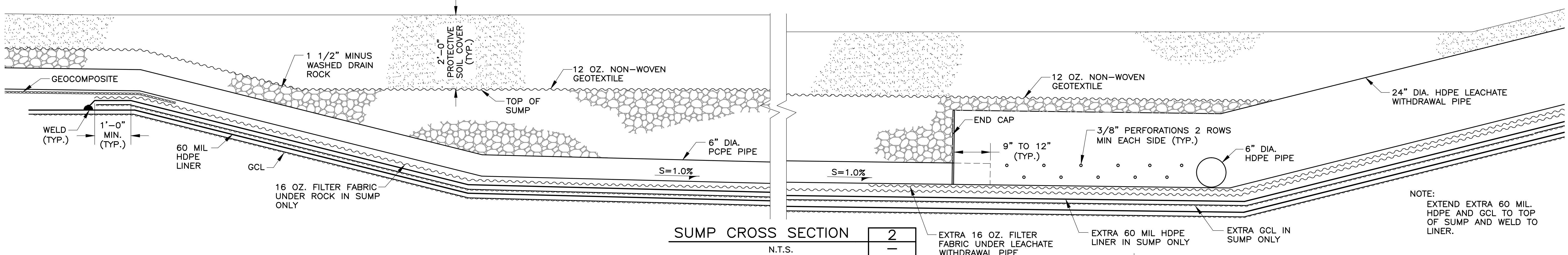
1. FILL ENTIRE SUMP WITH 1 1/2" MINUS WASHED DRAIN ROCK TO TOP OF SUMP.
2. PCPE REFERS TO PERFORATED CORRUGATED POLYETHYLENE PIPE.
3. SEE LS-2 FOR PCPE PIPE LCRS DETAILS.



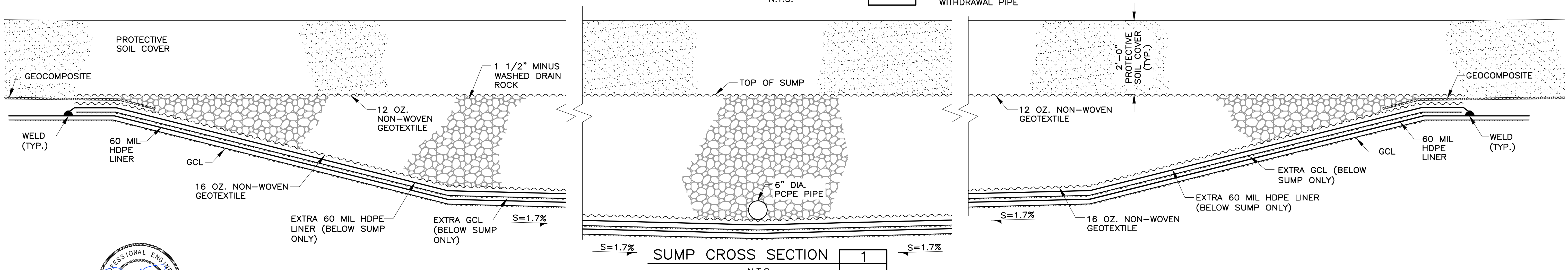
SUMP PLAN VIEW B LF-1 B LS-1
N.T.S.



SUMP PLAN VIEW C LF-1 C LS-1
N.T.S.



SUMP CROSS SECTION 2 -
N.T.S.



SUMP CROSS SECTION 1 -
N.T.S.

FILE NAME: PROJECTS\373 - INTERMOUNTAIN REGIONAL LANDFILL\02.100 - LF REDESIGN\CAD\WORKING\LS-4 SUMP PLANS.DWG
FILE DATE: 10.26.2016 11:18:42 (CAH)

HANSEN ALLEN & LUCE INC ENGINEERS

PROFESSIONAL ENGINEER No. 5048470-2202 GORDON L. JONES 10/26/2016 STATE OF UTAH

PROJECT ENGINEER

DESIGNED	TGA	3				SCALE	
DRAFTED	CAH	2				AS SHOWN	
CHECKED	GLJ	1					
DATE	OCTOBER 2016	NO.	DATE	REVISIONS	BY	APVD.	

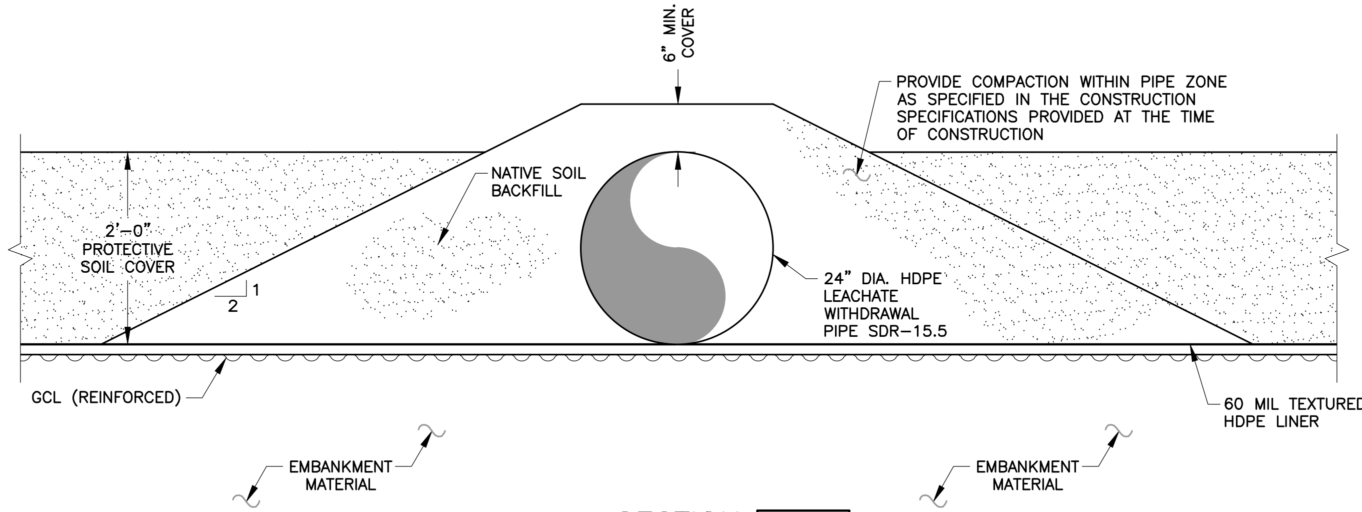
INTERMOUNTAIN regional landfill

2016 PERMIT MODIFICATION
LCRS
SUMP PLANS & SECTIONS

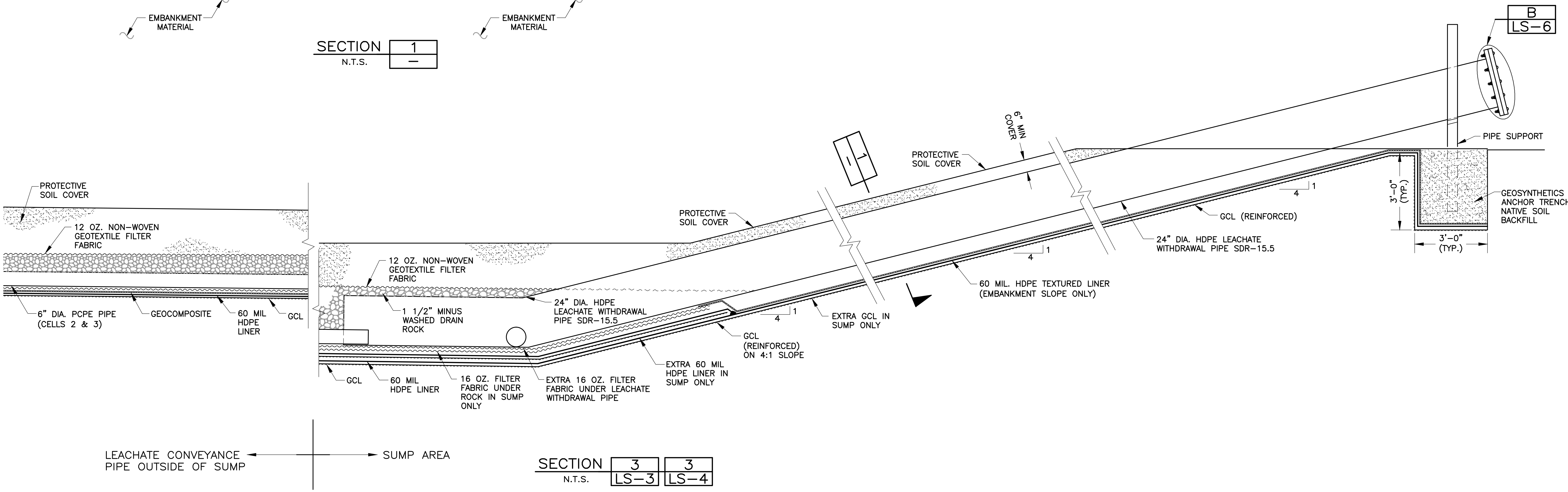
SHEET LS-4

373-02-100

10/07



SECTION 1
N.T.S. –



SECTION 3 / LS-3 3 / LS-4
N.T.S.

FILE NAME: PROJECTS\373 - INTERMOUNTAIN REGIONAL LANDFILL\02.100 - LF REDESIGN\CAD\WORKING\LS-5 SUMP SECTION PIPE.DWG
FILE DATE: 10.26.2016 11:22:22 (CAH)

HANSEN ALLEN & LUCE INC ENGINEERS

PROFESSIONAL ENGINEER GORDON L JONES No. 5048470-2202 10/26/2016 STATE OF UTAH
PROJECT ENGINEER

DESIGNED	TGA	3			
DRAFTED	CAH	2			
CHECKED	GLJ	1			
DATE	OCTOBER 2016	NO.	DATE	REVISIONS	BY	APVD.

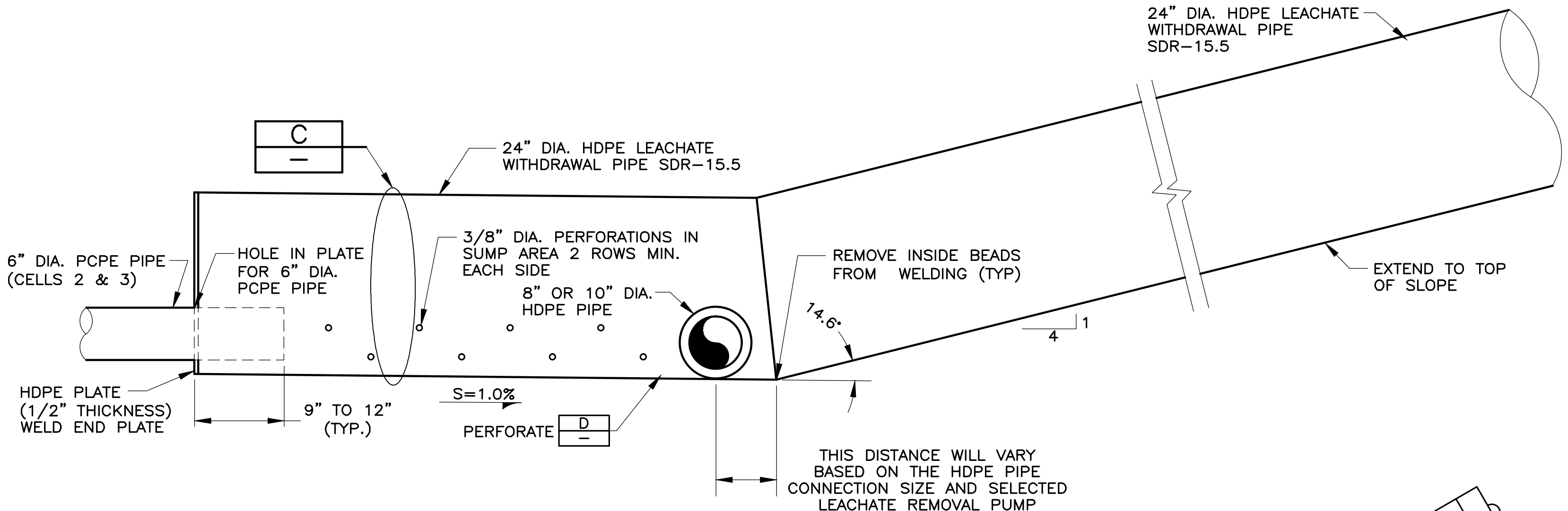
SCALE AS SHOWN

INTERMOUNTAIN regional landfill

2016 PERMIT MODIFICATION
LCRS
LEACHATE WITHDRAWAL PIPE SECTIONS

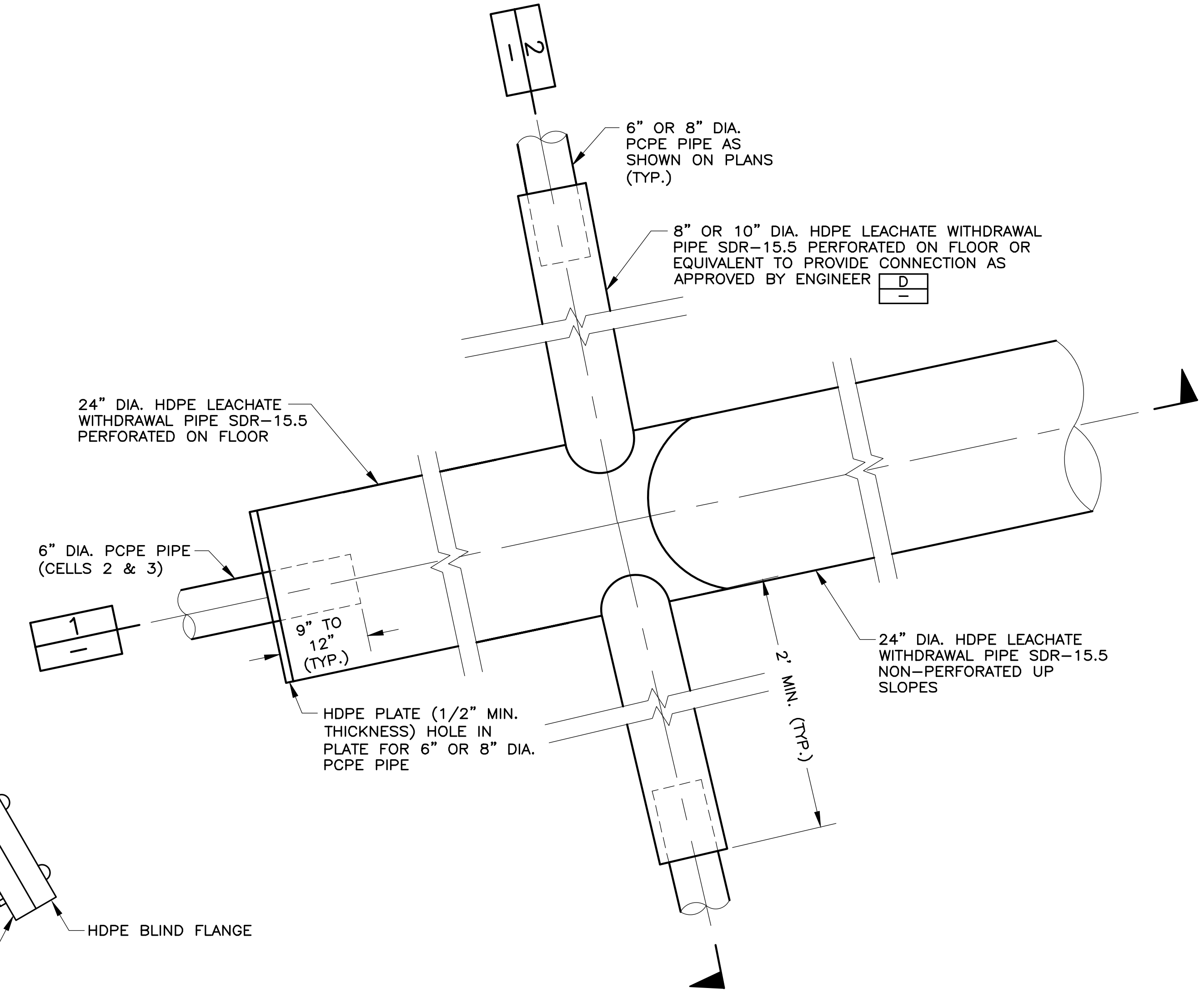
SHEET LS-5
373-02-100

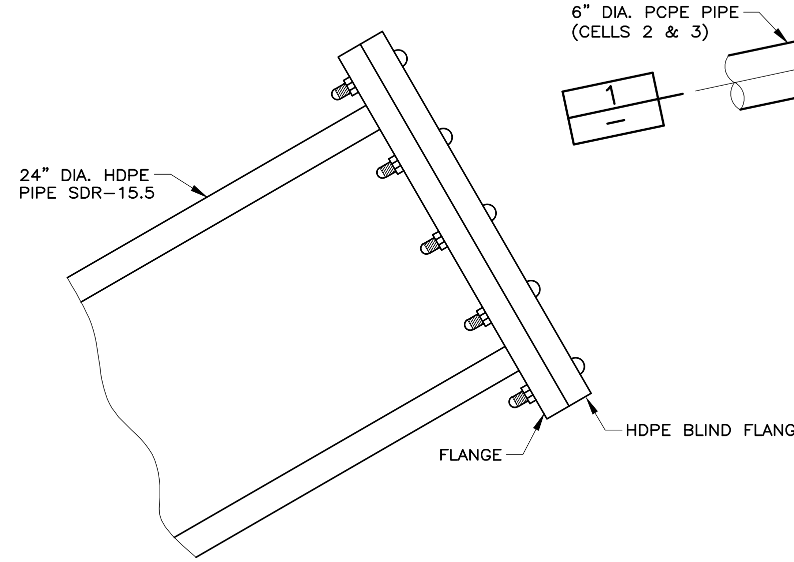
10/07



LEACHATE WITHDRAWAL PIPE SECTION 1 / –

N.T.S.



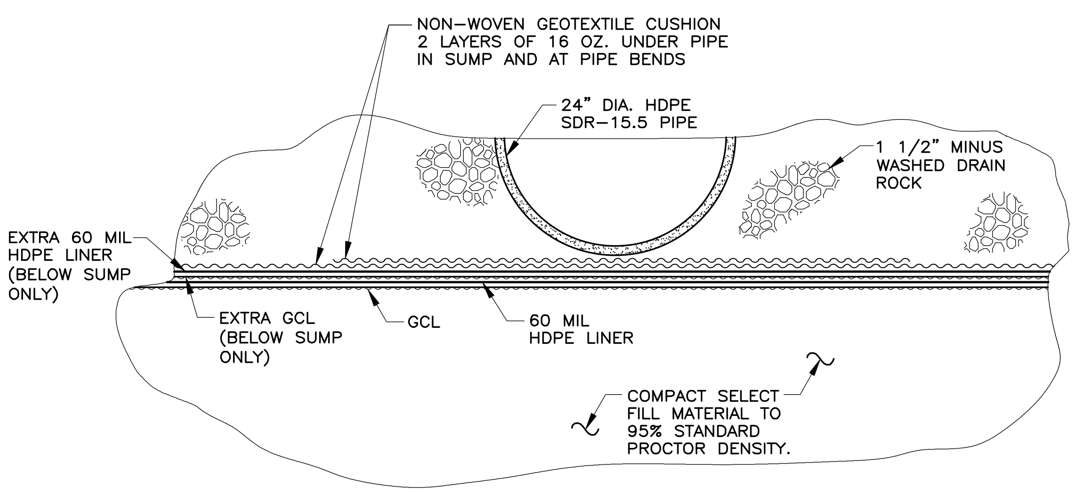


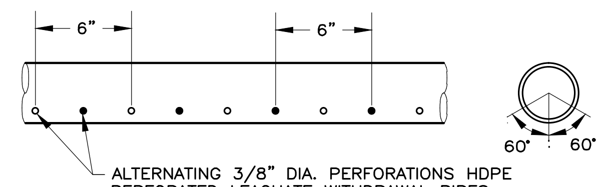
24" DIA. HDPE CAP DETAILS B / LS-5

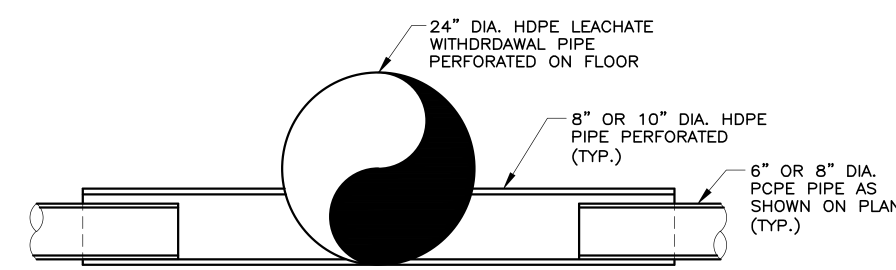
N.T.S.

LEACHATE WITHDRAWAL PIPE DETAIL A / LS-3 A / LS-4

N.T.S.







DETAIL C / –

4" = 1'-0"

PERFORATION DETAIL D / –

N.T.S.

CROSS SECTION 2 / –

N.T.S.

FILE NAME: PROJECTS\373 – INTERMOUNTAIN REGIONAL LANDFILL\02.100 – LF REDESIGN\CAD\WORKING\LS-6 LEACHATE WITHDRAWAL SYSTEM DETAILS.DWG
FILE DATE: 10.26.2016 11:25:43 (CAH)

HANSEN ALLEN & LUCE INC ENGINEERS

PROFESSIONAL ENGINEER GORDON L. JONES No. 5048470-2202 STATE OF UTAH

PROJECT ENGINEER

DESIGNED	TGA	3			
DRAFTED	CAH	2			
CHECKED	GLJ	1			
DATE	OCTOBER 2016	NO.	DATE	REVISIONS	BY / APVD.

SCALE AS SHOWN

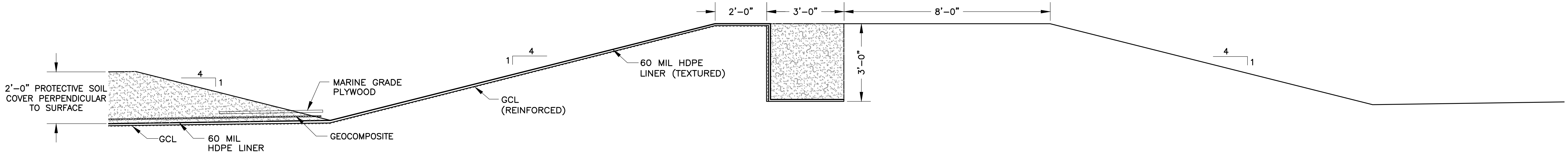
INTERMOUNTAIN regional landfill

2016 PERMIT MODIFICATION
LCRS
LEACHATE WITHDRAWAL SYSTEM DETAILS

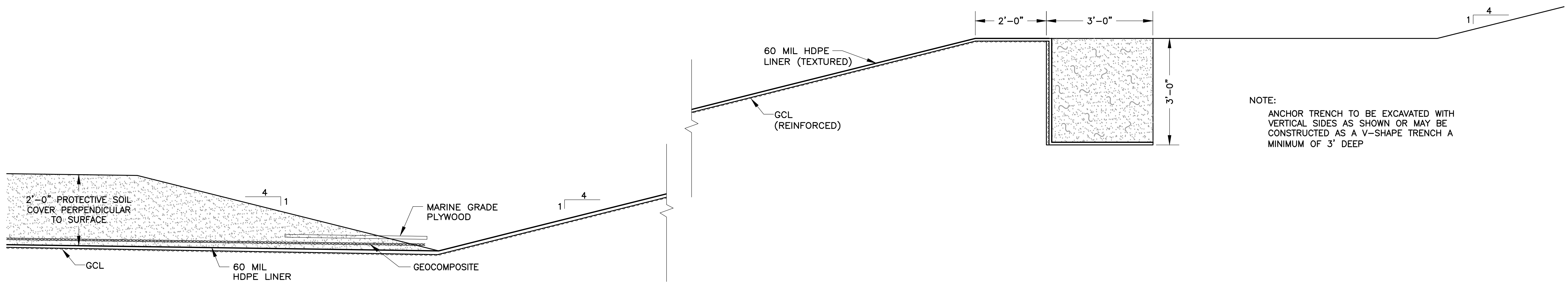
SHEET LS-6

373-02-100

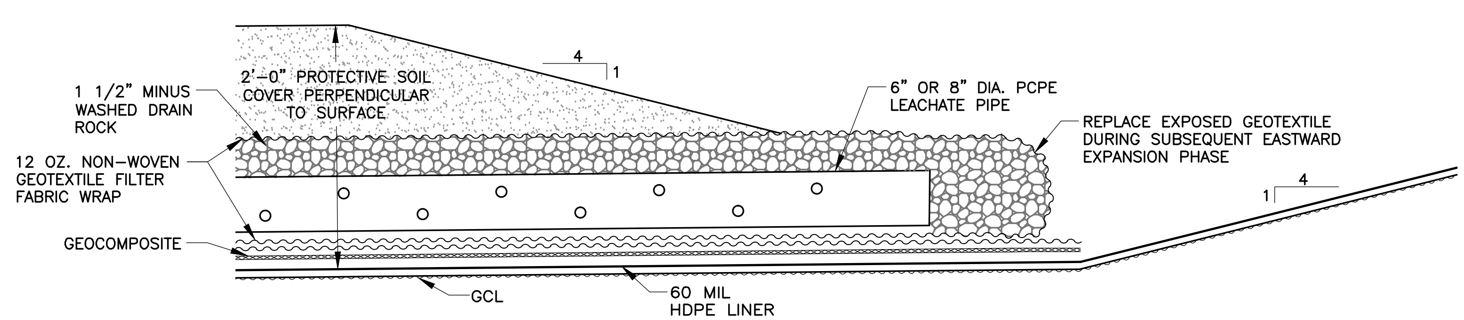
10/07



TYPICAL SOUTH TEMPORARY CONTAINMENT BERM DETAIL
FOR CELLS 2 & 3 AS CELL EXPANSION PROGRESSES



TYPICAL EAST TEMPORARY EMBANKMENT DETAIL FOR CELLS
2 & 3 AS CELL EXPANSION PROGRESSES



LEACHATE CONVEYANCE PIPE TERMINATION AT EAST EMBANKMENT DETAIL

HANSEN ALLEN & LUCE INC ENGINEERS

PROFESSIONAL ENGINEER GORDON L. JONES No. 5048470-2202 STATE OF UTAH

PROJECT ENGINEER

DESIGNED TGA	3				
DRAFTED	2				
CHECKED GLJ	1				
DATE OCTOBER 2016	NO.	DATE	REVISIONS	BY	APVD.

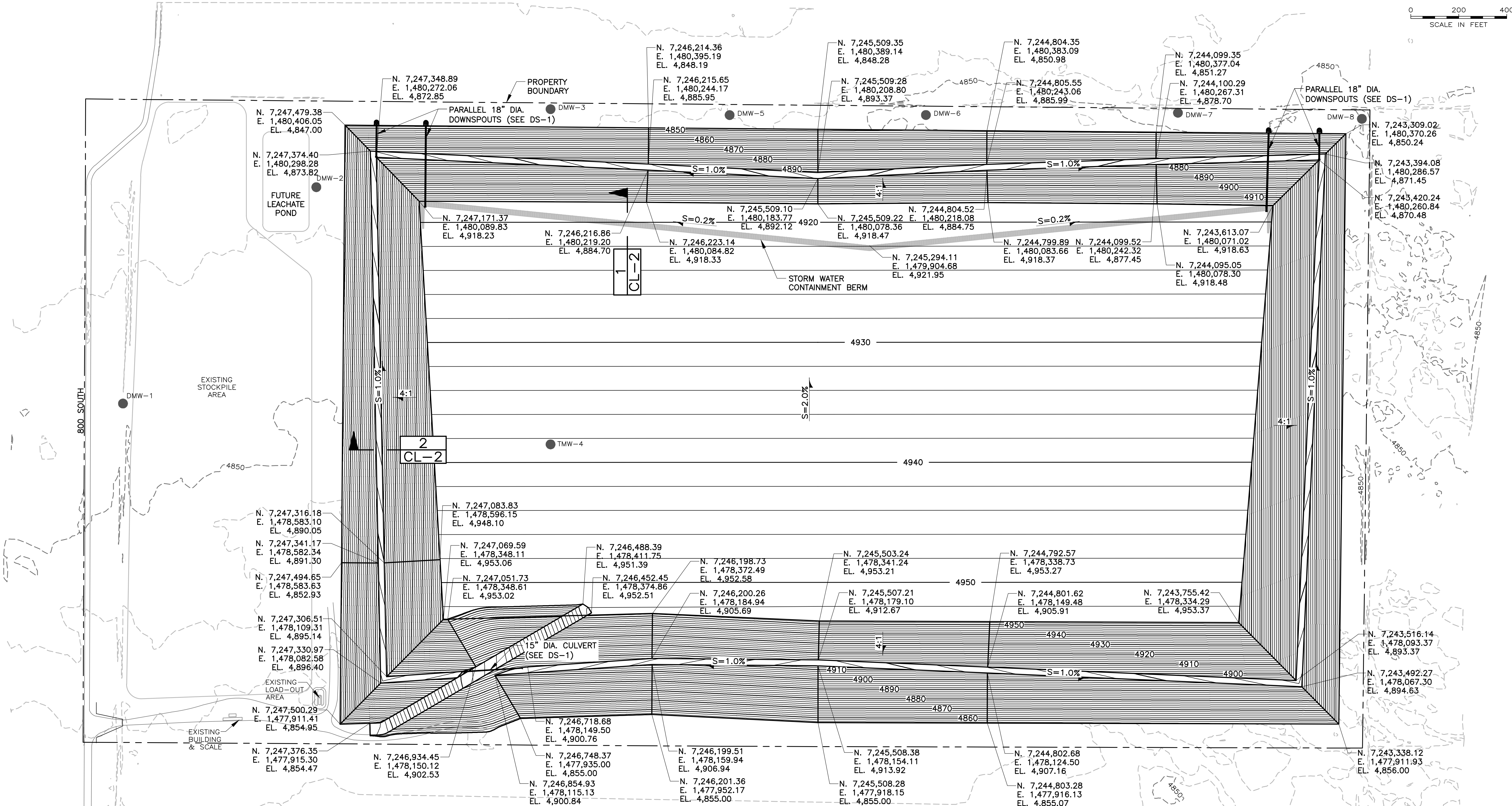
SCALE: NOT TO SCALE

INTERMOUNTAIN regional landfill

2016 PERMIT MODIFICATION
LANDFILL
PHASING DETAILS

SHEET PH-1

373-02-100



NOTE:

GENERAL DESIGN OF ACCESS RAMP IS BASED ON A 50 FT WIDE RAMP WITH A 12% MAXIMUM SLOPE, 2% CROSS SLOPE, AND VERTICAL CURVES DESIGNED TO ACCOMMODATE LOW CLEARANCE TRAILERS WITH A MEASURE LOADED CLEARANCE OF 8" (MEASURED BY LANDFILL EMPLOYEES). DETAILS NOT PRESENTED IN THIS DRAWING WILL BE PROVIDED AT THE TIME OF CONSTRUCTION.

FILE NAME: PROJECTS\373 – INTERMOUNTAIN REGIONAL LANDFILL\02.100 – LF REDESIGN\CAD\WORKING\CL-1 FINAL CLOSURE PLAN.DWG
FILE DATE: 10.26.2016 12:29:17 (CAH)

HANSEN ALLEN & LUCE INC ENGINEERS

PROFESSIONAL ENGINEER GORDON L JONES No. 5048470-2202 10/26/2016 STATE OF UTAH

PROJECT ENGINEER

DESIGNED TGA	3				
DRAFTED CAH	2				
CHECKED GLJ	1				
DATE OCTOBER 2016	NO.	DATE	REVISIONS	BY	APVD.

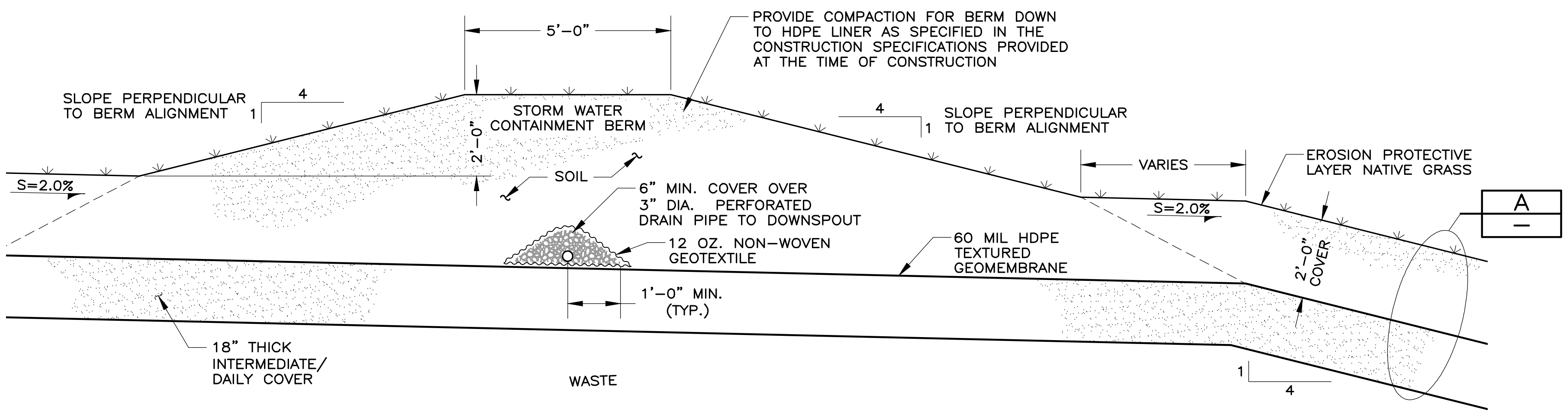
SCALE AS SHOWN

INTERMOUNTAIN regional landfill

2016 PERMIT MODIFICATION
CLOSURE
FINAL CLOSURE PLAN

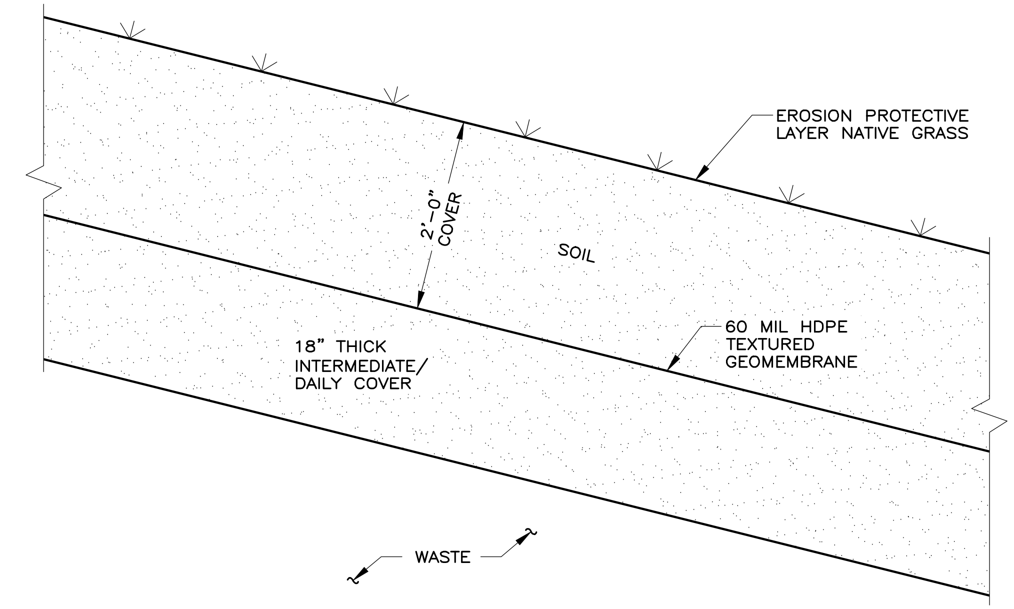
SHEET CL-1
373-02-100

10/07



STORM WATER CONTAINMENT BERM SECTION 1 / CL-1

N.T.S.

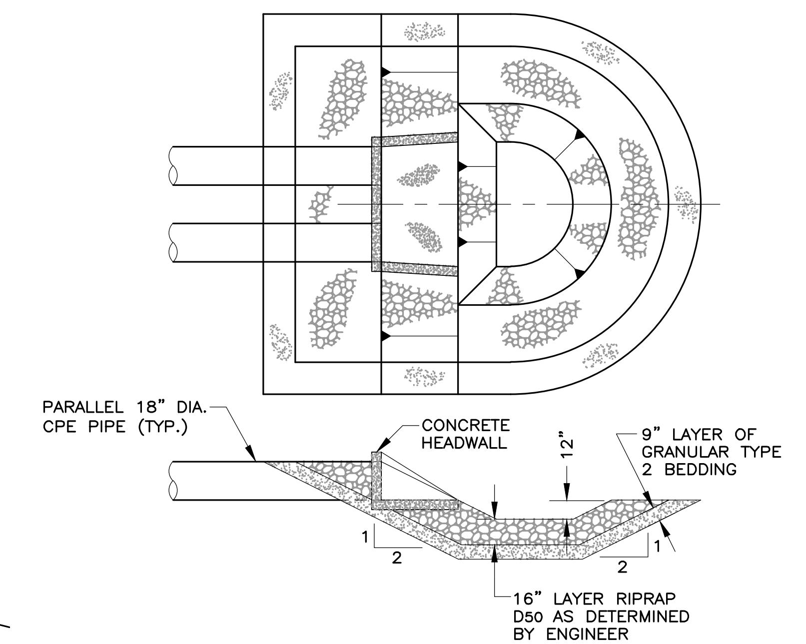


TYPICAL CLOSURE CAP LAYER DETAIL A / –

N.T.S.

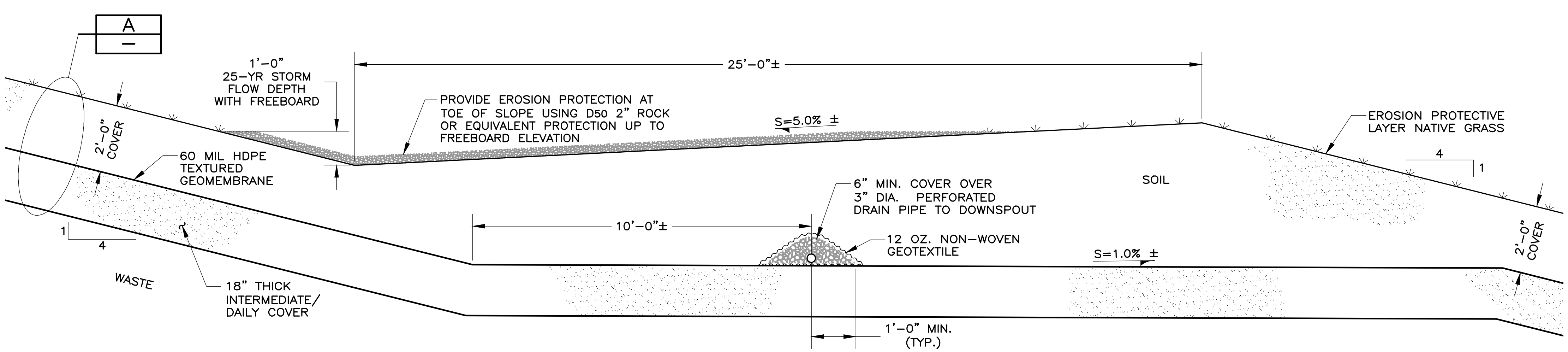
NOTES:

1. DRAIN PIPES UNDER STORM WATER CONTAINMENT BERMS AND UNDER BENCH DRAINAGE CHANNELS TO TIE INTO DOWN SPOUT INLET BOXES.



TYPICAL 18" DIA. PIPE OUTLET DETAIL A / DS-1 A / DS-2

N.T.S.



TYPICAL CLOSURE CAP BENCH DRAINAGE CHANNEL SECTION 2 / CL-1

N.T.S.

HANSEN ALLEN & LUCE INC ENGINEERS	PROFESSIONAL ENGINEER GORDON L. JONES No. 5048470-2202 STATE OF UTAH — PROJECT ENGINEER	DESIGNED TGA	3
		DRAFTED CAH	2
		CHECKED GLJ	1
		DATE OCTOBER 2016	NO. DATE REVISIONS BY APVD.

SCALE AS SHOWN

INTERMOUNTAIN regional landfill

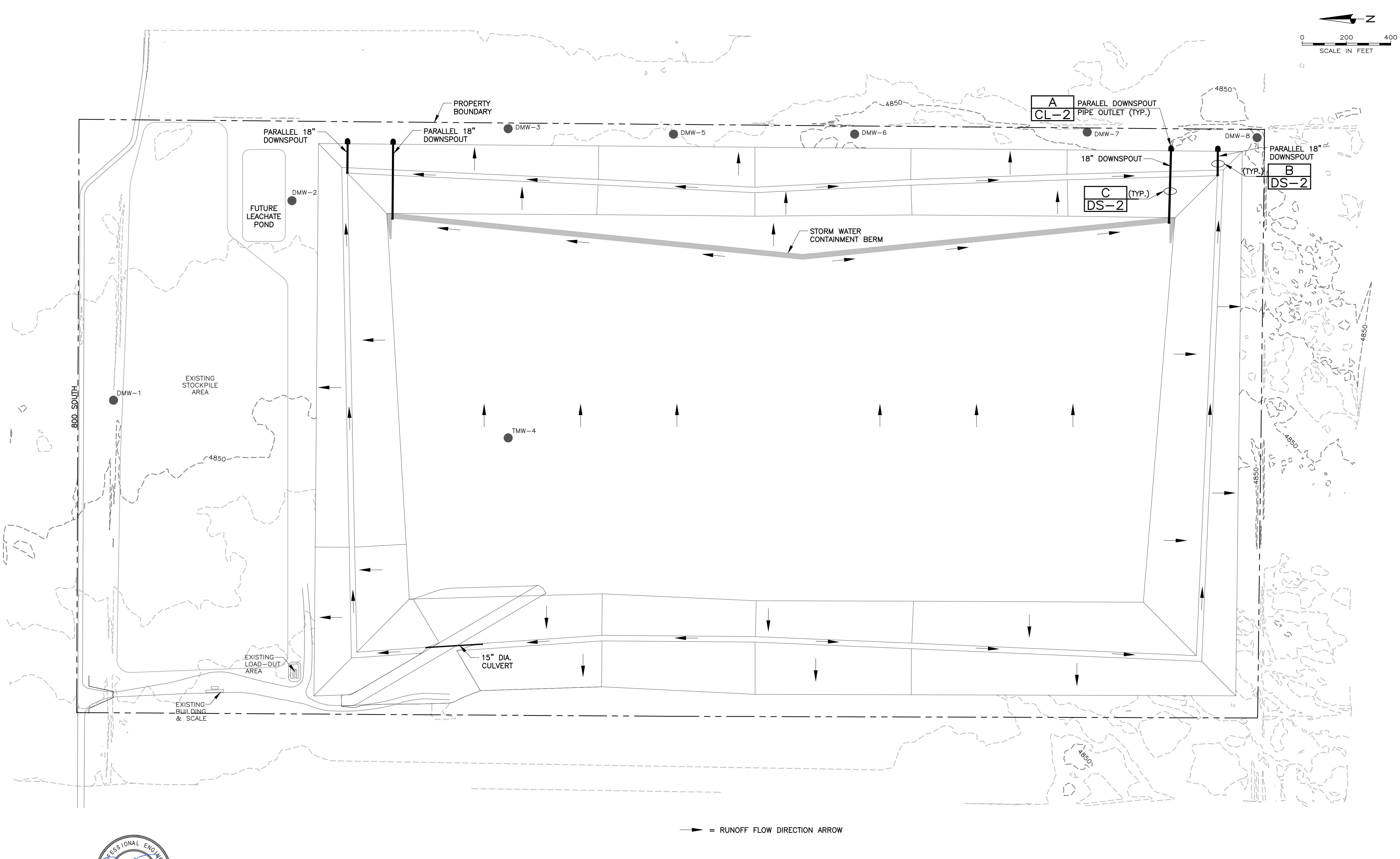
2016 PERMIT MODIFICATION
CLOSURE
SECTIONS & DETAILS

SHEET CL-2

373-02-100

FILE NAME: PROJECTS\373 - INTERMOUNTAIN REGIONAL LANDFILL\02.100 - LF REDESIGN\CAD\WORKING\CL-2 CLOSURE CAP DETAILS.DWG
FILE DATE: 10.26.2016 13:00:13 (CAH)

10/07



FILE NAME: PROJECTS\373 – INTERMOUNTAIN REGIONAL LANDFILL\02.100 – LF REDESIGN\CAD\WORKING\DS-1 DOWNSPOUT DRAINAGE.DWG
FILE DATE: 10.26.2016 13:28:49 (CAH)

HANSEN ALLEN & LUCE INC ENGINEERS

PROFESSIONAL ENGINEER GORDON L. JONES No. 5048470-2202 10/26/2016 STATE OF UTAH

PROJECT ENGINEER

DESIGNED	TGA	3			
DRAFTED	CAH	2			
CHECKED	GLJ	1			
DATE	OCTOBER 2016	NO.	DATE	REVISIONS	BY / APVD.

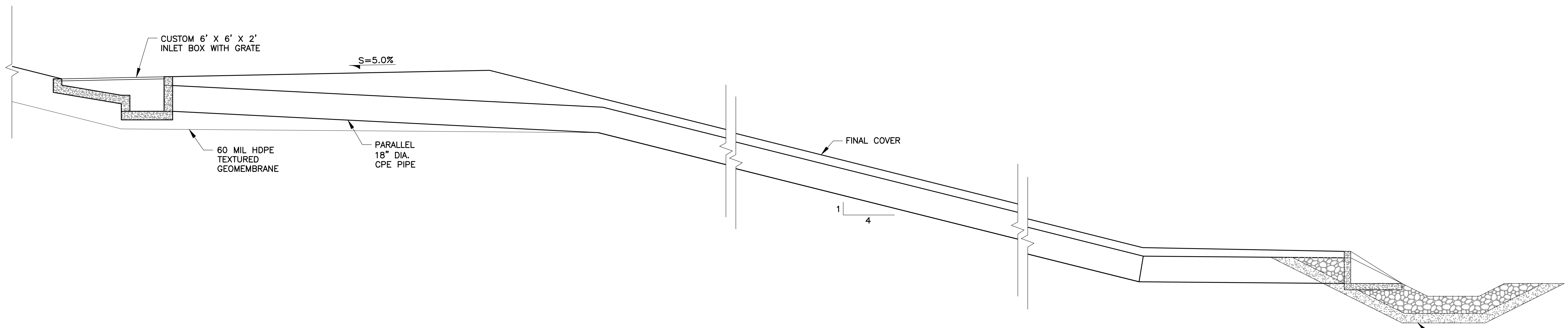
SCALE
AS SHOWN

INTERMOUNTAIN regional landfill

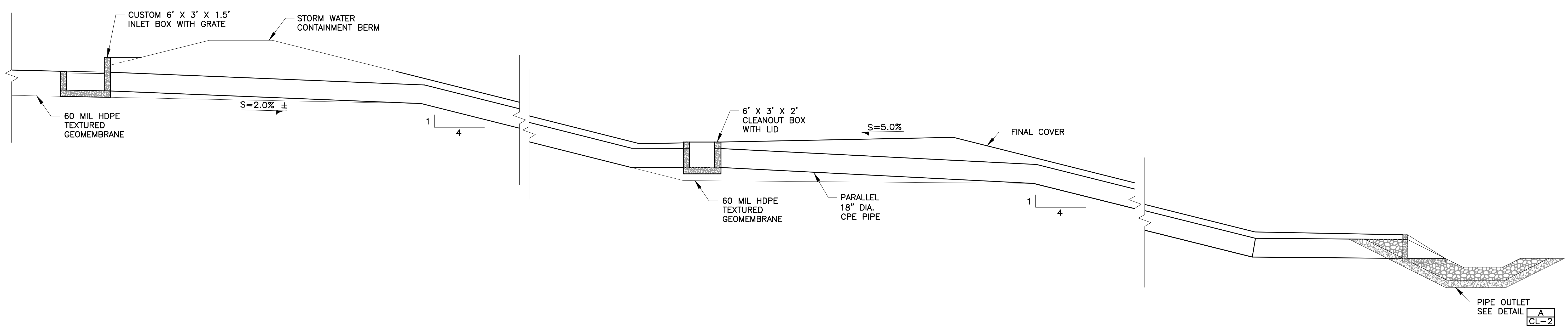
2016 PERMIT MODIFICATION
DRAINAGE SYSTEM
DOWNSPOUT DRAINAGE PLAN

SHEET
DS-1
373-02-100

10/07



TYPICAL BENCH DOWNSPOUT DETAIL B / DS-1
N.T.S.



TYPICAL TOP DOWNSPOUT DETAIL C / DS-1
N.T.S.

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FILE DATE: 10.26.2016 13:34:53 (CAH)

HANSEN ALLEN & LUCE INC ENGINEERS

PROFESSIONAL ENGINEER GORDON L. JONES No. 5048470-2202 10/26/2016 STATE OF UTAH
PROJECT ENGINEER

DESIGNED TGA	3				
DRAFTED CAH	2				
CHECKED GLJ	1				
DATE OCTOBER 2016	NO.	DATE	REVISIONS	BY	APVD.

SCALE
AS SHOWN

INTERMOUNTAIN regional landfill

2016 PERMIT MODIFICATION
DRAINAGE SYSTEM
DOWNSPOUT DETAILS

SHEET
DS-2
373-02-100

APPENDIX B

Geotechnical Investigation

Prepared by:
Earthtec Testing & Engineering, P.C.

October 13, 2006

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GEOTECHNICAL STUDY
INTERMOUNTAIN REGIONAL LANDFILL
FAIRFIELD, UTAH

Prepared By

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Prepared for

Mr David Johnston
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October 13 , 2006

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FIGURES

TABLES

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1.0 INTRODUCTION

Earthtec has completed a geotechnical study for an approximately 1 square mile parcel located about 3 miles south of the town of Fairfield, Utah as shown on Figure No 1, *Vicinity Map* We understand that it is proposed to construct a mixed solid waste landfill This report presents our findings and geotechnical engineering recommendations for the proposed development

The purposes of this study were to 1) evaluate the subsurface soil conditions at the site, 2) assess the engineering characteristics of the subsurface soils, and 3) provide geotechnical recommendations for general site grading and the design and construction of foundations, concrete floor slabs, miscellaneous concrete flatwork, and asphalt pavement sections The scope of work completed for this study included field reconnaissance, subsurface investigation, field and laboratory soil testing, engineering analysis, and the preparation of this report

2 0 CONCLUSIONS

The following is a brief summary of our findings and conclusions

1 Our subsurface exploration included test pits excavated with a rubber tire backhoe, and test holes drilled with a hydraulic drill rig In the test pits we observed approximately 12 to 24 inches of topsoil followed by Fat Clay (CH), Elastic Silt (MH), and a few layers of Silty Sand (SM), extending to the bottom of the test pits at about 10 to 11 feet below the existing surface We also encountered topsoil at the surface of the test hole locations followed by Fat Clay (CH) extending to the bottom of the test holes at about 31½ to 41½ feet below the ground surface Groundwater was not encountered in the test pits nor in the test holes

2 Percolation tests were performed in Test Pits 2, 3, 5, 9, 16, 18, and 19 at depths of about 4½ to 6½ feet below the existing surface Measured percolation rates ranged from 1½ to 24 minutes per inch, but slower rates would likely have been measured if the native soils had been saturated

3 Vegetation should be removed from below areas that will be filled with debris Where structures are planned, both the vegetation and topsoil should be completely removed from below foundation, floor slab, and exterior concrete

flatwork areas Soils in foundation areas disturbed during construction should also be removed or recompacted prior to placement of footings

4 We estimate that a fill depth of 20 feet (with an estimated unit weight of 50 psf for debris fill) will induce approximately 4 inches of consolidation settlement in the underlying native soils

5 The majority of the subsurface clay soils were found to have high plasticity characteristics Each of the consolidation test samples indicated swell potential of about 1 to 1½ % If allowed to become saturated after construction, these soils can swell under foundations and floor slabs causing distress and cracking The drainage recommendations presented in Section 13 0 could be carefully followed if structures are planned

6 Conventional strip and spread footings may be used to support proposed structures within this development Foundations should be constructed entirely on undisturbed, uniform, native soils, or entirely on a minimum 36 inches of structural fill placed on undisturbed native soils Footings constructed on the native soils should be designed for a minimum bearing capacity of 4,000 psf We also recommend a crawl space beneath floor slabs to minimize the potential for swelling soils to impact floor slabs More details regarding foundation design can be found in Section 10 0 of this report

These findings and conclusions should not be relied upon without reading and consulting this entire report for a more detailed description of the geotechnical evaluation and recommendations contained herein

3 0 PROPOSED DEVELOPMENT

We understand that the site will be used as a landfill and understand that the landfill will handle mixed solid waste We also anticipate that some associated structures will be constructed We estimate that foundation loads for structures will not exceed 4 kips per linear foot for bearing walls, 30 kips for columns, and 150 pounds per square foot for floor slabs If structural loads will be greater, our office should be notified so that we may review our recommendations and, if necessary, make modifications

4 0 GENERAL SITE DESCRIPTION

At the time we conducted our subsurface explorations, the site for the proposed landfill was an approximately 1 square mile parcel vegetated with sage brush and weeds No existing structures were observed The ground surface appeared to be relatively flat The site was bounded on the east, west, and south by fields, and on the north by a dirt road

5.0 SUBSURFACE INVESTIGATION

5.1 Soil Exploration

Subsurface soil conditions at the site were investigated under the direction of a qualified member of our geotechnical staff On September 7 and 8, 2006 a rubber tire backhoe was used to excavate 20 test pits extending to approximate depths of 10 to 11 feet below the existing surface On September 27, 2006 we returned to the site with an all-terrain hydraulic drill rig and drilled 2 test holes to depths of about 31½ to 41½ feet below the existing surface The approximate locations of the test pits and the test holes are shown on Figure No 2 at the end of this report

The soils exposed in the test pits, and the samples collected in the test holes, were classified by visual examination following the guidelines of the Unified Soil Classification System (USCS) In the test pits, disturbed bag samples and relatively undisturbed block samples of the subsurface soils were collected at various intervals In the test holes disturbed samples were collected with a 1⅜ inch inside diameter split spoon sampler The split spoon sampler was driven 18 inches into undisturbed soil with a 140 pound hammer free-falling through a distance of 30 inches The blows required to drive the sampler through the final 12 inches of penetration is called the blow count, which is recorded on the attached test hole logs at the respective sample depths When 50 blows were achieved for any 6-inch interval, sampling was stopped and the blows for each 6-inch interval (or less) are indicated on the logs Relatively undisturbed samples were collected with thin walled "Shelby" tubes hydraulically pushed into the soil below the augers by the drill

The collected samples were transported to our Orem, Utah laboratory where they will be retained for 30 days following the date of this report and then discarded, unless a written request for additional holding time is received prior to the 30 day limit

5 2 Percolation Testing

To provide information regarding the permeability of the native soils we conducted percolation tests in several of the test pits as part of our subsurface explorations The percolation tests were performed by digging a small hole into undisturbed soil with a shovel at the depth indicated, filling the hole with water, and measuring the rate of water loss with time The tests were conducted several times and the final measured percolation rate is presented in the following table

Table No 2· Percolation Test Results

TEST PIT NO	DEPTH (ft.)	SOIL TYPE	PERCOLATION RATE (min/inch)
TP-2	6½	SM	1½
TP 3	6	CH	3
TP-5	6	CH	20
TP-9	5	CH	6
TP-16	6	CH	17
TP 18	5	CH	9
TP 19	4½	CH	24

These tests give a representation of how percolation rates may change across the site The soils encountered in the test pits had high plasticity characteristics which would indicate these soils have the ability to absorb a significant amount of water The percolation rates generally were still slowing when the final percolation test was conducted, and actual percolation rates would likely be much slower if the soils were saturated.

6.0 LABORATORY TESTING

From the samples collected m the test pits and test holes, representative samples were selected for laboratory testmg to assess pertment engmeermg properties and to aid m refinmg field classifications, if needed Laboratory testmg consisted of natural moisture content and dry density tests, one-dimensional consohdation tests, Atterberg limits determmations, and mechamcal gradation analyses The following table summarizes the results of the laboratory testmg Test results are also shown on the enclosed test pit and test hole logs at the respective sample depths, and on Figure Nos 26 through 30, *Consolidation-Swell Test*

Table No 1· Laboratory Test Results

TEST PIT/ HOLE NO	DEPTH (ft)	NATURAL MOISTURE (%)	NATURAL DRY DENSITY (pcf)	ATTERBERG LIMITS		GRAIN SIZE DISTRIBUTION (%)			SOIL TYPE
				LIQUID LIMIT	PLASTICITY INDEX	GRAVEL #4	SAND	SILT/ CLAY #200	
TP-2	9	4	---	---	---	0	75	25	SM
TP-4	2½	19	---	50	17	---	---	---	MH
TP-6	8	22	---	63	41	---	---	-	CH
TP-7	9	23	90	70	37	---	---	---	CH
TP-9	7	23	---	73	50	---	---	---	CH
TP-10	8½	26	91	70	50	---	- -	---	CH
TP-12	4	11	---	---	---	0	37	63	ML
TP-14	6	20	93	71	47	---	---	---	CH
TP-15	7½	19	93	61	37	---	---	---	CH
TP-16	8½	20	---	70	46	---	- -	---	CH
TP-18	9	22	---	71	47	---	---	---	CH
TP-19	4	16	---	53	28	---	---	---	CH
TP-20	3	16	-	58	35	---	---	---	CH
TH-1	15	21	97	77	51	---	---	--	CH
TH-1	25	19	---	52	26	---	---	---	CH

Table No. 1 Laboratory Test Results continued

TEST PIT NO	DEPTH (ft)	NATURAL MOISTURE (%)	NATURAL DRY DENSITY (pcf)	ATTERBERG LIMITS		GRAIN SIZE DISTRIBUTION (%)			SOIL TYPE
				LIQUID LIMIT	PLASTICITY INDEX	GRAVEL #4	SAND	SILT/ CLAY #200	
TH-2	20	13	---	55	36	---	--	- -	CH
TH-2	30	15	---	55	33	---	- -	---	CH

7.0 SUBSURFACE CONDITIONS

7.1 Soil Types

At the locations of the test pits we encountered about 12 to 24 inches of topsoil at the surface Subsurface soils were predominately fine-grained and consisted of Fat Clay (CH), Elastic Silt (MH), and a few layers of Silty Sand (SM) to Sandy Silt (ML), extending to the maximum depths explored in the test pits of approximately 10 to 11 feet below the existing ground surface

At the locations of the test holes we also encountered topsoil at the surface which we estimated to extend about 18 inches in depth, followed by layers of Fat Clay (CH) extending to the bottom of the test holes at about 31½ to 41½ feet below the existing surface The subsurface soils encountered in the test holes below those observed in the test pits were found to be very stiff to hard and the hydraulic drill ng had considerable difficulty penetrating to the exploration depths

Graphical representations and detailed descriptions of the soils encountered in the test pits and test holes are shown on Figure Nos 3 through 22, *Test Pit Log*, and Figure Nos 23 and 24, *Test Hole Log*, at the end of this report The stratification lines shown on the logs represent the approximate boundary between soil units, the actual transition may be gradual Due to potential natural variations inherent in soil deposits, care should be taken in interpolating between and extrapolating beyond exploration points A key to the symbols and terms on the logs is presented on Figure No 25, *Legend*

7.2 Groundwater

Groundwater was not encountered within the depths explored Groundwater levels will fluctuate in response to the season, precipitation and snow melt, irrigation, and other on and off-site influences Precisely quantifying these fluctuations would require long term monitoring

8.0 SITE GRADING

8 1 General Site Grading

Vegetation should be removed from below the landfill areas Unsuitable soils and vegetation should be removed from below foundation, floor slab, exterior concrete flatwork, and pavement areas to minimize the potential for distress and settlement Unsuitable soils consist of topsoil, organic soils, undocumented fill, soft, loose, or disturbed native soils, and any other inapt materials Topsoil was encountered on the surface of the site which extended to depths of about 12 to 24 inches below the existing surface The topsoil, including any soil containing roots larger than about ¼ inch in diameter, and any other unsuitable soils, should be completely removed beneath building, flatwork, and pavement areas

Fill placed over large areas, even if only a few feet in depth, can cause consolidation in the underlying native soils and settlement of the overlying fill We assume that fairly deep fills will be placed on the site For settlement estimates (See Section 10 2) we have assumed that the material placed and compacted in the landfill will have a density of about 50 pounds per cubic foot

8 2 Temporary Excavations

For temporary excavations less than 5 feet in depth into the native soils or into structural fill, slopes should not be made steeper than 0 5 1 0 (horizontal vertical) Temporary excavations extending up to 10 feet in depth should not be made steeper than 1 1 If unstable conditions or groundwater seepage are encountered, flatter slopes, shoring, or bracing may be required

8 3 Fill Material

The native soils are not suitable for use as structural fill due to their generally high plasticity characteristics and difficulty controlling the moisture content needed to achieve the required compaction These soils are also subject to swelling and shrinkage with changes in moisture content

Structural fill should consist of imported material meeting the following requirements

Maximum particle size	4 inches
Percent retained on the 3/4 inch sieve (coarse gravel)	30 maximum
Percent passing the No 200 sieve (fines)	15 maximum
Liquid Limit of fines	35 maximum
Plasticity Index of fines	15 maximum

In some situations, particles larger than 4 inches and/or more than 30 percent coarse gravel may be acceptable, however, compaction and compaction testing may be more difficult As a result more strict quality control measures than normally used may be required Such measures may include using thinner lifts, and increased or full time observation of fill placement.

Utility trench fill below structures, concrete flatwork, and asphalt paving should consist of structural fill as defined above

8 4 Fill Placement and Compaction

The thickness of each lift should be appropriate for the compaction equipment that is used We recommend a maximum lift thickness of 4 inches for hand operated equipment, 6 inches for most "trench compactors", and 8 inches for larger rollers, unless it can be demonstrated by in-place density tests that the required compaction can be obtained throughout a thicker lift The full thickness of each lift of structural fill placed should be compacted to at least the following percentages of the maximum dry density, as determined by ASTM D-1557

In landscape areas not supportaıg structural loads	90%
Less than 5 feet of fill below foundatıons, flatwork and pavements	95%
Fıve or more feet of fill below foundatıons, flatwork and pavements	98%

Generally, placmg and compactıng fill at a moısture content wıthın 2% of the optımum moısture content, as determmed by **ASTM D**-1557, wıll facılıtate compactıon Typıcally, the further the moısture content ıs from optımum the more dıfficult ıt wıll be to achıeve the reqmred compactıon

Fıll should be tested frequently dunng placement and early testmg (mıtıal lıft) ıs recommended to demonstrate that placement methods and compactıon efforts are achıevmg the requıred compactıon It ıs the contractor's responsıbılıty to ensure that fill matenals and compactıon efforts are consıstent so that tested areas are representatıve of the entıre fill

9 0 SEISMIC CONSIDERATIONS

9.1 Fauhmg

Based on publıshed data no actıve faults are known to traverse the sıte and no surficıal evıdence of faultmg was observed durmg our field mvestıgatıon The nearest mapped[1] fault trace consıdered to be actıve ıs one of a group of faults located beneath Utah Lake and ıs located approxımately 12 mıles east of the sıte

9.2 Liquefaction Potentıal

The sıte appears to be located m an area mapped by the Utah Geologıcal Survey[2] as havmg very low lıquefactıon potentıal Lıquefactıon ıs a phenomenon where a soıl loses mtergranular strength due to an mcrease m soıl pore water pressures dunng a dynamıc event such as an earthquake The potentıal for lıquefactıon ıs based on several factors, mcludmg 1) the gram sıze

[1]Hecker, S , 1993, Quaternary Faults and Folds, Utah, Utah Geologıc Survey, Bulletın 127

[2]Lıquefactıon Potentıal Map, Utah Geologıcal Survey, Pubhc Informatıon Senes 25 1994

distribution of the soil, 2) the plasticity of the fine fraction of the soil (material passing the No 200 sieve), 3) relative density of the soil, 4) earthquake strength (magnitude) and duration, and 5) overburden pressures In addition, the soils must be saturated for liquefaction to occur As a part of this investigation, the potential for liquefaction to occur in the soils we observed was assessed

Loose, saturated sands are most susceptible to liquefaction, but soft, sensitive silt soils also have the potential to experience failure and movement during a seismic event Sand soils encountered in the test pits were unsaturated, and the remainder of the soils were predominately composed of Fat Clay (CH), typically considered non-liquefiable These conditions, in our opinion, support the very low liquefaction potential designation

9.3 IRC Seismic Design Category

The Site Class definitions in the International Building Code (IBC) are based upon the soil properties in the upper 100 feet of the soil profile These properties are determined from SPT blow counts and undrained shear strength measurements The code states that "Where site specific data are not available to a depth of 100 feet, appropriate soil properties may be estimated by the registered design professional preparing the soils report " We estimate the soils encountered in the test pits and test holes have properties consistent with those defined by Site Class D

The site is located at approximately 40 21 degrees latitude and -112 07 degrees longitude Using Site Class D, the design spectral response acceleration parameters are 0 55 g for S_{DS} and 0 31 g for S_{D1}, for short and one second periods, respectively The intermediate values from the IBC used to obtain the design parameters are contained in Table Nos 2 and 3 below

Table No. 2: Design Acceleration for Short Period

S_S	F_a	S_{MS}	S_{DS}
[illegible]	[illegible]	$S_{MS} = F_a S_s$	$S_{DS} = 2/3\ S_{MS}$
0 65 g	1 28	0 83 g	0 55 g

S_S = The mapped spectral accelerations for short penods from Figure 1615(5)
F_a = Site coefficient from Table 1615 1 2(1)
S_{MS} = The maximum considered earthquake spectral response accelerations for short periods
S_{DS} = Five-percent damped design spectral response acceleration at short periods

Table No. 3: Design Acceleration for 1 Second Period

S_1	F_v	S_{M1}	S_{D1}
[illegible]	[illegible]	$S_{M1} = F_v S_1$	$S_{D1} = 2/3\ S_{M1}$
0 24 g	1 92	0 46 g	0 31 g

S_1 = The mapped spectral accelerations for 1-second penod from Figure 1615(6)
F_v = Site coefficient from Table 1615 1 2(2)
S_{M1} = The maximum considered earthquake spectral response accelerations for 1 second period
S_{D1} = Five-percent damped design spectral response acceleration at 1 second penod

10.0 FOUNDATIONS

10 1 General

The foundation recommendations presented in this report are based on the sod conditions observed in the test pits, the results of laboratory testing of samples of the native soils, the site grading recommendations presented in this report, and the foundation loading conditions presented in Section 3 0, *Proposed Construction*, of this report If loading conditions are significantly different, we should be notified in order to re-evaluate our design parameters and estimates, and to provide additional recommendations if necessary

Conventional strip and spread footings may be used to support proposed structures Foundations should not be installed on topsoil, disturbed native soils, undocumented fill, debris, combination soils (structural fill/native soil combinations), frozen soil, or in ponded water If foundation soils become disturbed during construction they should be removed or recompacted until firm

The native soils have a potential to swell when wetted Foundations constructed directly on undisturbed, uniform native soils should be designed for a minimum bearing pressure of 4,000 psf to help counter potential swell pressures which could develop if the native soils are allowed to become saturated As an alternative, native soils directly below footings could be over excavated a minimum of 36 inches and replaced with compacted structural fill and footings designed for a maximum bearing capacity of 4,000 psf The recommendations given in Section 13 0 below should also be carefully followed to minimize the potential for foundation soils to become saturated

A representative from Earthtec should observe the soil conditions in foundation excavations if soil conditions differing from those described in this report are encountered Other general footing design parameters are as follows

Minimum embedment for frost protection	30 inches
Minimum strip footing width	20 inches
Minimum spot footing width	30 inches
Bearing pressure increase for transient loading	33 percent

Structural fill used below foundations should extend laterally a minimum of 12 inches for every 12 vertical inches of structural fill placed For example, if 36 inches of structural fill are required to bring the excavation to footing grade, the structural fill should extend laterally a minimum of 36 inches beyond the edge of the footings

10.2 Estimated Settlement

For structures, if the proposed foundations are properly designed and constructed using the parameters provided above, total settlement for non-earthquake conditions is estimated not to exceed one inch Differential settlement is anticipated to be one-half of the total settlement over a 25-foot length of foundation Additional movements could occur during an earthquake due to ground shaking, or if foundation soils become saturated

We estımate that consohdatıon setdement of about 4 mches wıll occur under the weıght of 20 feet of debns fill Deeper fill depths could cause addıtıonal setdement

11 0 FLOOR SLABS

The swell potentıal of the natıve sods could have the most detrımental ımpact to floor slabs ıf allowed to become saturated after constructıon To mınımıze thıs potentıal we recommend that crawl-spaces be constructed between the floor slabs and the natıve sods Suspended concrete floor slabs would requıre proper desıgn by a structural engmeer

For extenor concrete flat work, to facıhtate constructıon, act as a capıllary break, and aıd m dıstnbutmg loads we recommend that extenor flatwork be underlam by four mches of free-dıaınmg granular matenal such as "pea" gravel or three-quarters to one-mch mmus clean gravel supported on natıve sods or structural fill

Specıal precautıons should be taken durmg placement and cunng of all concrete slabs and flatwork Excessıve slump (hıgh water-cement ratıos) of the concrete and/or ımproper fimshmg and curmg procedures used durmg hot or cold weather condıtıons may lead to excessıve shnnkage, crackmg, spalhng, or curhng of slabs We recommend all concrete placement and curmg operatıons be performed m accordance wıth Amencan Concrete Instıtute (ACI) codes and practıces

12.0 MOISTURE CONTROL AND SURFACE DRAINAGE

The natıve subsurface soıls were found to have hıgh plastıcıty characterıstıcs and a potentıal to swell when wetted To mmımıze the potentıal for subsurface soıls to become wetted below and adjacent to any structures constructed at thıs sıte we recommend that the followmg precautıons be taken

1 Adequate compaction of foundation backfill should be provided i e a mmimum of 90% of ASTM D-1557 Water consolidation methods should not be used

2 The ground surface should be graded to dram away from structures m all directions We recommend a mmimum fall of 8 mches m the first 10 feet More slope may be needed96 m areas where settlement due to debns fill wlll occur

3 Roof runoff should be collected m ram gutters with down spouts designed to discharge well outside of the backfill limits, or at least 10 feet from foundations, whichever is greater

4 Spnnklers should be aimed away from foundation walls and sprinkler heads, lmes, and valves should be kept at least 5 feet from foundations Sprmkler systems should be well mamtamed, checked for leaks frequently, and repaired prompdy Over watenng should be avoided and consideration should be given to mmimizmg lawn areas

5 Any additional precautions which may become evident durmg construction

13.0 GENERAL CONDITIONS

The exploratory data presented m this report was collected to provide geotechmcal design recommendations for this project The test pits and test holes may not be indicative of subsurface conditions outside the study area or between pomts explored and thus have a limited value m depicting subsurface conditions for conttactor biddmg Vanations from the conditions portrayed m the test pits and test holes may occur and may be sufficient to require modifications m the design If dunng construction, conditions are different than presented m this report, please advise us so that the appropriate modifications can be made

The geotechmcal study as presented m this report was conducted withm the limits prescnbed by our chent, with the usual thoroughness and competence of the engmeermg profession m the area No other warranty or representation, either expressed or implied, is mtended m our proposals, contracts or reports

We appreciate the opportumty of providnrg our services on thrs project If we can answer questions or be of further service, please call

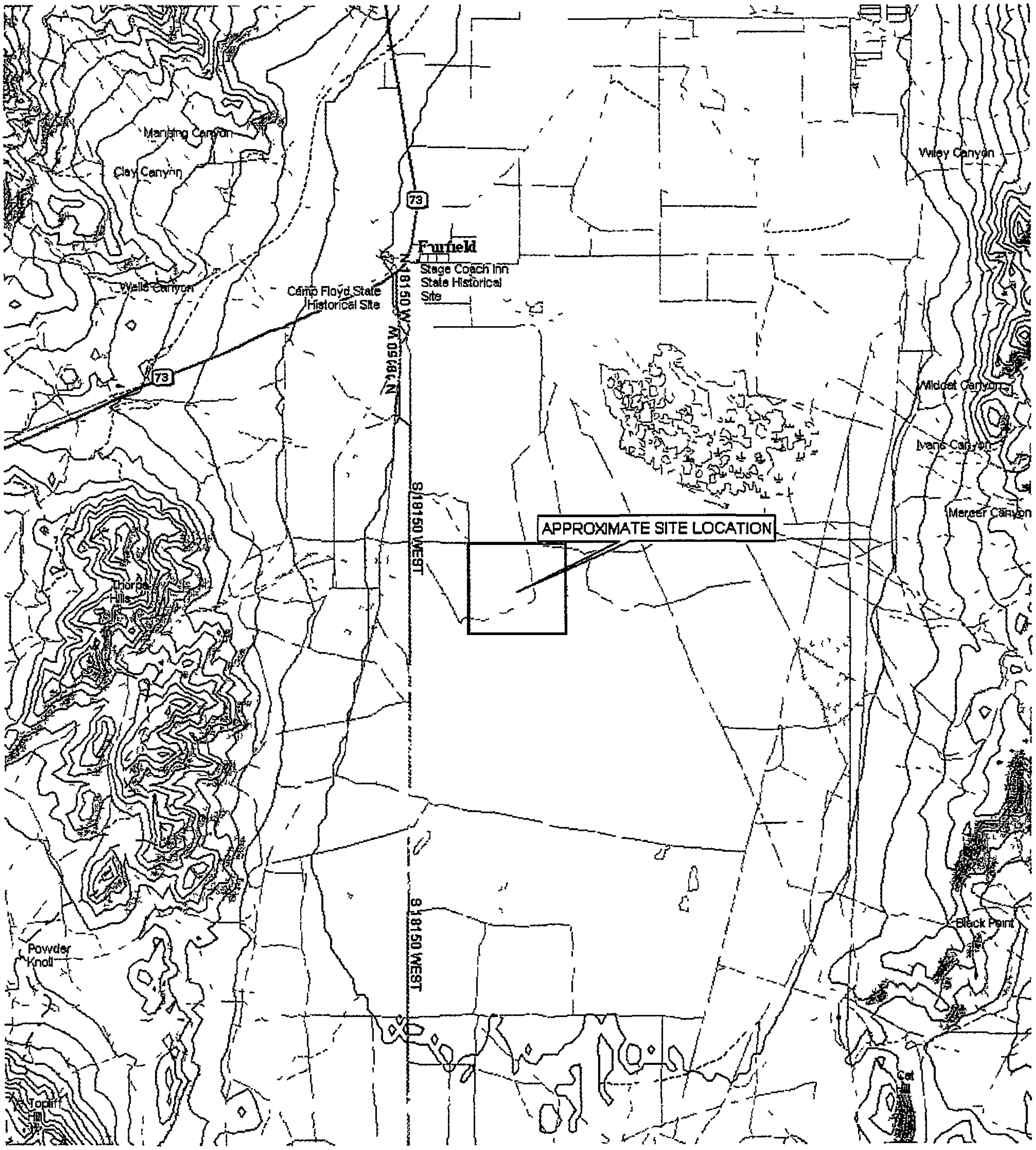
Respectfully,

EARTHTEC TESTING AND ENGINEERING, P.C

Jeffrey J Egbert, P E
Project Geotechmcal Engmeer

Wrlham G Turner, P E
Semor Geotechmcal Engmeer

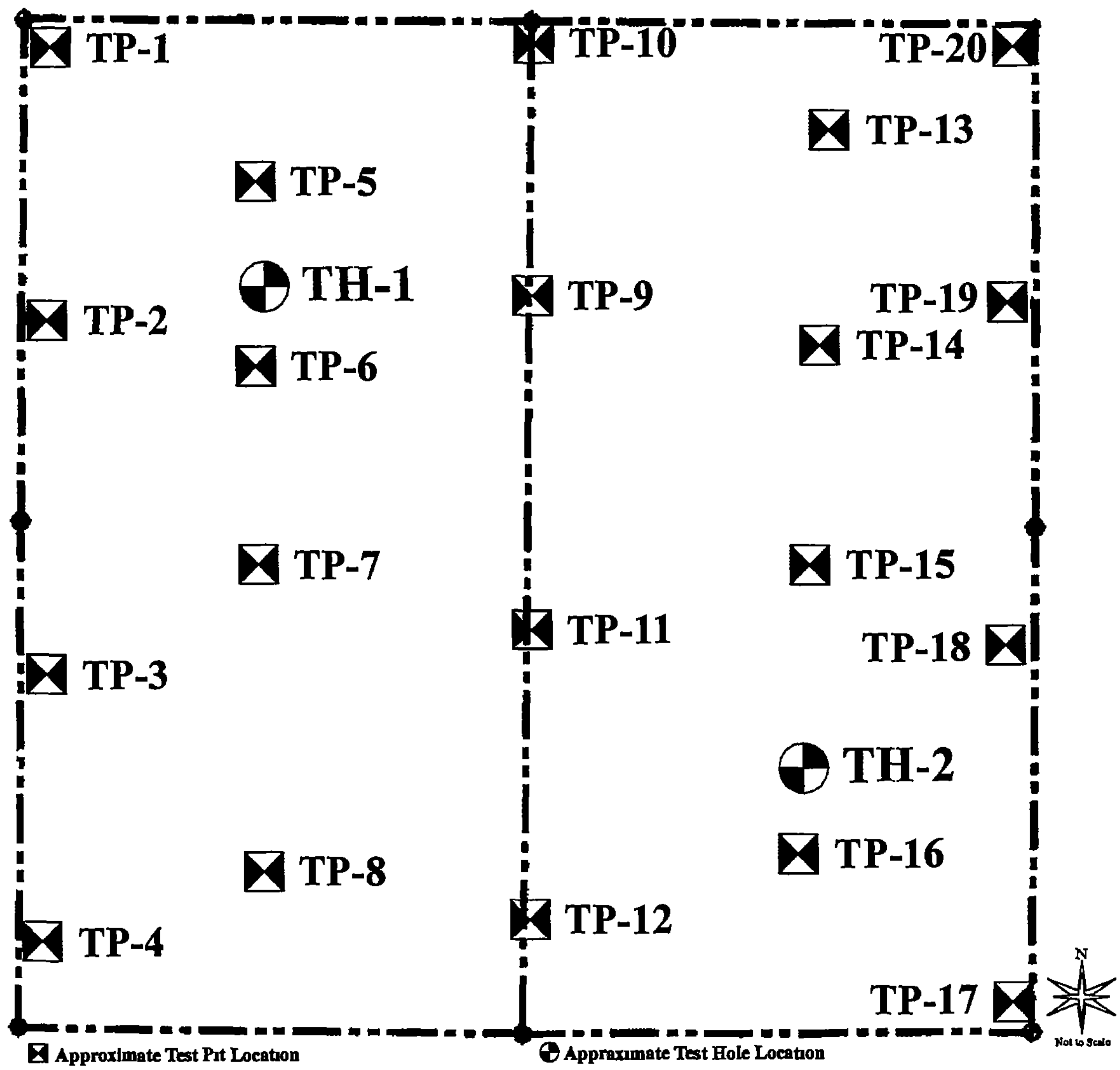
VICINITY MAP
INTERMOUNTAIN REGIONAL LANDFILL



PROJECT NO 062496	Earthtec Testing and Engineering, P.C.	FIGURE NO. 1

SITE PLAN & LOCATION OF EXPLORATIONS

INTERMOUNTAIN REGIONAL LANDFILL



PROJECT NO.. 062496	Earthtec Testing and Engineering P.C.	FIGURE NO.. 2

TEST PIT LOG

NO.: TP- 1

PROJECT	Intermountain Regional Landfill	**PROJECT NO**	062496
CLIENT	David Johnston	**DATE**	09/07/06 - 09/08/06
LOCATION	Refer to Figure 2	**ELEVATION**	NM
OPERATOR	Halls	**LOGGED BY**	P E
EQUIPMENT	RTB		

DEPTH TO WATER, INITIAL ∇ **AT COMPLETION** ▼

Depth (Ft)	Graphic Log	USGS	Description	Samples	Water Cent (%)	Dry Dens (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0–2			TOPSOIL Silt with sand, dry, light brown									
2–6.5		CH	FAT CLAY, some sand, very stiff, slightly moist to moist, gray	X								
				X								
6.5–10		SM	SILTY SAND, medium dense, moist, brown	X								
10–11		CH	FAT CLAY with sand, very stiff, moist, gray	X								
11			Bottom at approximately 11 feet									

Notes No groundwater encountered

Tests Key
- CBR = California Bearing Ratio
- C = Consolidation
- R = Resistivity
- DS = Direct Shear
- SS = Soluble Sulfates
- UC = Unconfined Compressive Strength

PROJECT NO.: 062496 Earthtec Testing and Engineering, P.C. **FIGURE NO** 3

TEST PIT LOG

NO.: TP-2

PROJECT	Intermountain Regional Landfill	**PROJECT NO.**	062496
CLIENT	David Johnston	**DATE**	09/07/06 - 09/08/06
LOCATION	Refer to Figure 2	**ELEVATION**	NM
OPERATOR	Halls	**LOGGED BY**	P E
EQUIPMENT:	RTB		
DEPTH TO WATER, INITIAL ▽		**AT COMPLETION** ▼ .	

Depth (Ft)	USCS	Description	Samples	Water Cont (%)	Dry Dens (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0–2		TOPSOIL Silt with sand, dry, brown									
2–6	CH	FAT CLAY with sand, minor pinholes, very stiff, slightly moist to moist, gray	X								
			X								
6–10	SM	SILTY SAND, medium dense, moist, brown	X	4				0	75	25	
10–12		Bottom at approximately 10 feet									

Notes No groundwater encountered

Tests Key
- CBR = California Bearing Ratio
- C = Consolidation
- R = Resistivity
- DS = Direct Shear
- SS = Soluble Sulfates
- UC = Unconfined Compressive Strength

PROJECT NO. 062496 | Earthtec Testing and Engineering, P.C. | **FIGURE NO** 4

TEST PIT LOG
NO.: TP- 3

PROJECT	Intermountain Regional Landfill	**PROJECT NO**	062496
CLIENT.	David Johnston	**DATE:**	09/07/06 - 09/08/06
LOCATION	Refer to Figure 2	**ELEVATION**	NM
OPERATOR	Halls	**LOGGED BY**	P E
EQUIPMENT.	RTB		

DEPTH TO WATER, INITIAL ▽ **AT COMPLETION** ▼

Depth (Ft)	Graphic Log	USCS	Description	Samples	Water Cont (%)	Dry Dens (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0–2			TOPSOIL Silt with sand, dry, brown									
2–7		CH	FAT CLAY with sand, very stiff, slightly moist, gray-brown	X (≈4.5 ft), X (≈6.5 ft)								
7–10		SM	SILTY SAND, medium dense, moist, brown	X (≈10 ft)								
10			Bottom at approximately 10 feet									

Notes No groundwater encountered

Tests Key
- CBR = California Bearing Ratio
- C = Consolidation
- R = Resistivity
- DS = Direct Shear
- SS = Soluble Sulfates
- UC = Unconfined Compressive Strength

PROJECT NO 062496 — Earthtec Testing and Engineering, P.C. — **FIGURE NO** 5

TEST PIT LOG

NO.: TP- 4

PROJECT	Intermountain Regional Landfill	**PROJECT NO**	062496
CLIENT	David Johnston	**DATE**	09/07/06 - 09/08/06
LOCATION	Refer to Figure 2	**ELEVATION**	NM
OPERATOR	Halls	**LOGGED BY.**	P E
EQUIPMENT	RTB		
DEPTH TO WATER, INITIAL ∇		**AT COMPLETION** ▼	

Depth (Ft)	Graphic Log	USCS	Descoption	Samples	Water Cont (%)	Dry Dens (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0–2			TOPSOIL Silt with sand, dry, brown									
2–7		MH	ELASTIC SILT with sand, minor pinholes, very stiff, slightly moist, gray	X (3)	19		50	17				
				X (7)								
7–10		SM	SILTY SAND, medium dense, moist, brown	X (9.5)								
10–12			Bottom at approximately 10 feet.									

Notes No groundwater encountered

Tests Key
- CBR = California Bearing Ratio
- C = Consolidation
- R = Resistivity
- DS = Direct Shear
- SS = Soluble Sulfates
- UC = Unconfined Compressive Strength

PROJECT NO. 062496 | Earthtec Testing and Engineering, P.C. | **FIGURE NO** 6

TEST PIT LOG

NO.: TP- 5

PROJECT	Intermountain Regional Landfill	**PROJECT NO**	062496
CLIENT	David Johnston	**DATE**	09/07/06 - 09/08/06
LOCATION	Refer to Figure 2	**ELEVATION**	NM
OPERATOR	Halls	**LOGGED BY**	P E
EQUIPMENT	RTB		
DEPTH TO WATER, INITIAL ▽		**AT COMPLETION** ▼ .	

Depth (Ft)	Graphic Log	USCS	Description	Samples	Water Cont (%)	Dry Dens (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0–2			TOPSOIL Silt with sand, dry, brown									
2–10		CH	FAT CLAY, very stiff, slighlty moist to moist, gray									Perc
10			Bottom at approximately 10 feet									

Notes No groundwater encountered

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO 062496 | Earthtec Testing and Engineering, P.C. | **FIGURE NO** 7

LOG OF TESTPIT 062496 GPJ EARTHTEC GDT 4/12/07

TEST PIT LOG

NO.: TP- 6

PROJECT	Intermountain Regional Landfill	**PROJECT NO**	062496
CLIENT	David Johnston	**DATE**	09/07/06 - 09/08/06
LOCATION:	Refer to Figure 2	**ELEVATION:**	NM
OPERATOR:	Halls	**LOGGED BY:**	P E
EQUIPMENT:	RTB		
DEPTH TO WATER, INITIAL ▽		**AT COMPLETION** ▼ .	

Depth (Ft.)	Graphic Log	USCS	Description	Samples	Water Cont (%)	Dry Dens (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0–2			TOPSOIL Silt with sand, dry, brown									
2–10		CH	FAT CLAY with sand, pockets of white sand, very stiff, slightly moist, gray									
~5.5				X								
~8.5				X	22		63	41				
10			Bottom at approximately 10 feet									

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

Notes No groundwater encountered

Tests Key
- CBR = California Bearing Ratio
- C = Consolidation
- R = Resistivity
- DS = Direct Shear
- SS = Soluble Sulfates
- UC = Unconfined Compressive Strength

TEST PIT LOG

NO.: TP- 7

PROJECT	Intermountain Regional Landfill	**PROJECT NO**	062496
CLIENT	David Johnston	**DATE**	09/07/06 - 09/08/06
LOCATION	Refer to Figure 2	**ELEVATION**	NM
OPERATOR	Halls	**LOGGED BY**	P E
EQUIPMENT	RTB		
DEPTH TO WATER, INITIAL ▽		**AT COMPLETION** ▼	

Depth (Ft)	Graphic Log	USCS	Description	Samples	Water Cont (%)	Dry Dens (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0–2			TOPSOIL Silt with sand, dry, brown									
2–10		CH	FAY CLAY with sand, very stiff, slightly moist to moist, gray									
5				X								
9.5				■	23	90	70	37				C
10			Bottom at approximately 10 feet									

Notes No groundwater encountered

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO 062496 | Earthtec Testing and Engineering, P.C. | **FIGURE NO** 9

TEST PIT LOG
NO.: TP- 8

PROJECT	Intermountain Regional Landfill	**PROJECT NO**	062496
CLIENT·	David Johnston	**DATE**	09/07/06 - 09/08/06
LOCATION·	Refer to Figure 2	**ELEVATION**	NM
OPERATOR	Halls	**LOGGED BY**	P E
EQUIPMENT	RTB		

DEPTH TO WATER, INITIAL ∇ **AT COMPLETION ▼**

Depth (Ft)	Graphic Log	USCS	Description	Samples	Water Cont (%)	Dry Dens (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0–2			TOPSOIL Silt with sand, dry, brown									
2–10		CH	FAT CLAY with layers of white sand, very stiff, slightly moist to moist, gray	X (5–5.5), X (9–9.5)								
10–12			Bottom at approximately 10 feet									

Notes No groundwater encountered

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

TEST PIT LOG

NO.: TP- 9

PROJECT	Intermountain Regional Landfill	**PROJECT NO**	062496
CLIENT	David Johnston	**DATE.**	09/07/06 - 09/08/06
LOCATION.	Refer to Figure 2	**ELEVATION**	NM
OPERATOR	Halls	**LOGGED BY**	P E
EQUIPMENT	RTB		
DEPTH TO WATER, INITIAL ∇.		**AT COMPLETION** ▼	

Depth (Ft)	Graphic Log	USCS	Description	Samples	Water Cont (%)	Dry Dens (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0–2			TOPSOIL Silt with sand, dry, brown									
2–10		CH	FAT CLAY with layers of white sand, very stiff, slightly moist to moist, gray									
3.5				X								
5												Perc
7.5				X	23		73	50				
10–12			Bottom at approximately 10 feet									

Notes No groundwater encountered

Tests Key
- CBR = California Bearing Ratio
- C = Consolidation
- R = Resistivity
- DS = Direct Shear
- SS = Soluble Sulfates
- UC = Unconfined Compressive Strength

TEST PIT LOG

NO.: TP-10

PROJECT	Intermountam Regional Landfill	**PROJECT NO**	062496
CLIENT	David Johnston	**DATE·**	09/07/06 - 09/08/06
LOCATION	Refer to Figure 2	**ELEVATION·**	NM
OPERATOR	Halls	**LOGGED BY**	P E
EQUIPMENT	RTB		

DEPTH TO WATER, INITIAL ▽ **AT COMPLETION** ▼

Depth (Ft)	Graphic Log	USCS	Description	Samples	Water Cont (%)	Dry Dens (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0–2			TOPSOIL Silt with sand, dry, brown									
2–10		CH	FAT CLAY with layers of white sand, very stiff, slightly moist to moist, gray									
~4.5				X								
~8				X								
9				X	26	91	70	50				C
10–12			Bottom at approximately 10 feet									

Notes. No groundwater encountered

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO · 062496 | Earthtec Testing and Engineering, P.C. | **FIGURE NO** 12

TEST PIT LOG

NO.: TP-11

PROJECT	Intermountam Regional Landfill	**PROJECT NO**	062496
CLIENT	David Johnston	**DATE.**	09/07/06 - 09/08/06
LOCATION.	Refer to Figure 2	**ELEVATION**	NM
OPERATOR	Halls	**LOGGED BY**	P E
EQUIPMENT	RTB		
DEPTH TO WATER, INITIAL ∇		**AT COMPLETION** ▼	

Depth (Ft)	Graphic Log	USCS	Description	Samples	Water Cont (%)	Dry Dens (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0–2			TOPSOIL Silt with sand, dry, brown									
2–10		CH	FAT CLAY with sand, some layers of white sand, very stiff, slightly moist to moist, gray	X (approx. 5–5.5)								
			Minor pinholes at 8 5 feet	X (approx. 9–9.5)								
10			Bottom at approximataly 10 feet									

Notes No groundwater encountered

Tests Key
- CBR = Cahforma Bearing Ratio
- C = Consolidation
- R = Resistivity
- DS = Direct Shear
- SS = Soluble Sulfates
- UC = Unconfined Compressive Strength

PROJECT NO 062496 Earthtec Testing and Engineering, P.C. **FIGURE NO** 13

TEST PIT LOG

NO.: TP-12

PROJECT Intermountain Regional Landfill
PROJECT NO. 062496
CLIENT David Johnston
DATE. 09/07/06 - 09/08/06
LOCATION Refer to Figure 2
ELEVATION NM
OPERATOR Halls
LOGGED BY P E
EQUIPMENT RTB
DEPTH TO WATER, INITIAL ▽
AT COMPLETION ▼

Depth (Ft)	Graphic Log	USCS	Description	Samples	Water Cont (%)	Dry Dens (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0–2			TOPSOIL Silt with sand, dry, brown									
2–5		ML	Sandy SILT, stiff, slightly moist, brown	X	11				0	37	63	
5–10		CH	FAT CLAY with sand, very stiff, slightly moist to moist, gray-brown	X								
				X								
10			Bottom at approximately 10 feet									

Notes. No groundwater encountered

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO 062496 Earthtec Testing and Engineering, P.C. **FIGURE NO** 14

LOG OF TESTPIT 062496 GPJ EARTHTEC GDT 4/12/07

TEST PIT LOG
NO.: TP-13

PROJECT	Intennountain Regional Landfill	**PROJECT NO** ·	062496
CLIENT.	David Johnston	**DATE·**	09/07/06 - 09/08/06
LOCATION	Refer to Figure 2	**ELEVATION**	NM
OPERATOR	Halls	**LOGGED BY**	P E
EQUIPMENT	RTB		
DEPTH TO WATER, INITIAL ⊻		**AT COMPLETION** ▼	

Depth (Ft.)	Graphic Log	USCS	Description	Samples	Water Cont (%)	Dry Dens (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL Silt with sand, dry, brown									
1												
2			FAT CLAY with sand, minor pinholes, very stiff, slightly moist, white									
3												
4				X								
5			Moist, gray-brown at 4 feet,	X								
6		CH										
7												
8				X								
9												
10			Bottom at approximately 10 feet									
11												
12												

Notes No groundwater encountered

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO 062496 — Earthtec Testing and Engineering, P.C. — **FIGURE NO** 15

LOG OF TESTPIT 062496 GPJ EARTHTEC GDT 4/12/07

TEST PIT LOG

NO.: TP-14

PROJECT	Intermountain Regional Landfill	**PROJECT NO**	062496
CLIENT	David Johnston	**DATE:**	09/07/06 - 09/08/06
LOCATION	Refer to Figure 2	**ELEVATION:**	NM
OPERATOR	Halls	**LOGGED BY:**	P E
EQUIPMENT	RTB		

DEPTH TO WATER, INITIAL ▽ **AT COMPLETION** ▼

Depth (Ft)	Graphic Log	USCS	Description	Samples	Water Cont (%)	Dry Dens (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0–1			TOPSOIL Silt with sand, dry, brown									
1–10		CH	FAT CLAY with sand, minor pinholes, very stiff, slightly moist, white									
4				X								
4.3			Moist, gray at 4 feet									
6.4				▮	20	93	71	47				C
9.5				X								
10			Bottom at approximately 10 feet									

Notes: No groundwater encountered

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO 062496 Earthtec Testing and Engineering, P.C. **FIGURE NO.** 16

TEST PIT LOG
NO.: TP-15

PROJECT	Intermountain Regional Landfill	**PROJECT NO**	062496
CLIENT.	David Johnston	**DATE**	09/07/06 - 09/08/06
LOCATION	Refer to Figure 2	**ELEVATION**	NM
OPERATOR·	Halls	**LOGGED BY**	P E
EQUIPMENT·	RTB		

DEPTH TO WATER; INITIAL ▽ **AT COMPLETION ▼**

Depth (Ft)	Graphic Log	USCS	Description	Samples	Water Cont (%)	Dry Dens (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0–1			TOPSOIL Silt with sand, dry, brown									
2–4			FAT CLAY with sand, minor pinholes, very stiff, slightly moist, light brown									
5				X								
6		CH	Moist, gray at 5 feet									
8				▌	19	93	61	37				C
10–12			Bottom at approximately 10 feet									

Notes No groundwater encountered

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

TEST PIT LOG
NO.: TP-16

PROJECT	Intermountain Regional Landfill	**PROJECT NO**	062496
CLIENT	David Johnston	**DATE**	09/07/06 - 09/08/06
LOCATION	Refer to Figure 2	**ELEVATION**	NM
OPERATOR.	Halls	**LOGGED BY**	P E
EQUIPMENT	RTB		
DEPTH TO WATER, INITIAL ∇.		**AT COMPLETION ▼**	

Depth (Ft)	Graphic Log	USCS	Description	Samples	Water Cont (%)	Dry Dens (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0–2			TOPSOIL Silt with sand, dry, brown									
2–10		CH	FAT CLAY with sand, very stiff, slightly moist, light brown									Perc
4			Moist, gray at 4 feet	X								
9				X	20		70	46				
10			Bottom at approximately 10 feet.									

Notes No groundwater encountered

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

TEST PIT LOG

NO.: TP-17

PROJECT	Intermountain Regional Landfill	**PROJECT NO**	062496
CLIENT	David Johnston	**DATE**	09/07/06 - 09/08/06
LOCATION	Refer to Figure 2	**ELEVATION**	NM
OPERATOR	Halls	**LOGGED BY**	P E
EQUIPMENT	RTB		
DEPTH TO WATER, INITIAL ▽ .		**AT COMPLETION** ▼	

Depth (Ft)	Graphic Log	USCS	Description	Samples	Water Cont (%)	Dry Dens (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0–2			TOPSOIL Silt with sand, dry, brown									
2–10		CH	FAT CLAY with layers of white sand, very stiff, slightly moist to moist, gray-brown	X (~3.2–3.7 ft); X (~7.2–7.7 ft)								
10			Bottom at approximately 10 feet									

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

Notes No groundwater encountered

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO. 062496 | Earthtec Testing and Engineering, P.C. | **FIGURE NO** · 19

TEST PIT LOG

NO.: TP-18

PROJECT	Intermountain Regional Landfill	**PROJECT NO**	062496
CLIENT	David Johnston	**DATE**	09/07/06 - 09/08/06
LOCATION	Refer to Figure 2	**ELEVATION**	NM
OPERATOR	Halls	**LOGGED BY**	P E
EQUIPMENT	RTB		
DEPTH TO WATER, INITIAL ∇		**AT COMPLETION** ▼	

Depth (Ft)	Graphic Log	USCS	Description	Samples	Water Cont (%)	Dry Dens (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL Silt with sand, dry, brown									
1		CH	FAT CLAY with sand, minor pinholes, very stiff, slightly moist, light brown									
2												
3												
4				X								
5			Moist, gray at 5 feet									Perc
6												
7												
8												
9				X	22		71	47				
10			Bottom at approximately 10 feet									
11												
12												

Notes No groundwater encountered

Tests Key
- CBR = California Bearing Ratio
- C = Consolidation
- R = Resistivity
- DS = Direct Shear
- SS = Soluble Sulfates
- UC = Unconfined Compressive Strength

PROJECT NO 062496 | Earthtec Testing and Engineering, P.C. | **FIGURE NO** 20

TEST PIT LOG

NO.: TP-19

PROJECT	Intermountain Regional Landfill	**PROJECT NO**	062496
CLIENT:	David Johnston	**DATE:**	09/07/06 - 09/08/06
LOCATION	Refer to Figure 2	**ELEVATION**	NM
OPERATOR	Halls	**LOGGED BY:**	P E
EQUIPMENT	RTB		
DEPTH TO WATER, INITIAL ▽		**AT COMPLETION** ▼	

Depth (Ft)	Graphic Log	USCS	Description	Samples	Water Cont (%)	Dry Dens (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0–1			TOPSOIL Silt with sand, dry, brown									
1–10		CH	FAT CLAY with sand, very stiff, slightly moist, light brown									
3			Moist, gray at 3 feet									
4.5				X	16		53	28				Perc
8.5				X								
10			Bottom at approximately 10 feet									

Notes No groundwater encountered

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO 062496 | Earthtec Testing and Engineering, P.C. | **FIGURE NO. 21**

LOG OF TESTPIT 062496 GPJ EARTHTEC GDT 4/12/07

TEST PIT LOG
NO.: TP-20

PROJECT	Intermountain Regional Landfill	**PROJECT NO**	062496
CLIENT	David Johnston	**DATE·**	09/07/06 - 09/08/06
LOCATION·	Refer to Figure 2	**ELEVATION**	NM
OPERATOR:	Halls	**LOGGED BY**	P E
EQUIPMENT	RTB		
DEPTH TO WATER, INITIAL ∇		**AT COMPLETION** ▼	

Depth (Ft)	Graphic Log	USCS	Description	Samples	TEST RESULTS Water Cont (%)	Dry Dens (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL Silt with sand, dry, brown									
1			FAT CLAY with sand, very stiff, slightly moist, light brown									
2												
3				X	16		58	35				
4				X								
5		CH	Moist, gray at 5 feet									
6												
7												
8				X								
9												
10			Bottom at approximately 10 feet									
11												
12												

Notes No groundwater encountered

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

TEST HOLE LOG

NO.: TH-1

PROJECT	Intermountain Regional Landfill	**PROJECT NO**	062496
CLIENT.	David Johnston	**DATE:**	09/27/06 - 09/27/06
LOCATION	Refer to Figure 2	**ELEVATION**	NM
OPERATOR	Great Basin	**LOGGED BY**	P E
EQUIPMENT	Mobile A T		

DEPTH TO WATER, INITIAL ▽ **AT COMPLETION** ▼

Depth (Ft)	Graphic Log	USCS	Description	Samples	TEST RESULTS Blows per foot	Water Cont (%)	Dry Dens (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL Silt with sand, dry, brown										
		CH	FAT CLAY with sand, stiff to hard, slightly moist to moist, brown										
3					25								
6					26								
9					35								
12					15								
15						21	97	77	51				C
18													
21					40								
24													

Notes. No groundwater encountered

Tests Key

CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO : 062496 | Earthtec Testing and Engineering, P.C. | **FIGURE NO** 23a

TEST HOLE LOG

NO.. TH-1

PROJECT	Intermountain Regional Landfill	**PROJECT NO**	062496
CLIENT	David Johnston	**DATE**	09/27/06 - 09/27/06
LOCATION	Refer to Figure 2	**ELEVATION**	NM
OPERATOR	Great Basin	**LOGGED BY**	P E
EQUIPMENT	Mobile A T		
DEPTH TO WATER, INITIAL ▽		**AT COMPLETION** ▼ :	

Depth (Ft)	Graphic Log	USCS	Description	Samples	Blows per foot	Water Cont (%)	Dry Dens (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
			FAT CLAY with sand, stiff to hard, slightly moist to moist, brown		20	19		52	26				
27													
		CH											
30					17 35 50/5 5"								
			Bottom at approximately 31 feet 5 5 inches										
33													
36													
39													
42													
45													
48													

Notes: No groundwater encountered

Tests Key

CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO. 062496 | Earthtec Testing and Engineering, LLC | **FIGURE NO.** 23b

TEST HOLE LOG

NO.: TH-2

PROJECT	Intermountain Regional Landfill	**PROJECT NO**	062496
CLIENT	David Johnston	**DATE**	09/27/06 - 09/27/06
LOCATION	Refer to Figure 2	**ELEVATION**	NM
OPERATOR	Great Basin	**LOGGED BY**	P E
EQUIPMENT	Mobile A T		
DEPTH TO WATER, INITIAL ▽		**AT COMPLETION** ▼ :	

Depth (Ft)	Graphic Log	USCS	Description	Samples	Blows per foot	Water Cont (%)	Dry Dens (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL Silt with sand, dry, brown										
3			FAT CLAY with sand, hard to very stiff, slightly moist to moist, brown										
6					47								
9													
12					24								
15		CH											
18					45								
21					38	13		55	36				
24													

Notes No groundwater encountered

Tests Key
- CBR = California Bearing Ratio
- C = Consolidation
- R = Resistivity
- DS = Direct Shear
- SS = Soluble Sulfates
- UC = Unconfined Compressive Strength

TEST HOLE LOG

NO.: TH-2

PROJECT	Intermountain Regional Landfill	**PROJECT NO**	062496
CLIENT	David Johnston	**DATE:**	09/27/06 - 09/27/06
LOCATION	Refer to Figure 2	**ELEVATION**	NM
OPERATOR	Great Basin	**LOGGED BY**	P E
EQUIPMENT.	Mobile A T		

DEPTH TO WATER, INITIAL ∇ **AT COMPLETION** ▼ ·

Depth (Ft)	Graphic Log	USGS	Description	Samples	TEST RESULTS: Blows per foot	Water Cont (%)	Dry Dens (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
			FAT CLAY with sand, hard to very stiff, slightly moist to moist, brown										
27													
30													
					60	15		55	33				
33		CH											
36													
39													
					13 34 50/5 5"								
42			Bottom at approximately 41 feet 5 5 inches										
45													
48													

Notes No groundwater encountered

Tests Key

CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO · 062496 | Earthtec Testing and Engineering, P.C. | **FIGURE NO** 24b

LEGEND

PROJECT	Intermountain Regional Landfill	**DATE**	09/07/06
CLIENT	David Johnston	**LOGGED BY**	P E

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR SOIL DIVISIONS			USCS SYMBOL	TYPICAL SOIL DESCRIPTIONS
COARSE GRAINED SOILS (More than 50% retaining on No 200 Sieve)	GRAVELS (More than 50% of coarse fraction retained on No 4 Sieve)	CLEAN GRAVELS (Less than 5% fines)	GW	Well Graded Gravel, May Contain Sand, Very Little Fines
			GP	Poorly Graded Gravel, May Contain Sand, Very Little Fines
		GRAVELS WITH FINES (More than 12% fines)	GM	Silty Gravel, May Contain Sand
			GC	Clayey Gravel, May Contain Sand
	SANDS (50% or more of coarse fraction passes No 4 Sieve)	CLEAN SANDS (Less than 5% fines)	SW	Well Graded Sand, May Contain Gravel, Very Little Fines
			SP	Poorly Graded Sand, May Contain Gravel, Very Little Fines
		SANDS WITH FINES (More than 12% fines)	SM	Silty Sand, May Contain Gravel
			SC	Clayey Sand, May Contain Gravel
FINE GRAINED SOILS (More than 50% passing No 200 Sieve)	SILTS AND CLAYS (Liquid Limit less than 50)		CL	Lean Clay, Inorganic, May Contain Gravel and/or Sand
			ML	Silt, Inorganic, May Contain Gravel and/or Sand
			OL	Organic Silt or Clay, May Contain Gravel and/or Sand
	SILTS AND CLAYS (Liquid Limit Greater than 50)		CH	Fat Clay, Inorganic, May Contain Gravel and/or Sand
			MH	Elastic Silt, Inorganic, May Contain Gravel and/or Sand
			OH	Organic Clay or Silt, May Contain Gravel and/or Sand
HIGHLY ORGANIC SOILS			PT	Peat, Primarily Organic Matter

SAMPLER DESCRIPTIONS

- SPLIT SPOON SAMPLER (1 3/8 inch inside diameter)
- MODIFIED CALIFORNIA SAMPLER (2 inch outside diameter)
- SHELBY TUBE (3 inch outside diameter)
- BLOCK SAMPLE
- BAG/BULK SAMPLE

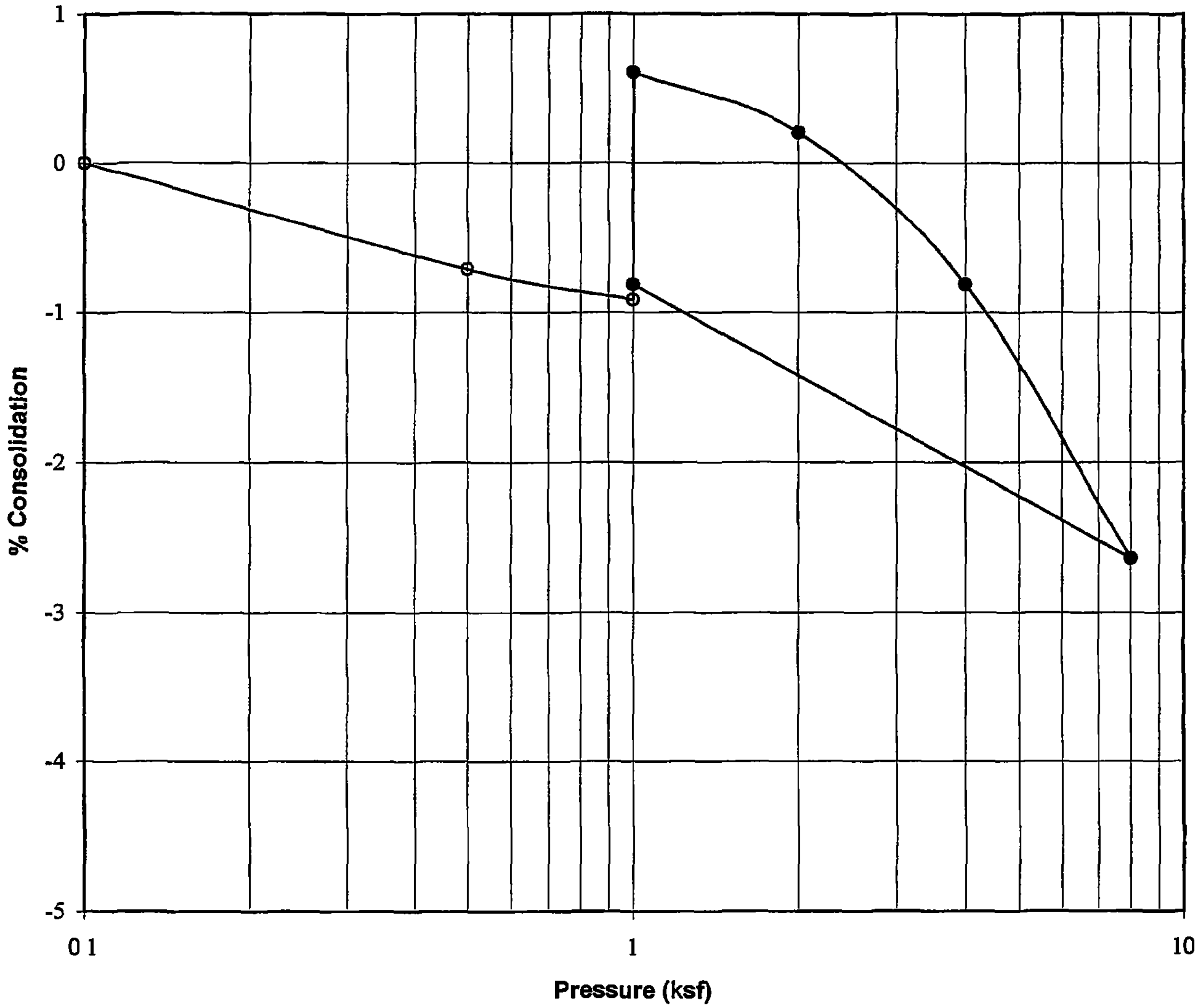
WATER SYMBOLS

- ▽ Water level encountered during field exploration
- ▼ Water level encountered at completion of field exploration

NOTES:
1. The logs are subject to the limitations, conclusions, and recommendations in this report
2. Results of tests conducted on samples recovered are reported on the logs and any applicable graphs
3. Strata lines on the logs represent approximate boundaries only Actual transitions may be gradual
4. In general, USCS symbols shown on the logs are based on visual methods only actual designations (based on laboratory tests) may vary

PROJECT NO 062496	Earthtec Testing and Engineering, P.C.	**FIGURE NO ·** 25

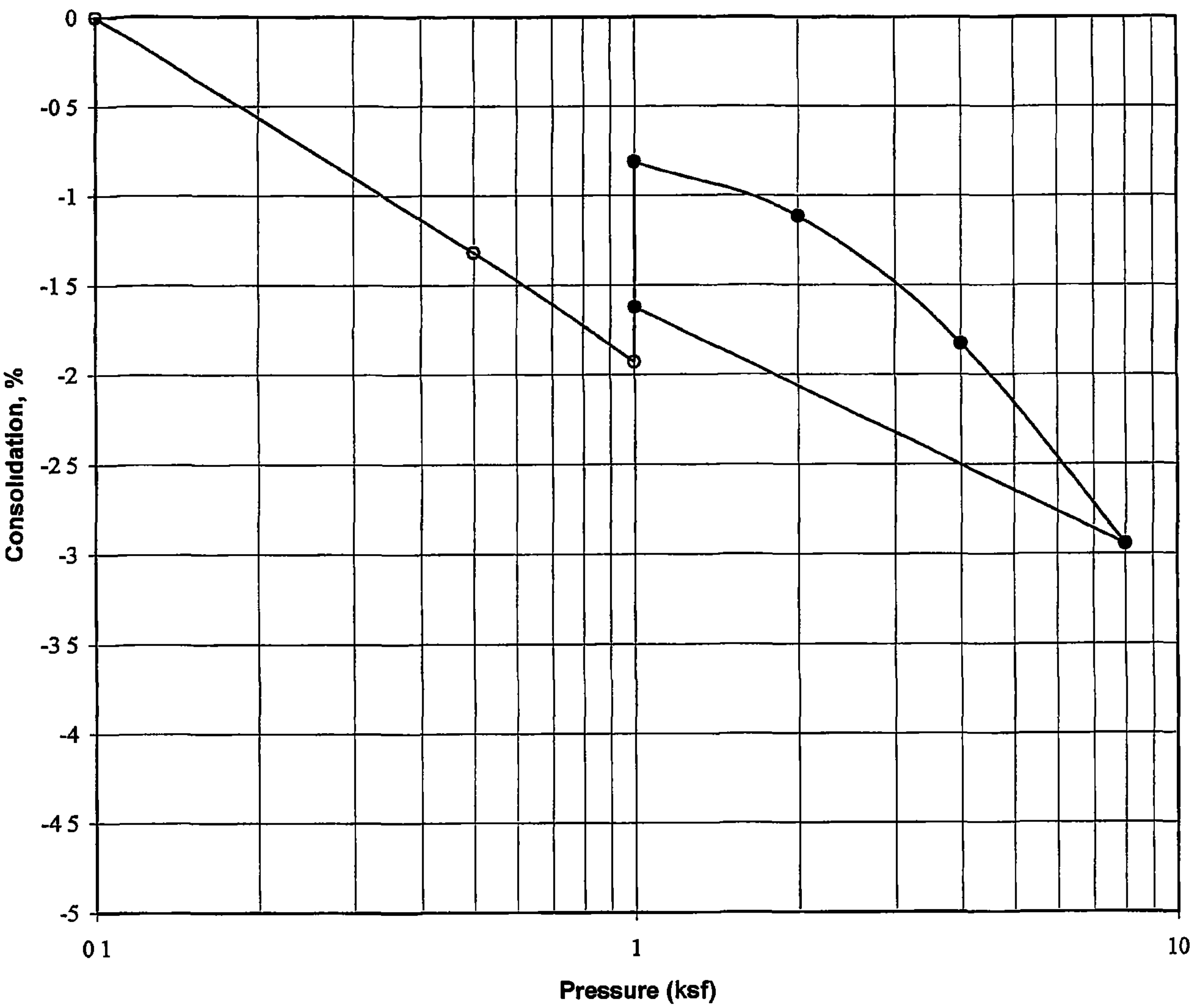
CONSOLIDATION - SWELL TEST



Project	Intennountain Regional Landfill
Location	TP-7
Sample Depth	9
Description	Block
Soil Type	FAT CLAY (CH)
Dry Density, pcf	90
Natural Moisture, %	23
Liquid Limit	70
Plasticity Index	37
Water Added at	1 ksf
Percent Swell	1 5

PROJECT NO 062496	Earthtec Testing and Engineering, P.C.	FIGURE NO 26

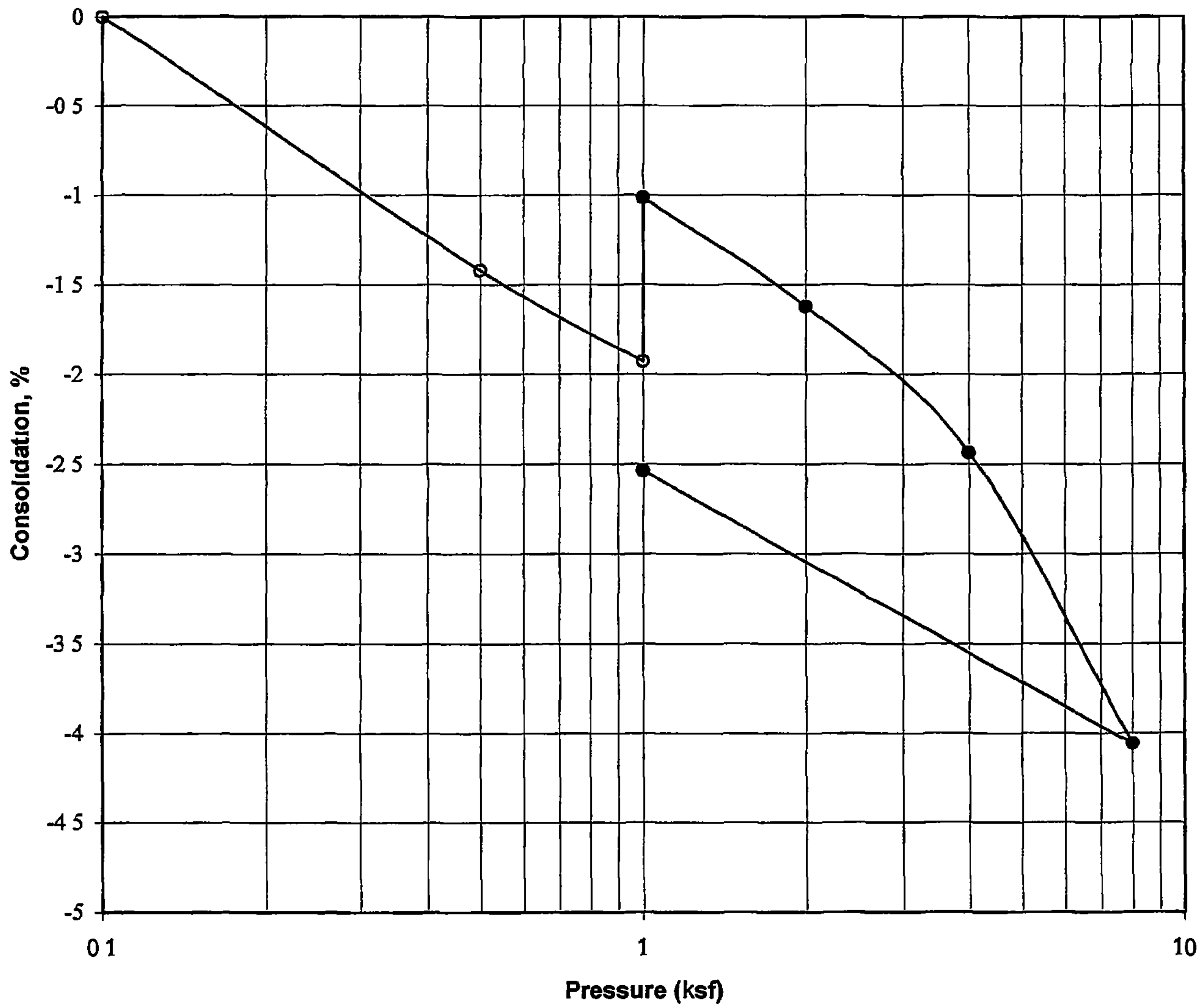
CONSOLIDATION - SWELL TEST



Project	Intermountain Regional Landfill
Location	TP-10
Sample Depth	8½
Description	Block
Soil Type	FAT CLAY (CH)
Dry Density, pcf	91
Natural Moisture, %	26
Liquid Limit	70
Plasticity Index	50
Water Added at	1 ksf
Percent Swell	1 1

PROJECT NO 062496	Earthtec Testing and Engineering, P.C.	**FIGURE NO** 27

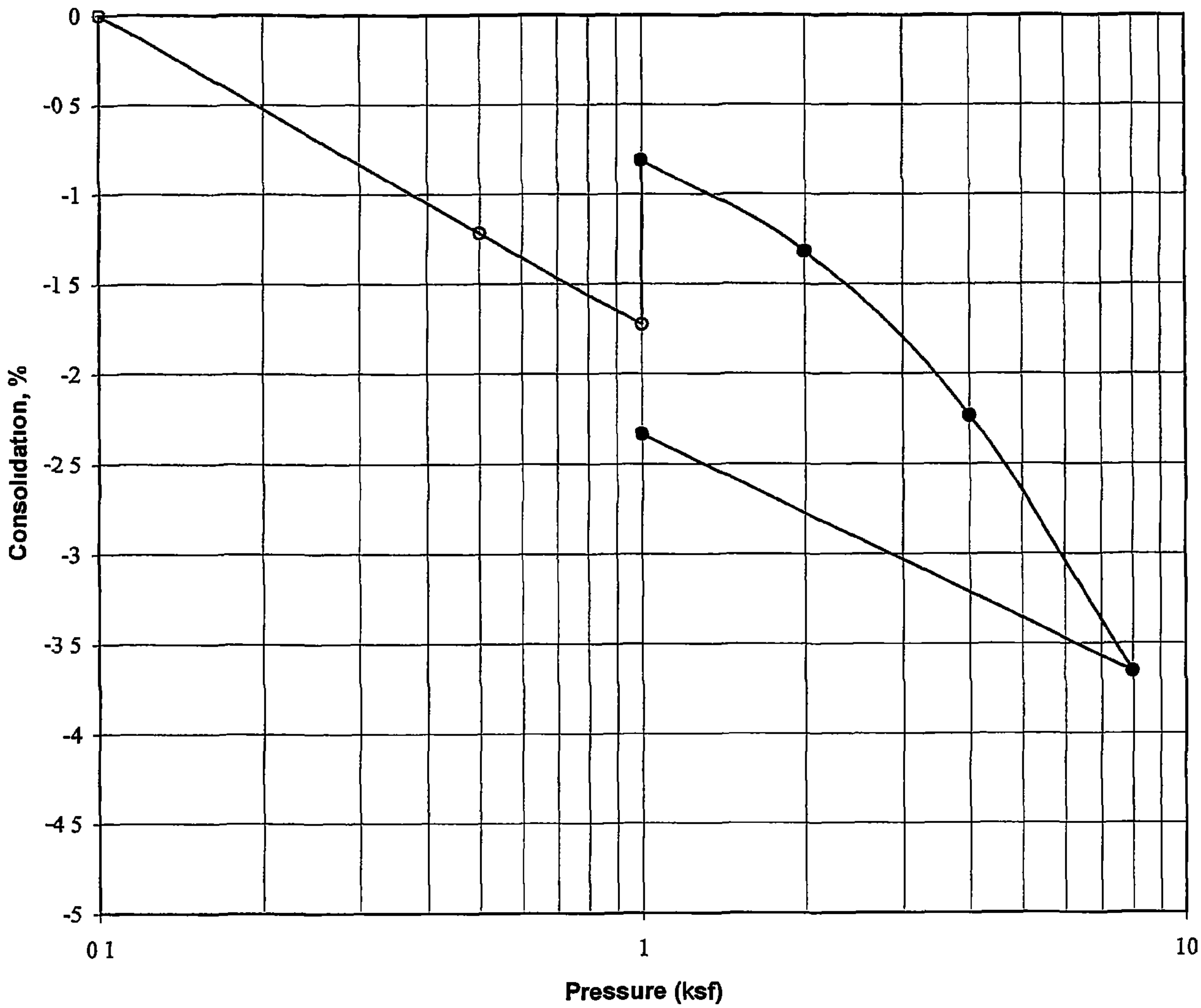
CONSOLIDATION - SWELL TEST



Project	Intermountain Regional Landfill
Location	TP-14
Sample Depth	6
Description	Block
Soil Type	FTA CLAY (CH)
Dry Density, pcf	93
Natural Moisture, %	20
Liquid Limit	71
Plasticity Index	47
Water Added at	1 ksf
Percent Swell	0 9

PROJECT NO 062496	Earthtec Testing and Engineering, P.C.	**FIGURE NO** 28

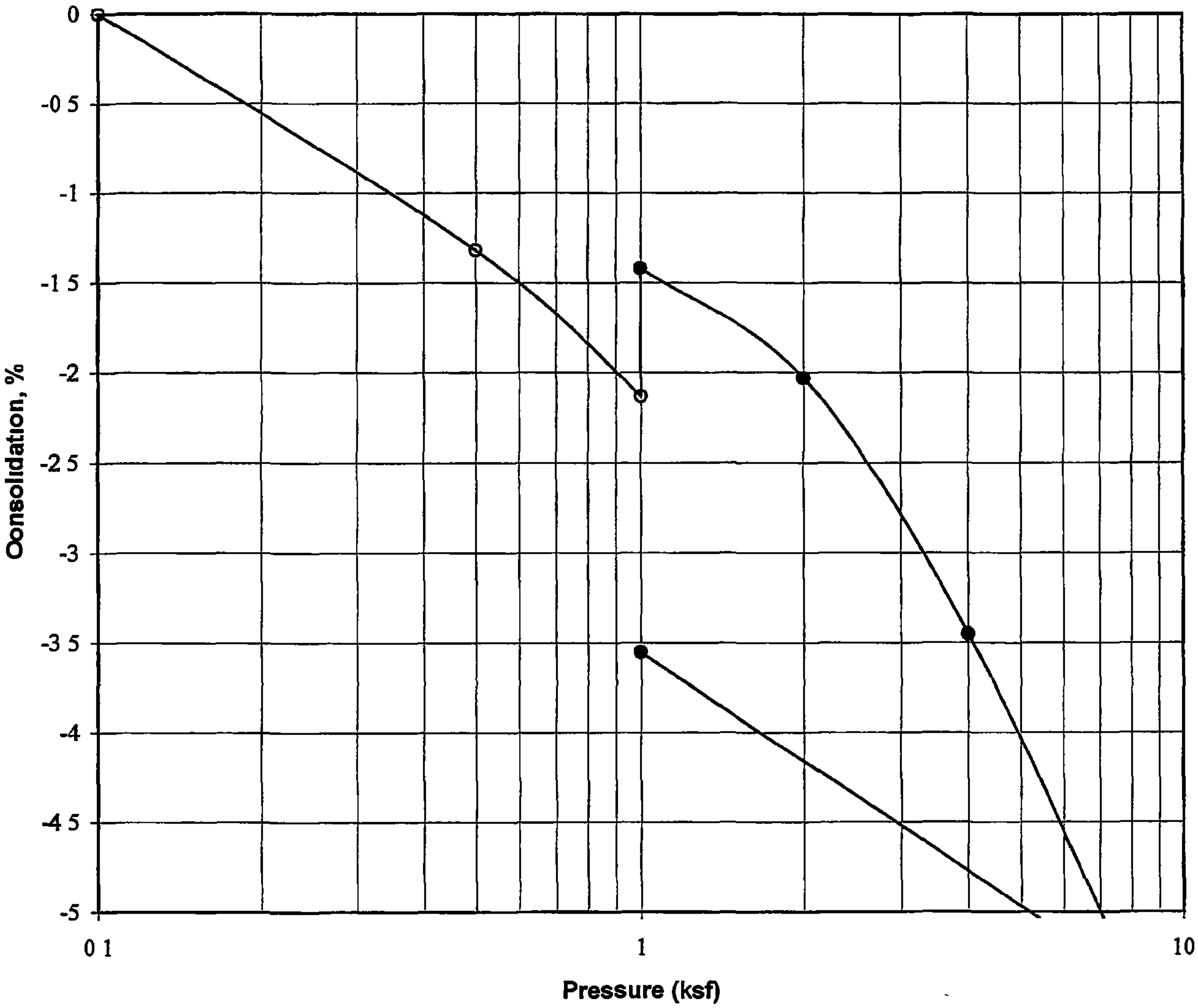
CONSOLIDATION - SWELL TEST



Project	**Intermountain Regional Landfill**
Location	TP-15
Sample Depth	7½
Description	Block
Soil Type	FTA CLAY (CH)
Dry Density, pcf	93
Natural Moisture, %	19
Liquid Limit	61
Plasticity Index	37
Water Added at	1 ksf
Percent Swell	0 9

PROJECT NO 062496	Earthtec Testing and Engineering, P.C.	**FIGURE NO** 29

CONSOLIDATION - SWELL TEST



Project	Intermountain Regional Landfill
Location	TH-1
Sample Depth	15
Description	Block
Soil Type	FAT CLAY (CH)
Dry Density, pcf	97
Natural Moisture, %	21
Liquid Limit	77
Plasticity Index	51
Water Added at	1 ksf
Percent Swell	0 7

PROJECT NO 062496	Earthtec Testing and Engineering, P.C.	**FIGURE NO** 30

APPENDIX C

Slope Stability and Settlement Analysis

Prepared by:
HDR Engineering, Inc.

August, 2010

SLOPE STABILITY AND SETTLEMENT ANALYSIS

INTERMOUNTAIN REGIONAL LANDFILL
FAIRFIELD, UTAH

CLASS I LANDFILL PERMIT APPLICATION

ISSUED AUGUST 2010
PREPARED BY
HDR ENGINEERING, INC

TABLE OF CONTENTS

ATTACHMENTS

SECTION 1.0 INTRODUCTION

1 1 PURPOSE

This technical memorandum presents the results of slope stability and settlement analyses as part of the 2010 Permit Application for the Intermountain Regional Landfill (the Site) in Fairfield, Utah The purpose of this work is to

- Evaluate the stability of the maximum cut and fill slopes
- Evaluate the settlement along the leachate collection and recovery system (LCRS) piping alignments

The Site is located in a seismic impact zone as defined by the State of Utah Administrative Code (UAC) R315-301-2 This report provides analyses demonstrating that " all containment structures, including liners, leachate collection systems, and surface water control systems, are designed to resist the maximum horizontal acceleration in lithified earth material for the site " In addition, this report provides analyses demonstrating that the LCRS piping alignment maintains positive drainage toward the sumps

These analyses have been conducted in accordance with the State of Utah Administrative Code and U S Environmental Protection Agency (EPA) guidance presented in Resource Conservation and Recovery Act (RCRA) Subtitle D (258) Seismic Design Guidance for Municipal Solid Waste Landfill Facilities (EPA 1995)

1 2 SCOPE

The scope of this report includes a literature review of regional and local seismicity, demonstration analyses of the seismic performance and settlement of the site features, and findings and conclusions This report is divided into the following sections

- Section 2 0, Site Conditions, presents soils, geology, and site-specific seismicity data for the Site
- Section 3 0, Static and Pseudo-Static Stability Analyses and Deformation Analyses, presents stability analyses for maximum cut and maximum fill slopes
- Section 4 0, Settlement and Liner Strain, presents estimates of settlement along the LCRS piping alignment
- Section 5 0, Findings and Conclusions, discusses the impact of the estimated deformations and settlement on the function of the landfill features

SECTION 2.0 SITE CONDITIONS

2 1 LOCATION

The Site is located in Township 7 South, Range 2 West, west half of Section 16 (Salt Lake Base and Meridian) in Utah County The Site is located southeast of the intersection of county roads 800 South and 18150 West The approximate latitude and longitude of the site are 40 21 degrees and – 112 07 degrees, respectively This location is in Cedar Valley between the Thorpe Hills on the west and the Lake Mountains on the east

2 2 SOILS

Information on the site soils has been obtained from regional references and on-site soil borings The locations of the on-site borings are shown on the Site Plan & Location of Explorations, Figure 2 of Reference 1

The surficial soils consist of mostly lacustrine fine-grained deposits (Qlf, see Reference 2) Twenty test pit excavations and two test holes were advanced during the Geotechnical Study (Reference 1) to depths ranging from 10 feet to 41 feet below grade The soil borings indicate that the soils consist mostly of very stiff to hard fat clay (CH) with a few layers of dense silty sand (SM) and very stiff elastic silt (MH) Standard penetration blow counts range from 15 to refusal in the fat clay

2 3 SEISMICITY

The probabilistic bedrock maximum (peak) horizontal acceleration for a return period of 2% in 50 years (10% in 250 years) at the Site is 0 25g, as determined from the U S Geological Survey (USGS), National Seismic Hazard Mapping Project Probabilistic Seismic Hazards Assessment, Custom Mapping and Analysis Tools, Interactive Deaggregation Tool (2008 http //eqint cr usgs gov/deaggint/2008/)

Using the Interactive Deaggregation Tool and adjusting the shear wave velocity based on the site-specific soil characteristics, the maximum (peak) horizontal acceleration for the Site was determined to be 0 28g This value was used to evaluate the cut slope and the waste mass stability See Attachment 1

The peak maximum credible earthquake was also determined probabilistically using the same source and methodology A magnitude 7 0 was used for slope stability evaluation See Attachment 1

The design accelerations (above the bedrock at bottom of waste) for Short Period, S_{DS}, and for 1-Second Period, S_{D1}, were determined to be 0 55g and 0 31g, respectively These were determined by Earthtec in accordance with International Building Code (IBC) using a Site Class D classification See Reference 1 These values are appropriate to evaluate structural components that are not part of this analysis

2 4 ADOPTED DESIGN VALUES

The regional soil stratigraphy and site-specific boring logs were reviewed to establish a design profile for use in stability and settlement analyses Soil shear strengths were based on the laboratory soil testing program and correlations with the Standard Penetration Test results, Attachment 1, Reference D Waste shear strengths were based on EPA data (EPA 1995)

The adopted stratigraphy and corresponding physical properties for stability are summarized in Table 2 1 below from Attachment 2

Table 2 1
Adopted Soil Properties (Attachment 2)

Feature	Depth (ft)	Total Unit Weight (PCF)	Saturated Unit Weight (PCF)	Cohesion (PSF)*	Phi (degrees)	Material
Upper very stiff clay	0–10	113 5	121 0	3000 short term, 50 long term	0 short term, 29 long term	CH
Less stiff clay	10–20	121 0	125 5	1500 short term, 50 long term	0 short term, 29 long term	CH
Stiff clay	20–30	121 0	125 5	2000 short term, 50 long term	0 short term, 29 long term	CH
Lower very stiff clay	30+	121 0	125 5	3000 short term, 50 long term	0 short term, 50 long term	CH
Waste	Varies	50 0	60 0	150	22	Waste*
LCRS		100 0	110 0	0	32	Sand
Cap		110 0	120 0	1000	0	Clay

*EPA Reference 4

The adopted seismic properties for stability, as discussed in the previous section, are summarized in Table 2 2 from Attachment 2

Table 2 2

Maximum Horizontal Acceleration and Design Earthquake (Attachment 2)

Location	Maximum Horizontal Acceleration	Design Earthquake Intensity
Bottom of waste (cut slope)	0 28g	7 0
Waste mass (fill slope)	0 28g	7 0

SECTION 3.0 STATIC AND PSEUDO-STATIC STABILITY ANALYSES AND DEFORMATION ANALYSES

3 1 METHOD OF ANALYSIS

The stability analyses were performed using the computer program PCSTABL7 (Purdue University 2002) and STEDwin Smart Editor (Van Aller 2007) The STABL program is an analytical tool developed by Purdue University that uses limit equilibnum techniques to search for and identify the critical failure surface and provides estimates of the factor of safety against instability Failure surfaces can be circular, block, or random in shape depending on the geometry of the slope, loading condition, and subsurface details STEDwin is a user interface for STABL that allows on-screen data entry and modifications and generates graphics

3 2 CASES CONSIDERED

Stability analyses were conducted to determine the factor of safety against slope failures under static and pseudo-static loading conditions The following landfill features, which are shown on Figure 2-1, were considered

3 2 1 Maximum Cut Slope (Excavation)

The proposed excavation will be 1V 4H (25%) slopes to a maximum depth of nominally 45 feet at the east portion of the cells To be conservative, a maximum depth of 50 feet was evaluated

3 2 2 Maximum Fill Slope (Waste)

The proposed waste fill slopes are about 2 5% north and south and about 5% east and west from the crest at El 4950+ to a vanable slope break, ranging between from El 4898 to 4905 The side slopes are 1V 4H (25%) from the slope break to onginal grade Maximum waste fill heights in Cell 4 are 130 feet above the cell bottom and 100 feet above onginal grade These slopes are consistent with UAC R315-303-4(4)

3 2 3 Waste Fill over Liner and Leachate Collection System (Sliding Block)

The proposed liner system will consist of a lower cushion nonwoven geotextile (or a sand cushion) placed on the subgrade A geosynthetic clay liner (GCL) will be placed over the lower cushion with a 60-mil textured high-density polyethylene (HDPE) geomembrane overlying the GCL The leachate collection/protective cover layer will consist of 2 feet of protective soil cover (granular leachate collection matenal) placed over an upper cushion geotextile placed over the HDPE geomembrane

It is anticipated that the Cell 4 waste fills could reach a maximum of 130 feet above the liner/ leachate collection system in the adjacent Cell 5 area For analysis, a waste/intermediate soil cover slope of 1V 3H (33%) was evaluated

3 3 METHODOLOGY

Both static and pseudo-static conditions were evaluated The generalized factor of safety against a slope failure is defined as $FS = s/t$, where s is the available shear strength of the slope and t is the shear strength required for unity (FS = 1 0)

The Simplified Bishop circular arc method was used to evaluate the global stability of the excavated and filled slopes The computer program PCSTABL7 (Purdue University 2002) was used to conduct these analyses This program searches for the potential failure surface that produces the lowest factor of safety The location of this failure surface is a function of the site geometry (slope angle and height), matenal stratigraphy and physical properties, and loadings (weight of soil and/or waste above the failure surface)

The sliding block (wedge) method was used to evaluate the sliding stability along the bottom liner and the LCRS system The computer program PCSTABL7 (Purdue University 2002) was also used to conduct these analyses The failure surface is defined by the bottom of the cell For a given slope geometry, the interface fnction angle, S, between adjacent materials normally controls slope stability, with the lowest interface friction angle controlling overall slope stability Adopted fnction values for the geosynthetic interfaces are presented in Table 3 1

A minimum static safety factor of 1 3 was adopted (EPA 1995) The pseudo-static seismic coefficient (ay) was iterated for both the circular arc and sliding block analyses to determine the yield acceleration (ay) corresponding to a factor of safety of 1 0 This yield acceleration is used to estimate the excavation, closure cap, and leachate collection system deformations cell (Section 5)

Table 3 1
Adopted Interface Friction Angles

Lower	Upper	Interface Friction Angle (degrees)
Soil subgrade	Lower cushion nonwoven geotextile or sand cushion	25
Lower cushion nonwoven geotextile or sand cushion	Geosynthetic clay liner (GCL)	25
Geosynthetic clay liner (GCL)	60-mil textured HDPE geomembrane	18
60-mil textured HDPE geomembrane	Upper cushion nonwoven geotextile	18
Upper cushion nonwoven geotextile	2-ft leachate collection/protective soil cover	18

The results of the static and pseudo-static stability analyses for the excavations and waste fills are presented in Attachment 2 and summarized below in Table 3 2 The results indicate that the static factor of safety is adequate for the existing and proposed cut and fill slope geometry The yield accelerations at a safety factor of 1 0 are near the adopted peak bedrock acceleration, suggesting minimal permanent deformation (EPA 1995)

Table 3 2
Global Stability Results

Feature	Static Factor of Safety	Yield Acceleration	Displacement, U (cm)
Maximum excavation slope, 1V 4H (short-term controls)	2 95	0 10g	14 0
Maximum fill slope, 1V 4H	2 19	0 28g	0 05
Waste fill over liner and leachate collection system (sliding block)	1 46 (18° interface fnction)	0 13g	8 0

SECTION 4 0 SETTLEMENT AND LINER STRAIN

4 1 SETTLEMENT

For thıs analysıs, settlement was calculated along the Cell 3 leachate collectıon pıpe alıgnment for the worst-case scenarıo Poınts along the alıgnment were evaluated to determıne ıf the slope toward the sump would be posıtıve after fınal waste has been placed The results are shown ın Table 4 1

Table 4 1
Dıfferentıal Settlement Results

Poınt	Location	Thıckness of Waste (ft)	Settlement (ft)	Fınal Slope between Poınts (%)
1	Intenor west toe of slope	42	1 6	NA
2	120 ft east of west toe of slope	72	1 8	1 69
3	560 ft east of west toe of slope	100	2 0	1 54
4	1110 ft east of west toe of slope	134	2 2	1 53
5	1660 ft east of west toe of slope	73	1 8	1 44
6	2160 ft east of west toe of slope (east sump)	46	1 6	1 45

4 2 LINER STRAIN

The straın ın the lıner between the poınts above was also determıned based on the ınıtıal and fınal (after settlement) slope ınformatıon The calculated straıns were much less than the 17% allowable See Attachment 3

SECTION 5.0 FINDINGS AND CONCLUSIONS

5 1 FINDINGS

The Intermountain Regional Landfill site is located in a seismic impact zone Probabilistic methods indicate a peak bedrock acceleration of 0 25g Factonng the on-site soils and waste properties, the maximum bottom of waste and waste mass accelerations were both determined to be 0 28g

The cut and fill slopes have adequate static factor of safety and indicate minimal permanent deformations (U<30 cm) in response to the design seismic event The upper limit of 30 cm (1 ft) was established as the maximum tolerable deformation of the geosynthetic components (EPA 1995)

Settlement along the leachate collection line (worst case) was evaluated in Attachment 3 and was determined to range from 1 6 ft to 2 2 ft Differential settlement calculations indicate that positive slopes toward the sumps will be maintained and liner strains (<1%) will be less than allowable (17%)

5 2 CONCLUSIONS

The analyses show that the proposed Intermountam Regional Landfill components are designed to resist the "maximum horizontal acceleration" at the site

SECTION 6 0 REFERENCES

Earthtec 2009 Geotechnical Study Intermountain Regional Landfill, Fairfield, Utah October 13

[EPA] U S Environmental Protection Agency 1995 RCRA Subtitle D (258) Seismic Design Guidance for Municipal Solid Waste Landfill Facilities EPA/600/R-95/051 Prepared by G N Richardson and E Kavazanjian

Purdue University 2002 PCSTABL7 Slope Stability Computer Program

Van Aller, H W 2007 STEDwin Smart Editor for PCSTABL

ATTACHMENT 1: MAXIMUM HORIZONTAL ACCELERATION & DESIGN EARTHQUAKE

HDR ONE COMPANY *Many Solutions*					
Project	Intermountain Regional Landfill	Computed	GMS	Date March 2010	
Subject	Slope Stability	Checked	PNP	Date	4 6 10
Task	Slope Stability MHA & Design EQ	Page 1 of 2			
Job #	Dept 00143	No	125184		

1 1 Task

A Determine the maximum (peak) horizontal acceleration (MHA) for the site
   a At bedrock
   b At bottom of waste
   c At top of waste

B Determine the design earthquake for the site

1 2 References

A EPA, Richardson, G N and Kavazanjian, E (1995), RCRA Subtitle D (258) Seismic Design Guidance for Municipal Solid Waste Landfill Facilities, EPA/600/R-95/051

B USGS, National Seismic Hazard Mapping Project Probabilistic Seismic Hazards Assessment , Custom Mapping and Analysis Tools, Interactive Deaggregation Tool http //eqint cr usgs gov/deaggint/2008/index php

C Earthtec Testing & Engineenng, P C (2006) Geotechnical Study Intermountain Regional Landfill

D Das, B , (1990) Pnnciples of Foundation Engineenng, 2nd Ed

1 3 Summary

A Site location 40 21 degrees latitude, -112 07 degrees longitude Ref C

B Determine the shear wave velocity
   a Below the waste
   b Depth & N, Standard Penetration values

TH-1, Ref C, Figure No's 23a & 23b				
Depth (FT)	N, Blows/FT	Unconfined Compressive Strength Correlation (TSF)*	Consistency*	Shear Wave Velocity** (m/s)
2 5-4 0	25	3 0	Very Stiff	650
5 0-6 5	26	3 0	Very Stiff	650
7 5-9 0	35	4 0+	Hard	700
10 0-11 5	15	1 5	Stiff	550
20 0-21 5	40	4 0+	Hard	700
25 0-26 5	20	2 0	Stiff	550
30 0-31 5	80+	4 0+	Hard	700

TH-2, Ref C, Figure No's 24a & 24b				
Depth (FT)	N, Blows/FT	Unconfined Compressive Strength Correlation (TSF)*	Consistency*	Shear Wave Velocity** (m/s)
5 0-6 5	47	4 0+	Hard	700
10 0-11 5	24	3 0	Very Stiff	650
15 0-16 5	45	4 0+	Hard	700
20 0-21 5	38	4 0+	Hard	700
30 0-31 5	60	4 0+	Hard	700
40 0-41 5	80+	4 0+	Hard	700

Notes
* Reference D, pg 87
** Reference A, Section 4

1 4 Results

A Maximum (peak) Horizontal Acceleration (MHA)

a At bedrock = 0 2467g (Vs=760 m/s) Reference B, see attached

b At the bottom of the waste = 0 2747g (Vs=500 m/s) Reference B, see attached Note that Reference A indicates to use the bedrock acceleration based on the site specific shear wave velocities (stiff soils, page 45 of Ref A) Therefore this value is conservative

c From Reference C (Earthtec) These accelerations to be used for evaluation of structures on the site and not the slopes or waste mass The evaluation of structures was not part of this analysis

i S_{DS} = 0 55g, Short Period Acceleration (bottom of waste)

ii S_{D1} = 0 31g, 1-Second Acceleration (bottom of waste)

d For slope stability evaluation (worst case, maximum accelerations)

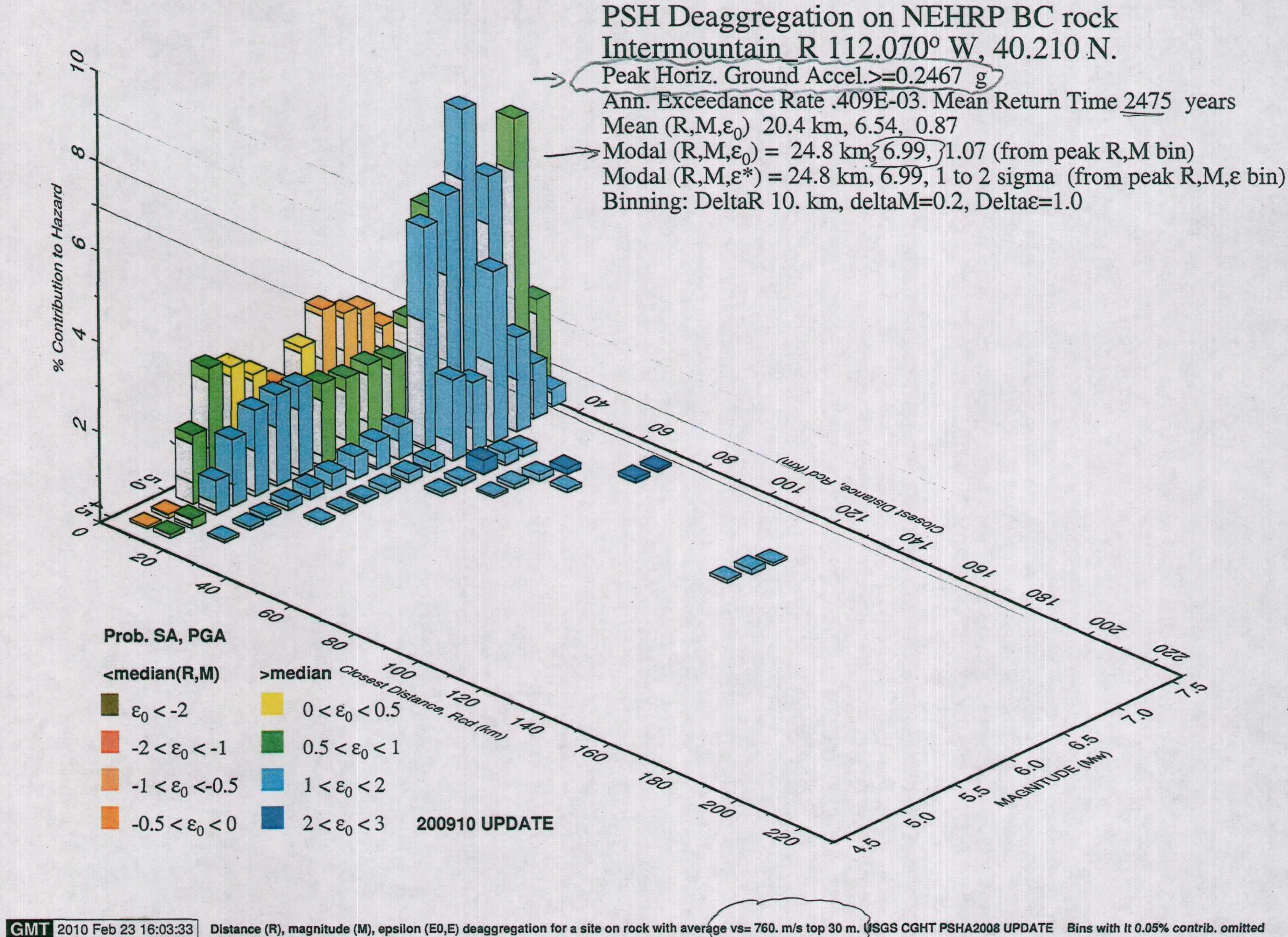
i Bottom of Waste (cut slope) = 0 28g

ii The average acceleration of the failure mass (waste fill slope) = 0 28g See Reference A, pages 46 and 47

B Maximum (peak) horizontal acceleration (MHA)

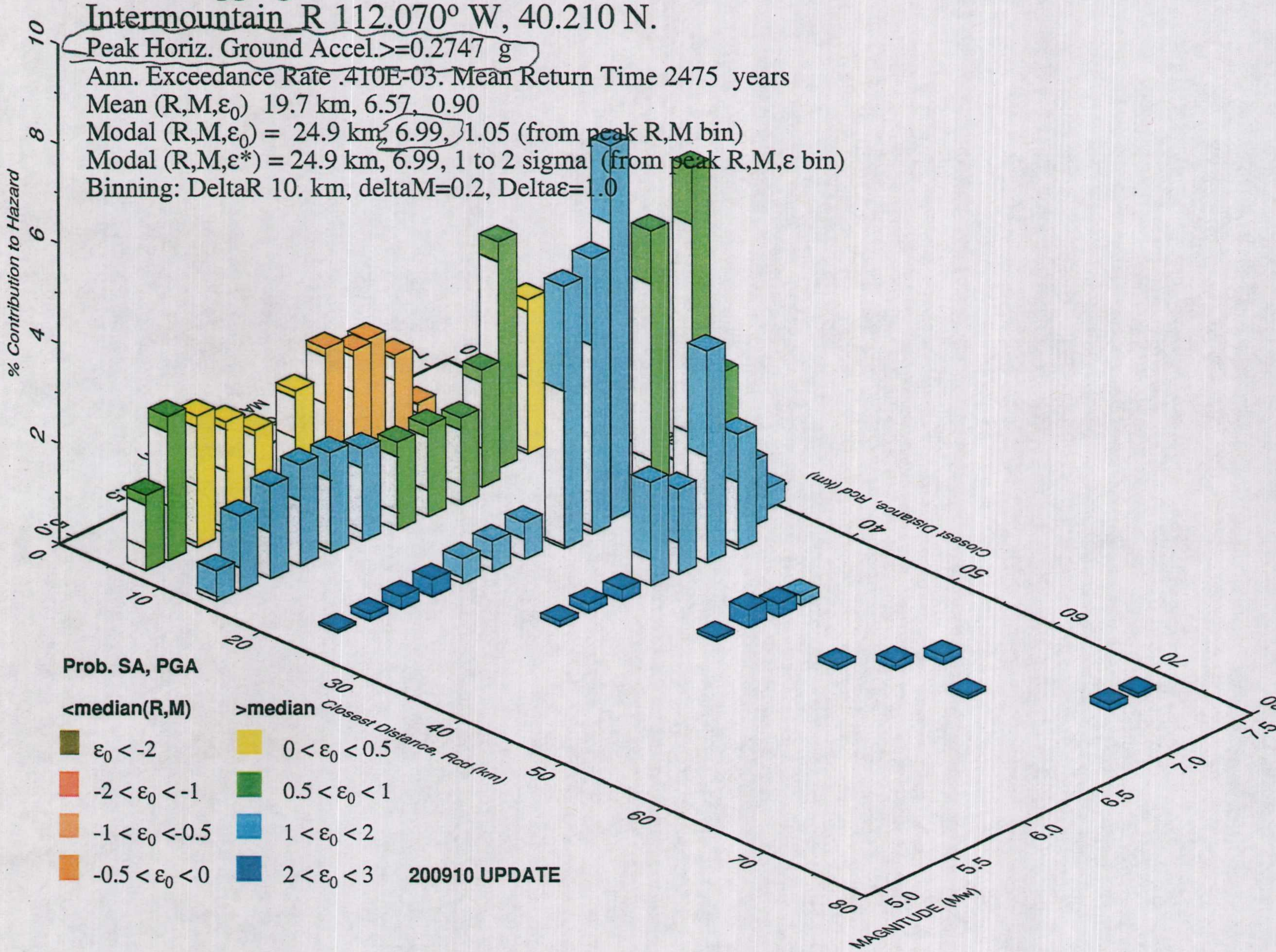
a Magnitude of the design earthquake for the site 7 0 Reference B, see Attachment 1A

ATTACHMENT 1A: USGS MAPPING, REFERENCE B


PSH Deaggregation on NEHRP BC rock
Intermountain_R 112.070° W, 40.210 N.
Peak Horiz. Ground Accel.>=0.2467 g
Ann. Exceedance Rate .409E-03. Mean Return Time 2475 years
Mean (R,M,ε0) 20.4 km, 6.54, 0.87
Modal (R,M,ε0) = 24.8 km, 6.99, 1.07 (from peak R,M bin)
Modal (R,M,ε*) = 24.8 km, 6.99, 1 to 2 sigma (from peak R,M,ε bin)
Binning: DeltaR 10. km, deltaM=0.2, Deltaε=1.0
% Contribution to Hazard
Closest Distance, Rcd (km)
MAGNITUDE (Mw)
Prob. SA, PGA
<median(R,M)
>median
ε0 < -2
-2 < ε0 < -1
-1 < ε0 <-0.5
-0.5 < ε0 < 0
0 < ε0 < 0.5
0.5 < ε0 < 1
1 < ε0 < 2
2 < ε0 < 3
200910 UPDATE
GMT 2010 Feb 23 16:03:33 Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on rock with average vs= 760. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted

1/2

PSH Deaggregation on NEHRP C soil
Intermountain_R 112.070° W, 40.210 N.
Peak Horiz. Ground Accel.>=0.2747 g
Ann. Exceedance Rate .410E-03. Mean Return Time 2475 years
Mean (R,M,ε_0) 19.7 km, 6.57, 0.90
Modal (R,M,ε_0) = 24.9 km, 6.99, 1.05 (from peak R,M bin)
Modal (R,M,ε^*) = 24.9 km, 6.99, 1 to 2 sigma (from peak R,M,ε bin)
Binning: DeltaR 10. km, deltaM=0.2, Deltaε=1.0



2/2

GMT 2010 Mar 3 16:45:29 Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 500. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted

ATTACHMENT 1B: SOIL CONSISTENCY, REFERENCE D

From Ref D

1/1

where A_R = area ratio
D_o = outside diameter of the sampling tube
D_i = inside diameter of the sampling tube

When the area ratio is 10% or less, the sample is generally considered to be undisturbed For a standard split-spoon sampler

$$A_R(\%) = \frac{(50\ 8)^2 - (34\ 93)^2}{(34\ 93)^2}(100) = 111\ 5\%$$

Hence, these samples are highly disturbed Split-spoon samples are generally taken at intervals of about 1 53 m (5 ft)

When the material encountered on the field is sand (particularly fine sand below the water table), sample recovery by a split-spoon sampler may be difficult In that case, a device such as a spring core catcher may have to be placed inside the split spoon (Figure 2 7b)

Besides obtaining soil samples, standard penetration tests provide several useful correlations For example, the consistency of clayey soils can often be estimated from the standard penetration number (N) This is shown in Table 2 3

1 kN/m² = 0 01044 Tons/ft²
pg 719

Table 2 3 Consistency of Clays and Approximate Correlation to the Standard Penetration Number N

Standard penetration number, N	Consistency	Unconfined compression strength, q_u (kN/m²)	q_u TSF
0–2	Very soft	0–25	0 - 0 26
2–5	Soft	25–50	0.26 - 0 52
5–10	Medium stiff	50–100	0 52 - 1 04
10–20	Stiff	100–200	1 04 - 2.09
20–30	Very stiff	200–400	2.09 - 4 17
>30	Hard	>400	> 4 17

In granular soils, the N-value is affected by the effective overburden pressure, σ_v' For that reason, the N-value obtained from field exploration under different effective overburden pressures should be changed to correspond to a standard value of σ_v' This means that

$$\boxed{N_{cor} = C_N N_F} \qquad (2\ 4)$$

where N_{cor} = corrected N-value to a standard value of σ_v' [95 6 kN/m² (1 ton/ft²)]
C_N = correction factor
N_F = N-value obtained from the field

ATTACHMENT 2: SLOPE STABILITY CASES AND RUNS

2 1 Task

A Determine the Static Factor of Safety (FS) and Seismic Yield Acceleration (a_y) for

a Case 1 Maximum Cut Slope

b Case 2 Maximum Fill Slope

c Case 3 Maximum Operational Waste Fill Slope (sliding block)

B Determine the maximum displacement and verify less than 30 CM

2 2 References

A EPA, Richardson, G N and Kavazanjian, E (1995), RCRA Subtitle D (258) Seismic Design Guidance for Municipal Solid Waste Landfill Facilities, EPA/ 600/R-95/051

B Salgado, R , Purdue University (2002) PCSTABL7 Slope Stability Computer Program, Joint Highway Research Program FHWA, and Van Aller, H W (2007) STEDwin Smart Editor for PCSTABL

C Earthtec Testing & Engineering, P C (2006) Geotechnical Study Intermountain Regional Landfill

D Das, B , (1990) Principles of Foundation Engineering, 2^{nd} Ed

E HDR (2010) Determination of the MHA and Design EQ Calculations

2 3 Soil Profile and Material Properties (Reference C and E)

A Unit weight/classification

Sample, Depth (FT)	Dry Density (PCF)	Water Content (%)	Total Unit Weight (PCF)	Classification
TP-14, 6'	93	20	111 7	CH
TP-15, 7 5'	93	19	110 7	CH
TP-10, 8 5'	91	26	114 7	CH
TP-7, 9'	90	23	110 7	CH
TH-1, 15'-17'	97	21	117 4	CH

Unit weight relationship

$$\Upsilon d = \frac{(Gs*\Upsilon w)}{(1+e)}, \quad e = \frac{(Gs*\Upsilon w)}{\Upsilon d} - 1, \quad \Upsilon sat = \frac{(Gs+e)*(\Upsilon w)}{(1+e)}$$, Reference D

Where

Υd = Dry Density

e = void ratio

Υsat = saturated unit weight

Gs = 2 70 (assumed)

γ_w = 62 4 PCF

i) Depth 0-10' γ_d = 93 PCF, w = 22 0, γ_{total} = 113 5,e = 0 8, γ_{sat} = 121 0 PCF
ii) Depth 10+ For γ_d = 100 PCF, w = 21 0, γ_{total} = 121 0, e = 0 68, γ_{sat} = 125 5 PCF

B Strength

TH-1, Ref C, Figure No's 23a & 23b			
Sample Depth (FT)	N, Blows/FT	Unconfined Compressive Strength Correlation (TSF)*	Consistency*
2 5-4 0	25	3 0	Very Stiff (CH)
5 0-6 5	26	3 0	Very Stiff (CH)
7 5-9 0	35	4 0+	Hard (CH)
10 0-11 5	15	1 5	Stiff (CH)
20 0-21 5	40	4 0+	Hard (CH)
25 0-26 5	20	2 0	Stiff (CH)
30 0-31 5	80+	4 0+	Hard (CH)

TH-2, Ref C, Figure No's 24a & 24b			
Depth (FT)	N, Blows/FT	Unconfined Compressive Strength Correlation (TSF)*	Consistency*
5 0-6 5	47	4 0+	Hard (CH)
10 0-11 5	24	3 0	Very Stiff (CH)
15 0-16 5	45	4 0+	Hard (CH)
20 0-21 5	38	4 0+	Hard (CH)
30 0-31 5	60	4 0+	Hard (CH)
40 0-41 5	80+	4 0+	Hard (CH)

<u>Notes</u>
* Reference D, pg 87

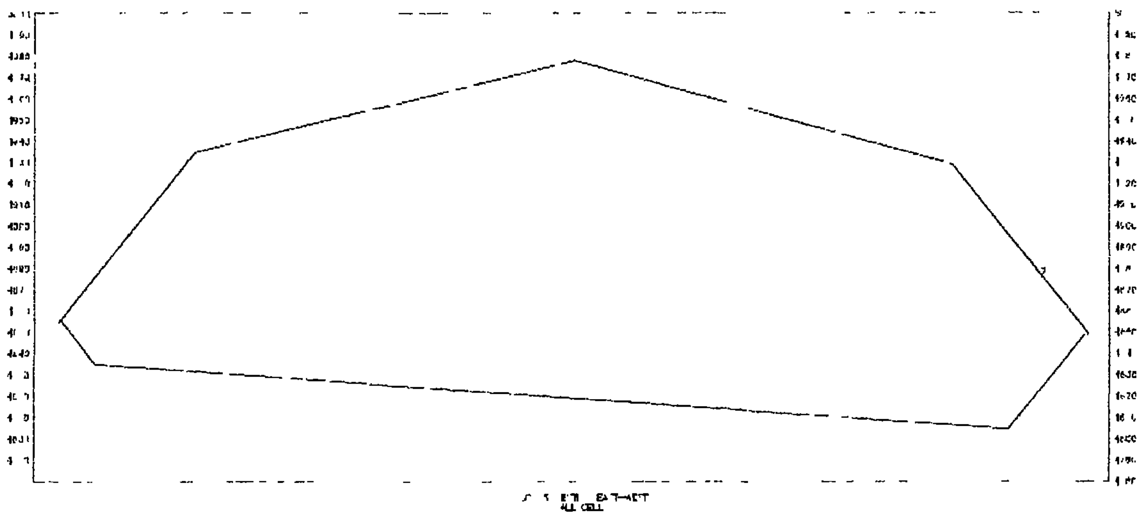
C Design values

Feature	Depth (FT)	Total Unit Weight (PCF)	Saturated Unit Weight (PCF)	Cohesion (PSF)*	Phi (Degrees)	Material
Upper Very Stiff Clay	0-10	113 5	121 0	3000 Short Term, 50 Long Term	0 Short Term, 29 Long Term	CH
Less Stiff Clay	10-20	121 0	125 5	1500 Short Term, 50 Long Term	0 Short Term, 29 Long Term	CH
Stiff Clay	20-30	121 0	125 5	2000 Short Term, 50 Long Term	0 Short Term, 29 Long Term	CH
Lower Very Stiff Clay	30+	121 0	125 5	3000 Short Term, 50 Long Term	0 Short Term, 50 Long Term	CH
Waste	Vanes	50 0	60 0	150	22	Waste**
LCRS		100 0	110 0	0	32	Sand
Cap		110 0	120 0	1000	0	Clay

* Reference D, pg 87
**EPA, Reference 4

2 4 Cross Sections

A West-East Cross Section (see attached)



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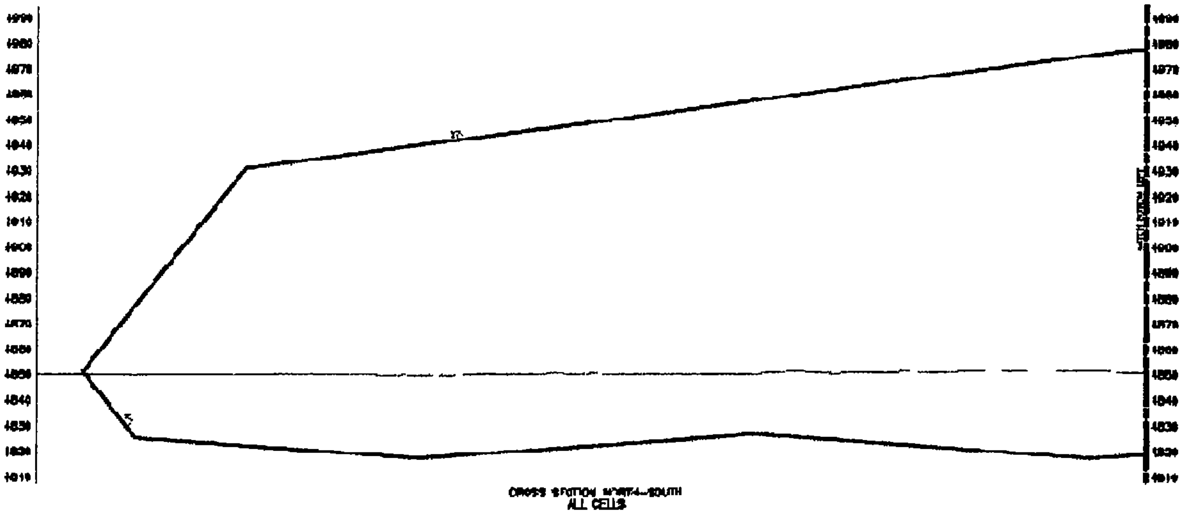
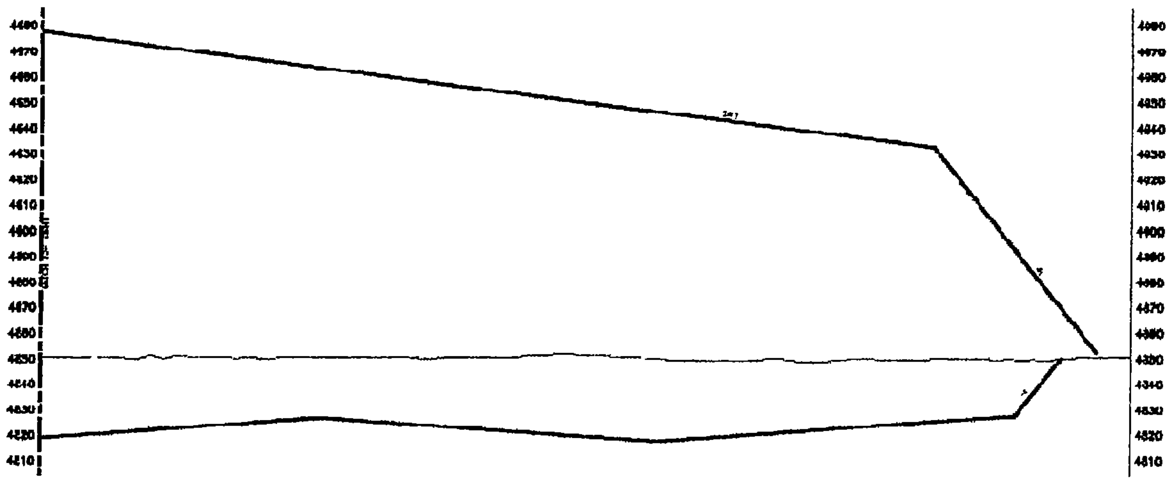
Project	Intermountain Regional Landfill	Computed	GMS	Date	March 2010
Subject	Slope Stability	Checked	PUP	Date	4 16 10
Task	Slope Stability Gases	Page	5 of 6		
Job #	Dept 00143	No	125184		

B North-South Cross Sections (see attached)





C Case 1 - Maximum Cut Slope
- i) East end of East-West cross-section (Cell 1, Phase 3) Depth of cut=45 FT Use 50 FT for analysis
- ii) Slope = 4H 1V
- iii) See Attachment 2C-1 for stability output

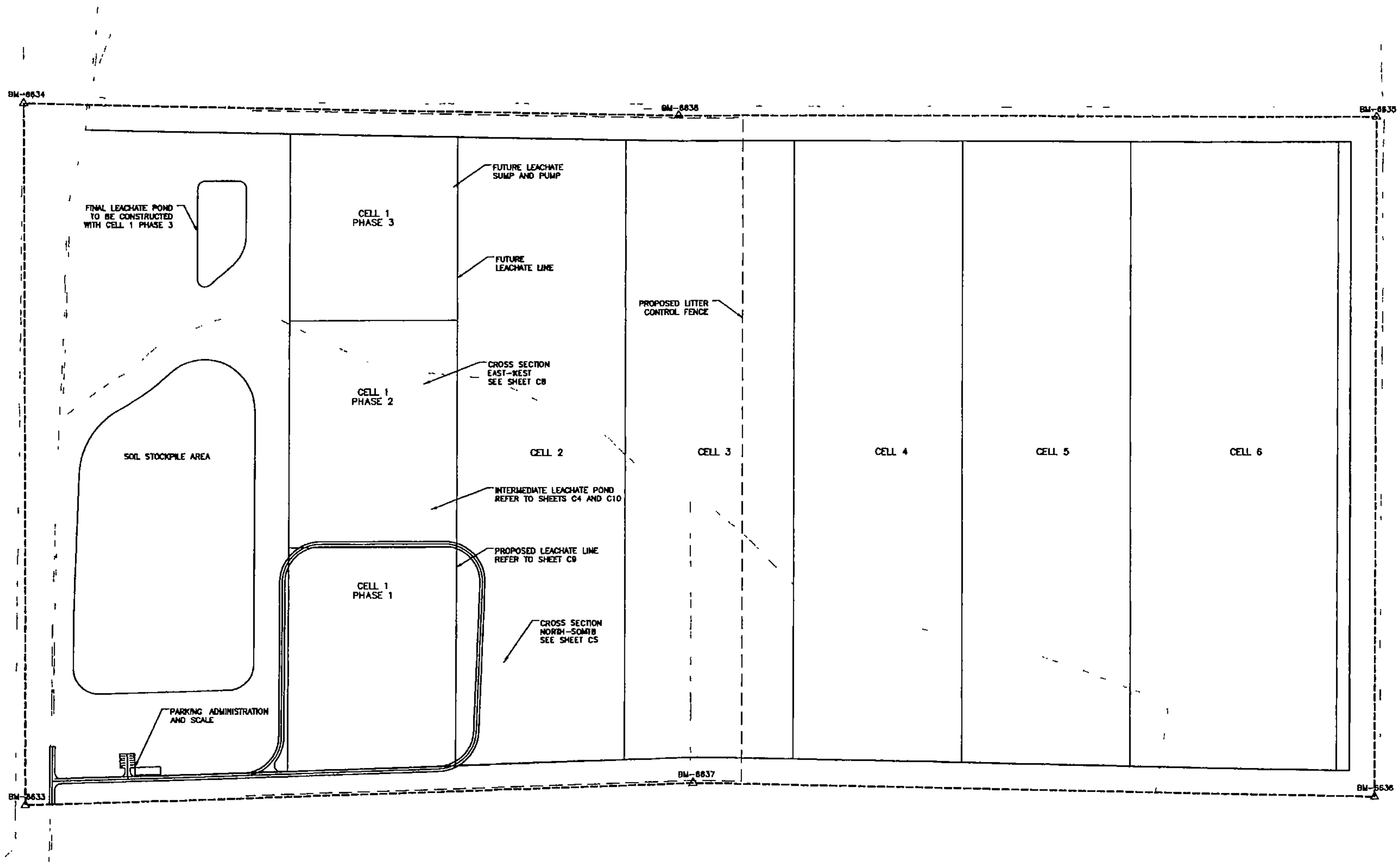
D Case 2 - Maximum Fill Slope (Waste)
- i) East end of the East-West cross section (Cell 1, Phase 3) Height above existing grade = 80 FT Use 100 FT for analysis
- ii) Slope = 4H 1V
- iii) See Attachment 2C-2 for stability output

E Case 3 – Maximum Operational Fill Slope (Cell 4/Cell 5)
- i) Maximum waste height = 130 FT above cell floor
- ii) Waste slope = 3H 1V
- iii) See Attachment 2C-3 for stability output

2 5 Results

Feature	Static Factor of Safety	Yield Acceleration	Displacement, U (CM)
Maximum Excavation Slope, 1V 4H (Short Term controls)	2 95	0 10g	14 0
Maximum Fill Slope, 1V 4H	2 19	0 28g	0 05
Waste Fill Over Liner and Leachate Collection System (Sliding Block)	1 46 (18° Interface Fnction)	0 13g	8 0

ATTACHMENT 2A: PLAN VIEWS, CROSS SECTIONS, AND DETAILS



C:\PWworking\PHX\d0164095\01C003.dwg Plot, 3/1/2010 1 44 13 PM gshafer

1/6

0 200
SCALE IN FEET

NOTES.

EXISTING TOPOGRAPHIC DATA IS PROVI
AERIAL SURVEYS INC NOVEMBER 18,

BENCHMARKS		
BM	N	E
6633	7248525 12	1477769 21
6634	7248548 22	1480525 47
6635	7243228.01	1480465.01
6636	7243237 28	1477796 04
6637	7245907 75	1477851 32
6638	7245968.82	1480470 15

LEGEND

EXISTING CONTOURS
CELL FOOTP BOUNDARY
PROPOSED L DRAIN LINE
LITTER CON FENCE LOCA

HDR
HDR Engineering, Inc.

ISSUE	DATE	DESCRIPTION

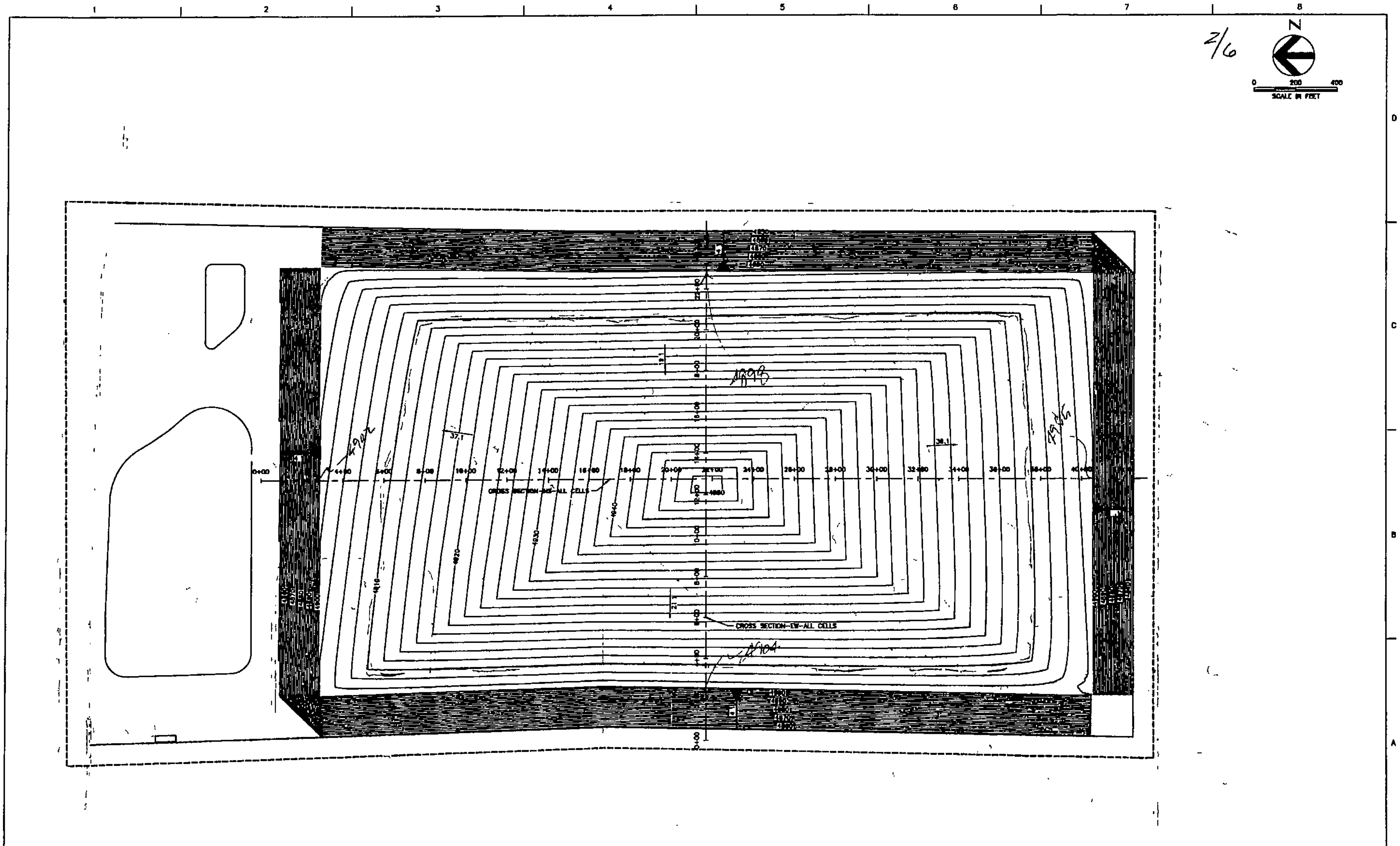
PROJECT MANAGOR	T WARNER
CHECKED BY	S. WOMACK
DESIGNED BY	C MCCARTY
DRAWN BY	C MCCMBY
PROJECT NUMBER	

INTERMOUNTAIN
REGIONAL
LANDFILL

SITE PLAN

0 1 2

FILENAME	D1C003.DWG
SCALE	1 =200



HDR

PROJECT MANAGER	T. WARNER
CHECKED BY	S. WOMACK
DESIGNED BY	C. MCCARTY
DRAWN BY	C. MCCARTY
PROJECT NUMBER	

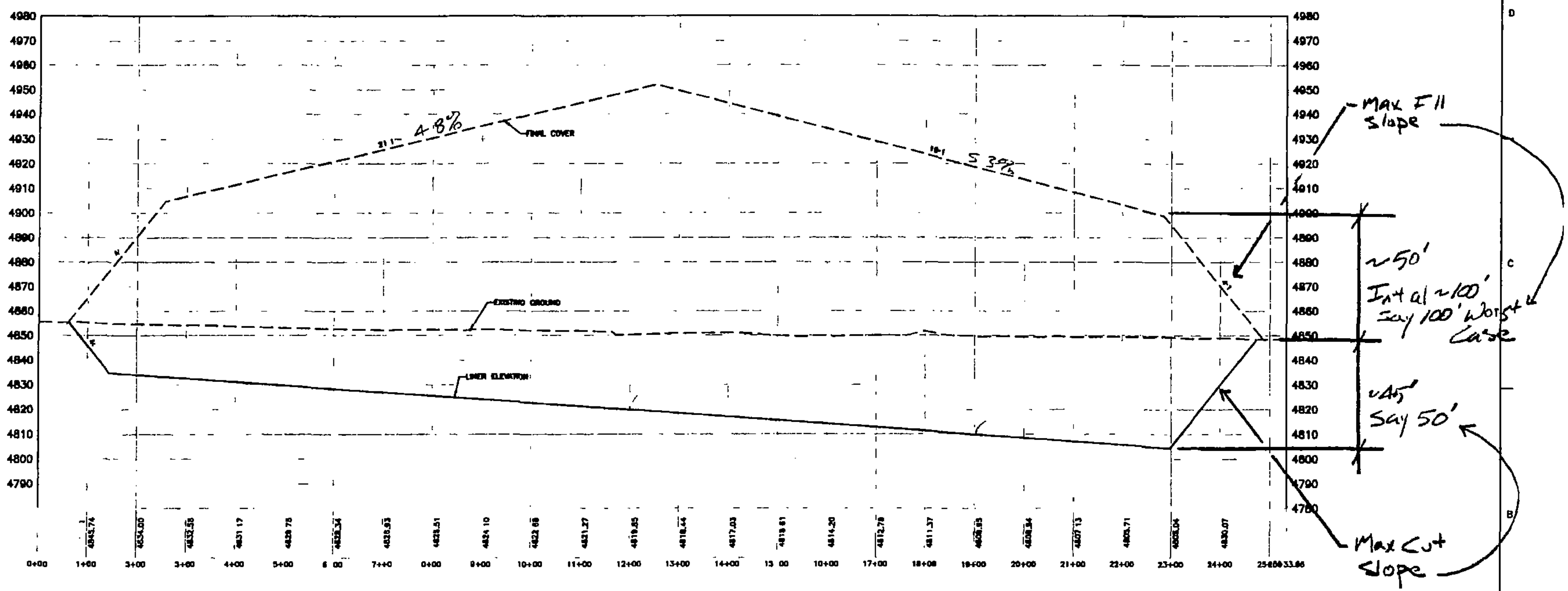
ISSUE	DATE	DESCRIPTION

INTERMOUNTAIN
REGIONAL
LANDFILL

FINAL COVER PLAN

FILENAME 010005.DWG
SCALE 1"=200'
SHEET 5 OF 13

3/6



CROSS SECTION EAST–WEST
ALL CELLS

PROJECT MANAGER	T. WARNER
CHECKED BY	S. WOMACK
DESIGNED BY	C. MOCARTY
DRAWN BY	C. MOCARTY
PROJECT NUMBER	

HDR

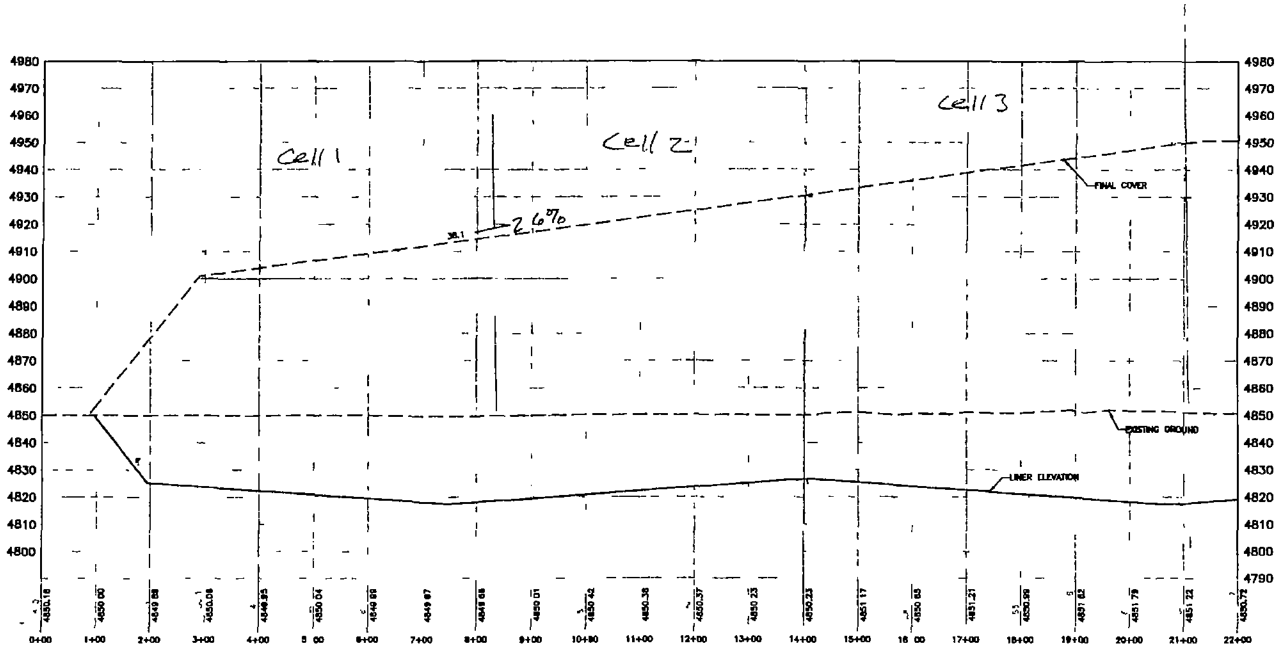
ISSUE	DATE	DESCRIPTION

INTERMOUNTAIN
REGIONAL
LANDFILL

CROSS SECTION

FILENAME 010097
SCALE 1"=100'
SHEET 7 OF 12

4/6



HDR

HDR Engineering, Inc.

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	T. WARNER
CHECKED BY	S. WOMACK
DESIGNED BY	C. MCCARTY
DRAWN BY	C. MCCARTY
PROJECT NUMBER	

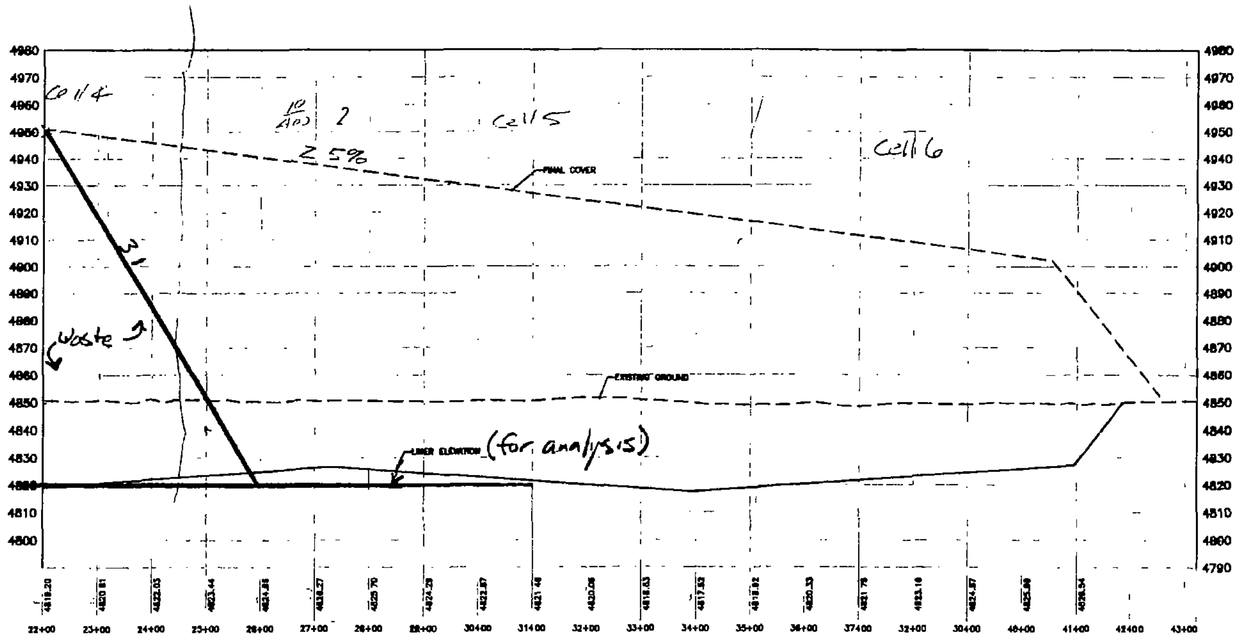
INTERMOUNTAIN
REGIONAL
LANDFILL

CROSS SECTION

FILENAME	01C000.DWG
SCALE	1"=100'

SHEET 8 OF 13

5/6



CROSS SECTION NORTH–SOUTH
ALL CELLS

PROJECT MANAGER	T. WARNER
CHECKED BY	S. WOMACK
DESIGNED BY	C. MCCARTY
DRAWN BY	C. MCCARTY
PROJECT NUMBER	

ISSUE	DATE	DESCRIPTION

HDR Engineering, Inc.

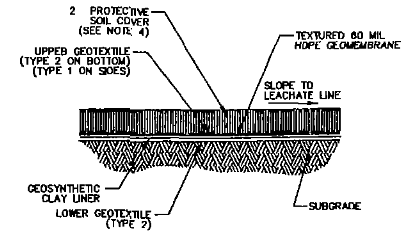
INTERMOUNTAIN REGIONAL LANDFILL

CROSS SECTION

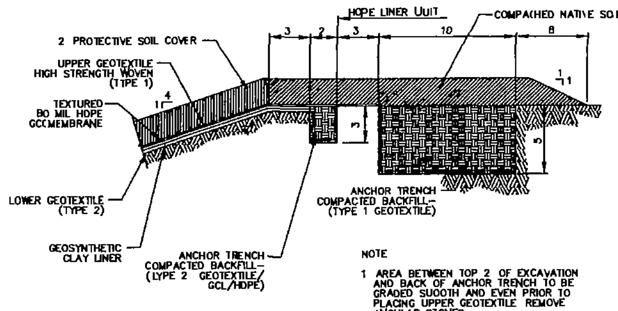
FILENAME 010006.DWG
SCALE 1"=100'

SHEET 9 OF 13

6/6



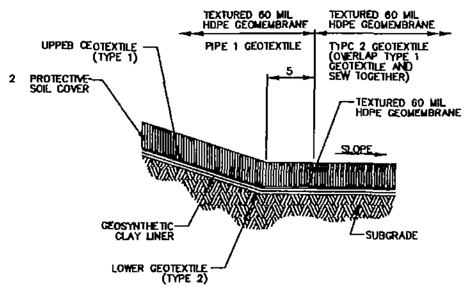
TYPICAL LANDFILL LINER DETAIL (1/C9)
NOT TO SCALE



NOTE

1 AREA BETWEEN TOP 2 OF EXCAVATION AND BACK OF ANCHOR TRENCH TO BE GRADED SMOOTH AND EVEN PRIOR TO PLACING UPPER GEOTEXTILE REMOVE ANGULAR STONES

LINER SYSTEM ANCHOR TRENCH (2/C9)
NOT TO SCALE



LINER AT SLOPE TRANSITION (3/C9)
NOT TO SCALE

NOTE THICKNESS MEASURED PERPENDICULAR TO EXCAVATION SURFACE.

NOTES:

1 TEMPORARY STORMWATER INTERCEPTOR BERM TO BE PLACED IN FRONT OF WORKING AREA TO DIVERT STORMWATER AWAY FROM ACTIVE FACE OWNER WILL RELOCATE AS NEEDED

2 STAGE 2 GEOMEMBRANE TO BE WELDED TO STAGE 1 FUTURE GEOSYNTHETIC COMPONENTS TO BE OVERLAPPED AND SECURED

3 TYPE 1 GEOTEXTILE IS REINFORCED AND REQUIRED ON SIDE SLOPES ONLY ABOVE HDPE LINER TYPE 2 GEOTEXTILE IS NON-REINFORCED (NON-WOVEN) AND IS TO BE USED ABOVE HDPE LINER ON BOTTOM AND BETWEEN SUBGRADE AND CCL A SAND CUSHION MAY BE USED IN LIEU OF THE LOWER TYPE 2 GEOTEXTILE WITH PRIOR APPROVAL OF ENGINEER AND OWNER

4 SEE SPECIFICATION 02240 FOR PROTECTIVE COVER MATERIAL REQUIREMENTS

5 SEE SPECIFICATION 02776 FOR REQUIRED MINIMUM INTERFACE FRICTION VALUES

GEOTEXTILE SCHEDULE		
LOCATION	TYPE	COMMENTS
ALL	ALL	REMOVE ALL ANGULAR STONES GREATER THAN 0.5 INCHES
LOWER GEOTEXTILE	2	USE 16 OZ/SY NON-WOVEN IF ROUNDED STONES GREATER THAN 2.5 INCHES ARE REMOVED USE 20 OZ/SY NON-WOVEN IF ONLY ROUNDED STONES GREATER THAN 4 INCHES ARE REMOVED NO HORIZONTAL SEAMS ON SIDESLOPES
UPPER GEOTEXTILE ON SIDESLOPES	1	REINFORCED GEOTEXTILE NO HORIZONTAL SEAMS ON SIDESLOPES
UPPER GEOTEXTILE ON BOTTOM (FLOOR)	2	USE 12 OZ/SY NON-WOVEN BENEATH DUNE SAND (PROTECTIVE SOIL COVER)

HDR
HDR Engineering, Inc.

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	T WARNER
CHECKED BY	S WOMACK
DESIGNED BY	C MCCARTY
DRAWN BY	C MCCARTY
PROJECT NUMBER	

INTERMOUNTAIN REGIONAL LANDFILL

LINER DETAILS

FILENAME 01C009 DWG
SCALE NTS
SHEET 9 OF 12

C:\PWworking\PHX\d0164095\01C009.dwg Plot, 3/1/2010 2:07:11 PM gshafer

ATTACHMENT 2B: DISPLACEMENT CHART, REFERENCE A

Ref. A

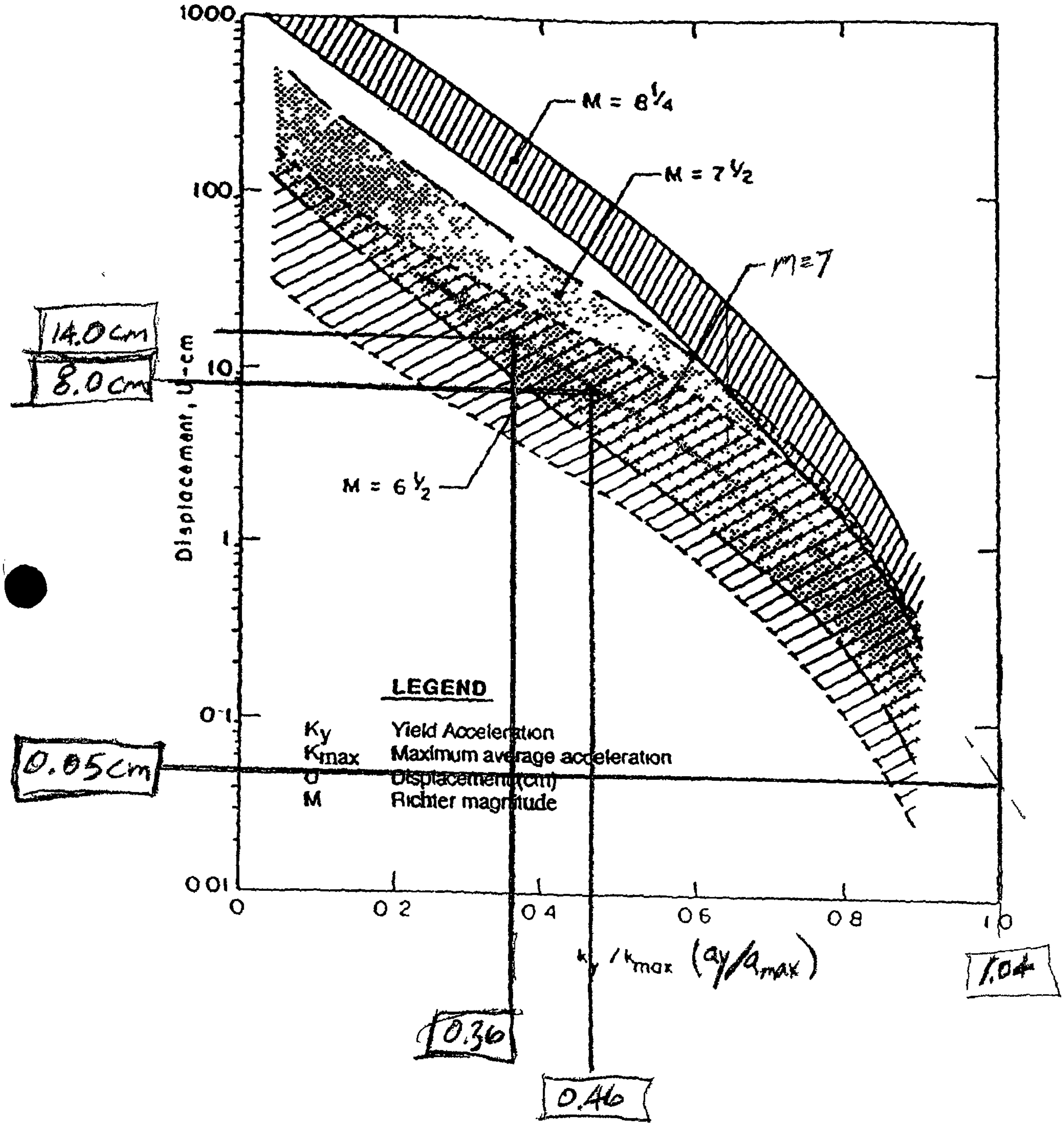


Figure 6 6 Makdisi and Seed Permanent Displacement Chart (Makdisi and Seed, 1978)

ATTACHMENT 2C: SLOPE STABILITY RUNS & RESULTS

ATTACHMENT 2C-1: SLOPE STABILITY RUNS & RESULTS – CUT SLOPE

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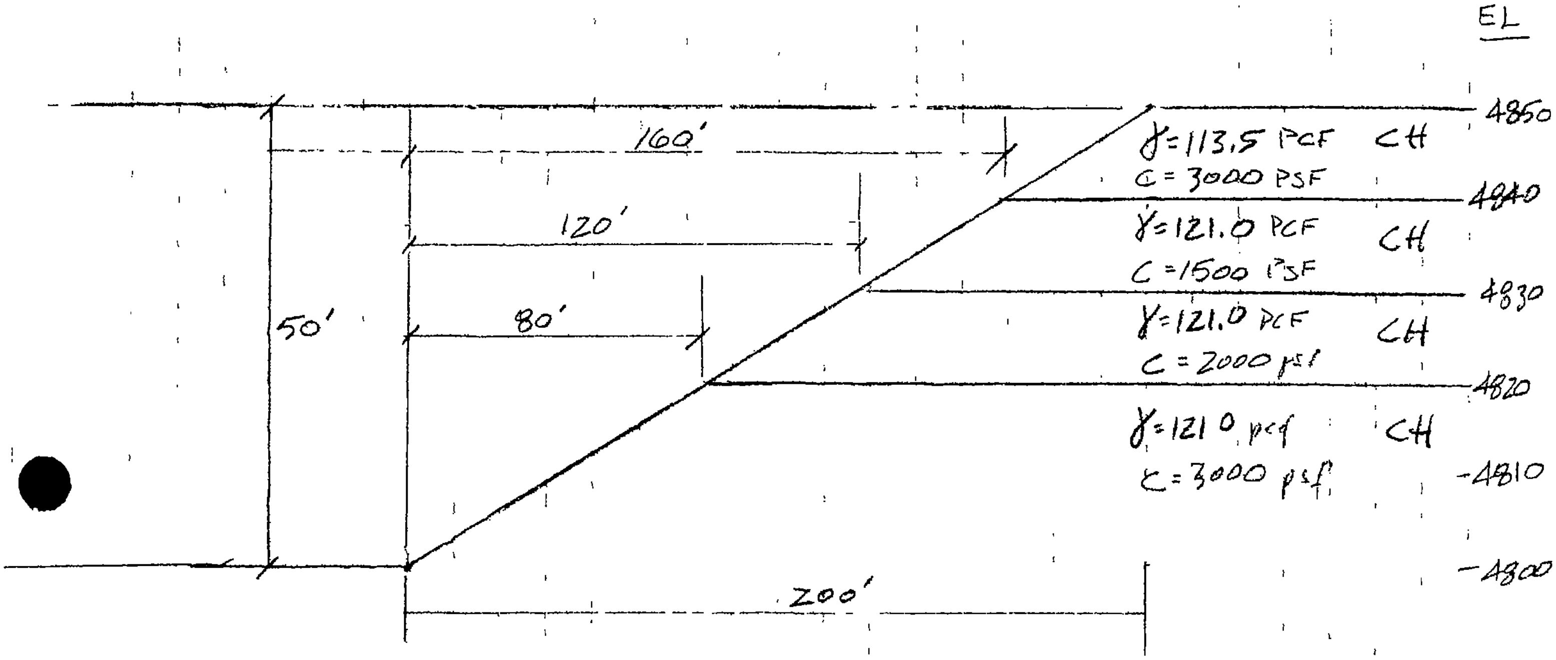
Project IRL		Computed GMS	Date 3/2010
Subject Slope stability		Checked Pllg	Date 4-26-10
Task Cut Slope		Page 1	of 130
Job # 125184	Dept 143	No	

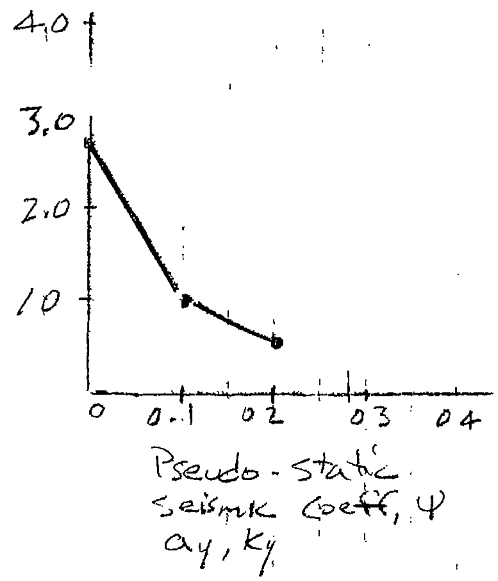
Cut slope (Max)
H=50'



H 1"=50'
V 1"=20'

Horizontal Acceleration	Short Term F.S.	Long Term F.S.
static	2.95	2.49
0.1g	1.00 ←	1.75
0.2g	0.57	1.33

↑ Controls



Project IRL		Computed GMS	Date 4/2010
Subject Slope stability		Checked PH	Date 4 26-10
Task Cut Slope		Page 2	of 130
Job # 125184 Dest 143		No	

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Maximum Cut Slope Results / Displacement

$a_{max} = 0.28\,g$ (Reference E)

$a_y = 0.1g$ (Previous page)

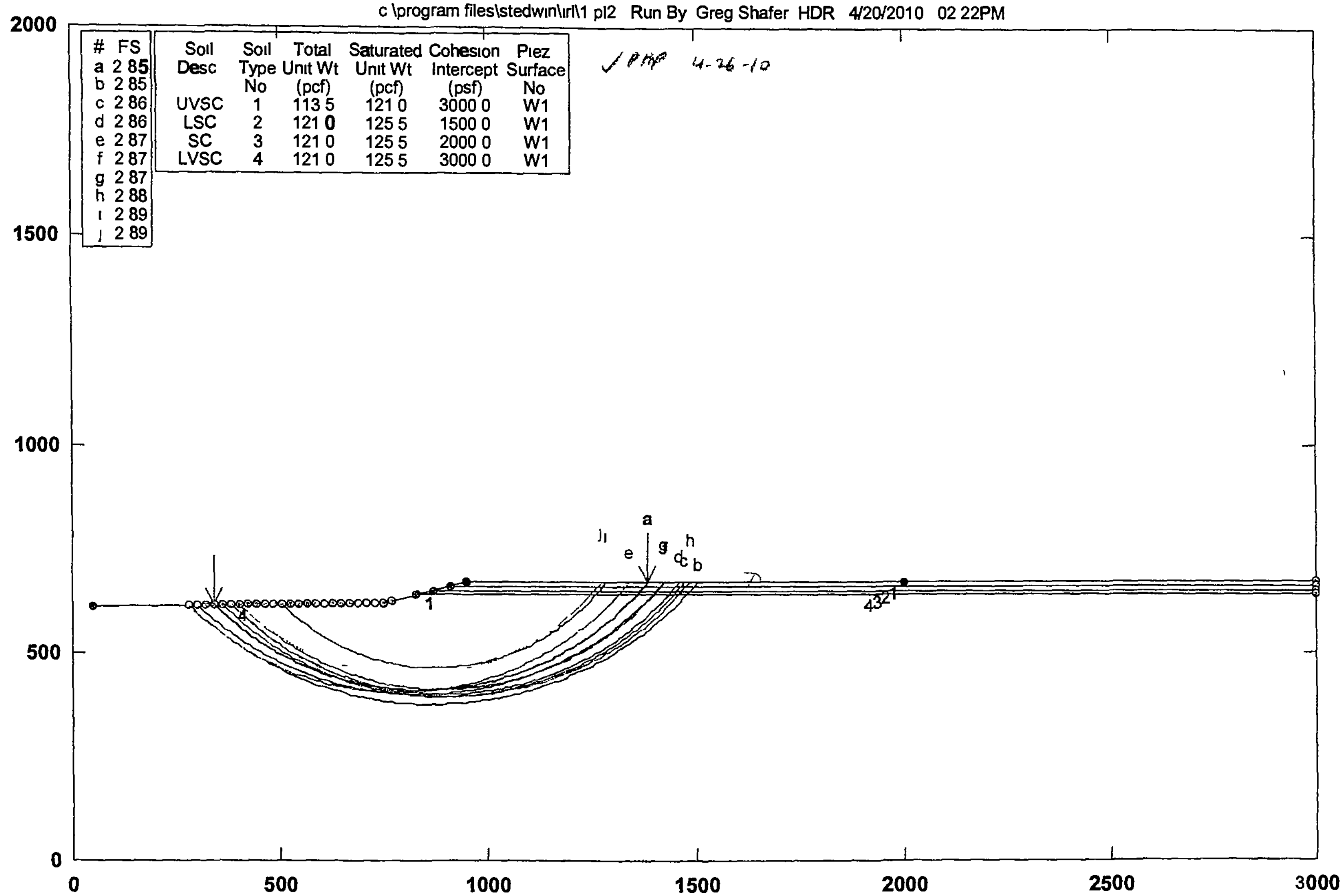
$\frac{a_y}{a_{max}} = \frac{0.1g}{0.28g} = 0.36$ @ $M = 7.0$

Attachment 2B (Reference A)

$U_{max} = 14$ cm < 30 cm (max allow) <u>OK</u>

Intermountam Regional Landfill Cut slope 1

c \program files\stedwin\irl\1 pl2 Run By Greg Shafer HDR 4/20/2010 02 22PM



PCSTABL7 FSmin=2 85
Safety Factors Are Calculated By The Modified Bishop Method

STED

3/130

4/130

** PCSTABL7 **
by
Purdue University
--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer s Method of Slices

Run Date 4/20/2010
Time of Run 02 22PM
Run By Greg Shafer, HDR
Input Data Filename C 1 in
Output Filename C 1 OUT
Unit ENGLISH
Plotted Output Filename C 1 PLT
PROBLEM DESCRIPTION Intermountain Regional Landfill
Cut slope 1

BOUNDARY COORDINATES
Note User origin value specified
Add 0 00 to X-values and 0 00 to Y-values listed

3 Top Boundaries
6 Total Boundaries

Boundary No	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below End
1	50 00	611 45	750 00	620 00	4
2	750 00	620 00	950 00	670 00	1
3	950 00	670 00	3000 00	670 00	1
4	910 00	660 00	3000 00	660 00	2
5	870 00	650 00	3000 00	650 00	3
6	830 00	640 00	3000 00	640 00	4

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type No	Total Unit Wt (pcf)	Saturated Unit Wt (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param	Pressure Constant (psf)	Piez Surface No
1	113 5	121 0	3000 0	0 0	0 00	0 0	1
2	121 0	125 5	1500 0	0 0	0 00	0 0	1
3	121 0	125 5	2000 0	0 0	0 00	0 0	1
4	121 0	125 5	3000 0	0 0	0 00	0 0	1

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified
625 Trial Surfaces Have Been Generated
25 Surfaces Initiate From Each Of 25 Points Equally Spaced
Along The Ground Surface Between X = 280 00 ft
and X = 770 00 ft
Each Surface Terminates Between X = 950 00 ft
and X =2000 00 ft
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0 00 ft
10 00 ft Line Segments Define Each Trial Failure Surface
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Examined They Are Ordered - Most Critical
First
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Failure Surface Specified By119 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	341 25	615 01
2	348 38	508 00
3	355 61	601 09
4	362 94	594 29
5	370 37	587 59
6	377 89	580 99
7	385 50	574 51
8	393 20	568 13
9	400 99	561 87
10	408 88	555 71
11	416 85	549 67
12	424 90	543 74
13	433 04	537 93

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14	441 26	532 24
15	449 56	526 66
16	457 93	521 20
17	466 39	515 86
18	474 92	510 64
19	483 52	505 54
20	492 20	500 57
21	500 94	495 72
22	509 75	490 99
23	518 63	486 39
24	527 58	481 92
25	536 58	477 57
26	545 65	473 36
27	554 78	469 27
28	563 96	465 31
29	573 20	461 49
30	582 49	457 79
31	591 84	454 23
32	601 23	450 80
33	610 68	447 51
34	620 16	444 35
35	629 69	441 33
36	639 27	438 44
37	648 88	435 69
38	658 53	433 07
39	668 22	430 60
40	677 95	428 26
41	687 70	426 06
42	697 49	424 00
43	707 30	422 07
44	717 14	420 29
45	727 00	418 65
46	736 89	417 15
47	746 80	415 79
48	756 72	414 57
49	766 66	413 49
50	776 62	412 56
51	786 59	411 76
52	796 57	411 11
53	806 55	410 60
54	816 55	410 23
55	826 55	410 00
56	836 55	409 92
57	846 54	409 98
58	856 54	410 18
59	866 54	410 52
60	876 53	411 00
61	886 51	411 63
62	896 48	412 40
63	906 43	413 31
64	916 38	414 36
65	926 31	415 56
66	936 22	416 89
67	946 11	418 37
68	955 98	419 98
69	965 82	421 74
70	975 64	423 64
71	985 43	425 67
72	995 19	427 85
73	1004 92	430 16
74	1014 61	432 51
75	1024 27	435 20
76	1033 89	437 93
77	1043 48	440 79
78	1053 02	443 79
79	1062 51	446 92
80	1071 96	450 19
81	1081 37	453 60

82	1090 72	457 13
83	1100 02	460 80
84	1109 27	464 61
85	1118 46	468 54
86	1127 60	472 60
87	1136 68	476 80
88	1145 70	481 12
89	1154 65	485 57
90	1163 54	490 14
91	1172 37	494 85
92	1181 13	499 67
93	1189 82	504 63
94	1198 43	509 70
95	1206 98	514 90
96	1215 44	520 22
97	1223 84	525 65
98	1232 15	531 21
99	1240 38	536 89
100	1248 54	542 68
101	1255 61	548 58
102	1264 59	554 60
103	1272 49	560 74
104	1280 30	566 98
105	1288 02	573 34
106	1295 55	579 80
107	1303 18	586 38
108	1310 62	593 06
109	1317 97	599 84
110	1325 22	606 73
111	1332 37	613 72
112	1339 42	620 81
113	1346 37	628 01
114	1353 21	635 30
115	1359 95	642 68
116	1366 59	650 16
117	1373 12	657 74
118	1379 54	665 41
119	1383 27	670 00

Circle Center At X = 837 5 , Y = 1112 7 and Radius, 702 8

*** 2 850 ***

Individual data on the 126 slices

Slice No	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Sot (lbs)	Force Tnorm (lbs)	Force Ttan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	7 1	3062 1	0 0	0 0	0 0	0 0	0 0	0 0	0 0
2	7 2	9269 7	0 0	0 0	0 0	0 0	0 0	0 0	0 0
3	7 3	15552 9	0 0	0 0	0 0	0 0	0 0	0 0	0 0
4	7 4	21902 9	0 0	0 0	0 0	0 0	0 0	0 0	0 0
5	7 5	28311 4	0 0	0 0	0 0	0 0	0 0	0 0	0 0
6	7 6	34769 4	0 0	0 0	0 0	0 0	0 0	0 0	0 0
7	7 7	41268 9	0 0	0 0	0 0	0 0	0 0	0 0	0 0
8	7 8	47800 7	0 0	0 0	0 0	0 0	0 0	0 0	0 0
9	7 9	54356 4	0 0	0 0	0 0	0 0	0 0	0 0	0 0
10	8 0	60927 7	0 0	0 0	0 0	0 0	0 0	0 0	0 0
11	8 1	67506 3	0 0	0 0	0 0	0 0	0 0	0 0	0 0
12	8 1	74083 2	0 0	0 0	0 0	0 0	0 0	0 0	0 0
13	8 2	80650 6	0 0	0 0	0 0	0 0	0 0	0 0	0 0
14	8 3	87200 2	0 0	0 0	0 0	0 0	0 0	0 0	0 0
15	8 4	93723 4	0 0	0 0	0 0	0 0	0 0	0 0	0 0
16	8 5	100212 1	0 0	0 0	0 0	0 0	0 0	0 0	0 0
17	8 5	106658 9	0 0	0 0	0 0	0 0	0 0	0 0	0 0
18	8 6	113055 3	0 0	0 0	0 0	0 0	0 0	0 0	0 0
19	8 7	119393 6	0 0	0 0	0 0	0 0	0 0	0 0	0 0
20	8 7	125666 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
21	8 8	131865 4	0 0	0 0	0 0	0 0	0 0	0 0	0 0
22	8 9	137983 1	0 0	0 0	0 0	0 0	0 0	0 0	0 0
23	8 9	144013 1	0 0	0 0	0 0	0 0	0 0	0 0	0 0

7/130

24	9 0	149947	8	0 0	0 0	0 0	0 0	0 0	0 0	0 0
25	9 1	155779	8	0 0	0 0	0 0	0 0	0 0	0 0	0 0
26	9 1	161502	5	0 0	0 0	0 0	0 0	0 0	0 0	0 0
27	9 2	167109	3	0 0	0 0	0 0	0 0	0 0	0 0	0 0
28	9 2	172592	6	0 0	0 0	0 0	0 0	0 0	0 0	0 0
29	9 3	177946	2	0 0	0 0	0 0	0 0	0 0	0 0	0 0
30	9 3	183165	4	0 0	0 0	0 0	0 0	0 0	0 0	0 0
31	9 4	188242	8	0 0	0 0	0 0	0 0	0 0	0 0	0 0
32	9 4	193171	8	0 0	0 0	0 0	0 0	0 0	0 0	0 0
33	9 5	197947	8	0 0	0 0	0 0	0 0	0 0	0 0	0 0
34	9 5	202565	7	0 0	0 0	0 0	0 0	0 0	0 0	0 0
35	9 6	207019	0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
36	9 6	211304	0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
37	9 7	215413	3	0 0	0 0	0 0	0 0	0 0	0 0	0 0
38	9 7	219345	2	0 0	0 0	0 0	0 0	0 0	0 0	0 0
39	9 7	223092	6	0 0	0 0	0 0	0 0	0 0	0 0	0 0
40	9 8	226652	7	0 0	0 0	0 0	0 0	0 0	0 0	0 0
41	9 8	230021	7	0 0	0 0	0 0	0 0	0 0	0 0	0 0
42	9 8	233194	3	0 0	0 0	0 0	0 0	0 0	0 0	0 0
43	9 8	236168	7	0 0	0 0	0 0	0 0	0 0	0 0	0 0
44	9 9	238940	1	0 0	0 0	0 0	0 0	0 0	0 0	0 0
45	9 9	241505	5	0 0	0 0	0 0	0 0	0 0	0 0	0 0
46	9 9	243863	7	0 0	0 0	0 0	0 0	0 0	0 0	0 0
47	3 2	79195	3	0 0	0 0	0 0	0 0	0 0	0 0	0 0
48	6 7	157083	9	0 0	0 0	0 0	0 0	0 0	0 0	0 0
49	9 9	235711	4	0 0	0 0	0 0	0 0	0 0	0 0	0 0
50	10 0	240000	3	0 0	0 0	0 0	0 0	0 0	0 0	0 0
51	10 0	244094	7	0 0	0 0	0 0	0 0	0 0	0 0	0 0
52	10 0	247990	9	0 0	0 0	0 0	0 0	0 0	0 0	0 0
53	10 0	251684	1	0 0	0 0	0 0	0 0	0 0	0 0	0 0
54	10 0	255174	0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
55	10 0	258454	5	0 0	0 0	0 0	0 0	0 0	0 0	0 0
56	3 5	90014	5	0 0	0 0	0 0	0 0	0 0	0 0	0 0
57	5 5	182803	0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
58	10 0	281635	0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
59	10 0	284263	7	0 0	0 0	0 0	0 0	0 0	0 0	0 0
60	10 0	286660	7	0 0	0 0	0 0	0 0	0 0	0 0	0 0
61	3 5	99879	8	0 0	0 0	0 0	0 0	0 0	0 0	0 0
62	6 5	189432	1	0 0	0 0	0 0	0 0	0 0	0 0	0 0
63	10 0	291499	5	0 0	0 0	0 0	0 0	0 0	0 0	0 0
64	10 0	293189	1	0 0	0 0	0 0	0 0	0 0	0 0	0 0
65	10 0	294641	2	0 0	0 0	0 0	0 0	0 0	0 0	0 0
66	3 6	105898	8	0 0	0 0	0 0	0 0	0 0	0 0	0 0
67	6 4	190434	4	0 0	0 0	0 0	0 0	0 0	0 0	0 0
68	9 9	297575	8	0 0	0 0	0 0	0 0	0 0	0 0	0 0
69	9 9	298309	6	0 0	0 0	0 0	0 0	0 0	0 0	0 0
70	9 9	298803	9	0 0	0 0	0 0	0 0	0 0	0 0	0 0
71	3 9	117829	7	0 0	0 0	0 0	0 0	0 0	0 0	0 0
72	6 0	180724	1	0 0	0 0	0 0	0 0	0 0	0 0	0 0
73	9 8	296033	7	0 0	0 0	0 0	0 0	0 0	0 0	0 0
74	9 8	293082	0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
75	9 8	289918	4	0 0	0 0	0 0	0 0	0 0	0 0	0 0
76	9 8	286544	5	0 0	0 0	0 0	0 0	0 0	0 0	0 0
77	9 7	282965	5	0 0	0 0	0 0	0 0	0 0	0 0	0 0
78	9 7	279183	4	0 0	0 0	0 0	0 0	0 0	0 0	0 0
79	9 7	275204	0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
80	9 6	271033	2	0 0	0 0	0 0	0 0	0 0	0 0	0 0
81	9 6	266671	8	0 0	0 0	0 0	0 0	0 0	0 0	0 0
82	9 5	262129	8	0 0	0 0	0 0	0 0	0 0	0 0	0 0
83	9 5	257404	9	0 0	0 0	0 0	0 0	0 0	0 0	0 0
84	9 5	252509	1	0 0	0 0	0 0	0 0	0 0	0 0	0 0
85	9 4	247444	1	0 0	0 0	0 0	0 0	0 0	0 0	0 0
86	9 4	242215	5	0 0	0 0	0 0	0 0	0 0	0 0	0 0
87	9 3	236831	9	0 0	0 0	0 0	0 0	0 0	0 0	0 0
88	9 2	231299	0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
89	9 2	225619	9	0 0	0 0	0 0	0 0	0 0	0 0	0 0
90	9 1	219803	6	0 0	0 0	0 0	0 0	0 0	0 0	0 0
91	9 1	213856	3	0 0	0 0	0 0	0 0	0 0	0 0	0 0

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92	9 0	207784 6	0 0	0 0	0 0	0 0	0 0	0 0	0 0
93	9 0	201592 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
94	8 9	195291 3	0 0	0 0	0 0	0 0	0 0	0 0	0 0
95	8 8	188889 1	0 0	0 0	0 0	0 0	0 0	0 0	0 0
96	8 8	182387 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
97	8 7	175797 6	0 0	0 0	0 0	0 0	0 0	0 0	0 0
98	8 6	169128 2	0 0	0 0	0 0	0 0	0 0	0 0	0 0
99	8 5	162383 6	0 0	0 0	0 0	0 0	0 0	0 0	0 0
100	8 5	155573 9	0 0	0 0	0 0	0 0	0 0	0 0	0 0
101	8 4	148706 8	0 0	0 0	0 0	0 0	0 0	0 0	0 0
102	8 3	141792 1	0 0	0 0	0 0	0 0	0 0	0 0	0 0
103	8 2	134833 4	0 0	0 0	0 0	0 0	0 0	0 0	0 0
104	8 2	127843 1	0 0	0 0	0 0	0 0	0 0	0 0	0 0
105	8 1	120826 8	0 0	0 0	0 0	0 0	0 0	0 0	0 0
106	8 0	113794 9	0 0	0 0	0 0	0 0	0 0	0 0	0 0
107	7 9	106755 4	0 0	0 0	0 0	0 0	0 0	0 0	0 0
108	7 8	99714 9	0 0	0 0	0 0	0 0	0 0	0 0	0 0
109	7 7	92685 1	0 0	0 0	0 0	0 0	0 0	0 0	0 0
110	7 6	85671 3	0 0	0 0	0 0	0 0	0 0	0 0	0 0
111	7 5	78686 1	0 0	0 0	0 0	0 0	0 0	0 0	0 0
112	7 4	71734 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
113	7 3	54826 2	0 0	0 0	0 0	0 0	0 0	0 0	0 0
114	7 2	57972 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
115	7 2	51178 1	0 0	0 0	0 0	0 0	0 0	0 0	0 0
116	7 0	44453 9	0 0	0 0	0 0	0 0	0 0	0 0	0 0
117	6 9	37808 2	0 0	0 0	0 0	0 0	0 0	0 0	0 0
118	6 8	31250 3	0 0	0 0	0 0	0 0	0 0	0 0	0 0
119	4 3	16484 3	0 0	0 0	0 0	0 0	0 0	0 0	0 0
120	2 4	8304 1	0 0	0 0	0 0	0 0	0 0	0 0	0 0
121	6 5	18091 7	0 0	0 0	0 0	0 0	0 0	0 0	0 0
122	0 1	339 2	0 0	0 0	0 0	0 0	0 0	0 0	0 0
123	6 5	12186 8	0 0	0 0	0 0	0 0	0 0	0 0	0 0
124	1 9	2407 3	0 0	0 0	0 0	0 0	0 0	0 0	0 0
125	4 5	3748 9	0 0	0 0	0 0	0 0	0 0	0 0	0 0
126	3 7	973 8	0 0	0 0	0 0	0 0	0 0	0 0	0 0

Failure Surface Specified By139 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	280 00	514 26
2	287 20	607 32
3	294 49	600 47
4	301 86	593 71
5	309 30	587 03
6	316 83	580 45
7	324 43	573 95
8	332 11	567 55
9	339 87	561 24
10	347 70	555 02
11	355 60	548 89
12	363 58	542 86
13	371 62	536 92
14	379 74	531 08
15	387 93	525 34
16	396 18	519 70
17	404 50	514 15
18	412 89	508 70
19	421 34	503 36
20	429 86	498 11
21	438 43	492 97
22	447 07	487 93
23	455 76	482 99
24	464 52	478 16
25	473 33	473 43
26	482 19	468 80
27	491 12	464 28
28	500 09	459 87
29	509 12	455 57
30	518 19	451 37

31	527 32	447 28
32	536 49	443 30
33	545 71	439 44
34	554 98	435 68
35	564 29	432 03
36	573 65	428 49
37	583 04	425 06
38	592 47	421 75
39	601 95	418 55
40	611 46	415 46
41	621 01	412 48
42	630 59	409 62
43	640 20	406 88
44	649 85	404 25
45	659 53	401 73
46	669 24	399 33
47	678 97	397 04
48	688 73	394 87
49	698 52	392 82
50	708 33	390 88
51	718 17	389 06
52	728 02	387 36
53	737 89	385 78
54	747 78	384 31
55	757 69	382 96
56	767 62	381 73
57	777 56	380 62
58	787 51	379 62
59	797 47	378 75
60	807 44	377 99
61	817 42	377 35
62	827 40	376 83
63	837 40	376 43
64	847 39	376 15
65	857 39	375 99
66	867 39	375 95
67	877 39	376 02
68	887 39	376 22
69	897 38	376 53
70	907 37	376 97
71	917 36	377 52
72	927 34	378 19
73	937 31	378 98
74	947 26	379 89
75	957 21	380 91
76	967 15	382 06
77	977 07	383 32
78	986 97	384 71
79	996 85	386 21
80	1006 73	387 82
81	1016 57	389 56
82	1026 40	391 41
83	1036 20	393 38
84	1045 98	395 46
85	1055 74	397 66
86	1065 47	399 98
87	1075 17	402 42
88	1084 84	404 96
89	1094 48	407 63
90	1104 08	410 41
91	1113 65	413 30
92	1123 19	416 31
93	1132 69	419 43
94	1142 16	422 66
95	1151 58	426 00
96	1160 96	429 46
97	1170 30	433 03
98	1179 60	436 71

99	1188 86	440 50
100	1198 06	444 40
101	1207 23	448 41
102	1216 34	452 53
103	1225 40	456 75
104	1234 41	461 09
105	1243 37	465 53
106	1252 28	470 08
107	1251 13	474 73
108	1269 93	479 49
109	1278 66	484 35
110	1287 34	489 32
111	1295 96	494 39
112	1304 52	499 56
113	1313 02	504 83
114	1321 45	510 21
115	1329 82	515 68
116	1338 12	521 25
117	1346 36	526 93
118	1354 53	532 70
119	1362 62	538 56
120	1370 65	544 53
121	1378 61	550 58
122	1386 49	556 74
123	1394 30	562 98
124	1402 04	569 32
125	1409 70	575 75
126	1417 28	582 27
127	1424 78	588 88
128	1432 20	595 58
129	1439 55	602 37
130	1446 81	609 24
131	1453 99	616 20
132	1461 09	623 25
133	1468 10	630 38
134	1475 03	537 59
135	1481 87	644 88
136	1488 62	652 26
137	1495 29	659 71
138	1501 86	667 25
139	1504 21	670 00

Circle Center At X = 866 0 , Y = 1215 6 and Radius, 839 6

*** 2 851 ***

Failure Surface Specified By127 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	361 67	615 26
2	368 76	608 20
3	375 94	601 25
4	383 21	594 38
5	390 58	587 62
6	398 04	580 96
7	405 58	574 40
8	413 21	567 93
9	420 93	561 58
10	428 73	555 32
11	436 62	549 17
12	444 59	543 13
13	452 63	537 19
14	460 76	531 36
15	468 96	525 64
16	477 24	520 03
17	485 60	514 54
18	494 02	509 15
19	502 52	503 88
20	511 09	498 72
21	519 72	493 68
22	528 43	488 76

23	537 19	483 95
24	546 03	479 26
25	554 92	474 68
26	563 87	470 23
27	572 89	465 90
28	581 96	461 69
29	591 08	457 60
30	600 26	453 63
31	609 49	449 79
32	618 77	446 07
33	628 11	442 47
34	637 48	439 00
35	646 91	435 66
36	656 38	432 44
37	665 89	429 35
38	675 44	426 39
39	685 03	423 55
40	694 65	420 84
41	704 32	418 27
42	714 01	415 82
43	723 74	413 50
44	733 50	411 32
45	743 28	409 25
46	753 10	407 34
47	762 94	405 54
48	772 80	403 88
49	782 68	402 35
50	792 58	400 96
51	802 50	399 69
52	812 44	398 56
53	822 39	397 56
54	832 35	396 70
55	842 32	395 97
56	852 30	395 37
57	862 29	394 91
58	872 29	394 58
59	882 29	394 38
60	892 29	394 32
61	902 29	394 39
62	912 28	394 60
63	922 28	394 93
64	932 27	395 41
65	942 25	396 01
66	952 22	396 76
67	962 18	397 63
68	972 13	398 64
69	982 07	399 78
70	991 99	401 05
71	1001 89	402 46
72	1011 77	404 00
73	1021 63	405 67
74	1031 46	407 47
75	1041 27	409 40
76	1051 06	411 47
77	1060 81	413 67
78	1070 54	415 99
79	1080 23	418 45
80	1089 89	421 03
81	1099 52	423 75
82	1109 10	426 59
83	1118 65	429 57
84	1128 16	432 67
85	1137 62	435 89
86	1147 05	439 25
87	1156 42	442 73
88	1165 75	446 33
89	1175 03	450 06
90	1184 26	453 91

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91	1193 43	457 89
92	1202 55	461 99
93	1211 62	466 21
94	1220 63	470 55
95	1229 58	475 01
96	1238 47	479 59
97	1247 29	484 29
98	1256 06	489 11
99	1264 75	494 04
100	1273 38	499 09
101	1281 95	504 26
102	1290 44	509 54
103	1298 86	514 93
104	1307 21	520 43
105	1315 48	526 05
106	1323 68	531 78
107	1331 80	537 61
108	1339 84	543 56
109	1347 80	549 61
110	1355 68	555 77
111	1363 48	562 03
112	1371 19	568 39
113	1378 82	574 86
114	1386 36	581 43
115	1393 81	588 10
116	1401 17	594 87
117	1408 43	601 74
118	1415 61	608 71
119	1422 69	615 77
120	1429 58	622 92
121	1436 57	630 17
122	1443 36	637 51
123	1450 06	644 94
124	1456 65	652 45
125	1463 14	650 06
126	1469 53	667 75
127	1471 35	570 00

Circle Center At X = 891 9 , Y = 1141 1 and Radius, 746 8
*** 2 858 ***
Failure Surface Specified By123 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	382 08	615 51
2	389 16	608 44
3	396 33	601 46
4	403 59	594 59
5	410 95	587 82
6	418 40	581 16
7	425 95	574 59
8	433 58	568 13
9	441 31	561 78
10	449 12	555 54
11	457 01	549 40
12	464 99	543 37
13	473 06	537 46
14	481 20	531 66
15	489 42	525 97
16	497 73	520 39
17	506 10	514 93
18	514 56	509 59
19	523 08	504 37
20	531 68	499 26
21	540 35	494 27
22	549 08	489 40
23	557 89	484 66
24	566 75	480 04
25	575 58	475 54
26	584 68	471 16

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27	593 73	466 91
28	602 84	462 79
29	612 00	458 79
30	621 22	454 92
31	630 50	451 17
32	639 82	447 56
33	649 19	444 08
34	658 62	440 72
35	668 08	437 50
36	677 59	434 40
37	687 14	431 44
38	696 74	428 62
39	705 37	425 92
40	716 03	423 36
41	725 73	420 93
42	735 47	418 64
43	745 23	415 48
44	755 02	414 46
45	764 84	412 58
46	774 69	410 83
47	784 56	409 21
48	794 45	407 74
49	804 36	405 40
50	814 29	405 19
51	824 23	404 13
52	834 19	403 20
53	844 16	402 41
54	854 14	401 76
55	864 12	401 25
56	874 11	400 88
57	884 11	400 64
58	894 11	400 54
59	904 11	400 59
60	914 11	400 77
61	924 10	401 08
62	934 09	401 54
63	944 08	402 13
64	954 05	402 87
65	964 01	403 74
56	973 96	404 75
67	983 89	405 89
68	993 81	407 18
69	1003 71	408 60
70	1013 59	410 16
71	1023 44	411 85
72	1033 27	413 58
73	1043 08	415 55
74	1052 86	417 75
75	1062 60	419 99
76	1072 32	422 37
77	1082 00	424 87
78	1091 64	427 51
79	1101 25	430 29
80	1110 82	433 19
81	1120 34	436 23
82	1129 83	439 40
83	1139 27	442 71
84	1148 66	446 14
85	1158 00	449 70
86	1167 30	453 39
87	1176 54	457 21
88	1185 73	461 16
89	1194 86	465 23
90	1203 94	459 43
91	1212 95	473 76
92	1221 91	478 21
93	1230 80	482 78
94	1239 63	487 47

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95	1248 39	492 29
96	1257 09	497 23
97	1265 71	502 29
98	1274 27	507 47
99	1282 75	512 76
100	1291 16	518 17
101	1299 49	523 70
102	1307 75	529 35
103	1315 93	535 10
104	1324 02	540 97
105	1332 04	546 95
106	1339 97	553 05
107	1347 81	559 25
108	1355 57	555 56
109	1363 24	571 97
110	1370 82	578 49
111	1378 31	585 12
112	1385 71	591 85
113	1393 01	598 68
114	1400 22	605 61
115	1407 33	612 64
116	1414 35	619 77
117	1421 26	626 99
118	1428 07	634 31
119	1434 79	641 73
120	1441 39	549 23
121	1447 90	656 83
122	1454 30	664 51
123	1458 74	670 00

Circle Center At X = 896 1 , Y = 1122 6 and Radius, 722 1

*** 2 864 ***

Failure Surface Specified By121 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	280 00	614 26
2	287 10	607 21
3	294 29	600 27
4	301 58	593 43
5	308 97	586 59
6	316 45	580 05
7	324 03	573 52
8	331 69	567 10
9	339 45	560 79
10	347 29	554 58
11	355 22	548 49
12	353 23	542 51
13	371 33	536 64
14	379 51	530 89
15	387 77	525 25
16	396 11	519 73
17	404 52	514 32
18	413 01	509 04
19	421 57	503 87
20	430 21	498 83
21	438 91	493 91
22	447 69	489 11
23	456 52	484 43
24	465 43	479 88
25	474 40	475 45
26	483 43	471 16
27	492 51	466 98
28	501 66	452 94
29	510 86	459 03
30	520 12	455 24
31	529 43	451 59
32	538 79	448 07
33	548 19	444 67
34	557 65	441 42

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35	567 15	438 29
36	576 69	435 30
37	586 27	432 44
38	595 89	429 72
39	605 55	427 13
40	615 25	424 68
41	624 98	422 37
42	634 74	420 19
43	644 53	418 15
44	654 35	416 25
45	664 19	414 49
46	674 06	412 86
47	683 94	411 38
48	693 85	410 03
49	703 78	408 82
50	713 72	407 76
51	723 68	406 83
52	733 65	406 04
53	743 63	405 39
54	753 62	404 89
55	763 61	404 52
56	773 61	404 29
57	783 61	404 21
58	793 61	404 26
59	803 60	404 46
60	813 60	404 79
61	823 59	405 27
62	833 57	405 89
63	843 54	406 64
64	853 50	407 54
65	863 44	408 58
66	873 38	409 75
67	883 29	411 07
68	893 18	412 52
69	903 05	414 12
70	912 90	415 85
71	922 73	417 72
72	932 52	419 73
73	942 29	421 88
74	952 02	424 16
75	961 73	425 58
76	971 40	429 14
77	981 03	431 83
78	990 62	434 66
79	1000 17	437 62
80	1009 68	440 72
81	1019 14	443 94
82	1028 56	447 31
83	1037 93	450 80
84	1047 25	454 43
85	1056 52	458 18
86	1065 73	462 07
87	1074 89	465 08
88	1083 99	470 23
89	1093 03	474 50
90	1102 01	478 89
91	1110 93	483 42
92	1119 79	488 07
93	1128 58	492 84
94	1137 29	497 73
95	1145 95	502 75
96	1154 52	507 89
97	1163 03	513 15
98	1171 46	518 53
99	1179 82	524 02
100	1188 09	529 63
101	1196 29	535 36
102	1204 40	541 20

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103	1212 44	547 16
104	1220 38	553 23
105	1228 25	559 41
106	1236 02	565 70
107	1243 71	572 10
108	1251 30	578 60
109	1258 80	585 22
110	1266 21	591 93
111	1273 52	598 75
112	1280 74	605 68
113	1287 85	612 70
114	1294 88	619 82
115	1301 80	527 04
116	1308 61	634 36
117	1315 33	641 77
118	1321 93	549 28
119	1328 44	656 87
120	1334 83	664 56
121	1339 22	670 00

Circle Center At X = 784 7 , Y = 1115 6 and Radius, 711 4
*** 2 865 ***
Failure Surface Specified By117 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	402 50	615 76
2	409 58	608 69
3	416 75	601 73
4	424 03	594 87
5	431 41	588 12
6	438 89	581 48
7	446 46	574 95
8	454 13	568 53
9	461 89	562 22
10	459 74	556 03
11	477 68	549 95
12	485 71	543 99
13	493 83	538 15
14	502 03	532 43
15	510 31	526 82
16	518 68	521 34
17	527 12	515 99
18	535 64	510 75
19	544 24	505 55
20	552 91	500 66
21	561 65	495 81
22	570 46	491 08
23	579 35	486 49
24	588 29	482 02
25	597 30	477 69
26	606 38	473 48
27	615 51	469 41
28	624 71	455 48
29	533 96	461 68
30	643 26	458 01
31	652 52	454 49
32	662 02	451 10
33	671 48	447 84
34	580 98	444 73
35	690 53	441 75
35	700 12	438 92
37	709 75	436 22
38	719 42	433 67
39	729 12	431 26
40	738 86	428 99
41	748 63	426 85
42	758 44	424 88
43	768 27	423 04
44	778 12	421 35

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45	788 00	419 79
46	797 90	418 39
47	807 82	417 13
48	817 76	416 01
49	827 71	415 04
50	837 68	414 21
51	847 65	413 53
52	857 64	413 00
53	867 63	412 61
54	877 63	412 37
55	887 63	412 28
56	897 63	412 33
57	907 63	412 53
58	917 62	412 87
59	927 61	413 36
60	937 59	414 00
61	947 56	414 78
62	957 51	415 71
63	967 46	416 78
64	977 38	418 00
65	987 29	419 36
66	997 17	420 87
67	1007 04	422 53
68	1016 87	424 32
69	1026 68	426 26
70	1036 46	428 35
71	1045 21	430 57
72	1055 93	432 94
73	1055 61	435 46
74	1075 25	438 11
75	1084 85	440 90
76	1094 41	443 84
77	1103 93	446 91
78	1113 40	450 12
79	1122 82	453 47
80	1132 19	456 96
81	1141 51	460 58
82	1150 78	454 34
83	1159 99	468 24
84	1169 14	472 27
85	1178 23	476 43
86	1187 26	480 73
87	1196 23	485 15
88	1205 13	489 71
89	1213 96	494 40
90	1222 73	499 22
91	1231 42	504 16
92	1240 04	509 23
93	1248 58	514 43
94	1257 05	519 75
95	1265 44	525 19
96	1273 74	530 76
97	1281 97	536 45
98	1290 11	542 25
99	1298 17	548 18
100	1306 13	554 22
101	1314 01	560 38
102	1321 80	566 65
103	1329 49	573 04
104	1337 10	579 54
105	1344 60	586 15
106	1352 01	592 87
107	1359 32	599 59
108	1366 52	606 62
109	1373 63	513 66
110	1380 63	520 80
111	1387 53	628 04
112	1394 32	635 38

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113	1401 00	642 82
114	1407 57	650 35
115	1414 03	657 99
116	1420 38	665 72
117	1423 80	670 00

Circle Center At X = 889 1 , Y = 1095 8 and Radius, 683 6

*** 2 867 ***

Failure Surface Specified By127 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	300 42	614 51
2	307 68	607 64
3	315 03	600 86
4	322 47	594 17
5	330 00	587 59
6	337 61	581 10
7	345 30	574 71
8	353 07	568 42
9	350 93	562 23
10	368 86	556 15
11	376 88	550 17
12	384 97	544 29
13	393 13	538 51
14	401 37	532 84
15	409 58	527 28
16	418 06	521 83
17	426 52	516 49
18	435 04	511 25
19	443 63	506 13
20	452 28	501 12
21	461 00	496 22
22	469 78	491 43
23	478 62	486 76
24	487 52	482 20
25	496 48	477 76
26	505 49	473 43
27	514 56	469 22
28	523 69	465 13
29	532 86	461 16
30	542 09	457 30
31	551 37	453 57
32	560 69	449 95
33	570 06	445 45
34	579 48	443 09
35	588 93	439 84
36	598 43	436 71
37	607 97	433 71
38	617 55	430 83
39	627 16	428 07
40	636 81	425 44
41	645 49	422 93
42	656 20	420 55
43	665 94	418 29
44	675 71	416 16
45	685 51	414 16
46	695 33	412 28
47	705 18	410 53
48	715 04	408 91
49	724 93	407 42
50	734 84	406 05
51	744 76	404 81
52	754 70	403 70
53	764 65	402 72
54	774 51	401 87
55	784 59	401 15
56	794 57	400 55
57	804 56	400 09
58	814 55	399 75

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59	824 55	399 54
50	834 55	399 47
51	844 55	399 52
62	854 55	399 70
63	864 55	400 01
64	874 54	400 45
65	884 52	401 02
66	894 50	401 72
67	904 46	402 54
68	914 42	403 50
69	924 36	404 58
70	934 28	405 79
71	944 19	407 14
72	954 08	408 60
73	963 96	410 20
74	973 81	411 93
75	983 63	413 78
76	993 44	415 76
77	1003 21	417 86
78	1012 96	420 09
79	1022 68	422 45
80	1032 36	424 93
81	1042 02	427 54
82	1051 64	430 27
83	1051 22	433 13
84	1070 77	436 11
85	1080 27	439 21
86	1089 74	442 44
87	1099 16	445 78
88	1108 54	449 25
89	1117 87	452 84
90	1127 16	456 56
91	1136 40	460 39
92	1145 58	454 34
93	1154 72	468 40
94	1153 80	472 59
95	1172 83	476 89
95	1181 80	481 31
97	1190 71	485 85
98	1199 56	490 50
99	1208 35	495 26
100	1217 08	500 14
101	1225 75	505 13
102	1234 35	510 23
103	1242 89	515 44
104	1251 35	520 77
105	1259 75	526 20
106	1268 07	531 74
107	1276 33	537 38
108	1284 51	543 14
109	1292 61	548 99
110	1300 64	554 96
111	1308 59	561 02
112	1316 46	567 19
113	1324 25	573 46
114	1331 96	579 83
115	1339 59	586 30
116	1347 13	592 86
117	1354 58	599 53
118	1361 95	606 29
119	1369 24	613 14
120	1376 43	620 09
121	1383 53	627 13
122	1390 54	634 25
123	1397 46	641 48
124	1404 28	648 79
125	1411 01	656 19
126	1417 64	563 68

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127   1423 10   670 00
Circle Center At X = 835 5 , Y = 1172 8 and Radius,   773 3
*** 2 873 ***
Failure Surface Specified By126 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	382 08	615 51
2	389 15	608 44
3	396 32	601 46
4	403 58	594 58
5	410 93	587 80
6	418 38	581 13
7	425 91	574 55
8	433 53	568 07
9	441 24	561 70
10	449 03	555 44
11	456 91	549 28
12	464 87	543 22
13	472 91	537 28
14	481 03	531 44
15	489 23	525 71
16	497 50	520 10
17	505 85	514 60
18	514 27	509 21
19	522 77	503 93
20	531 34	498 77
21	539 97	493 73
22	548 67	488 81
23	557 44	484 00
24	565 28	479 31
25	575 17	474 74
26	584 13	470 29
27	593 14	465 97
28	602 22	461 76
29	611 35	457 68
30	620 53	453 72
31	629 76	449 89
32	639 05	446 18
33	648 39	442 50
34	657 77	439 14
35	667 20	435 82
36	676 68	432 52
37	686 19	429 54
38	695 75	426 50
39	705 35	423 79
40	714 98	421 10
41	724 65	418 55
42	734 35	416 13
43	744 08	413 83
44	753 85	411 68
45	763 64	409 65
46	773 46	407 75
47	783 30	405 99
48	793 17	404 36
49	803 06	402 87
50	812 96	401 51
51	822 89	400 28
52	832 83	399 19
53	842 78	398 23
54	852 75	397 40
55	862 72	396 72
56	872 71	395 16
57	882 70	395 74
58	892 70	395 46
59	902 69	395 31
60	912 69	395 30
61	922 69	395 42
62	932 69	395 67

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63	942 68	396 07
64	952 67	396 59
65	962 65	397 25
55	972 62	398 05
67	982 57	398 98
68	992 52	400 05
69	1002 44	401 25
70	1012 35	402 58
71	1022 25	404 05
72	1032 12	405 65
73	1041 96	407 39
74	1051 79	409 25
75	1061 59	411 25
76	1071 36	413 39
77	1081 10	415 65
78	1090 81	418 05
79	1100 48	420 57
80	1110 12	423 23
81	1119 72	426 02
82	1129 29	428 94
83	1138 81	431 98
84	1148 30	435 15
85	1157 74	438 45
86	1167 13	441 89
87	1176 48	445 45
88	1185 77	449 13
89	1195 02	452 94
90	1204 21	456 87
91	1213 35	450 92
92	1222 44	465 10
93	1231 47	469 41
94	1240 43	473 83
95	1249 34	478 37
96	1258 19	483 04
97	1266 97	487 82
98	1275 69	492 72
99	1284 34	497 74
100	1292 92	502 88
101	1301 43	508 13
102	1309 86	513 50
103	1318 23	518 97
104	1326 52	524 57
105	1334 73	530 27
106	1342 87	536 08
107	1350 93	542 01
108	1358 90	548 04
109	1366 80	554 18
110	1374 61	560 42
111	1382 33	565 77
112	1389 97	573 23
113	1397 52	579 78
114	1404 98	586 44
115	1412 35	593 20
116	1419 53	600 06
117	1426 82	607 01
118	1433 91	614 06
119	1440 90	621 21
120	1447 80	628 45
121	1454 60	635 79
122	1461 30	643 21
123	1467 89	650 72
124	1474 39	658 33
125	1480 78	665 02
126	1484 00	670 00

C1rcle Center At X = 908 7 , Y = 1135 0 and Rad1us, 739 8

*** 2 875 ***

Fa1lure Surface Spec1fied By 90 Coord1nate Po1nts

Po1nt	X-Surf	Y-Surf

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No	(ft)	(ft)
1	504 58	617 00
2	511 67	609 95
3	518 90	603 04
4	526 26	596 26
5	533 74	589 64
6	541 36	583 16
7	549 10	576 82
8	556 96	570 64
9	564 94	564 62
10	573 04	558 74
11	581 24	553 03
12	589 55	547 48
13	597 98	542 09
14	606 51	536 87
15	615 14	531 81
16	623 86	526 92
17	632 68	522 20
18	641 58	517 65
19	650 57	513 28
20	659 65	509 08
21	668 81	505 05
22	678 04	501 21
23	687 34	497 55
24	596 72	494 07
25	706 16	490 77
26	715 66	487 65
27	725 22	484 72
28	734 84	481 98
29	744 50	479 42
30	754 22	477 05
31	763 98	474 87
32	773 78	472 88
33	783 62	471 09
34	793 49	469 48
35	803 39	468 06
36	813 31	466 84
37	823 26	465 81
38	833 22	464 97
39	843 20	464 33
40	853 19	463 88
41	863 19	463 62
42	873 19	463 56
43	883 19	463 69
44	893 18	454 02
45	903 17	464 54
46	913 14	465 26
47	923 10	466 15
48	933 04	467 27
49	942 96	468 56
50	952 85	470 05
51	952 70	471 72
52	972 53	473 59
53	982 31	475 65
54	992 06	477 90
55	1001 75	480 34
56	1011 40	482 97
57	1021 00	485 78
58	1030 54	488 78
59	1040 02	491 96
60	1049 44	495 33
61	1058 79	498 88
62	1068 06	502 60
63	1077 27	505 51
64	1086 40	510 60
65	1095 44	514 86
66	1104 40	519 30
67	1113 28	523 91

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68	1122 06	528 70
69	1130 74	533 65
70	1139 33	538 77
71	1147 82	544 05
72	1156 21	549 50
73	1164 49	555 12
74	1172 65	560 89
75	1180 71	566 81
76	1188 64	572 90
77	1196 46	579 14
78	1204 15	585 52
79	1211 72	592 06
80	1219 16	598 74
81	1226 47	605 56
82	1233 65	612 53
83	1240 69	619 63
84	1247 59	626 87
85	1254 34	634 24
86	1260 96	641 74
87	1267 42	649 37
88	1273 74	657 12
89	1279 91	664 99
90	1283 57	670 00

Circle Center At X = 871 3 , Y = 978 6 and Radius, 515 0

*** 2 890 ***

Failure Surface Specified By100 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	402 50	615 76
2	409 55	608 76
3	416 92	501 90
4	424 31	595 15
5	431 81	588 54
6	439 42	582 06
7	447 14	575 71
8	454 97	569 49
9	462 91	563 40
10	470 95	557 46
11	479 09	551 65
12	487 33	545 98
13	495 66	540 46
14	504 09	535 07
15	512 61	529 84
16	521 22	524 75
17	529 92	519 81
18	538 69	515 02
19	547 55	510 38
20	556 49	505 89
21	565 50	501 56
22	574 59	497 38
23	583 74	493 36
24	592 97	489 50
25	602 26	485 79
26	611 61	482 25
27	621 02	478 87
28	530 48	475 64
29	640 00	472 59
30	649 58	469 69
31	659 20	466 96
32	668 86	454 40
33	678 57	462 00
34	688 32	459 77
35	698 10	457 70
36	707 92	455 81
37	717 77	454 08
38	727 65	452 52
39	737 55	451 13
40	747 48	449 91

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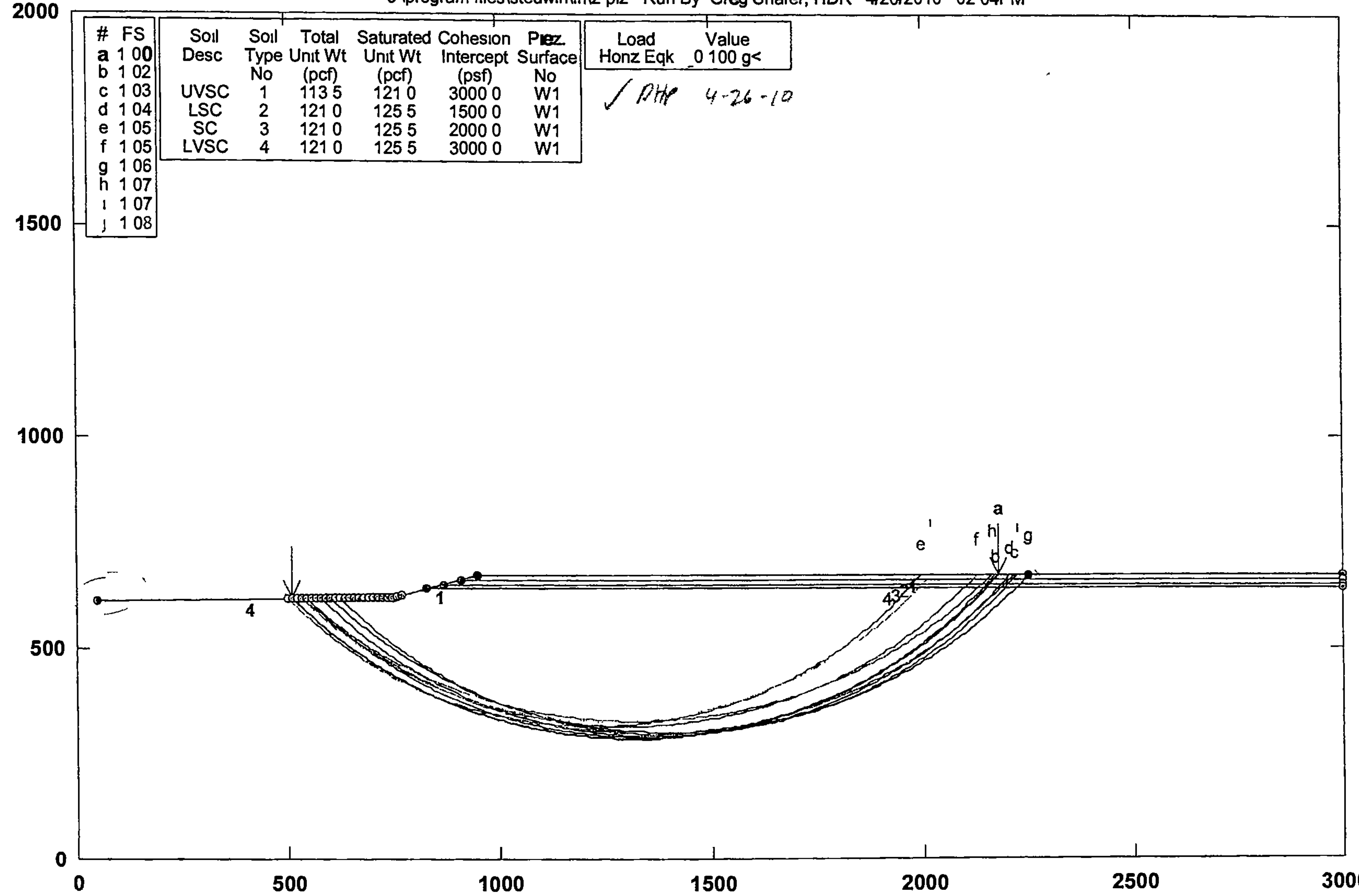
41	757 42	448 87
42	767 38	447 99
43	777 36	447 28
44	787 34	446 75
45	797 34	446 39
46	807 34	446 19
47	817 34	446 17
48	827 33	446 33
49	837 33	446 65
50	847 32	447 14
51	857 29	447 81
52	867 26	448 65
53	877 21	449 65
54	887 14	450 83
55	897 05	452 18
56	906 93	453 70
57	916 79	455 39
58	926 61	457 24
59	936 41	459 27
60	946 16	461 46
61	955 88	463 82
62	965 56	466 35
53	975 19	469 04
64	984 77	471 90
65	994 30	474 92
66	1003 78	478 10
67	1013 21	481 45
68	1022 57	484 95
69	1031 88	488 62
70	1041 11	492 45
71	1050 29	495 43
72	1059 39	500 57
73	1068 42	504 87
74	1077 37	509 32
75	1086 25	513 92
76	1095 05	518 68
77	1103 75	523 58
78	1112 39	528 64
79	1120 93	533 84
80	1129 38	539 19
81	1137 74	544 68
82	1146 00	550 31
83	1154 16	556 09
84	1162 23	562 00
85	1170 19	568 06
86	1178 04	574 24
87	1185 79	580 56
88	1193 43	587 02
89	1200 96	593 60
90	1208 37	600 31
91	1215 67	607 15
92	1222 85	614 11
93	1229 90	621 20
94	1236 84	628 40
95	1243 65	635 73
96	1250 33	643 16
97	1256 89	650 72
98	1263 31	658 38
99	1269 61	666 15
100	1272 61	670 00

Circle Center At X = 813 5 , Y = 1028 9 and Radius, 582 8

*** 2 893 ***

Intermountain Regional Landfill Cut slope 1

c \program files\stedwin\irl\2 pl2 Run By Greg Shafer, HDR 4/20/2010 02 04PM



PCSTABL7 FSmin=1 00

Safety Factors Are Calculated By The Modified Bishop Method

STED

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** PCSTABL7 **
by
Purdue University
--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer s Method of Slices

Run Date	4/20/2010
Time of Run	02 04PM
Run By	Greg Shafer, HDR
Input Data Filename	C 2 in
Output Filename	C 2 OUT
Unit	ENGLISH
Plotted Output Filename	C 2 PLT

PROBLEM DESCRIPTION Intermountain Regional Landfill
Cut slope 1

BOUNDARY COORDINATES
Note User origin value specified
Add 0 00 to X-values and 0 00 to Y-values listed

3 Top Boundaries
6 Total Boundaries

Boundary No	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	50 00	611 45	750 00	620 00	4
2	750 00	620 00	950 00	670 00	1
3	950 00	670 00	3000 00	670 00	1
4	910 00	660 00	3000 00	660 00	2
5	870 00	650 00	3000 00	550 00	3
6	830 00	640 00	3000 00	640 00	4

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type No	Total Unit Wt (pcf)	Saturated Unit Wt (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param	Pressure Constant (psf)	Piez Surface No
1	113 5	121 0	3000 0	0 0	0 00	0 0	1
2	121 0	125 5	1500 0	0 0	0 00	0 0	1
3	121 0	125 5	2000 0	0 0	0 00	0 0	1
4	121 0	125 5	3000 0	0 0	0 00	0 0	1

A Horizontal Earthquake Loading Coefficient
Of0 100 Has Been Assigned
A Vertical Earthquake Loading Coefficient
Of0 000 Has Been Assigned
Cavitation Pressure = 0 0 (psf)
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified
625 Trial Surfaces Have Been Generated
25 Surfaces Initiate From Each Of 25 Points Equally Spaced
Along The Ground Surface Between X = 500 00 ft
and X = 770 00 ft
Each Surface Terminates Between X = 950 00 ft
and X =2250 00 ft
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0 00 ft
10 00 ft Line Segments Define Each Trial Failure Surface
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Examined They Are Ordered - Most Critical
First
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Failure Surface Specified By188 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	511 25	617 08
2	518 40	610 09
3	525 61	603 16
4	532 88	596 30
5	540 21	589 49
6	547 60	582 75
7	555 04	576 08
8	562 55	569 47

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9	570 11	562 93
10	577 73	556 45
11	585 40	550 04
12	593 13	543 69
13	600 92	537 41
14	608 75	531 20
15	616 65	525 06
16	624 59	518 99
17	632 59	512 99
18	640 64	507 05
19	648 74	501 19
20	656 89	495 40
21	665 09	489 68
22	673 34	484 03
23	681 64	478 45
24	689 99	472 94
25	598 39	467 51
26	706 83	462 15
27	715 32	456 86
28	723 85	451 65
29	732 43	446 51
30	741 05	441 45
31	749 72	436 46
32	758 43	431 55
33	767 18	426 71
34	775 98	421 95
35	784 81	417 27
36	793 69	412 66
37	802 60	408 13
38	811 55	403 68
39	820 55	399 30
40	829 58	395 00
41	838 64	390 79
42	847 75	386 65
43	856 89	382 59
44	866 06	378 61
45	875 27	374 71
46	884 51	370 89
47	893 79	367 15
48	903 09	363 49
49	912 43	359 91
50	921 80	356 42
51	931 20	353 00
52	940 63	349 67
53	950 08	346 42
54	959 57	343 25
55	959 08	340 17
56	978 62	337 16
57	988 18	334 24
58	997 77	331 40
59	1007 38	328 65
60	1017 02	325 98
61	1026 68	323 39
62	1036 36	320 89
63	1046 07	318 47
64	1055 79	316 14
65	1065 53	313 89
66	1075 30	311 73
67	1085 08	309 65
68	1094 88	307 65
69	1104 69	305 74
70	1114 53	303 92
71	1124 37	302 18
72	1134 24	300 53
73	1144 11	298 96
74	1154 00	297 48
75	1163 90	296 09
76	1173 82	294 78

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77	1183 74	293 55
78	1193 68	292 42
79	1203 62	291 37
80	1213 58	290 40
81	1223 54	289 53
82	1233 51	288 74
83	1243 48	288 03
84	1253 46	287 42
85	1263 45	286 88
86	1273 44	286 44
87	1283 43	286 08
88	1293 43	285 81
89	1303 43	285 63
90	1313 43	285 53
91	1323 43	285 52
92	1333 43	285 60
93	1343 43	285 77
94	1353 42	286 02
95	1363 42	285 36
96	1373 41	286 78
97	1383 39	287 29
98	1393 38	287 89
99	1403 35	288 58
100	1413 32	289 35
101	1423 29	290 21
102	1433 24	291 15
103	1443 19	292 18
104	1453 13	293 30
105	1453 05	294 50
106	1472 97	295 79
107	1482 87	297 17
108	1492 77	298 63
109	1502 65	300 18
110	1512 51	301 81
111	1522 36	303 53
112	1532 20	305 34
113	1542 02	307 23
114	1551 82	309 21
115	1561 61	311 27
116	1571 37	313 41
117	1581 12	315 64
118	1590 85	317 96
119	1600 56	320 36
120	1610 24	322 84
121	1619 91	325 41
122	1629 55	328 06
123	1639 17	330 80
124	1648 76	333 62
125	1658 33	335 52
126	1557 88	339 50
127	1677 40	342 57
128	1686 89	345 72
129	1596 35	348 96
130	1705 78	352 27
131	1715 19	355 67
132	1724 56	359 15
133	1733 91	362 71
134	1743 22	366 35
135	1752 50	370 07
136	1761 75	373 87
137	1770 97	377 75
138	1780 15	381 72
139	1789 30	385 76
140	1798 41	389 88
141	1807 48	394 08
142	1816 52	398 36
143	1825 52	402 72
144	1834 48	407 15

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145	1843 41	411 67
146	1852 29	416 26
147	1861 14	420 92
148	1869 94	425 67
149	1878 70	430 49
150	1887 42	435 38
151	1896 10	440 36
152	1904 73	445 40
153	1913 32	450 53
154	1921 86	455 72
155	1930 36	460 99
156	1938 81	466 34
157	1947 22	471 75
158	1955 58	477 24
159	1963 89	482 81
160	1972 15	488 44
161	1980 36	494 15
162	1988 52	499 92
163	1996 63	505 77
164	2004 69	511 59
165	2012 70	517 68
166	2020 66	523 74
167	2028 56	529 86
168	2036 41	536 06
169	2044 21	542 32
170	2051 95	548 65
171	2059 64	555 05
172	2067 27	561 51
173	2074 84	568 04
174	2082 36	574 64
175	2089 82	581 30
176	2097 22	588 02
177	2104 56	594 81
178	2111 84	601 65
179	2119 07	608 58
180	2125 23	615 56
181	2133 33	622 60
182	2140 37	629 70
183	2147 35	636 86
184	2154 27	644 08
185	2151 12	651 37
186	2167 91	658 71
187	2174 63	666 11
188	2178 11	670 00

Circle Center At X = 1319 5 , Y = 1436 4 and Radius, 1150 9

*** 0 997 ***

Individual data on the 195 slices

Slice No	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Force Tnorm (lbs)	Force Ttan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	7 1	3062 0	0 0	0 0	0 0	0 0	306 2	0 0	0 0
2	7 2	9236 9	0 0	0 0	0 0	0 0	923 7	0 0	0 0
3	7 3	15459 3	0 0	0 0	0 0	0 0	1545 9	0 0	0 0
4	7 3	21725 9	0 0	0 0	0 0	0 0	2172 6	0 0	0 0
5	7 4	28033 8	0 0	0 0	0 0	0 0	2803 4	0 0	0 0
6	7 4	34379 6	0 0	0 0	0 0	0 0	3438 0	0 0	0 0
7	7 5	40759 7	0 0	0 0	0 0	0 0	4076 0	0 0	0 0
8	7 6	47171 9	0 0	0 0	0 0	0 0	4717 2	0 0	0 0
9	7 6	53612 1	0 0	0 0	0 0	0 0	5351 2	0 0	0 0
10	7 7	60077 2	0 0	0 0	0 0	0 0	6007 7	0 0	0 0
11	7 7	66564 4	0 0	0 0	0 0	0 0	6656 4	0 0	0 0
12	7 8	73069 9	0 0	0 0	0 0	0 0	7307 0	0 0	0 0
13	7 8	79591 4	0 0	0 0	0 0	0 0	7959 1	0 0	0 0
14	7 9	86125 1	0 0	0 0	0 0	0 0	8612 5	0 0	0 0
15	7 9	92668 5	0 0	0 0	0 0	0 0	9266 8	0 0	0 0
16	8 0	99217 1	0 0	0 0	0 0	0 0	9921 7	0 0	0 0
17	8 0	105769 2	0 0	0 0	0 0	0 0	10576 9	0 0	0 0

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18	8 1	112320 3	0 0	0 0	0 0	0 0	11232 0	0 0	0 0
19	8 2	118868 8	0 0	0 0	0 0	0 0	11886 9	0 0	0 0
20	8 2	125411 0	0 0	0 0	0 0	0 0	12541 1	0 0	0 0
21	8 3	131942 9	0 0	0 0	0 0	0 0	13194 3	0 0	0 0
22	8 3	138462 3	0 0	0 0	0 0	0 0	13846 2	0 0	0 0
23	8 3	144966 4	0 0	0 0	0 0	0 0	14496 5	0 0	0 0
24	8 4	151452 1	0 0	0 0	0 0	0 0	15145 2	0 0	0 0
25	8 4	157915 5	0 0	0 0	0 0	0 0	15791 5	0 0	0 0
26	8 5	164354 6	0 0	0 0	0 0	0 0	16435 5	0 0	0 0
27	8 5	170765 5	0 0	0 0	0 0	0 0	17076 6	0 0	0 0
28	8 6	177146 4	0 0	0 0	0 0	0 0	17714 6	0 0	0 0
29	8 5	183493 3	0 0	0 0	0 0	0 0	18349 3	0 0	0 0
30	8 7	189803 4	0 0	0 0	0 0	0 0	18980 3	0 0	0 0
31	0 3	6244 7	0 0	0 0	0 0	0 0	624 5	0 0	0 0
32	8 4	179022 8	0 0	0 0	0 0	0 0	17902 3	0 0	0 0
33	8 8	192789 5	0 0	0 0	0 0	0 0	19279 0	0 0	0 0
34	8 8	200586 8	0 0	0 0	0 0	0 0	20068 7	0 0	0 0
35	8 8	208568 1	0 0	0 0	0 0	0 0	20856 8	0 0	0 0
36	8 9	215432 1	0 0	0 0	0 0	0 0	21643 2	0 0	0 0
37	8 9	224272 5	0 0	0 0	0 0	0 0	22427 3	0 0	0 0
38	9 0	232088 1	0 0	0 0	0 0	0 0	23208 8	0 0	0 0
39	9 0	239877 3	0 0	0 0	0 0	0 0	23987 7	0 0	0 0
40	9 0	247634 2	0 0	0 0	0 0	0 0	24763 4	0 0	0 0
41	0 4	11750 2	0 0	0 0	0 0	0 0	1175 0	0 0	0 0
42	8 6	259534 3	0 0	0 0	0 0	0 0	25963 4	0 0	0 0
43	9 1	280200 2	0 0	0 0	0 0	0 0	28020 0	0 0	0 0
44	9 1	288193 5	0 0	0 0	0 0	0 0	28819 3	0 0	0 0
45	9 2	296139 8	0 0	0 0	0 0	0 0	29614 0	0 0	0 0
46	3 9	129228 5	0 0	0 0	0 0	0 0	12922 9	0 0	0 0
47	5 3	175202 9	0 0	0 0	0 0	0 0	17520 3	0 0	0 0
48	9 2	312573 1	0 0	0 0	0 0	0 0	31257 3	0 0	0 0
49	9 3	320361 6	0 0	0 0	0 0	0 0	32036 2	0 0	0 0
50	9 3	328089 4	0 0	0 0	0 0	0 0	32808 9	0 0	0 0
51	6 9	247739 7	0 0	0 0	0 0	0 0	24774 0	0 0	0 0
52	2 4	88198 4	0 0	0 0	0 0	0 0	8819 8	0 0	0 0
53	9 4	344060 7	0 0	0 0	0 0	0 0	34405 1	0 0	0 0
54	9 4	351595 0	0 0	0 0	0 0	0 0	35159 6	0 0	0 0
55	9 4	359059 3	0 0	0 0	0 0	0 0	35905 9	0 0	0 0
56	9 4	363192 0	0 0	0 0	0 0	0 0	36319 2	0 0	0 0
57	0 1	3258 0	0 0	0 0	0 0	0 0	325 8	0 0	0 0
58	9 5	372462 4	0 0	0 0	0 0	0 0	37246 2	0 0	0 0
59	9 5	377130 8	0 0	0 0	0 0	0 0	37713 1	0 0	0 0
60	9 5	381692 7	0 0	0 0	0 0	0 0	38169 3	0 0	0 0
61	9 6	386151 1	0 0	0 0	0 0	0 0	38615 1	0 0	0 0
62	9 6	390501 5	0 0	0 0	0 0	0 0	39050 2	0 0	0 0
63	9 6	394740 1	0 0	0 0	0 0	0 0	39474 0	0 0	0 0
64	9 6	398872 3	0 0	0 0	0 0	0 0	39887 2	0 0	0 0
65	9 7	402886 5	0 0	0 0	0 0	0 0	40288 7	0 0	0 0
66	9 7	406791 2	0 0	0 0	0 0	0 0	40679 1	0 0	0 0
67	9 7	410577 2	0 0	0 0	0 0	0 0	41057 7	0 0	0 0
68	9 7	414245 5	0 0	0 0	0 0	0 0	41424 5	0 0	0 0
69	9 7	417794 6	0 0	0 0	0 0	0 0	41779 5	0 0	0 0
70	9 8	421223 2	0 0	0 0	0 0	0 0	42122 3	0 0	0 0
71	9 8	424529 8	0 0	0 0	0 0	0 0	42453 0	0 0	0 0
72	9 8	427713 1	0 0	0 0	0 0	0 0	42771 3	0 0	0 0
73	9 8	430771 9	0 0	0 0	0 0	0 0	43077 2	0 0	0 0
74	9 8	433704 9	0 0	0 0	0 0	0 0	43370 5	0 0	0 0
75	9 8	436511 0	0 0	0 0	0 0	0 0	43651 1	0 0	0 0
76	9 9	439189 1	0 0	0 0	0 0	0 0	43918 9	0 0	0 0
77	9 9	441732 5	0 0	0 0	0 0	0 0	44173 3	0 0	0 0
78	9 9	444151 3	0 0	0 0	0 0	0 0	44415 1	0 0	0 0
79	9 9	446433 5	0 0	0 0	0 0	0 0	44643 4	0 0	0 0
80	9 9	448583 7	0 0	0 0	0 0	0 0	44858 4	0 0	0 0
81	9 9	450601 0	0 0	0 0	0 0	0 0	45060 1	0 0	0 0
82	9 9	452484 6	0 0	0 0	0 0	0 0	45248 5	0 0	0 0
83	9 9	454233 8	0 0	0 0	0 0	0 0	45423 4	0 0	0 0
84	10 0	455848 0	0 0	0 0	0 0	0 0	45584 8	0 0	0 0
85	10 0	457320 8	0 0	0 0	0 0	0 0	45732 1	0 0	0 0

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86	10 0	458662 9	0 0	0 0	0 0	0 0	45866 3	0 0	0 0
87	10 0	459862 6	0 0	0 0	0 0	0 0	45986 3	0 0	0 0
88	10 0	460924 8	0 0	0 0	0 0	0 0	46092 5	0 0	0 0
89	10 0	461849 4	0 0	0 0	0 0	0 0	46184 9	0 0	0 0
90	10 0	462630 1	0 0	0 0	0 0	0 0	46263 0	0 0	0 0
91	10 0	463278 2	0 0	0 0	0 0	0 0	45327 8	0 0	0 0
92	10 0	463781 9	0 0	0 0	0 0	0 0	46378 2	0 0	0 0
93	10 0	454146 8	0 0	0 0	0 0	0 0	46414 7	0 0	0 0
94	10 0	464372 6	0 0	0 0	0 0	0 0	46437 3	0 0	0 0
95	10 0	464459 2	0 0	0 0	0 0	0 0	46445 9	0 0	0 0
96	10 0	464406 8	0 0	0 0	0 0	0 0	46440 7	0 0	0 0
97	10 0	464209 5	0 0	0 0	0 0	0 0	46421 0	0 0	0 0
98	10 0	463873 2	0 0	0 0	0 0	0 0	46387 3	0 0	0 0
99	10 0	463398 0	0 0	0 0	0 0	0 0	46339 8	0 0	0 0
100	10 0	462784 0	0 0	0 0	0 0	0 0	46278 4	0 0	0 0
101	10 0	462031 7	0 0	0 0	0 0	0 0	46203 2	0 0	0 0
102	10 0	461135 4	0 0	0 0	0 0	0 0	46113 5	0 0	0 0
103	10 0	460107 0	0 0	0 0	0 0	0 0	46010 7	0 0	0 0
104	10 0	458935 4	0 0	0 0	0 0	0 0	45893 5	0 0	0 0
105	10 0	457627 0	0 0	0 0	0 0	0 0	45762 7	0 0	0 0
105	10 0	456176 5	0 0	0 0	0 0	0 0	45617 6	0 0	0 0
107	9 9	454595 7	0 0	0 0	0 0	0 0	45459 6	0 0	0 0
108	9 9	452879 6	0 0	0 0	0 0	0 0	45288 0	0 0	0 0
109	9 9	451023 5	0 0	0 0	0 0	0 0	45102 4	0 0	0 0
110	9 9	449033 5	0 0	0 0	0 0	0 0	44903 4	0 0	0 0
111	9 9	446910 4	0 0	0 0	0 0	0 0	44691 0	0 0	0 0
112	9 9	444655 2	0 0	0 0	0 0	0 0	44465 5	0 0	0 0
113	9 9	442268 7	0 0	0 0	0 0	0 0	44226 9	0 0	0 0
114	9 9	439751 8	0 0	0 0	0 0	0 0	43975 2	0 0	0 0
115	9 9	437105 5	0 0	0 0	0 0	0 0	43710 6	0 0	0 0
115	9 8	434325 6	0 0	0 0	0 0	0 0	43432 6	0 0	0 0
117	9 8	431423 8	0 0	0 0	0 0	0 0	43142 4	0 0	0 0
118	9 8	428390 7	0 0	0 0	0 0	0 0	42839 1	0 0	0 0
119	9 8	425232 7	0 0	0 0	0 0	0 0	42523 3	0 0	0 0
120	9 8	421956 5	0 0	0 0	0 0	0 0	42195 6	0 0	0 0
121	9 7	418552 7	0 0	0 0	0 0	0 0	41855 3	0 0	0 0
122	9 7	415028 1	0 0	0 0	0 0	0 0	41502 8	0 0	0 0
123	9 7	411384 0	0 0	0 0	0 0	0 0	41138 4	0 0	0 0
124	9 7	407627 1	0 0	0 0	0 0	0 0	40762 7	0 0	0 0
125	9 7	403748 5	0 0	0 0	0 0	0 0	40374 9	0 0	0 0
126	9 5	399755 0	0 0	0 0	0 0	0 0	39975 5	0 0	0 0
127	9 6	395648 2	0 0	0 0	0 0	0 0	39564 8	0 0	0 0
128	9 6	391434 7	0 0	0 0	0 0	0 0	39143 5	0 0	0 0
129	9 6	387106 3	0 0	0 0	0 0	0 0	38710 6	0 0	0 0
130	9 5	382659 9	0 0	0 0	0 0	0 0	38267 0	0 0	0 0
131	9 5	378131 8	0 0	0 0	0 0	0 0	37813 2	0 0	0 0
132	9 5	373489 3	0 0	0 0	0 0	0 0	37348 9	0 0	0 0
133	9 5	368739 2	0 0	0 0	0 0	0 0	36873 9	0 0	0 0
134	9 4	363893 4	0 0	0 0	0 0	0 0	36389 3	0 0	0 0
135	9 4	358953 4	0 0	0 0	0 0	0 0	35895 3	0 0	0 0
136	9 4	353912 1	0 0	0 0	0 0	0 0	35391 2	0 0	0 0
137	9 3	348776 2	0 0	0 0	0 0	0 0	34877 5	0 0	0 0
138	9 3	343552 3	0 0	0 0	0 0	0 0	34355 2	0 0	0 0
139	9 3	338238 2	0 0	0 0	0 0	0 0	33823 8	0 0	0 0
140	9 2	332835 9	0 0	0 0	0 0	0 0	33283 6	0 0	0 0
141	9 2	327352 1	0 0	0 0	0 0	0 0	32735 2	0 0	0 0
142	9 2	321784 6	0 0	0 0	0 0	0 0	32178 5	0 0	0 0
143	9 1	316136 0	0 0	0 0	0 0	0 0	31613 6	0 0	0 0
144	9 1	310408 4	0 0	0 0	0 0	0 0	31040 8	0 0	0 0
145	9 1	304608 4	0 0	0 0	0 0	0 0	30460 8	0 0	0 0
146	9 0	298734 4	0 0	0 0	0 0	0 0	29873 4	0 0	0 0
147	9 0	292792 9	0 0	0 0	0 0	0 0	29279 3	0 0	0 0
148	9 0	286782 2	0 0	0 0	0 0	0 0	28678 2	0 0	0 0
149	8 9	280709 0	0 0	0 0	0 0	0 0	28070 9	0 0	0 0
150	8 9	274571 7	0 0	0 0	0 0	0 0	27457 2	0 0	0 0
151	8 8	268373 1	0 0	0 0	0 0	0 0	26837 3	0 0	0 0
152	8 8	252119 8	0 0	0 0	0 0	0 0	26212 0	0 0	0 0
153	8 8	255814 0	0 0	0 0	0 0	0 0	25581 4	0 0	0 0

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154	8 7	249455 0	0 0	0 0	0 0	0 0	24945 5	0 0	0 0
155	8 7	243049 1	0 0	0 0	0 0	0 0	24304 9	0 0	0 0
156	8 6	236595 4	0 0	0 0	0 0	0 0	23659 5	0 0	0 0
157	8 6	230100 3	0 0	0 0	0 0	0 0	23010 0	0 0	0 0
158	8 5	223566 5	0 0	0 0	0 0	0 0	22356 7	0 0	0 0
159	8 5	216996 6	0 0	0 0	0 0	0 0	21699 7	0 0	0 0
160	8 5	210390 5	0 0	0 0	0 0	0 0	21039 1	0 0	0 0
161	8 4	203754 2	0 0	0 0	0 0	0 0	20375 4	0 0	0 0
152	8 4	197090 6	0 0	0 0	0 0	0 0	19709 1	0 0	0 0
163	8 3	190399 5	0 0	0 0	0 0	0 0	19040 0	0 0	0 0
164	8 3	183689 9	0 0	0 0	0 0	0 0	18359 0	0 0	0 0
165	8 2	176958 9	0 0	0 0	0 0	0 0	17695 9	0 0	0 0
166	8 2	170215 0	0 0	0 0	0 0	0 0	17021 5	0 0	0 0
167	8 1	163455 9	0 0	0 0	0 0	0 0	16345 6	0 0	0 0
168	8 1	156687 2	0 0	0 0	0 0	0 0	15668 7	0 0	0 0
169	8 0	149912 0	0 0	0 0	0 0	0 0	14991 2	0 0	0 0
170	8 0	143135 8	0 0	0 0	0 0	0 0	14313 6	0 0	0 0
171	7 9	136355 8	0 0	0 0	0 0	0 0	13635 7	0 0	0 0
172	7 9	129582 7	0 0	0 0	0 0	0 0	12958 3	0 0	0 0
173	7 8	122812 3	0 0	0 0	0 0	0 0	12281 2	0 0	0 0
174	7 7	115054 9	0 0	0 0	0 0	0 0	11605 5	0 0	0 0
175	7 7	109305 6	0 0	0 0	0 0	0 0	10930 6	0 0	0 0
176	7 6	102573 6	0 0	0 0	0 0	0 0	10257 4	0 0	0 0
177	7 6	95861 8	0 0	0 0	0 0	0 0	9586 2	0 0	0 0
178	7 5	89169 9	0 0	0 0	0 0	0 0	8917 0	0 0	0 0
179	7 5	82507 2	0 0	0 0	0 0	0 0	8250 7	0 0	0 0
180	7 4	75868 4	0 0	0 0	0 0	0 0	7586 8	0 0	0 0
181	7 3	69264 7	0 0	0 0	0 0	0 0	6926 5	0 0	0 0
182	7 3	62694 3	0 0	0 0	0 0	0 0	6269 4	0 0	0 0
183	7 2	56162 7	0 0	0 0	0 0	0 0	5616 3	0 0	0 0
184	7 2	49672 8	0 0	0 0	0 0	0 0	4967 3	0 0	0 0
185	7 1	43228 1	0 0	0 0	0 0	0 0	4322 8	0 0	0 0
186	7 0	36830 1	0 0	0 0	0 0	0 0	3683 0	0 0	0 0
187	7 0	30483 4	0 0	0 0	0 0	0 0	3048 3	0 0	0 0
188	3 0	11256 7	0 0	0 0	0 0	0 0	1125 7	0 0	0 0
189	3 9	12934 6	0 0	0 0	0 0	0 0	1293 5	0 0	0 0
190	5 6	15048 3	0 0	0 0	0 0	0 0	1504 8	0 0	0 0
191	1 3	2908 6	0 0	0 0	0 0	0 0	290 9	0 0	0 0
192	6 8	11783 4	0 0	0 0	0 0	0 0	1178 3	0 0	0 0
193	1 2	1424 3	0 0	0 0	0 0	0 0	142 4	0 0	0 0
194	5 6	4376 3	0 0	0 0	0 0	0 0	437 6	0 0	0 0
195	3 5	767 5	0 0	0 0	0 0	0 0	76 7	0 0	0 0

Failure Surface Specified By184 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	545 00	617 50
2	552 09	610 44
3	559 23	603 45
4	566 45	596 52
5	573 72	589 66
6	581 05	582 86
7	588 45	576 13
8	595 90	569 46
9	503 42	562 87
10	610 99	556 34
11	618 63	549 88
12	625 32	543 48
13	634 07	537 16
14	641 87	530 91
15	649 73	524 73
16	657 65	518 62
17	665 62	512 58
18	673 64	506 61
19	581 72	500 72
20	689 85	494 89
21	698 03	489 15
22	706 27	483 47
23	714 55	477 87

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24	722 88	472 34
25	731 27	466 89
26	739 70	461 52
27	748 18	456 22
28	756 71	451 00
29	765 29	445 85
30	773 91	440 78
31	782 57	435 79
32	791 28	430 88
33	800 04	426 05
34	808 83	421 29
35	817 67	416 62
36	826 56	412 02
37	835 48	407 51
38	844 44	403 07
39	853 44	398 72
40	862 48	394 45
41	871 56	390 25
42	880 68	386 15
43	889 83	382 12
44	899 02	378 17
45	908 25	374 31
46	917 50	370 53
47	925 80	365 84
48	936 12	363 22
49	945 48	359 70
50	954 87	356 25
51	964 29	352 89
52	973 74	349 62
53	983 21	346 43
54	992 72	343 33
55	1002 25	340 31
56	1011 81	337 38
57	1021 40	334 53
58	1031 01	331 77
59	1040 65	329 10
60	1050 31	326 52
61	1059 99	324 02
62	1069 70	321 61
63	1079 42	319 28
64	1089 17	317 04
65	1098 94	314 90
66	1108 72	312 83
67	1118 52	310 86
68	1128 34	308 98
69	1138 18	307 18
70	1148 04	305 47
71	1157 90	303 85
72	1167 79	302 32
73	1177 68	300 88
74	1187 59	299 53
75	1197 51	298 27
76	1207 44	297 10
77	1217 38	296 01
78	1227 33	295 02
79	1237 29	294 11
80	1247 26	293 30
81	1257 23	292 57
82	1267 21	291 94
83	1277 20	291 39
84	1287 19	290 93
85	1297 18	290 57
86	1307 17	290 29
87	1317 17	290 10
88	1327 17	290 01
89	1337 17	290 00
90	1347 17	290 08
91	1357 17	290 26

92	1367 17	290 52
93	1377 16	290 87
94	1387 15	291 32
95	1397 14	291 85
96	1407 12	292 47
97	1417 09	293 19
98	1427 06	293 99
99	1437 02	294 88
100	1446 97	295 86
101	1456 91	296 93
102	1466 85	298 09
103	1476 77	299 34
104	1485 68	300 68
105	1496 58	302 11
106	1506 46	303 63
107	1516 33	305 23
108	1526 19	306 93
109	1536 03	308 71
110	1545 85	310 58
111	1555 65	312 54
112	1565 44	314 59
113	1575 21	316 73
114	1584 96	318 95
115	1594 69	321 26
116	1604 40	323 66
117	1614 08	326 15
118	1623 75	328 72
119	1633 39	331 38
120	1643 00	334 13
121	1652 59	336 96
122	1662 16	339 88
123	1671 70	342 88
124	1681 21	345 98
125	1690 69	349 15
126	1700 14	352 41
127	1709 56	355 76
128	1718 96	359 19
129	1728 32	362 71
130	1737 65	366 31
131	1746 95	369 99
132	1756 21	373 76
133	1765 44	377 61
134	1774 63	381 54
135	1783 79	385 55
136	1792 91	389 65
137	1802 00	393 83
138	1811 04	398 09
139	1820 05	402 43
140	1829 02	406 86
141	1837 95	411 36
142	1846 84	415 95
143	1855 68	420 61
144	1864 49	425 35
145	1873 25	430 17
146	1881 96	435 07
147	1890 64	440 05
148	1899 25	445 11
149	1907 85	450 24
150	1916 38	455 46
151	1924 87	460 74
152	1933 31	466 11
153	1941 70	471 55
154	1950 04	477 06
155	1958 33	482 65
156	1966 57	488 31
157	1974 76	494 05
158	1982 90	499 86
159	1990 99	505 75

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160	1999 02	511 71
161	2007 00	517 73
162	2014 92	523 83
163	2022 79	530 01
164	2030 60	536 25
165	2038 36	542 56
166	2046 06	548 94
167	2053 70	555 39
168	2061 28	561 91
169	2068 81	568 50
170	2076 27	575 15
171	2083 68	581 87
172	2091 02	588 66
173	2098 30	595 52
174	2105 52	602 43
175	2112 68	609 42
176	2119 77	616 47
177	2126 80	623 58
178	2133 77	630 75
179	2140 67	637 99
180	2147 51	645 28
181	2154 28	652 64
182	2160 98	660 06
183	2167 62	567 54
184	2169 76	670 00

Circle Center At X = 1332 9 , Y = 1401 5 and Radius, 1111 5

*** 1 021 ***

Failure Surface Specified By187 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	545 00	617 50
2	552 32	610 69
3	559 70	603 94
4	567 14	597 25
5	574 63	590 63
6	582 18	584 07
7	589 78	577 58
8	597 44	571 15
9	605 16	564 78
10	612 92	558 48
11	620 74	552 25
12	628 61	546 08
13	636 54	539 98
14	644 51	533 95
15	652 54	527 98
15	660 61	522 08
17	658 74	516 25
18	676 91	510 49
19	685 14	504 80
20	693 41	499 18
21	701 72	493 63
22	710 09	488 15
23	718 50	482 74
24	726 96	477 41
25	735 46	472 14
26	744 00	466 95
27	752 59	461 82
28	761 22	456 78
29	769 90	451 80
30	778 62	446 90
31	787 37	442 07
32	796 17	437 32
33	805 01	432 64
34	813 89	428 04
35	822 80	423 51
36	831 76	419 05
37	840 75	414 68
38	849 78	410 38

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39	858 84	406 15
40	867 94	402 00
41	877 07	397 93
42	886 24	393 94
43	895 44	390 03
44	904 68	386 19
45	913 94	382 43
46	923 24	378 75
47	932 57	375 15
48	941 93	371 63
49	951 32	368 18
50	960 74	364 82
51	970 18	361 54
52	979 55	358 33
53	989 15	355 21
54	998 68	352 17
55	1008 23	349 20
56	1017 81	346 32
57	1027 41	343 52
58	1037 03	340 80
59	1046 68	338 17
60	1056 34	335 61
61	1065 03	333 14
62	1075 74	330 74
63	1085 47	328 44
64	1095 22	326 21
65	1104 99	324 06
66	1114 77	322 00
67	1124 58	320 02
68	1134 40	318 13
69	1144 23	316 32
70	1154 08	314 59
71	1163 94	312 94
72	1173 82	311 38
73	1183 71	309 90
74	1193 61	308 50
75	1203 53	307 19
76	1213 45	305 97
77	1223 38	304 82
78	1233 33	303 76
79	1243 28	302 79
80	1253 24	301 90
81	1253 21	301 09
82	1273 18	300 37
83	1283 16	299 73
84	1293 15	299 18
85	1303 14	298 71
86	1313 13	298 33
87	1323 12	298 03
88	1333 12	297 81
89	1343 12	297 68
90	1353 12	297 63
91	1363 12	297 67
92	1373 12	297 80
93	1383 12	298 01
94	1393 11	298 30
95	1403 11	298 68
96	1413 10	299 14
97	1423 08	299 68
98	1433 06	300 31
99	1443 04	301 03
100	1453 00	301 83
101	1462 96	302 71
102	1472 92	303 68
103	1482 86	304 73
104	1492 80	305 87
105	1502 72	307 09
106	1512 64	308 39

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107	1522 54	309 78
108	1532 43	311 25
109	1542 31	312 81
110	1652 17	314 45
111	1552 02	316 17
112	1571 86	317 98
113	1581 68	319 87
114	1591 48	321 84
115	1601 27	323 89
116	1611 04	326 03
117	1620 79	328 25
118	1630 52	330 55
119	1640 23	332 94
120	1649 92	335 41
121	1559 59	337 96
122	1669 24	340 59
123	1678 87	343 30
124	1688 47	346 09
125	1698 05	348 97
126	1707 60	351 92
127	1717 13	354 96
128	1726 63	358 08
129	1736 10	361 27
130	1745 55	364 55
131	1754 97	367 91
132	1764 36	371 34
133	1773 72	374 86
134	1783 05	378 46
135	1792 35	382 13
136	1801 62	385 88
137	1810 86	389 71
138	1820 07	393 62
139	1829 24	397 61
140	1838 37	401 67
141	1847 48	405 81
142	1856 54	410 03
143	1865 57	414 33
144	1874 57	418 70
145	1883 52	423 14
146	1892 44	427 67
147	1901 32	432 26
148	1910 17	436 94
149	1918 97	441 68
150	1927 73	446 51
151	1936 45	451 40
152	1945 12	456 37
153	1953 76	461 41
154	1962 35	466 53
155	1970 90	471 72
156	1979 41	476 98
157	1987 87	482 31
158	1996 28	487 71
159	2004 65	493 19
160	2012 97	498 73
161	2021 25	504 35
162	2029 47	510 03
163	2037 65	515 79
164	2045 78	521 61
165	2053 86	527 50
166	2061 89	533 45
167	2069 87	539 49
168	2077 80	545 58
169	2085 67	551 75
170	2093 50	557 97
171	2101 27	564 27
172	2108 98	570 63
173	2116 65	577 05
174	2124 26	583 54

175	2131 81	590 10
176	2139 31	596 71
177	2145 75	503 39
178	2154 13	610 14
179	2161 46	616 94
180	2168 73	623 81
181	2175 94	630 74
182	2183 09	637 73
183	2190 18	544 78
184	2197 22	651 89
185	2204 19	659 06
185	2211 10	665 28
187	2214 59	670 00

Circle Center At X = 1353 5 Y = 1479 4 and Radius, 1181 8

*** 1 026 ***

Failure Surface Specified By184 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	578 75	617 91
2	585 86	510 87
3	593 03	603 91
4	600 26	597 00
5	607 56	590 16
6	614 91	583 39
7	622 33	576 68
8	629 81	570 04
9	637 34	563 46
10	644 93	556 95
11	652 59	550 52
12	660 29	544 15
13	668 06	537 85
14	675 88	531 62
15	683 76	525 46
16	691 69	519 37
17	699 68	513 35
18	707 72	507 40
19	715 81	501 53
20	723 96	495 73
21	732 15	490 00
22	740 40	484 34
23	748 70	478 76
24	757 05	473 26
25	765 44	467 83
26	773 89	462 47
27	782 38	457 19
28	790 92	451 99
29	799 51	446 86
30	808 14	441 81
31	816 82	436 84
32	825 54	431 95
33	834 30	427 13
34	843 11	422 39
35	851 96	417 74
36	860 85	413 16
37	869 78	408 66
38	878 75	404 24
39	887 76	399 90
40	896 81	395 64
41	905 89	391 47
42	915 02	387 37
43	924 18	383 36
44	933 37	379 43
45	942 60	375 58
46	951 87	371 82
47	961 16	368 14
48	970 49	364 54
49	979 85	361 02
50	989 25	357 59

51	998 67	354 25
52	1008 12	350 98
53	1017 61	347 81
54	1027 12	344 72
55	1036 55	341 71
55	1045 22	338 79
57	1055 81	335 95
58	1065 42	333 20
59	1075 06	330 54
60	1084 72	327 96
61	1094 41	325 47
62	1104 11	323 07
63	1113 84	320 75
64	1123 59	318 52
55	1133 36	316 38
66	1143 15	314 33
67	1152 95	312 36
68	1162 77	310 48
69	1172 61	308 69
70	1182 47	306 99
71	1192 33	305 38
72	1202 22	303 85
73	1212 11	302 42
74	1222 02	301 07
75	1231 94	299 81
76	1241 87	298 64
77	1251 82	297 56
78	1261 77	296 57
79	1271 72	295 66
80	1281 69	294 85
81	1291 67	294 12
82	1301 65	293 49
83	1311 63	292 94
84	1321 62	292 49
85	1331 61	292 12
86	1341 61	291 84
87	1351 61	291 65
88	1361 61	291 56
89	1371 61	291 55
90	1381 61	291 63
91	1391 51	291 80
92	1401 50	292 06
93	1411 60	292 41
94	1421 59	292 85
95	1431 57	293 38
96	1441 55	293 99
97	1451 53	294 70
98	1461 50	295 50
99	1471 46	296 38
100	1481 41	297 36
101	1491 35	298 42
102	1501 29	299 58
103	1511 21	300 82
104	1521 12	302 15
105	1531 02	303 57
106	1540 90	305 08
107	1550 78	306 67
108	1560 63	308 36
109	1570 47	310 13
110	1580 30	311 99
111	1590 11	313 94
112	1599 90	315 98
113	1509 67	318 11
114	1519 42	320 32
115	1629 15	322 62
116	1638 86	325 00
117	1648 55	327 48
118	1558 22	330 04

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119	1667 86	332 68
120	1677 48	335 42
121	1687 08	338 24
122	1696 65	341 14
123	1706 19	344 13
124	1715 70	347 21
125	1725 19	350 37
126	1734 65	353 61
127	1744 08	356 94
128	1753 48	360 36
129	1752 85	363 86
130	1772 18	367 44
131	1781 49	371 10
132	1790 76	374 85
133	1799 99	378 68
134	1809 20	382 60
135	1818 36	386 60
136	1827 49	390 67
137	1836 59	394 83
138	1845 64	399 08
139	1854 66	403 40
140	1863 64	407 80
141	1872 58	412 29
142	1881 48	416 85
143	1890 33	421 49
144	1899 15	426 21
145	1907 92	431 01
146	1916 65	435 89
147	1925 33	440 85
148	1933 97	445 88
149	1942 57	451 00
150	1951 12	456 18
151	1959 62	461 45
152	1968 07	466 79
153	1976 48	472 21
154	1984 84	477 70
155	1993 14	483 26
156	2001 40	488 90
157	2009 61	494 62
158	2017 76	500 41
159	2025 87	506 27
160	2033 92	512 20
161	2041 91	518 20
162	2049 86	524 28
163	2057 75	530 42
164	2055 58	536 64
165	2073 35	542 93
166	2081 07	549 28
167	2088 74	555 71
168	2096 34	562 20
169	2103 89	568 76
170	2111 38	575 39
171	2118 80	582 09
172	2126 17	588 85
173	2133 46	595 68
174	2140 72	602 57
175	2147 91	609 53
176	2155 03	616 55
177	2162 08	623 63
178	2169 08	630 78
179	2176 01	637 99
180	2182 87	645 26
181	2189 67	652 60
132	2196 40	659 99
183	2203 07	667 44
184	2205 31	670 00

Circle Center At X = 1367 6 , Y = 1408 0 and Radius, 1116 4

*** 1 040 ***

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Failure Surface Specified By170 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	500 00	616 95
2	507 07	609 88
3	514 21	602 87
4	521 42	595 94
5	528 70	589 08
6	536 04	582 30
7	543 45	575 58
8	550 93	568 94
9	558 47	562 37
10	566 07	555 88
11	573 74	549 46
12	581 47	543 12
13	589 26	535 85
14	597 12	530 66
15	605 03	524 55
16	613 01	518 51
17	621 04	512 56
18	629 13	506 68
19	637 28	500 89
20	645 49	495 17
21	653 75	489 54
22	662 06	483 98
23	670 43	478 51
24	678 86	473 12
25	687 33	467 82
26	695 86	452 59
27	704 44	457 46
28	713 07	452 40
29	721 75	447 43
30	730 48	442 55
31	739 25	437 75
32	748 07	433 04
33	756 94	428 42
34	765 85	423 88
35	774 81	419 44
35	783 81	415 07
37	792 85	410 80
38	801 93	406 62
39	811 05	402 53
40	820 22	398 53
41	829 42	394 61
42	838 66	390 79
43	847 94	387 06
44	857 25	383 42
45	866 60	379 87
46	875 99	376 42
47	885 40	373 05
48	894 85	369 78
49	904 34	366 60
50	913 85	363 52
51	923 39	360 53
52	932 96	357 63
53	942 56	354 83
54	952 19	352 12
55	961 84	349 51
56	971 52	346 99
57	981 22	344 57
58	990 95	342 24
59	1000 69	340 01
60	1010 45	337 87
61	1020 25	335 83
62	1030 06	333 89
63	1039 89	332 04
64	1049 74	330 29
65	1059 60	328 64

66	1059 48	327 08
67	1079 37	325 62
68	1089 28	324 26
59	1099 20	323 00
70	1109 13	321 83
71	1119 07	320 76
72	1129 02	319 79
73	1138 99	318 92
74	1148 96	318 14
75	1158 93	317 46
76	1168 92	316 89
77	1178 90	316 40
78	1188 90	315 02
79	1198 89	315 74
80	1208 89	315 55
81	1218 89	315 46
82	1228 89	315 47
83	1238 89	315 58
84	1248 89	315 79
85	1258 88	316 09
86	1268 87	316 50
87	1278 86	317 00
88	1288 84	317 60
89	1298 82	318 30
90	1308 79	319 09
91	1318 75	319 98
92	1328 70	320 98
93	1338 64	322 07
94	1348 57	323 25
95	1358 49	324 54
96	1368 39	325 92
97	1378 28	327 40
98	1388 15	328 97
99	1398 01	330 65
100	1407 86	332 42
101	1417 68	334 29
102	1427 49	336 25
103	1437 27	338 31
104	1447 04	340 46
105	1456 78	342 72
106	1466 50	345 06
107	1476 20	347 51
108	1485 87	350 04
109	1495 52	352 68
110	1505 14	355 40
111	1514 73	358 23
112	1524 30	361 14
113	1533 83	364 15
114	1543 34	367 26
115	1552 81	370 45
116	1562 26	373 74
117	1571 67	377 13
118	1581 04	380 60
119	1590 39	384 17
120	1599 69	387 83
121	1608 96	391 58
122	1618 20	395 42
123	1627 39	399 35
124	1636 55	403 37
125	1645 66	407 48
126	1654 74	411 68
127	1663 77	415 97
128	1672 76	420 35
129	1681 71	424 82
130	1690 61	429 37
131	1699 47	434 01
132	1708 28	438 74
133	1717 04	443 56

134	1725 76	448 46
135	1734 43	453 44
136	1743 05	458 51
137	1751 62	463 67
138	1760 13	468 91
139	1768 60	474 23
140	1777 01	479 64
141	1785 37	485 13
142	1793 68	490 70
143	1801 93	496 35
144	1810 12	502 08
145	1818 26	507 90
146	1826 34	513 79
147	1834 36	519 76
148	1842 32	525 81
149	1850 22	531 94
150	1858 06	538 14
151	1865 84	544 43
152	1873 56	550 79
153	1881 22	557 22
154	1888 81	563 73
155	1896 33	570 31
156	1903 80	576 97
157	1911 19	583 70
158	1918 52	590 50
159	1925 79	597 38
160	1932 98	604 32
161	1940 11	611 34
162	1947 16	618 42
163	1954 15	625 58
164	1951 07	632 80
165	1967 91	640 09
166	1974 68	647 45
167	1981 38	654 87
168	1988 01	662 35
169	1994 56	669 91
170	1994 64	670 00

Circle Center At X = 1222 9 , Y = 1332 8 and Radius, 1017 3

*** 1 046 ***

Failure Surface Specified By178 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	533 75	517 36
2	541 11	610 59
3	548 54	603 89
4	556 02	597 26
5	563 56	590 69
6	571 16	584 19
7	578 81	577 75
8	586 52	571 38
9	594 29	565 09
10	602 11	558 86
11	609 99	552 70
12	617 92	546 61
13	625 91	540 59
14	633 94	534 64
15	642 03	528 76
16	650 18	522 95
17	558 37	517 22
18	666 61	511 56
19	674 90	505 97
20	683 24	500 45
21	691 63	495 01
22	700 07	489 64
23	708 56	484 36
24	717 09	479 13
25	725 67	473 99
26	734 29	468 93

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27	742 95	463 94
28	751 66	459 02
29	760 42	454 19
30	769 21	449 43
31	778 05	444 75
32	786 93	440 15
33	795 85	435 63
34	804 80	431 18
35	813 80	426 82
36	822 84	422 53
37	831 91	418 32
38	841 02	414 20
39	850 16	410 15
40	859 34	406 19
41	858 56	402 31
42	877 81	398 51
43	887 09	394 79
44	896 41	391 15
45	905 75	387 60
46	915 13	384 12
47	924 54	380 74
48	933 98	377 43
49	943 45	374 21
50	952 94	371 07
51	962 46	358 01
52	972 01	365 04
53	981 58	362 16
54	991 18	359 36
55	1000 81	356 64
56	1010 46	354 01
57	1020 13	351 46
58	1029 82	349 00
59	1039 63	346 63
60	1049 27	344 34
61	1059 02	342 14
62	1058 80	340 02
63	1078 59	337 99
64	1088 40	336 05
65	1098 22	334 19
66	1108 06	332 42
67	1117 92	330 74
68	1127 79	329 14
69	1137 68	327 53
70	1147 58	326 21
71	1157 49	324 87
72	1167 41	323 63
73	1177 34	322 47
74	1187 29	321 40
75	1197 24	320 42
76	1207 20	319 52
77	1217 16	318 71
78	1227 14	317 99
79	1237 12	317 36
80	1247 10	316 82
81	1257 09	316 37
82	1267 09	316 00
83	1277 08	315 72
84	1287 08	315 53
85	1297 08	315 43
86	1307 08	315 42
87	1317 08	315 49
88	1327 08	315 65
89	1337 08	315 91
90	1347 07	316 25
91	1357 06	316 67
92	1367 05	317 19
93	1377 03	317 80
94	1387 00	318 49

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95	1396 97	319 27
96	1406 94	320 14
97	1416 89	321 09
98	1426 84	322 14
99	1436 77	323 27
100	1446 70	324 49
101	1456 61	325 80
102	1466 51	327 19
103	1476 40	328 68
104	1486 28	330 25
105	1496 14	331 90
106	1505 99	333 65
107	1515 82	335 48
108	1525 63	337 40
109	1535 43	339 40
110	1545 21	341 49
111	1554 97	343 67
112	1564 71	345 93
113	1574 43	348 28
114	1584 13	350 72
115	1593 81	353 24
115	1603 46	355 84
117	1613 09	358 53
118	1622 70	361 31
119	1632 28	364 17
120	1641 84	367 11
121	1651 37	370 14
122	1660 87	373 26
123	1670 35	376 45
124	1679 79	379 73
125	1689 21	383 10
126	1698 60	386 55
127	1707 95	390 08
128	1717 28	393 69
129	1726 57	397 38
130	1735 83	401 16
131	1745 05	405 02
132	1754 25	408 96
133	1763 40	412 98
134	1772 52	417 08
135	1781 61	421 26
136	1790 65	425 52
137	1799 66	429 86
138	1808 63	434 28
139	1817 56	438 78
140	1826 45	443 36
141	1836 30	448 02
142	1844 11	452 75
143	1852 88	457 56
144	1861 60	452 45
145	1870 28	467 42
146	1878 91	472 46
147	1887 51	477 58
148	1896 05	482 78
149	1904 55	488 05
150	1913 00	493 39
151	1921 41	498 81
152	1929 75	504 30
153	1938 07	509 87
154	1946 33	515 51
155	1954 53	521 22
156	1962 69	527 01
157	1970 80	532 86
158	1978 85	538 79
159	1986 85	544 79
160	1994 80	550 86
161	2002 69	557 00
162	2010 53	563 21

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153	2018 32	569 49
164	2026 04	575 83
165	2033 72	582 25
166	2041 33	588 73
167	2048 89	595 28
168	2056 39	601 89
169	2063 83	608 57
170	2071 21	615 32
171	2078 53	622 13
172	2085 79	529 01
173	2092 99	535 95
174	2100 13	542 95
175	2107 21	650 02
176	2114 22	557 14
177	2121 17	664 33
178	2126 55	670 00

Circle Center At X = 1303 6 , Y = 1447 7 and Radius, 1132 3

*** 1 052 ***

Failure Surface Specified By185 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	601 25	618 18
2	608 54	611 34
3	615 89	604 56
4	623 30	597 85
5	630 77	591 20
6	638 30	584 61
7	645 88	578 09
8	653 51	571 63
9	661 20	565 24
10	668 95	558 92
11	676 75	552 66
12	684 61	546 47
13	592 51	540 35
14	700 47	534 29
15	708 48	528 31
16	716 55	522 39
17	724 65	516 55
18	732 82	510 77
19	741 04	505 07
20	749 30	499 43
21	757 61	493 87
22	765 97	488 38
23	774 37	482 96
24	782 82	477 61
25	791 32	472 34
26	799 86	467 14
27	808 44	462 01
28	817 07	456 96
29	825 75	451 98
30	834 46	447 08
31	843 22	442 25
32	852 02	437 50
33	860 86	432 82
34	869 74	428 22
35	878 66	423 70
36	887 61	419 25
37	896 61	414 88
38	905 64	410 59
39	914 71	406 38
40	923 81	402 24
41	932 95	398 19
42	942 13	394 21
43	951 34	390 31
44	960 58	386 49
45	969 85	382 75
46	979 16	379 09
47	988 50	375 51

48	997 86	372 01
49	1007 26	368 59
50	1016 69	365 26
51	1026 14	362 00
52	1035 63	358 83
53	1045 14	355 73
54	1054 67	352 72
55	1064 23	349 79
56	1073 82	346 95
57	1083 43	344 18
58	1093 07	341 50
59	1102 72	338 91
60	1112 40	336 39
51	1122 10	333 96
62	1131 82	331 61
63	1141 56	329 35
64	1151 32	327 17
65	1161 10	325 03
66	1170 90	323 06
67	1180 71	321 14
68	1190 54	319 30
69	1200 38	317 54
70	1210 24	315 87
71	1220 11	314 28
72	1230 00	312 78
73	1239 90	311 36
74	1249 81	310 03
75	1259 73	308 78
76	1269 66	307 62
77	1279 61	306 54
78	1289 56	305 55
79	1299 52	304 65
80	1309 48	303 83
81	1319 46	303 10
82	1329 43	302 45
83	1339 42	301 89
84	1349 41	301 41
85	1359 40	301 02
86	1369 40	300 72
87	1379 39	300 50
88	1389 39	300 37
89	1399 39	300 33
90	1409 39	300 37
91	1419 39	300 50
92	1429 39	300 71
93	1439 38	301 01
94	1449 38	301 40
95	1459 37	301 87
96	1469 35	302 43
97	1479 33	303 07
98	1489 30	303 80
99	1499 27	304 61
100	1509 23	305 52
101	1519 18	306 50
102	1529 12	307 58
103	1539 06	308 73
104	1548 98	309 98
105	1558 89	311 31
106	1568 79	312 72
107	1578 68	314 22
108	1588 55	315 80
109	1598 41	317 47
110	1608 25	319 23
111	1618 08	321 07
112	1627 90	322 99
113	1637 69	325 00
114	1647 47	327 09
115	1657 23	329 27

116	1666 97	331 53
117	1576 69	333 87
118	1686 40	336 30
119	1696 07	338 81
120	1705 73	341 40
121	1715 37	344 08
122	1724 98	346 84
123	1734 57	349 68
124	1744 13	352 61
125	1753 67	355 62
125	1763 18	358 71
127	1772 66	361 88
128	1782 12	365 13
129	1791 54	368 46
130	1800 94	371 88
131	1810 31	375 38
132	1819 65	378 95
133	1828 96	382 61
134	1838 23	386 35
135	1847 48	390 15
136	1856 69	394 06
137	1865 86	398 03
138	1875 00	402 09
139	1884 11	406 22
140	1893 18	410 43
141	1902 21	414 72
142	1911 21	419 08
143	1920 17	423 53
144	1929 09	428 05
145	1937 97	432 65
146	1946 81	437 32
147	1955 61	442 07
148	1964 37	446 89
149	1973 09	451 79
150	1981 76	456 77
151	1990 39	461 82
152	1998 98	466 94
153	2007 52	472 14
154	2016 02	477 41
155	2024 47	482 75
156	2032 88	488 17
157	2041 24	493 66
158	2049 55	499 22
159	2057 82	504 85
160	2066 03	510 55
161	2074 20	516 33
162	2082 31	522 17
163	2090 38	528 08
164	2098 39	534 06
165	2106 35	540 12
166	2114 26	546 23
167	2122 12	552 42
168	2129 92	558 68
169	2137 67	565 00
170	2145 36	571 38
171	2153 00	577 84
172	2160 58	584 36
173	2168 11	590 94
174	2175 58	597 59
175	2182 99	604 30
176	2190 34	611 08
177	2197 64	617 92
178	2204 87	624 82
179	2212 05	631 79
180	2219 17	638 81
181	2226 22	645 90
182	2233 22	653 05
183	2240 15	650 25

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184	2247 02	667 52
185	2249 32	670 00

Circle Center At X = 1399 6 , Y = 1461 8 and Radius, 1161 5

*** 1 060 ***

Failure Surface Specified By180 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	533 75	617 36
2	541 38	610 90
3	549 07	504 50
4	556 80	598 16
5	564 59	591 89
6	572 43	585 68
7	580 32	579 54
8	588 26	573 46
9	596 25	567 45
10	604 30	561 51
11	612 39	555 63
12	620 52	549 82
13	628 71	544 07
14	636 94	538 40
15	645 22	532 79
16	653 55	527 25
17	661 92	521 78
18	670 34	516 38
19	678 80	511 05
20	587 30	505 79
21	695 85	500 60
22	704 44	495 48
23	713 07	490 43
24	721 75	485 45
25	730 46	480 55
26	739 22	475 72
27	748 01	470 96
28	756 84	466 27
29	765 72	461 55
30	774 62	457 11
31	783 57	452 65
32	792 56	448 25
33	801 57	443 94
34	810 63	439 59
35	819 72	435 52
36	828 84	431 43
37	838 00	427 41
38	847 19	423 47
39	856 41	419 60
40	865 67	415 81
41	874 95	412 10
42	884 27	408 47
43	893 61	404 91
44	902 99	401 42
45	912 39	398 02
46	921 82	394 69
47	931 28	391 45
48	940 76	388 28
49	950 27	385 18
50	959 81	382 17
51	969 37	379 24
52	978 95	376 38
53	988 56	373 61
54	998 19	370 91
55	1007 84	368 30
56	1017 51	365 76
57	1027 21	363 30
58	1036 92	360 93
59	1046 65	358 63
60	1056 40	356 41
51	1056 17	354 28

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62	1075 96	352 23
63	1085 75	350 25
64	1095 58	348 35
65	1105 42	345 55
66	1115 27	344 82
67	1125 13	343 17
68	1135 01	341 61
69	1144 90	340 12
70	1154 80	338 72
71	1164 71	337 40
72	1174 63	336 16
73	1184 67	335 00
74	1194 51	333 93
75	1204 46	332 94
76	1214 42	332 03
77	1224 38	331 20
78	1234 36	330 45
79	1244 33	329 79
80	1254 32	329 21
81	1264 30	328 71
82	1274 30	328 29
83	1284 29	327 96
84	1294 29	327 71
85	1304 29	327 54
86	1314 28	327 46
87	1324 28	327 46
88	1334 28	327 54
89	1344 28	327 70
90	1354 28	327 94
91	1364 27	328 27
92	1374 27	328 68
93	1384 25	329 18
94	1394 24	329 75
95	1404 22	330 41
96	1414 19	331 15
97	1424 15	331 97
98	1434 11	332 88
99	1444 06	333 87
100	1454 01	334 94
101	1463 94	336 09
102	1473 86	337 32
103	1483 78	338 64
104	1493 68	340 04
105	1503 57	341 52
106	1513 45	343 08
107	1523 31	344 72
108	1533 16	346 44
109	1543 00	348 25
110	1552 82	350 14
111	1562 62	352 10
112	1572 41	354 15
113	1582 18	356 28
114	1591 93	358 49
115	1601 67	360 78
116	1611 38	353 16
117	1621 08	365 61
118	1630 75	368 14
119	1640 40	370 75
120	1650 03	373 44
121	1659 64	376 21
122	1669 23	379 06
123	1678 79	381 99
124	1688 33	385 00
125	1697 84	388 09
126	1707 32	391 25
127	1716 78	394 50
128	1726 21	397 82
129	1735 62	401 22

130	1745 00	404 69
131	1754 34	408 25
132	1763 65	411 88
133	1772 95	415 59
134	1782 20	419 37
135	1791 43	423 23
136	1800 62	427 17
137	1809 78	431 19
138	1818 90	435 27
139	1828 00	439 44
140	1837 05	443 68
141	1846 07	447 99
142	1855 06	452 38
143	1864 01	455 84
144	1872 92	461 38
145	1881 80	465 99
146	1890 63	470 67
147	1899 43	475 43
148	1908 18	480 25
149	1916 90	485 16
150	1925 58	490 13
151	1934 21	495 17
152	1942 81	500 29
153	1951 35	505 47
154	1959 86	510 73
155	1968 33	516 05
156	1976 75	521 45
157	1985 12	526 92
158	1993 45	532 45
159	2001 73	538 06
160	2009 97	543 73
161	2018 16	549 47
162	2025 30	555 27
153	2034 39	561 15
164	2042 43	567 09
165	2050 43	573 10
166	2058 37	579 17
167	2066 27	585 31
168	2074 11	591 51
169	2081 90	597 78
170	2089 64	604 11
171	2097 33	610 51
172	2104 96	616 97
173	2112 54	623 49
174	2120 07	630 07
175	2127 54	636 72
176	2134 96	643 43
177	2142 32	650 20
178	2149 62	657 03
179	2156 87	663 92
180	2163 17	670 00

Circle Center At X = 1319 6 , Y = 1537 4 and Radius, 1210 0

*** 1 068 ***

Failure Surface Specified By181 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	623 75	618 46
2	630 82	511 39
3	637 96	604 39
4	546 16	597 45
5	652 43	590 58
6	659 76	583 77
7	667 15	577 03
8	674 60	570 36
9	682 11	563 76
10	689 68	557 23
11	697 31	550 77
12	705 00	544 38

13	712 75	538 05
14	720 55	531 80
15	728 42	526 63
16	735 34	519 52
17	744 31	513 49
18	752 34	507 53
19	760 43	501 64
20	768 56	495 83
21	776 75	490 09
22	785 00	484 43
23	793 29	478 84
24	801 64	473 33
25	810 03	467 90
26	818 48	462 54
27	826 97	457 26
28	835 51	452 06
29	844 10	446 94
30	852 73	441 90
31	861 41	436 93
32	870 14	432 05
33	878 91	427 24
34	887 72	422 52
35	896 58	417 88
36	905 48	413 31
37	914 42	408 83
38	923 40	404 44
39	932 42	400 12
40	941 48	395 89
41	950 58	391 74
42	959 72	387 67
43	968 89	383 69
44	978 10	379 79
45	987 34	375 98
46	996 62	372 25
47	1005 93	368 61
48	1015 28	365 05
49	1024 66	361 58
50	1034 07	358 19
51	1043 51	354 89
52	1052 98	351 68
53	1062 48	348 55
54	1072 00	345 51
55	1081 56	342 56
56	1091 14	339 70
57	1100 74	336 92
58	1110 38	334 23
59	1120 03	331 63
60	1129 71	329 12
61	1139 41	326 70
62	1149 14	324 36
63	1158 88	322 12
64	1158 65	319 96
55	1178 43	317 90
66	1188 24	315 92
67	1198 06	314 04
68	1207 89	312 24
69	1217 75	310 63
70	1227 62	308 92
71	1237 50	307 39
72	1247 39	305 96
73	1257 30	304 61
74	1267 23	303 36
75	1277 16	302 20
76	1287 10	301 13
77	1297 05	300 15
78	1307 01	299 26
79	1316 98	298 46
80	1325 96	297 75

81	1336 94	297 14
82	1345 92	296 62
83	1356 91	296 18
84	1366 91	295 84
85	1376 90	295 59
86	1386 90	295 44
87	1396 90	295 37
88	1406 90	295 40
89	1416 90	295 51
90	1426 90	295 72
91	1436 90	296 02
92	1446 89	296 42
93	1456 88	295 90
94	1466 86	297 47
95	1476 84	298 14
96	1486 81	298 90
97	1496 77	299 75
98	1506 73	300 69
99	1516 68	301 72
100	1526 61	302 84
101	1636 54	304 05
102	1546 45	305 36
103	1556 35	306 75
104	1566 24	308 24
105	1576 12	309 82
106	1585 98	311 48
107	1595 82	313 24
108	1605 65	315 09
109	1615 46	317 02
110	1625 25	319 05
111	1635 03	321 16
112	1644 78	323 37
113	1654 52	325 67
114	1664 23	328 05
115	1673 92	330 52
116	1683 58	333 08
117	1693 23	335 73
118	1702 84	338 47
119	1712 44	341 30
120	1722 00	344 21
121	1731 54	347 21
122	1741 05	350 30
123	1750 53	353 48
124	1759 99	356 74
125	1769 41	360 09
126	1778 80	363 52
127	1788 16	367 04
128	1797 49	370 65
129	1806 78	374 34
130	1816 04	378 11
131	1825 27	381 98
132	1834 46	385 92
133	1843 61	389 95
134	1852 72	394 06
135	1861 80	398 26
136	1870 84	402 54
137	1879 84	406 90
138	1888 79	411 34
139	1897 71	415 87
140	1906 59	420 48
141	1915 42	425 17
142	1924 21	429 94
143	1932 95	434 79
144	1941 66	439 71
145	1950 31	444 72
146	1958 92	449 81
147	1967 48	454 98
148	1976 00	460 22

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149	1984 46	465 55
150	1992 88	470 95
151	2001 25	476 42
152	2009 56	481 97
153	2017 83	487 60
154	2025 04	493 31
155	2034 20	499 09
155	2042 31	504 94
157	2050 35	510 87
158	2058 36	516 87
159	2066 30	522 95
150	2074 19	629 09
161	2082 02	535 31
162	2089 80	541 50
163	2097 51	547 96
164	2105 17	554 39
165	2112 77	560 90
166	2120 31	567 47
167	2127 78	574 11
168	2135 20	580 81
169	2142 66	587 59
170	2149 85	594 43
171	2157 08	601 34
172	2164 24	608 32
173	2171 34	615 36
174	2178 38	622 46
175	2185 35	629 63
176	2192 26	536 86
177	2199 10	644 16
178	2205 87	651 52
179	2212 57	658 94
180	2219 21	666 42
181	2222 33	670 00

Circle Center At X = 1399 1 , Y = 1387 2 and Radius, 1091 9

*** 1 074 ***

Failure Surface Specified By167 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	533 76	617 36
2	540 98	610 45
3	548 27	603 61
4	655 63	596 84
5	563 06	590 14
6	570 55	583 51
7	578 10	576 96
8	685 71	570 48
9	593 39	564 07
10	601 13	557 74
11	608 94	551 48
12	616 80	545 30
13	624 72	539 20
14	632 70	533 17
15	640 74	527 23
16	648 83	521 36
17	655 98	515 55
18	665 19	509 85
19	673 45	504 22
20	681 77	498 67
21	690 14	493 19
22	698 56	487 80
23	707 04	482 49
24	715 56	477 27
25	724 14	472 12
26	732 77	467 06
27	741 44	462 09
28	750 16	457 20
29	758 93	452 39
30	767 75	447 67

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31	776 61	443 03
32	785 51	438 48
33	794 46	434 02
34	803 45	429 54
36	812 48	425 36
36	821 56	421 15
37	830 67	417 04
38	839 83	413 01
39	849 02	409 07
40	858 25	405 23
41	867 52	401 47
42	876 82	397 80
43	886 16	394 23
44	895 53	390 74
45	904 94	387 34
45	914 38	384 04
47	923 85	380 83
48	933 35	377 71
49	942 88	374 68
50	952 44	371 74
51	962 02	368 90
52	971 64	366 15
53	981 28	363 49
54	990 94	350 93
55	1000 63	358 46
56	1010 35	356 08
57	1020 08	353 80
58	1029 84	351 61
59	1039 62	349 62
60	1049 42	347 52
61	1059 24	345 62
62	1069 07	343 82
63	1078 92	342 10
64	1088 79	340 49
65	1098 68	338 97
66	1108 57	337 54
67	1118 49	336 21
68	1128 41	334 98
69	1138 34	333 84
70	1148 29	332 80
71	1158 25	331 86
72	1168 21	331 01
73	1178 18	330 25
74	1188 16	329 61
75	1198 15	329 05
76	1208 13	328 69
77	1218 13	328 23
78	1228 12	327 96
79	1238 12	327 79
80	1248 12	327 72
81	1258 12	327 74
82	1258 12	327 86
83	1278 12	328 08
84	1288 11	328 39
85	1298 11	328 81
86	1308 09	329 31
87	1318 07	329 92
88	1328 05	330 62
89	1338 02	331 42
90	1347 98	332 31
91	1357 93	333 30
92	1367 87	334 39
93	1377 80	335 58
94	1387 72	336 86
95	1397 62	338 23
96	1407 51	339 70
97	1417 39	341 27
98	1427 26	342 93

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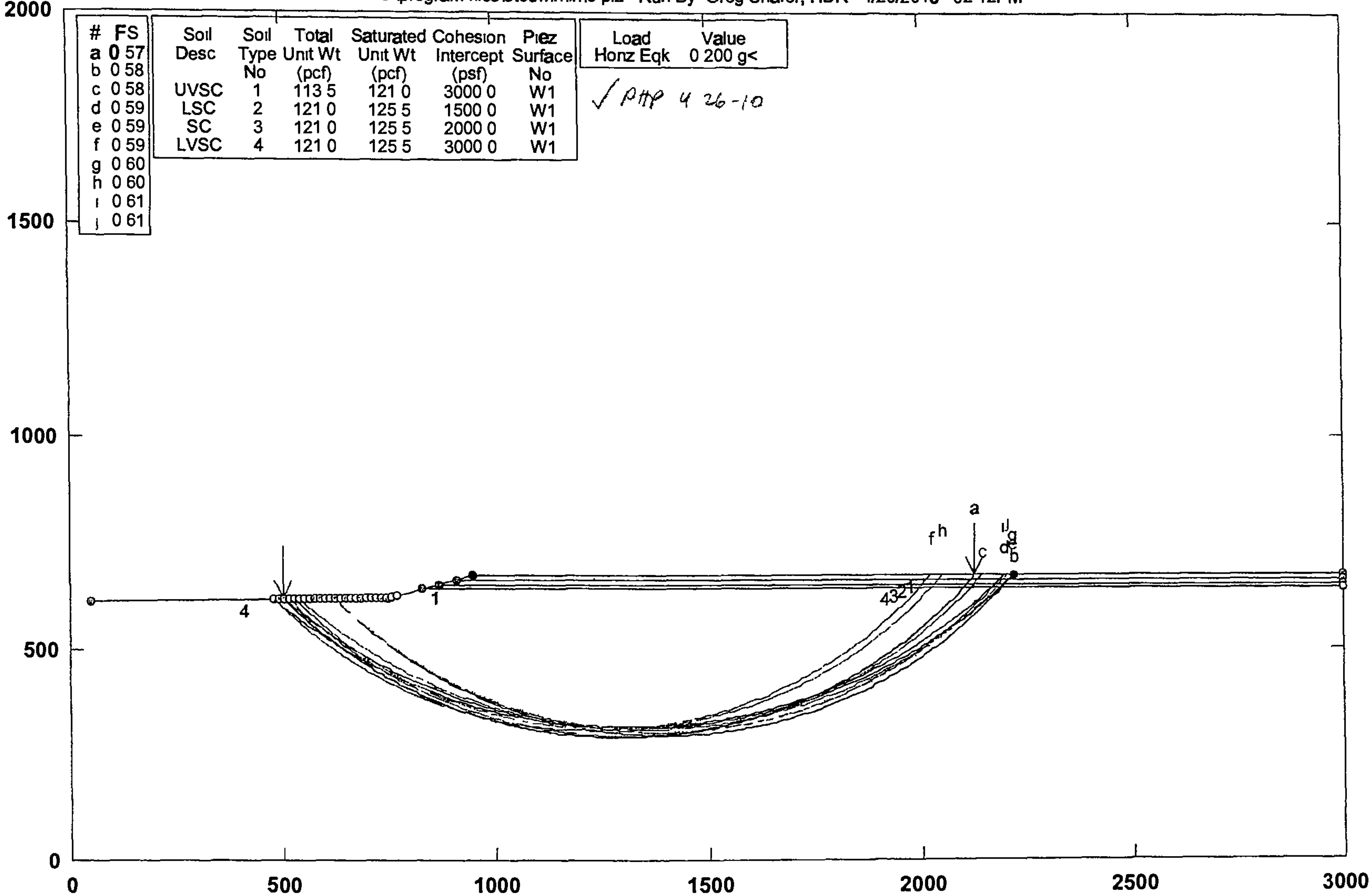
99	1437 09	344 69
100	1446 92	346 65
101	1456 73	348 50
102	1466 52	350 64
103	1476 29	352 68
104	1486 03	354 91
105	1495 76	357 24
106	1505 46	359 66
107	1515 14	362 18
108	1524 79	364 79
109	1534 42	367 49
110	1544 02	370 29
111	1553 60	373 18
112	1563 14	376 15
113	1572 66	379 23
114	1582 14	382 40
115	1591 60	386 66
116	1601 02	389 00
117	1610 41	392 44
118	1619 77	395 98
119	1629 09	399 60
120	1638 37	403 31
121	1647 62	407 11
122	1656 83	411 00
123	1665 01	414 98
124	1675 14	419 05
125	1684 24	423 21
125	1693 29	427 45
127	1702 30	431 79
128	1711 27	436 21
129	1720 20	440 71
130	1729 08	445 30
131	1737 92	449 98
132	1746 71	454 75
133	1755 46	459 60
134	1764 16	464 53
135	1772 81	469 55
136	1781 41	474 55
137	1789 96	479 83
138	1798 46	485 10
139	1806 91	490 45
140	1815 31	495 88
141	1823 65	501 39
142	1831 94	506 98
143	1840 18	512 65
144	1848 36	518 41
145	1856 48	524 24
146	1864 55	530 15
147	1872 56	536 13
148	1880 51	542 20
149	1888 40	548 34
150	1896 23	554 56
151	1904 01	550 85
152	1911 72	567 22
153	1919 36	573 66
154	1926 95	580 18
155	1934 47	586 77
156	1941 93	593 43
157	1949 32	600 16
158	1956 65	606 97
159	1963 91	613 84
160	1971 10	520 79
161	1978 23	627 80
162	1985 29	634 89
163	1992 28	642 04
164	1999 20	649 26
165	2006 05	656 55
166	2012 83	663 90

```
    167         2018 34        670 00
Circle Center At X = 1250 7 , Y = 1359 8  and Radius, 1032 0
        ***       1 080    ***
```

Intermountain Regional Landfill Cut slope 1

c \program files\stedwin\irl\3 pl2 Run By Greg Shafer, HDR 4/20/2010 02 12PM



#	FS
a	0 57
b	0 58
c	0 58
d	0 59
e	0 59
f	0 59
g	0 60
h	0 60
i	0 61
j	0 61

Soil Desc	Soil Type No	Total Unit Wt (pcf)	Saturated Unit Wt (pcf)	Cohesion Intercept (psf)	Piez Surface No
UVSC	1	113 5	121 0	3000 0	W1
LSC	2	121 0	125 5	1500 0	W1
SC	3	121 0	125 5	2000 0	W1
LVSC	4	121 0	125 5	3000 0	W1

Load	Value
Horiz Eqk	0 200 g<

PCSTABL7 FSmin=0 57

Safety Factors Are Calculated By The Modified Bishop Method

STED

```
                    ** PCSTABL7 **
                          by
                   Purdue University
                --Slope Stability Analysis--
            Simplified Janbu, Simplified Bishop
              or Spencer s Method of Slices
 Run Date                  4/20/2010
 Time of Run               02 12PM
 Run By                    Greg Shafer, HDR
 Input Data Filename       C 3 in
 Output Filename           C 3 OUT
 Unit                      ENGLISH
 Plotted Output Filename   C 3 PLT
 PROBLEM DESCRIPTION   Intermountain Regional Landfill
                       Cut slope 1
 BOUNDARY COORDINATES
      Note  User origin value specified
      Add 0 00 to X-values and 0 00 to Y-values listed

     3 Top   Boundaries
     6 Total Boundaries
```

Boundary No	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	50 00	611 45	750 00	620 00	4
2	750 00	620 00	950 00	670 00	1
3	950 00	670 00	3000 00	670 00	1
4	910 00	660 00	3000 00	660 00	2
5	870 00	650 00	3000 00	550 00	3
6	830 00	640 00	3000 00	640 00	4

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type No	Total Unit Wt (pcf)	Saturated Unit Wt (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param	Pressure Constant (psf)	Piez Surface No
1	113 5	121 0	3000 0	0 0	0 00	0 0	1
2	121 0	125 5	1500 0	0 0	0 00	0 0	1
3	121 0	125 5	2000 0	0 0	0 00	0 0	1
4	121 0	125 5	3000 0	0 0	0 00	0 0	1

```
A Horizontal Earthquake Loading Coefficient
Of0 200 Has Been Assigned
A Vertical Earthquake Loading Coefficient
Of0 000 Has Been Assigned
Cavitation Pressure =    0 0 (psf)
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified
625 Trial Surfaces Have Been Generated
 25 Surfaces Initiate From Each Of 25 Points Equally Spaced
Along The Ground Surface Between   X = 480 00 ft
                               and   X = 770 00 ft
Each Surface Termlnates Between    X = 950 00 ft
                               and   X =2220 00 ft
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is  Y =  0 00 ft
10 00 ft  Line Segments Define Each Trial Failure Surface
Following Are Displayed The Ten Most Critical Of The Trial
      Failure Surfaces Examined   They Are Ordered - Most Critical
      First
      * * Safety Factors Are Calculated By The Modified Bishop Method * *
      Failure Surface Specified By183 Coordinate Points
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Point No	X-Surf (ft)	Y-Surf (ft)
1	504 17	617 00
2	511 29	609 98
3	518 48	603 03
4	525 73	596 14
5	533 04	589 32
6	540 41	582 56
7	547 84	575 87
8	555 33	569 24

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9	562 88	562 69
10	570 49	556 20
11	578 16	549 78
12	585 88	543 43
13	593 57	537 15
14	601 50	630 93
15	609 39	524 79
16	617 34	518 72
17	625 34	512 72
18	533 40	505 80
19	641 50	500 94
20	649 66	495 16
21	657 87	489 45
22	666 13	483 82
23	674 45	478 26
24	682 81	472 77
25	691 22	467 36
26	699 68	462 03
27	708 18	455 77
28	716 73	451 59
29	725 33	446 48
30	733 98	441 45
31	742 67	435 50
32	751 40	431 63
33	760 17	426 84
34	768 99	422 12
35	777 85	417 49
36	786 75	412 93
37	796 70	408 45
38	804 68	404 06
39	813 70	399 74
40	822 76	395 51
41	831 86	391 35
42	840 99	387 28
43	860 16	383 29
44	859 37	379 39
45	868 60	375 56
46	877 88	371 82
47	887 19	368 16
48	896 53	364 59
49	905 90	361 10
50	915 30	367 69
51	924 73	354 37
52	934 19	351 13
53	943 68	347 98
54	953 20	344 91
55	952 74	341 93
55	972 32	339 04
57	981 91	336 23
58	991 53	333 50
59	1001 18	330 86
60	1010 85	328 31
61	1020 54	325 85
62	1030 25	323 47
63	1039 99	321 18
64	1049 74	318 98
65	1059 52	316 86
66	1069 31	314 83
67	1079 12	312 89
68	1088 95	311 04
69	1098 79	309 28
70	1108 65	307 50
71	1118 52	306 01
72	1128 41	304 52
73	1138 31	303 11
74	1148 22	301 78
75	1158 14	300 55
75	1168 08	299 41

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77	1178 02	298 35
78	1187 98	297 39
79	1197 94	296 51
80	1207 91	295 73
81	1217 88	295 03
82	1227 86	294 42
83	1237 85	293 90
84	1247 84	293 48
85	1257 84	293 14
86	1267 83	292 89
87	1277 83	292 73
88	1287 83	292 56
89	1297 83	292 68
90	1307 83	292 79
91	1317 83	292 98
92	1327 83	293 27
93	1337 82	293 65
94	1347 81	294 12
95	1357 79	294 57
96	1367 77	295 32
97	1377 74	296 06
98	1387 71	296 88
99	1397 57	297 79
100	1407 62	298 80
101	1417 56	299 89
102	1427 49	301 07
103	1437 41	302 34
104	1447 31	303 70
105	1457 21	305 15
106	1467 09	306 69
107	1476 96	308 31
108	1486 81	310 03
109	1496 64	311 83
110	1506 46	313 72
111	1516 27	315 70
112	1526 05	317 76
113	1535 82	319 92
114	1545 56	322 16
115	1555 29	324 48
116	1564 99	325 90
117	1574 67	329 40
118	1584 33	331 99
119	1593 97	334 66
120	1603 58	337 43
121	1613 17	340 27
122	1622 73	343 21
123	1632 26	346 23
124	1541 77	349 33
125	1651 24	352 52
126	1660 69	355 79
127	1670 11	359 15
128	1679 50	362 59
129	1688 86	356 12
130	1698 18	369 73
131	1707 48	373 42
132	1716 73	377 20
133	1725 96	381 06
134	1735 15	385 00
135	1744 30	389 03
136	1753 42	393 13
137	1762 50	397 32
138	1771 55	401 59
139	1780 55	405 94
140	1789 52	410 37
141	1798 44	414 88
142	1807 32	419 47
143	1816 17	424 14
144	1824 97	428 89

77	1178 02	298 35
78	1187 98	297 39
79	1197 94	296 51
80	1207 91	295 73
81	1217 88	295 03
82	1227 86	294 42
83	1237 85	293 90
84	1247 84	293 48
85	1257 84	293 14
86	1257 83	292 89
87	1277 83	292 73
88	1287 83	292 56
89	1297 83	292 68
90	1307 83	292 79
91	1317 83	292 98
92	1327 83	293 27
93	1337 82	293 65
94	1347 81	294 12
95	1367 79	294 67
96	1367 77	295 32
97	1377 74	296 06
98	1387 71	296 88
99	1397 67	297 79
100	1407 62	298 80
101	1417 56	299 89
102	1427 49	301 07
103	1437 41	302 34
104	1447 31	303 70
105	1457 21	305 15
106	1467 09	306 69
107	1476 96	308 31
108	1486 81	310 03
109	1496 64	311 83
110	1506 46	313 72
111	1516 27	315 70
112	1526 05	317 76
113	1535 82	319 92
114	1545 56	322 16
115	1565 29	324 48
116	1564 99	326 90
117	1574 67	329 40
118	1584 33	331 99
119	1593 97	334 66
120	1603 58	337 43
121	1613 17	340 27
122	1622 73	343 21
123	1632 26	346 23
124	1641 77	349 33
125	1651 24	352 52
126	1660 59	355 79
127	1670 11	359 15
128	1679 50	362 59
129	1688 86	366 12
130	1698 18	359 73
131	1707 48	373 42
132	1716 73	377 20
133	1725 96	381 06
134	1735 15	385 00
135	1744 30	389 03
136	1753 42	393 13
137	1762 50	397 32
138	1771 55	401 59
139	1780 55	405 94
140	1789 52	410 37
141	1798 44	414 88
142	1807 32	419 47
143	1816 17	424 14
144	1824 97	428 89

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145	1833 72	433 72
146	1842 44	438 63
147	1861 11	443 61
148	1859 73	448 57
149	1868 31	453 81
150	1876 84	459 03
151	1885 33	464 32
152	1893 77	469 68
153	1902 16	475 13
154	1910 50	480 66
155	1918 79	486 24
156	1927 03	491 90
157	1935 21	497 64
158	1943 35	503 46
159	1951 43	509 34
160	1959 47	615 30
161	1967 44	521 33
162	1975 37	527 43
163	1983 24	533 50
164	1991 05	539 84
165	1998 80	546 16
166	2006 50	552 54
167	2014 15	558 99
168	2021 73	565 51
169	2029 25	572 09
170	2036 72	578 74
171	2044 13	585 46
172	2051 47	592 25
173	2058 75	599 10
174	2065 98	606 02
175	2073 14	613 00
176	2080 24	520 04
177	2087 27	627 15
178	2094 24	634 32
179	2101 15	641 55
180	2107 99	648 85
181	2114 76	556 20
182	2121 47	663 62
183	2127 14	670 00

Circle Center At X = 1290 7 , Y = 1408 4 and Radius, 1115 8

*** 0 574 ***

Individual data on the 190 slices

Slice No	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Force Tnorm (lbs)	Force Ttan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	7 1	3062 2	0 0	0 0	0 0	0 0	612 4	0 0	0 0
2	7 2	9239 7	0 0	0 0	0 0	0 0	1847 9	0 0	0 0
3	7 2	15457 2	0 0	0 0	0 0	0 0	3093 4	0 0	0 0
4	7 3	21741 4	0 0	0 0	0 0	0 0	4348 3	0 0	0 0
5	7 4	28058 9	0 0	0 0	0 0	0 0	5611 8	0 0	0 0
6	7 4	34416 2	0 0	0 0	0 0	0 0	6883 2	0 0	0 0
7	7 6	40810 0	0 0	0 0	0 0	0 0	8162 0	0 0	0 0
8	7 5	47236 8	0 0	0 0	0 0	0 0	9447 4	0 0	0 0
9	7 6	53592 7	0 0	0 0	0 0	0 0	10738 5	0 0	0 0
10	7 7	60175 4	0 0	0 0	0 0	0 0	12035 1	0 0	0 0
11	7 7	66580 7	0 0	0 0	0 0	0 0	13336 1	0 0	0 0
12	7 8	73205 1	0 0	0 0	0 0	0 0	14641 0	0 0	0 0
13	7 8	79746 2	0 0	0 0	0 0	0 0	15949 2	0 0	0 0
14	7 9	86299 5	0 0	0 0	0 0	0 0	17259 9	0 0	0 0
15	7 9	92861 6	0 0	0 0	0 0	0 0	18572 3	0 0	0 0
16	8 0	99429 9	0 0	0 0	0 0	0 0	19886 0	0 0	0 0
17	8 1	106001 1	0 0	0 0	0 0	0 0	21200 2	0 0	0 0
18	8 1	112571 3	0 0	0 0	0 0	0 0	22514 3	0 0	0 0
19	8 2	119137 1	0 0	0 0	0 0	0 0	23827 4	0 0	0 0
20	8 2	125696 2	0 0	0 0	0 0	0 0	25139 2	0 0	0 0
21	8 3	132243 4	0 0	0 0	0 0	0 0	26448 7	0 0	0 0
22	8 3	138777 6	0 0	0 0	0 0	0 0	27755 5	0 0	0 0

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23	8 4	145294 5	0 0	0 0	0 0	0 0	29058 9	0 0	0 0
24	8 4	151791 1	0 0	0 0	0 0	0 0	30358 2	0 0	0 0
25	8 6	158264 1	0 0	0 0	0 0	0 0	31652 8	0 0	0 0
26	8 5	164710 5	0 0	0 0	0 0	0 0	32942 1	0 0	0 0
27	8 6	171127 2	0 0	0 0	0 0	0 0	34225 4	0 0	0 0
28	8 5	177510 0	0 0	0 0	0 0	0 0	35502 0	0 0	0 0
29	8 6	183856 9	0 0	0 0	0 0	0 0	35771 4	0 0	0 0
30	8 7	190154 0	0 0	0 0	0 0	0 0	38032 8	0 0	0 0
31	7 3	164631 9	0 0	0 0	0 0	0 0	32926 4	0 0	0 0
32	1 4	29854 0	0 0	0 0	0 0	0 0	5970 8	0 0	0 0
33	8 8	191469 2	0 0	0 0	0 0	0 0	38291 8	0 0	0 0
34	8 8	199348 8	0 0	0 0	0 0	0 0	39869 8	0 0	0 0
35	8 9	207221 0	0 0	0 0	0 0	0 0	41444 2	0 0	0 0
36	8 9	215071 4	0 0	0 0	0 0	0 0	43014 3	0 0	0 0
37	8 9	222896 7	0 0	0 0	0 0	0 0	44579 3	0 0	0 0
38	9 0	230693 5	0 0	0 0	0 0	0 0	46138 7	0 0	0 0
39	9 0	238460 5	0 0	0 0	0 0	0 0	47592 1	0 0	0 0
40	9 1	246193 0	0 0	0 0	0 0	0 0	49238 6	0 0	0 0
41	7 2	201544 0	0 0	0 0	0 0	0 0	40308 8	0 0	0 0
42	1 9	55799 6	0 0	0 0	0 0	0 0	11159 9	0 0	0 0
43	9 1	278712 8	0 0	0 0	0 0	0 0	55742 6	0 0	0 0
44	9 2	286668 3	0 0	0 0	0 0	0 0	57333 7	0 0	0 0
45	9 2	294572 3	0 0	0 0	0 0	0 0	58914 5	0 0	0 0
46	9 2	302419 3	0 0	0 0	0 0	0 0	60483 9	0 0	0 0
47	1 4	46241 5	0 0	0 0	0 0	0 0	9248 3	0 0	0 0
48	7 9	264560 1	0 0	0 0	0 0	0 0	52912 0	0 0	0 0
49	9 3	318537 0	0 0	0 0	0 0	0 0	63727 4	0 0	0 0
50	9 3	326303 8	0 0	0 0	0 0	0 0	65260 8	0 0	0 0
51	9 4	333903 5	0 0	0 0	0 0	0 0	66780 7	0 0	0 0
52	4 1	148249 9	0 0	0 0	0 0	0 0	29650 0	0 0	0 0
53	5 3	193678 7	0 0	0 0	0 0	0 0	38715 7	0 0	0 0
54	9 4	349693 4	0 0	0 0	0 0	0 0	69918 7	0 0	0 0
55	9 5	356974 8	0 0	0 0	0 0	0 0	71395 0	0 0	0 0
56	9 5	364275 1	0 0	0 0	0 0	0 0	72855 0	0 0	0 0
57	6 3	245928 8	0 0	0 0	0 0	0 0	49185 8	0 0	0 0
58	3 2	125420 0	0 0	0 0	0 0	0 0	25084 0	0 0	0 0
59	9 5	376467 4	0 0	0 0	0 0	0 0	75293 5	0 0	0 0
60	9 6	380908 7	0 0	0 0	0 0	0 0	76181 7	0 0	0 0
61	9 6	385239 6	0 0	0 0	0 0	0 0	77047 9	0 0	0 0
62	9 6	389458 5	0 0	0 0	0 0	0 0	77891 7	0 0	0 0
63	9 6	393558 5	0 0	0 0	0 0	0 0	78711 7	0 0	0 0
64	9 7	397642 8	0 0	0 0	0 0	0 0	79508 6	0 0	0 0
65	9 7	401409 7	0 0	0 0	0 0	0 0	80281 9	0 0	0 0
65	9 7	405155 1	0 0	0 0	0 0	0 0	81031 0	0 0	0 0
67	9 7	408772 2	0 0	0 0	0 0	0 0	81754 4	0 0	0 0
68	9 8	412269 8	0 0	0 0	0 0	0 0	82454 0	0 0	0 0
69	9 8	415643 7	0 0	0 0	0 0	0 0	83128 7	0 0	0 0
70	9 8	418887 4	0 0	0 0	0 0	0 0	83777 5	0 0	0 0
71	9 8	422004 8	0 0	0 0	0 0	0 0	84401 0	0 0	0 0
72	9 8	424989 3	0 0	0 0	0 0	0 0	84997 9	0 0	0 0
73	9 8	427844 7	0 0	0 0	0 0	0 0	85568 9	0 0	0 0
74	9 9	430564 7	0 0	0 0	0 0	0 0	86112 9	0 0	0 0
75	9 9	433153 4	0 0	0 0	0 0	0 0	86630 7	0 0	0 0
76	9 9	435604 4	0 0	0 0	0 0	0 0	87120 9	0 0	0 0
77	9 9	437922 0	0 0	0 0	0 0	0 0	87584 4	0 0	0 0
78	9 9	440099 8	0 0	0 0	0 0	0 0	88020 0	0 0	0 0
79	9 9	442142 3	0 0	0 0	0 0	0 0	88428 5	0 0	0 0
80	9 9	444043 3	0 0	0 0	0 0	0 0	88808 7	0 0	0 0
81	9 9	445807 3	0 0	0 0	0 0	0 0	89161 5	0 0	0 0
82	10 0	447428 2	0 0	0 0	0 0	0 0	89485 5	0 0	0 0
83	10 0	448905 2	0 0	0 0	0 0	0 0	89781 1	0 0	0 0
84	10 0	450243 4	0 0	0 0	0 0	0 0	90048 7	0 0	0 0
86	10 0	451441 9	0 0	0 0	0 0	0 0	90288 4	0 0	0 0
86	10 0	452495 1	0 0	0 0	0 0	0 0	90499 0	0 0	0 0
87	10 0	453402 2	0 0	0 0	0 0	0 0	90680 4	0 0	0 0
88	10 0	454168 5	0 0	0 0	0 0	0 0	90833 7	0 0	0 0
89	10 0	454788 1	0 0	0 0	0 0	0 0	90957 6	0 0	0 0
90	10 0	455250 8	0 0	0 0	0 0	0 0	91052 2	0 0	0 0

91	10 0	455597 4	0 0	0 0	0 0	0 0	91119 5	0 0	0 0
92	10 0	455781 2	0 0	0 0	0 0	0 0	91155 2	0 0	0 0
93	10 0	455823 2	0 0	0 0	0 0	0 0	91164 6	0 0	0 0
94	10 0	455717 8	0 0	0 0	0 0	0 0	91143 6	0 0	0 0
95	10 0	455470 6	0 0	0 0	0 0	0 0	91094 1	0 0	0 0
96	10 0	455076 1	0 0	0 0	0 0	0 0	91015 2	0 0	0 0
97	10 0	454640 2	0 0	0 0	0 0	0 0	90908 0	0 0	0 0
98	10 0	453867 4	0 0	0 0	0 0	0 0	90771 5	0 0	0 0
99	10 0	453028 0	0 0	0 0	0 0	0 0	90605 6	0 0	0 0
100	10 0	452058 0	0 0	0 0	0 0	0 0	90411 6	0 0	0 0
101	10 0	450942 3	0 0	0 0	0 0	0 0	90188 5	0 0	0 0
102	10 0	449686 8	0 0	0 0	0 0	0 0	89937 4	0 0	0 0
103	10 0	448286 3	0 0	0 0	0 0	0 0	89657 3	0 0	0 0
104	9 9	445741 8	0 0	0 0	0 0	0 0	89348 4	0 0	0 0
105	9 9	445064 7	0 0	0 0	0 0	0 0	89012 9	0 0	0 0
106	9 9	443239 3	0 0	0 0	0 0	0 0	88647 9	0 0	0 0
107	9 9	441277 3	0 0	0 0	0 0	0 0	88255 5	0 0	0 0
108	9 9	439174 1	0 0	0 0	0 0	0 0	87834 8	0 0	0 0
109	9 9	435936 0	0 0	0 0	0 0	0 0	87387 2	0 0	0 0
110	9 9	434564 0	0 0	0 0	0 0	0 0	86912 8	0 0	0 0
111	9 9	432053 6	0 0	0 0	0 0	0 0	86410 7	0 0	0 0
112	9 9	429406 0	0 0	0 0	0 0	0 0	85881 2	0 0	0 0
113	9 8	425627 5	0 0	0 0	0 0	0 0	85325 5	0 0	0 0
114	9 8	423719 6	0 0	0 0	0 0	0 0	84743 9	0 0	0 0
115	9 8	420677 7	0 0	0 0	0 0	0 0	84135 5	0 0	0 0
116	9 8	417503 5	0 0	0 0	0 0	0 0	83500 7	0 0	0 0
117	9 8	414203 5	0 0	0 0	0 0	0 0	82840 7	0 0	0 0
118	9 7	410779 2	0 0	0 0	0 0	0 0	82155 8	0 0	0 0
119	9 7	407226 7	0 0	0 0	0 0	0 0	81445 3	0 0	0 0
120	9 7	403552 7	0 0	0 0	0 0	0 0	80710 5	0 0	0 0
121	9 7	399758 7	0 0	0 0	0 0	0 0	79951 7	0 0	0 0
122	9 7	395841 4	0 0	0 0	0 0	0 0	79168 3	0 0	0 0
123	9 6	391807 5	0 0	0 0	0 0	0 0	78361 5	0 0	0 0
124	9 6	387553 6	0 0	0 0	0 0	0 0	77530 7	0 0	0 0
125	9 6	383386 6	0 0	0 0	0 0	0 0	76577 3	0 0	0 0
126	9 6	379008 3	0 0	0 0	0 0	0 0	75801 7	0 0	0 0
127	9 5	374515 6	0 0	0 0	0 0	0 0	74903 1	0 0	0 0
128	9 5	369920 2	0 0	0 0	0 0	0 0	73984 0	0 0	0 0
129	9 5	366214 4	0 0	0 0	0 0	0 0	73042 9	0 0	0 0
130	9 4	360400 2	0 0	0 0	0 0	0 0	72080 1	0 0	0 0
131	9 4	365489 3	0 0	0 0	0 0	0 0	71097 9	0 0	0 0
132	9 4	350474 4	0 0	0 0	0 0	0 0	70094 9	0 0	0 0
133	9 4	345362 3	0 0	0 0	0 0	0 0	69072 5	0 0	0 0
134	9 3	340155 2	0 0	0 0	0 0	0 0	68031 0	0 0	0 0
135	9 3	334855 3	0 0	0 0	0 0	0 0	66971 1	0 0	0 0
136	9 3	329465 0	0 0	0 0	0 0	0 0	55893 0	0 0	0 0
137	9 2	323986 6	0 0	0 0	0 0	0 0	64797 3	0 0	0 0
138	9 2	318418 1	0 0	0 0	0 0	0 0	53683 6	0 0	0 0
139	9 2	312770 7	0 0	0 0	0 0	0 0	62564 1	0 0	0 0
140	9 1	307038 3	0 0	0 0	0 0	0 0	51407 7	0 0	0 0
141	9 1	301231 8	0 0	0 0	0 0	0 0	60246 4	0 0	0 0
142	9 0	296345 6	0 0	0 0	0 0	0 0	59069 1	0 0	0 0
143	9 0	289390 2	0 0	0 0	0 0	0 0	57878 0	0 0	0 0
144	9 0	283364 4	0 0	0 0	0 0	0 0	56672 9	0 0	0 0
145	8 9	277267 1	0 0	0 0	0 0	0 0	56453 4	0 0	0 0
146	8 9	271108 6	0 0	0 0	0 0	0 0	54221 7	0 0	0 0
147	8 8	264887 9	0 0	0 0	0 0	0 0	52977 6	0 0	0 0
148	8 8	268607 8	0 0	0 0	0 0	0 0	51721 6	0 0	0 0
149	8 8	252274 7	0 0	0 0	0 0	0 0	50454 9	0 0	0 0
150	8 7	245887 7	0 0	0 0	0 0	0 0	49177 5	0 0	0 0
151	8 7	239449 9	0 0	0 0	0 0	0 0	47890 0	0 0	0 0
152	8 6	232954 3	0 0	0 0	0 0	0 0	46592 9	0 0	0 0
153	8 6	226433 9	0 0	0 0	0 0	0 0	45286 8	0 0	0 0
154	8 5	219864 7	0 0	0 0	0 0	0 0	43972 9	0 0	0 0
155	8 6	213259 9	0 0	0 0	0 0	0 0	42652 0	0 0	0 0
156	8 4	206616 4	0 0	0 0	0 0	0 0	41323 3	0 0	0 0
157	8 4	199943 1	0 0	0 0	0 0	0 0	39988 6	0 0	0 0
158	8 3	193243 2	0 0	0 0	0 0	0 0	38648 6	0 0	0 0

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159	8 3	186517 1	0 0	0 0	0 0	0 0	37303 4	0 0	0 0
160	8 2	179770 3	0 0	0 0	0 0	0 0	35954 1	0 0	0 0
161	8 2	173003 6	0 0	0 0	0 0	0 0	34600 7	0 0	0 0
162	8 1	166222 9	0 0	0 0	0 0	0 0	33244 6	0 0	0 0
163	8 1	159431 1	0 0	0 0	0 0	0 0	31886 2	0 0	0 0
164	8 0	152629 1	0 0	0 0	0 0	0 0	30525 8	0 0	0 0
165	8 0	145822 6	0 0	0 0	0 0	0 0	29164 6	0 0	0 0
166	7 9	139012 5	0 0	0 0	0 0	0 0	27802 5	0 0	0 0
167	7 9	132206 6	0 0	0 0	0 0	0 0	26441 3	0 0	0 0
168	7 8	125403 7	0 0	0 0	0 0	0 0	25080 7	0 0	0 0
169	7 8	118609 4	0 0	0 0	0 0	0 0	23721 9	0 0	0 0
170	7 7	111827 0	0 0	0 0	0 0	0 0	22365 4	0 0	0 0
171	7 6	105059 7	0 0	0 0	0 0	0 0	21011 9	0 0	0 0
172	7 6	98311 1	0 0	0 0	0 0	0 0	19662 2	0 0	0 0
173	7 5	91584 2	0 0	0 0	0 0	0 0	18316 8	0 0	0 0
174	7 5	84882 5	0 0	0 0	0 0	0 0	16976 5	0 0	0 0
175	7 4	78209 5	0 0	0 0	0 0	0 0	15641 9	0 0	0 0
176	7 3	71558 4	0 0	0 0	0 0	0 0	14313 7	0 0	0 0
177	7 3	64964 9	0 0	0 0	0 0	0 0	12993 0	0 0	0 0
178	7 2	58398 2	0 0	0 0	0 0	0 0	11679 6	0 0	0 0
179	7 2	51874 8	0 0	0 0	0 0	0 0	10375 0	0 0	0 0
180	7 1	45396 1	0 0	0 0	0 0	0 0	9079 2	0 0	0 0
181	7 0	38968 8	0 0	0 0	0 0	0 0	7793 8	0 0	0 0
182	7 0	32592 2	0 0	0 0	0 0	0 0	6518 4	0 0	0 0
183	5 4	21141 6	0 0	0 0	0 0	0 0	4228 3	0 0	0 0
184	1 5	5131 6	0 0	0 0	0 0	0 0	1026 3	0 0	0 0
185	6 8	20013 2	0 0	0 0	0 0	0 0	4002 6	0 0	0 0
186	1 1	2563 3	0 0	0 0	0 0	0 0	512 7	0 0	0 0
187	5 7	11253 8	0 0	0 0	0 0	0 0	2250 8	0 0	0 0
188	3 4	4687 9	0 0	0 0	0 0	0 0	937 6	0 0	0 0
189	3 3	3043 1	0 0	0 0	0 0	0 0	608 6	0 0	0 0
190	5 7	2053 1	0 0	0 0	0 0	0 0	410 6	0 0	0 0

Failure Surface Specified By192 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	480 00	616 70
2	487 72	510 34
3	496 49	604 04
4	503 30	597 80
5	511 16	591 62
6	519 07	585 50
7	527 02	579 44
8	535 02	573 44
9	543 07	567 51
10	561 16	561 63
11	559 30	555 81
12	567 48	550 06
13	575 70	544 37
14	583 97	638 74
15	692 27	533 18
16	600 62	627 68
17	609 02	622 24
18	617 45	516 87
19	625 92	511 55
20	634 44	506 31
21	642 99	501 13
22	651 59	496 02
23	660 22	490 97
24	658 89	485 99
25	677 60	481 07
26	686 34	476 22
27	695 12	471 43
28	703 94	466 72
29	712 79	462 07
30	721 68	457 48
31	730 60	452 97
32	739 56	448 52
33	748 55	444 15

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34	757 58	439 84
35	766 63	435 60
36	775 72	431 42
37	784 84	427 32
38	793 99	423 29
39	803 17	419 32
40	812 38	415 43
41	821 62	411 61
42	830 89	407 86
43	840 19	404 17
44	849 51	400 55
45	858 87	397 02
46	858 25	393 55
47	877 65	390 16
48	887 08	386 83
49	896 54	383 58
50	906 02	380 40
51	915 52	377 29
52	925 06	374 25
53	934 60	371 28
54	944 17	368 39
55	953 77	365 57
56	963 38	362 83
57	973 02	350 16
58	982 68	357 56
59	992 35	355 03
60	1002 05	352 58
61	1011 76	350 20
62	1021 49	347 90
63	1031 24	345 67
64	1041 00	343 51
65	1050 78	341 43
66	1060 58	339 42
57	1070 39	337 49
68	1080 22	335 63
59	1090 06	333 85
70	1099 91	332 14
71	1109 78	330 51
72	1119 66	328 95
73	1129 55	327 47
74	1139 45	326 06
75	1149 36	324 73
75	1159 28	323 48
77	1169 21	322 30
78	1179 16	321 19
79	1189 09	320 16
80	1199 05	319 21
81	1209 01	318 33
82	1218 98	317 53
83	1228 95	316 80
84	1238 93	316 15
86	1248 91	315 58
86	1258 90	315 08
87	1268 89	314 66
88	1278 89	314 31
89	1288 88	314 04
90	1298 88	313 85
91	1308 88	313 73
92	1318 88	313 69
93	1328 88	313 72
94	1338 88	313 83
95	1348 88	314 02
96	1358 87	314 28
97	1368 87	314 62
98	1378 86	316 03
99	1388 85	315 52
100	1398 83	315 09
101	1408 81	316 73

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102	1418 78	317 45
103	1428 75	318 24
104	1438 71	319 11
105	1448 67	320 06
106	1458 62	321 08
107	1458 56	322 18
108	1478 49	323 35
109	1488 41	324 60
110	1498 32	325 92
111	1508 22	327 32
112	1518 11	328 80
113	1527 99	330 35
114	1537 86	331 97
115	1547 72	333 67
116	1557 56	335 45
117	1567 38	337 30
118	1577 20	339 22
119	1586 99	341 22
120	1596 78	343 29
121	1606 54	345 44
122	1616 29	347 66
123	1626 03	349 96
124	1635 74	352 33
125	1645 44	354 77
126	1655 12	357 29
127	1654 77	359 88
128	1674 41	362 55
129	1684 03	365 29
130	1693 63	368 10
131	1703 20	370 98
132	1712 76	373 94
133	1722 29	376 97
134	1731 79	380 07
135	1741 28	383 24
135	1750 73	386 49
137	1760 17	389 81
138	1769 57	393 20
139	1778 96	396 66
140	1788 31	400 19
141	1797 54	403 80
142	1806 94	407 47
143	1816 21	411 22
144	1825 46	415 03
145	1834 67	418 92
146	1843 86	422 88
147	1853 01	426 90
148	1862 13	431 00
149	1871 22	435 16
150	1880 28	439 39
151	1889 31	443 70
152	1898 30	448 07
153	1907 26	452 51
154	1916 19	457 02
155	1925 08	461 59
156	1933 94	466 23
167	1942 76	470 94
158	1951 56	475 72
169	1960 29	480 56
160	1969 01	485 47
161	1977 68	490 45
162	1986 32	496 49
163	1994 91	500 60
164	2003 47	505 77
165	2011 99	511 01
166	2020 47	516 31
167	2028 90	521 68
168	2037 30	527 11
159	2045 66	532 61

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170	2053 97	538 17
171	2062 24	543 79
172	2070 47	549 47
173	2078 65	555 22
174	2086 79	561 03
175	2094 89	566 90
176	2102 94	672 83
177	2110 94	578 82
178	2118 90	584 88
179	2126 82	590 99
180	2134 68	597 16
181	2142 50	603 40
182	2160 27	609 59
183	2158 00	616 04
184	2165 67	622 45
185	2173 30	628 92
186	2180 87	635 45
187	2188 40	542 03
188	2195 88	648 67
189	2203 30	655 37
190	2210 68	662 13
191	2218 00	668 94
192	2219 12	670 00

Circle Center At X = 1319 4 , Y = 1627 8 and Radius, 1314 1

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Failure Surface Specified By183 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	516 25	617 14
2	523 44	610 20
3	530 69	603 31
4	538 00	596 49
5	546 38	589 73
6	552 81	583 04
7	560 30	675 42
8	567 85	569 86
9	575 46	563 37
10	583 12	566 94
11	590 84	550 59
12	598 62	544 30
13	606 45	538 08
14	614 34	531 93
15	622 28	525 86
16	630 27	519 85
17	638 32	513 91
18	646 42	508 05
19	654 57	502 25
20	662 77	496 53
21	671 02	490 88
22	679 32	485 31
23	687 67	479 81
24	696 07	474 38
25	704 52	469 03
26	713 01	463 75
27	721 66	458 55
28	730 14	453 42
29	738 77	448 37
30	747 46	443 40
31	756 17	438 50
32	764 93	433 68
33	773 73	428 94
34	782 58	424 28
35	791 47	419 69
36	800 39	415 18
37	809 36	410 75
38	818 35	406 41
39	827 41	402 14
40	836 49	397 96

41	845 51	393 85
42	854 76	389 82
43	863 96	385 88
44	873 17	382 01
45	882 43	378 23
46	891 72	374 53
47	901 04	370 91
48	910 40	367 38
49	919 78	363 93
50	929 20	350 56
51	938 64	357 28
52	948 12	354 07
53	967 62	350 95
54	967 15	347 92
55	976 70	344 97
55	986 29	342 11
57	995 89	339 33
58	1005 52	336 64
59	1015 18	334 03
60	1024 85	331 51
61	1034 55	329 07
62	1044 27	326 72
63	1064 01	324 45
64	1063 77	322 27
65	1073 55	320 18
66	1083 34	318 17
67	1093 16	316 25
68	1102 99	314 42
69	1112 84	312 68
70	1122 70	311 02
71	1132 57	309 45
72	1142 46	307 97
73	1152 36	306 57
74	1162 28	305 26
75	1172 20	304 04
76	1182 14	302 91
77	1192 09	301 86
78	1202 04	300 91
79	1212 00	300 04
80	1221 97	299 26
81	1231 95	298 57
82	1241 93	297 97
83	1251 92	297 45
84	1261 91	297 02
85	1271 90	296 69
86	1281 90	296 44
87	1291 90	296 28
88	1301 90	296 20
89	1311 90	296 22
90	1321 90	295 32
91	1331 89	296 52
92	1341 89	296 80
93	1351 88	297 17
94	1361 87	297 62
95	1371 86	298 17
96	1381 84	298 81
97	1391 81	299 53
98	1401 78	300 34
99	1411 74	301 24
100	1421 69	302 23
101	1431 63	303 30
102	1441 56	304 47
103	1451 48	305 72
104	1461 39	307 06
105	1471 29	308 48
106	1481 18	310 00
107	1491 05	311 60
108	1600 90	313 29

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109	1510 74	315 07
110	1520 57	316 93
111	1530 38	318 88
112	1540 17	320 92
113	1549 94	323 04
114	1559 69	325 25
115	1569 43	327 55
116	1579 14	329 93
117	1588 83	332 40
118	1598 50	334 95
119	1608 14	337 59
120	1517 76	340 31
121	1527 36	343 12
122	1635 93	346 02
123	1646 48	349 00
124	1656 00	352 06
125	1655 49	355 21
126	1674 95	358 44
127	1684 39	361 75
128	1693 79	365 15
129	1703 17	368 63
130	1712 51	372 20
131	1721 82	375 84
132	1731 10	379 57
133	1740 35	383 38
134	1749 56	387 28
135	1758 73	391 25
136	1767 88	395 30
137	1776 98	399 44
138	1785 05	403 66
139	1795 08	407 95
140	1804 07	412 33
141	1813 02	416 78
142	1821 94	421 32
143	1830 81	425 93
144	1839 54	430 62
145	1848 43	435 39
146	1857 18	440 24
147	1865 88	445 16
148	1874 54	450 17
149	1883 16	455 24
150	1891 72	450 40
151	1900 25	465 63
152	1908 72	470 93
153	1917 15	476 31
154	1925 54	481 75
155	1933 87	487 29
155	1942 15	492 89
157	1950 39	498 57
158	1958 57	504 31
159	1966 70	510 13
160	1974 78	516 02
161	1982 81	521 99
152	1990 79	528 02
163	1998 71	634 12
164	2006 58	540 30
165	2014 39	546 54
166	2022 16	552 85
167	2029 85	559 23
168	2037 49	565 68
169	2045 08	572 19
170	2052 60	578 77
171	2050 07	585 42
172	2057 49	592 14
173	2074 84	598 92
174	2082 13	605 76
175	2089 36	612 67
175	2096 53	619 64

177	2103 63	626 68
178	2110 68	633 77
179	2117 66	640 93
180	2124 57	648 16
181	2131 43	555 44
182	2138 22	662 78
183	2144 77	670 00

Circle Center At X = 1305 1 , Y = 1426 1 and Radius, 1130 0

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Failure Surface Specified By187 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	504 17	617 00
2	511 82	610 57
3	519 53	604 20
4	527 29	597 89
5	535 10	591 64
6	542 95	685 45
7	550 86	579 33
8	558 82	573 27
9	566 82	567 27
10	574 87	561 34
11	582 96	566 47
12	591 10	549 66
13	599 29	643 92
14	607 52	538 24
15	615 80	532 63
16	624 12	527 08
17	632 49	521 60
18	640 90	516 19
19	649 35	510 84
20	657 84	505 56
21	665 37	500 35
22	674 95	495 21
23	683 56	490 13
24	592 22	485 12
25	700 91	480 18
26	709 65	475 31
27	718 42	470 51
28	727 23	465 78
29	736 07	461 11
30	744 96	456 52
31	753 88	452 00
32	762 83	447 55
33	771 82	443 17
34	780 84	438 86
35	789 90	434 62
35	798 99	430 45
37	808 12	426 36
38	817 27	422 34
39	826 46	418 39
40	835 68	414 51
41	844 93	410 71
42	854 20	406 98
43	863 51	403 32
44	872 85	399 74
45	882 21	396 23
46	891 60	392 79
47	901 02	389 43
48	910 47	386 16
49	919 94	382 94
50	929 43	379 80
51	938 95	376 74
62	948 50	373 75
53	958 06	370 84
64	967 65	368 01
55	977 26	365 25
56	985 90	362 57

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67	996 55	359 96
58	1006 23	357 43
69	1015 92	354 98
60	1025 64	352 60
61	1035 37	360 30
62	1045 12	348 08
63	1054 88	345 94
64	1064 67	343 87
65	1074 47	341 88
56	1084 28	339 97
67	1094 11	338 13
68	1103 96	336 37
69	1113 82	334 59
70	1123 69	333 09
71	1133 57	331 57
72	1143 47	330 12
73	1153 37	328 76
74	1153 29	327 47
75	1173 21	326 26
76	1183 15	325 12
77	1193 09	324 07
78	1203 05	323 10
79	1213 01	322 20
80	1222 97	321 39
81	1232 95	320 65
82	1242 92	319 99
83	1252 91	319 41
84	1262 90	318 91
85	1272 89	318 48
86	1282 88	318 14
87	1292 88	317 88
88	1302 88	317 69
89	1312 87	317 59
90	1322 87	317 56
91	1332 87	317 61
92	1342 87	317 74
93	1352 87	317 95
94	1362 87	318 24
95	1372 86	318 61
96	1382 86	319 06
97	1392 84	319 58
98	1402 82	320 19
99	1412 79	320 87
100	1422 77	321 64
101	1432 73	322 48
102	1442 69	323 40
103	1452 64	324 40
104	1462 58	325 47
105	1472 51	326 63
106	1482 44	327 87
107	1492 35	329 18
108	1602 25	330 57
109	1612 14	332 04
110	1522 02	333 59
111	1531 89	336 22
112	1541 74	336 92
113	1551 58	338 70
114	1561 41	340 55
115	1671 22	342 50
116	1581 01	344 52
117	1590 79	346 61
118	1600 56	348 78
119	1610 30	351 02
120	1620 02	353 35
121	1629 73	355 75
122	1639 42	368 23
123	1649 09	360 78
124	1658 74	363 41

125	1568 36	366 12
126	1677 97	368 90
127	1687 55	371 76
128	1697 11	374 69
129	1706 65	377 70
130	1716 16	380 79
131	1725 65	383 95
132	1735 11	387 18
133	1744 55	390 49
134	1753 96	393 87
135	1763 34	397 33
136	1772 69	400 87
137	1782 02	404 47
138	1791 32	408 15
139	1800 59	411 91
140	1809 83	415 73
141	1819 04	419 63
142	1828 21	423 60
143	1837 36	427 65
144	1846 47	431 76
145	1855 55	435 95
146	1854 60	440 21
147	1873 61	444 55
148	1882 59	448 95
149	1891 53	463 42
150	1900 44	457 97
151	1909 31	452 68
152	1918 15	467 27
153	1926 95	472 02
154	1935 71	476 85
155	1944 43	481 74
156	1953 11	486 70
157	1961 75	491 73
158	1970 35	496 83
159	1978 92	502 00
150	1987 44	507 23
161	1995 92	512 53
162	2004 35	517 90
163	2012 75	523 33
164	2021 10	528 83
165	2029 41	534 40
166	2037 67	540 03
157	2045 89	545 73
168	2054 06	551 49
159	2062 19	557 32
170	2070 27	563 21
171	2078 30	569 16
172	2086 29	575 18
173	2094 23	581 25
174	2102 12	587 41
175	2109 96	593 61
176	2117 75	599 88
177	2125 50	606 21
178	2133 19	612 60
179	2140 83	619 05
180	2148 42	626 56
181	2155 96	632 13
182	2163 45	638 76
183	2170 88	646 45
184	2178 26	652 19
185	2185 59	659 00
186	2192 86	655 86
187	2197 18	670 00

Circle Center At X = 1321 3 , Y = 1582 2 and Radius, 1264 6

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Failure Surface Specified By186 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)

1	540 42	617 44
2	547 95	610 85
3	555 54	604 35
4	563 18	597 89
5	570 87	591 50
6	578 61	585 18
7	586 41	578 91
8	694 26	572 71
9	602 15	566 58
10	610 09	560 50
11	618 09	554 50
12	626 13	548 55
13	534 22	542 68
14	642 35	536 87
15	650 55	531 13
16	558 78	525 45
17	667 06	519 84
18	676 39	514 30
19	683 76	508 83
20	692 17	503 43
21	700 63	498 09
22	709 13	492 83
23	717 67	487 63
24	726 26	482 50
25	734 89	477 45
26	743 55	472 46
27	752 26	467 55
28	761 01	462 70
29	769 80	457 93
30	778 63	453 23
31	787 49	448 60
32	796 39	444 05
33	805 33	439 66
34	814 31	435 15
35	823 32	430 82
36	832 36	426 55
37	841 44	422 36
38	850 56	418 25
39	859 71	414 21
40	868 89	410 24
41	878 10	405 35
42	887 34	402 54
43	895 62	398 80
44	905 92	395 14
45	915 26	391 55
46	924 52	388 04
47	934 01	384 50
48	943 43	381 24
49	952 88	377 96
50	962 35	374 76
51	971 85	371 63
52	981 37	368 58
53	990 92	365 61
54	1000 49	362 72
55	1010 09	359 90
56	1019 70	357 16
57	1029 34	354 51
58	1039 01	351 93
59	1048 59	349 43
60	1058 39	347 00
61	1068 11	344 66
62	1077 85	342 40
63	1087 61	340 21
64	1097 39	338 11
66	1107 18	336 09
66	1116 99	334 14
67	1126 82	332 28
68	1136 66	330 50

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69	1145 51	328 79
70	1156 38	327 17
71	1166 26	325 63
72	1176 15	324 17
73	1186 05	322 78
74	1195 97	321 48
75	1205 89	320 26
76	1215 83	319 13
77	1225 77	318 07
78	1235 73	317 09
79	1245 69	316 20
80	1255 65	315 39
81	1265 63	314 65
82	1275 60	314 00
83	1285 59	313 43
84	1295 58	312 95
85	1305 57	312 54
86	1315 56	312 21
87	1325 56	311 97
88	1335 56	311 81
89	1345 56	311 73
90	1355 56	311 73
91	1365 56	311 81
92	1375 56	311 98
93	1385 55	312 22
94	1395 55	312 55
95	1405 54	312 96
96	1415 53	313 45
97	1425 51	314 02
98	1435 49	314 68
99	1445 46	315 41
100	1455 43	316 23
101	1465 39	317 13
102	1475 34	318 11
103	1485 28	319 17
104	1495 22	320 31
105	1505 14	321 53
106	1515 06	322 83
107	1524 96	324 22
108	1534 85	325 68
109	1544 73	327 22
110	1554 60	328 85
111	1564 45	330 55
112	1574 29	332 34
113	1584 12	334 21
114	1593 93	336 16
115	1603 72	338 18
116	1613 50	340 29
117	1623 25	342 48
118	1632 99	344 74
119	1642 71	347 09
120	1652 42	349 51
121	1662 10	352 02
122	1671 76	354 60
123	1681 40	357 26
124	1691 01	360 00
125	1700 61	362 82
126	1710 18	365 71
127	1719 73	368 69
128	1729 25	371 74
129	1738 75	374 87
130	1748 22	378 08
131	1757 67	381 36
132	1767 08	384 72
133	1776 47	388 16
134	1785 84	391 67
135	1795 17	395 26
136	1804 47	398 93

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137	1813 75	402 57
138	1822 99	406 49
139	1832 20	410 38
140	1841 38	414 35
141	1850 53	418 39
142	1859 64	422 51
143	1868 72	425 70
144	1877 76	430 97
145	1886 77	435 31
145	1895 75	439 72
147	1904 68	444 20
148	1913 58	448 76
149	1922 45	463 39
150	1931 27	468 10
151	1940 06	462 87
152	1948 81	467 72
153	1957 51	472 64
154	1966 18	477 62
155	1974 81	482 68
156	1983 39	487 81
157	1991 93	493 01
158	2000 43	498 28
159	2008 89	503 62
160	2017 30	609 02
161	2025 67	514 50
152	2033 99	520 04
153	2042 27	525 65
164	2050 50	531 33
165	2058 69	537 07
155	2066 83	542 89
167	2074 92	548 76
168	2082 96	554 71
169	2090 95	550 72
170	2098 90	556 79
171	2106 79	572 93
172	2114 63	579 13
173	2122 43	585 40
174	2130 17	591 73
175	2137 86	598 12
176	2145 50	604 58
177	2153 08	611 09
178	2160 51	617 67
179	2168 09	624 31
180	2175 51	631 01
181	2182 88	637 77
182	2190 19	644 60
183	2197 45	551 48
184	2204 65	658 42
185	2211 79	665 41
185	2216 39	670 00

Cırcle Center At X = 1350 4 , Y = 1537 5 and Radıus, 1225 8
*** 0 587 ***
Faılure Surface Specıfıed By175 Coordınate Poınts

Poınt No	X-Surf (ft)	Y-Surf (ft)
1	480 00	616 70
2	487 13	609 69
3	494 33	602 76
4	501 60	595 88
5	508 93	589 08
6	616 32	582 35
7	523 78	575 68
8	531 30	669 09
9	538 88	562 57
10	546 52	555 12
11	564 22	549 74
12	551 98	543 44
13	569 81	537 20

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14	577 68	531 05
15	585 62	524 96
16	593 62	518 95
17	601 67	513 02
18	609 77	507 17
19	617 93	501 39
20	626 15	495 69
21	634 42	490 06
22	642 74	484 52
23	651 11	479 05
24	659 54	473 66
25	668 01	468 35
26	676 54	463 13
27	685 11	457 98
28	693 73	452 91
29	702 40	447 93
30	711 11	443 02
31	719 88	438 20
32	728 68	433 46
33	737 53	428 81
34	746 43	424 24
35	755 36	419 75
35	764 34	415 35
37	773 36	411 03
38	782 42	406 80
39	791 52	402 65
40	800 56	398 59
41	809 84	394 62
42	819 05	390 73
43	828 30	386 93
44	837 58	383 21
45	846 90	379 59
46	856 26	376 05
47	865 64	372 60
48	875 06	369 24
49	884 51	365 97
50	893 99	362 78
51	903 50	359 69
52	913 04	356 69
53	922 60	363 78
54	932 20	350 95
55	941 82	348 22
56	951 46	345 58
57	951 13	343 03
58	970 82	340 57
59	980 54	338 20
60	990 28	335 93
61	1000 04	333 74
62	1009 81	331 65
63	1019 61	329 65
64	1029 43	327 74
65	1039 26	325 93
66	1049 11	324 21
67	1058 98	322 58
68	1068 86	321 04
69	1078 76	319 60
70	1088 57	318 25
71	1098 59	316 99
72	1108 52	315 83
73	1118 46	314 76
74	1128 41	313 79
75	1138 38	312 91
76	1148 34	312 12
77	1158 32	311 43
78	1168 30	310 83
79	1178 29	310 32
80	1188 28	309 91
81	1198 28	309 60

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82	1208 27	309 38
83	1218 27	309 25
84	1228 27	309 22
85	1238 27	309 28
86	1248 27	309 43
87	1258 27	309 68
88	1268 26	310 02
89	1278 25	310 46
90	1288 24	310 99
91	1298 22	311 62
92	1308 19	312 34
93	1318 16	313 16
94	1328 12	314 06
95	1338 07	315 07
96	1348 01	316 16
97	1357 94	317 35
98	1367 85	318 63
99	1377 76	320 01
100	1387 56	321 48
101	1397 63	323 04
102	1407 39	324 70
103	1417 24	326 45
104	1427 06	328 29
105	1436 88	330 22
106	1446 67	332 25
107	1456 44	334 37
108	1466 19	336 58
109	1475 92	338 88
110	1485 63	341 28
111	1495 32	343 76
112	1504 98	346 34
113	1514 62	349 01
114	1524 23	351 77
115	1533 82	354 62
116	1543 37	357 56
117	1552 90	360 59
118	1562 41	363 71
119	1571 88	366 92
120	1581 32	370 21
121	1590 73	373 60
122	1600 10	377 08
123	1609 45	380 64
124	1618 76	384 29
125	1628 03	388 03
126	1637 27	391 86
127	1646 47	396 77
128	1655 64	399 77
129	1664 76	403 86
130	1673 85	408 03
131	1682 90	412 28
132	1691 91	416 63
133	1700 88	421 05
134	1709 80	425 57
135	1718 68	430 16
136	1727 52	434 84
137	1735 31	439 60
138	1745 06	444 45
139	1753 76	449 38
140	1762 42	454 38
141	1771 03	459 47
142	1779 58	464 65
143	1788 09	469 90
144	1796 55	475 23
145	1804 95	480 64
146	1813 32	486 13
147	1821 63	491 70
148	1829 88	497 35
149	1838 08	503 07

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150	1845 22	508 87
151	1864 31	514 75
152	1862 35	520 71
153	1870 33	526 74
154	1878 25	532 84
155	1886 11	539 02
156	1893 91	545 27
157	1901 66	551 60
168	1909 34	558 00
159	1916 97	564 47
160	1924 53	571 01
161	1932 03	577 62
162	1939 47	584 31
153	1945 84	691 06
164	1954 15	597 89
165	1961 40	604 78
166	1968 58	611 74
167	1975 69	618 76
168	1982 74	625 86
169	1989 72	633 02
170	1996 64	640 24
171	2003 48	647 53
172	2010 26	654 89
173	2016 96	662 31
174	2023 60	669 79
175	2023 78	670 00

Circle Center At X = 1226 8 , Y = 1369 9 and Radius, 1060 7

*** 0 593 ***

Failure Surface Specified By180 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	625 00	618 47
2	632 07	611 40
3	639 21	604 40
4	646 41	597 46
5	653 68	590 59
6	651 00	583 78
7	668 39	577 05
8	675 85	570 38
9	683 36	563 78
10	690 93	557 25
11	698 57	550 79
12	706 26	544 40
13	714 01	538 08
14	721 82	531 83
15	729 68	525 56
16	737 60	519 66
17	745 58	513 53
18	753 62	507 57
19	761 70	501 59
20	769 84	495 88
21	778 04	490 15
22	786 29	484 49
23	794 58	478 91
24	802 93	473 41
25	811 33	467 98
26	819 78	462 63
27	828 28	457 35
28	836 83	452 17
29	845 42	447 05
30	864 05	442 02
31	862 75	437 07
32	871 48	432 19
33	880 25	427 40
34	889 07	422 69
35	897 94	418 06
36	906 84	413 61
37	915 79	409 04

38	924 77	404 65
39	933 80	400 35
40	942 87	396 13
41	951 97	391 99
42	961 11	387 94
43	970 29	383 97
44	979 51	380 09
45	988 75	376 29
46	998 05	372 68
47	1007 36	368 95
48	1016 72	365 41
49	1026 10	361 95
50	1035 52	358 59
51	1044 96	355 31
52	1054 44	352 11
53	1063 94	349 01
54	1073 48	345 99
55	1083 04	343 05
55	1092 62	340 21
57	1102 24	337 45
58	1111 87	334 79
59	1121 54	332 21
50	1131 22	329 72
61	1140 93	327 32
62	1150 66	325 01
63	1160 41	322 79
54	1170 18	320 66
65	1179 97	318 62
66	1189 78	316 67
57	1199 60	314 80
68	1209 44	313 03
69	1219 30	311 35
70	1229 18	309 77
71	1239 05	308 27
72	1248 96	306 86
73	1258 88	305 55
74	1268 80	304 32
75	1278 74	303 19
76	1288 68	302 15
77	1298 64	301 20
78	1308 60	300 34
79	1318 57	299 57
80	1328 55	298 90
81	1338 53	298 31
82	1348 52	297 82
83	1358 51	297 42
84	1368 51	297 11
85	1378 50	296 90
86	1388 50	296 77
87	1398 60	296 74
88	1408 50	296 80
89	1418 50	296 96
90	1428 50	297 20
91	1438 49	297 54
92	1448 48	297 95
93	1458 47	298 49
94	1468 46	299 10
95	1478 43	299 80
96	1488 39	300 60
97	1498 36	301 48
98	1508 31	302 46
99	1518 25	303 53
100	1528 18	304 70
101	1638 10	305 95
102	1548 01	307 29
103	1557 91	308 73
104	1567 79	310 25
105	1577 66	311 87

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106	1587 51	313 68
107	1597 35	315 38
108	1607 17	317 27
109	1615 97	319 25
110	1525 76	321 32
111	1636 52	323 48
112	1545 26	325 73
113	1655 99	328 06
114	1665 69	330 49
115	1675 36	333 01
116	1685 02	335 62
117	1694 65	338 31
118	1704 25	341 09
119	1713 83	343 96
120	1723 38	346 92
121	1732 91	349 97
122	1742 41	353 11
123	1751 87	356 33
124	1751 31	359 64
125	1770 71	363 03
126	1780 09	366 52
127	1789 43	370 08
128	1798 74	373 74
129	1808 01	377 48
130	1817 25	381 30
131	1826 46	385 21
132	1835 62	389 21
133	1844 76	393 28
134	1853 85	397 45
135	1862 90	401 69
136	1871 92	406 02
137	1880 89	410 43
138	1889 82	414 92
139	1898 72	419 50
140	1907 57	424 16
141	1916 37	428 90
142	1925 13	433 72
143	1933 85	438 61
144	1942 52	443 59
145	1951 15	448 65
146	1959 73	453 79
147	1968 26	459 01
148	1976 74	464 31
149	1985 18	469 68
150	1993 56	475 13
151	2001 89	480 66
152	2010 18	486 26
153	2018 41	491 94
154	2026 58	497 70
155	2034 71	503 53
156	2042 78	509 43
157	2050 79	515 41
158	2058 75	521 46
159	2066 66	527 59
160	2074 51	533 79
161	2082 30	540 06
162	2090 03	546 40
163	2097 70	552 81
164	2105 32	559 29
166	2112 87	565 84
166	2120 36	572 47
167	2127 80	579 16
168	2135 17	595 91
169	2142 48	592 74
170	2149 72	599 53
171	2156 90	606 59
172	2164 02	613 62
173	2171 07	620 71

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174	2178 06	627 85
175	2184 98	635 08
176	2191 83	542 36
177	2198 62	649 70
178	2205 34	657 11
179	2211 99	664 68
180	2216 73	670 00

Circle Center At X = 1396 9 , Y = 1383 6 and Radius, 1086 9

*** 0 598 ***

Failure Surface Specified By172 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	628 33	617 29
2	535 45	610 26
3	542 63	603 30
4	649 87	596 41
5	567 19	589 59
6	564 56	582 84
7	572 01	576 16
8	579 51	569 55
9	587 08	663 02
10	594 71	556 56
11	602 41	550 17
12	610 16	543 85
13	617 97	537 61
14	625 85	531 45
16	633 78	525 36
16	641 77	519 35
17	649 82	613 41
18	657 92	507 55
19	656 08	501 77
20	674 30	496 07
21	682 57	490 45
22	690 89	484 91
23	699 27	479 44
24	707 70	474 06
26	716 18	468 76
25	724 70	453 54
27	733 28	458 40
28	741 91	463 35
29	750 59	448 38
30	759 31	443 49
31	768 08	438 68
32	776 90	433 96
33	785 76	429 33
34	794 57	424 78
35	803 51	420 31
36	812 60	415 94
37	821 64	411 64
38	830 71	407 44
39	839 82	403 32
40	848 97	399 29
41	868 16	396 35
42	867 39	391 50
43	876 66	387 73
44	886 96	384 06
45	895 29	380 47
46	904 66	376 97
47	914 06	373 57
48	923 50	370 25
49	932 95	367 02
50	942 46	363 89
51	961 98	350 85
52	961 64	367 89
53	971 12	355 03
54	980 73	352 27
55	990 36	349 69
66	1000 03	347 01

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67	1009 71	344 52
58	1019 42	342 12
59	1029 15	339 82
60	1038 90	337 61
61	1048 68	335 49
62	1058 47	333 47
63	1068 28	331 54
64	1078 11	329 70
65	1087 96	327 96
66	1097 82	326 32
67	1107 70	324 77
68	1117 60	323 31
69	1127 50	321 95
70	1137 42	320 68
71	1147 35	319 51
72	1157 29	318 44
73	1167 25	317 46
74	1177 21	316 57
75	1187 18	315 78
76	1197 15	315 09
77	1207 13	314 49
78	1217 12	313 99
79	1227 11	313 59
80	1237 11	313 28
81	1247 11	313 06
82	1257 11	312 95
83	1267 11	312 92
84	1277 11	313 00
85	1287 10	313 17
86	1297 10	313 43
87	1307 09	313 80
88	1317 08	314 25
89	1327 07	314 81
90	1337 05	315 46
91	1347 02	316 20
92	1356 98	317 04
93	1366 94	317 98
94	1376 89	319 01
95	1386 82	320 14
96	1396 75	321 36
97	1406 66	322 68
98	1416 56	324 09
99	1426 45	325 60
100	1436 32	327 20
101	1445 17	328 90
102	1456 01	330 69
103	1466 83	332 57
104	1475 63	334 55
105	1485 42	336 63
106	1495 18	338 80
107	1504 92	341 06
108	1514 64	343 41
109	1524 33	345 86
110	1534 01	348 40
111	1543 65	351 03
112	1553 27	353 76
113	1562 87	356 58
114	1572 44	359 49
115	1581 97	362 49
116	1591 48	365 58
117	1600 96	368 77
118	1610 41	372 04
119	1619 83	375 41
120	1629 21	378 86
121	1638 56	382 41
122	1647 88	386 04
123	1657 16	389 77
124	1656 40	393 58

125	1575 61	397 48
126	1684 78	401 47
127	1593 91	405 55
128	1703 00	409 71
129	1712 05	413 97
130	1721 06	418 30
131	1730 03	422 73
132	1738 96	427 24
133	1747 84	431 84
134	1756 67	436 52
135	1765 47	441 28
136	1774 21	446 13
137	1782 91	451 07
138	1791 56	456 08
139	1800 16	461 18
140	1808 71	466 37
141	1817 22	471 63
142	1825 67	476 97
143	1834 07	482 40
144	1842 42	487 91
145	1850 71	493 49
145	1858 95	499 16
147	1867 14	504 90
148	1875 27	510 73
149	1883 34	516 63
150	1891 36	522 60
151	1899 32	528 66
152	1907 22	534 79
153	1915 06	540 99
154	1922 84	547 27
155	1930 56	553 63
156	1938 22	660 06
157	1945 82	556 56
158	1953 35	573 14
159	1960 82	579 78
160	1968 23	586 50
161	1975 57	593 29
162	1982 85	500 15
163	1990 06	607 08
154	1997 20	614 07
165	2004 28	621 14
166	2011 29	628 27
167	2018 23	636 47
168	2025 10	642 74
169	2031 90	650 07
170	2038 63	657 47
171	2045 29	664 93
172	2049 73	570 00

Circle Center At X = 1264 4 , Y = 1355 1 and Radius, 1042 2

*** 0 604 ***

Failure Surface Specified By177 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	625 00	618 47
2	632 12	611 46
3	639 31	604 50
4	646 57	597 62
5	653 88	590 80
6	661 26	584 05
7	668 70	577 37
8	676 21	570 76
9	683 77	554 22
10	691 39	567 75
11	699 08	551 36
12	706 82	545 02
13	714 62	538 77
14	722 48	532 58
15	730 40	626 47

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16	738 37	520 44
17	746 40	514 47
18	764 48	508 59
19	752 62	502 77
20	770 81	497 04
21	779 05	491 38
22	787 35	485 79
23	795 70	480 29
24	804 09	474 86
25	812 54	469 50
26	821 04	464 23
27	829 58	459 04
28	838 18	453 92
29	846 82	448 89
30	855 50	443 93
31	864 24	439 06
32	873 01	434 27
33	881 83	429 56
34	890 70	424 93
36	899 60	420 38
36	908 66	415 92
37	917 54	411 54
38	926 57	407 24
39	935 64	403 03
40	944 75	398 90
41	953 89	394 85
42	963 08	390 90
43	972 30	387 02
44	981 55	383 23
45	990 84	379 53
46	1000 15	375 91
47	1009 52	372 38
48	1018 91	368 94
49	1028 33	365 59
50	1037 78	362 32
51	1047 26	359 14
52	1056 77	366 05
53	1066 31	353 04
54	1075 87	350 13
55	1085 47	347 30
56	1095 08	344 55
57	1104 73	341 91
58	1114 39	339 35
59	1124 08	336 88
60	1133 80	334 51
61	1143 53	332 22
62	1153 29	330 02
63	1163 06	327 91
64	1172 86	325 89
65	1182 67	323 97
66	1192 50	322 13
67	1202 35	320 39
68	1212 21	318 73
69	1222 09	317 17
70	1231 98	315 70
71	1241 88	314 32
72	1251 80	313 04
73	1261 73	311 84
74	1271 67	310 74
75	1281 61	309 73
76	1291 57	308 81
77	1301 54	307 99
78	1311 51	307 25
79	1321 49	306 61
80	1331 48	306 06
81	1341 47	305 61
82	1351 45	305 25
83	1361 46	304 98

84	1371 45	304 80
85	1381 45	304 71
86	1391 45	304 72
87	1401 45	304 82
88	1411 45	306 01
89	1421 45	305 30
90	1431 44	305 68
91	1441 43	306 15
92	1451 41	306 71
93	1461 39	307 37
94	1471 36	308 12
95	1481 33	308 95
96	1491 28	309 89
97	1501 23	310 92
98	1511 17	312 04
99	1521 10	313 25
100	1531 01	314 55
101	1640 91	315 94
102	1550 80	317 43
103	1560 68	319 01
104	1570 54	320 67
105	1580 38	322 43
106	1590 21	324 28
107	1600 02	326 23
108	1609 81	328 26
109	1619 58	330 38
110	1629 33	332 60
111	1639 06	334 90
112	1648 77	337 30
113	1658 46	339 78
114	1668 12	342 35
115	1677 76	345 02
116	1687 37	347 77
117	1696 96	350 61
118	1706 52	353 54
119	1716 06	356 56
120	1725 56	359 67
121	1735 04	362 87
122	1744 48	366 15
123	1753 90	369 52
124	1763 28	372 98
125	1772 63	376 52
126	1781 95	380 15
127	1791 23	383 87
128	1800 48	387 67
129	1809 69	391 56
130	1818 87	395 53
131	1828 01	399 59
132	1837 11	403 74
133	1846 17	407 96
134	1855 20	412 27
135	1864 18	416 67
136	1873 12	421 15
137	1882 02	425 71
138	1890 88	430 35
139	1899 69	435 07
140	1908 46	439 88
141	1917 18	444 77
142	1925 85	449 74
143	1934 50	454 78
144	1943 08	459 91
145	1951 62	465 12
146	1960 11	470 40
147	1968 55	475 77
148	1976 93	481 21
149	1985 27	486 73
150	1993 56	492 33
151	2001 79	498 00

152	2009 98	503 75
153	2018 10	509 58
154	2026 18	515 48
155	2034 20	521 45
156	2042 16	527 50
157	2050 07	533 63
158	2057 91	539 82
159	2065 71	546 09
160	2073 44	552 43
161	2081 11	558 84
162	2088 73	566 32
153	2096 28	671 88
164	2103 77	578 50
165	2111 21	585 19
166	2118 57	691 95
167	2125 88	598 78
168	2133 12	605 68
159	2140 30	612 64
170	2147 41	619 67
171	2154 46	626 76
172	2161 44	633 92
173	2168 35	641 15
174	2175 20	648 43
175	2181 98	665 78
176	2188 70	663 20
177	2194 74	670 00

C1rcle Center At X = 1385 6 , Y = 1383 5 and Rad1us, 1078 8

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Fa1lure Surface Spec1f1ed By178 Coord1nate Po1nts

Po1nt No	X-Surf (ft)	Y-Surf (ft)
1	625 00	618 47
2	632 19	611 52
3	639 44	604 64
4	646 76	597 82
5	654 14	591 07
6	661 57	584 39
7	669 07	577 77
8	676 63	571 22
9	684 25	564 75
10	691 93	558 34
11	699 67	562 00
12	707 45	545 74
13	715 31	539 64
14	723 22	533 42
15	731 18	527 37
15	739 20	521 39
17	747 27	515 49
18	755 39	509 66
19	763 57	503 90
20	771 80	498 22
21	780 08	492 62
22	788 41	487 09
23	796 80	481 64
24	805 23	476 26
25	813 71	470 96
26	822 24	465 74
27	830 81	450 60
28	839 44	465 53
29	848 10	450 55
30	856 82	445 54
31	865 58	440 81
32	874 38	436 07
33	883 22	431 40
34	892 11	426 82
35	901 04	422 31
36	910 01	417 89
37	919 02	413 55

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38	928 06	409 29
39	937 15	405 12
40	946 28	401 03
41	955 44	397 02
42	964 64	393 10
43	973 87	389 26
44	983 14	385 50
45	992 44	381 83
46	1001 77	378 24
47	1011 14	374 74
48	1020 54	371 33
49	1029 97	368 00
50	1039 43	364 76
51	1048 92	361 60
52	1058 44	358 53
53	1067 98	355 55
54	1077 55	352 66
55	1087 15	349 85
56	1096 77	347 13
57	1106 42	344 50
58	1116 09	341 95
59	1125 79	339 50
60	1136 50	337 13
61	1145 24	334 86
62	1155 00	332 67
63	1164 77	330 57
64	1174 67	328 56
65	1184 38	326 64
66	1194 22	324 81
67	1204 05	323 07
68	1213 93	321 42
69	1223 80	319 85
70	1233 69	318 38
71	1243 60	317 00
72	1253 51	315 71
73	1263 44	314 52
74	1273 38	313 41
75	1283 33	312 39
76	1293 29	311 46
77	1303 25	310 63
78	1313 22	309 88
79	1323 20	309 23
80	1333 19	308 67
81	1343 17	308 19
82	1353 17	307 81
83	1363 16	307 63
84	1373 16	307 33
85	1383 16	307 22
85	1393 16	307 21
87	1403 16	307 28
88	1413 16	307 46
89	1423 16	307 71
90	1433 15	308 06
91	1443 14	308 50
92	1453 13	309 03
93	1463 11	309 66
94	1473 08	310 37
96	1483 05	311 18
96	1493 01	312 08
97	1502 96	313 06
98	1512 90	314 14
99	1522 83	315 31
100	1532 75	316 57
101	1542 66	317 92
102	1552 56	319 36
103	1562 44	320 89
104	1572 31	322 52
105	1682 16	324 23

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106	1592 00	326 03
107	1601 81	327 92
108	1611 62	329 90
109	1621 40	331 97
110	1631 16	334 13
111	1640 91	336 38
112	1650 63	338 71
113	1660 33	341 14
114	1670 01	343 65
115	1679 67	346 26
116	1689 30	348 95
117	1698 90	351 73
118	1708 48	354 59
119	1718 04	357 55
120	1727 56	360 59
121	1737 06	363 71
122	1746 53	366 93
123	1755 97	370 23
124	1765 38	373 61
126	1774 76	377 09
126	1784 11	380 64
127	1793 42	384 29
128	1802 70	388 02
129	1811 94	391 83
130	1821 15	395 72
131	1830 33	399 70
132	1839 46	403 77
133	1848 55	407 92
134	1857 62	412 15
135	1866 65	416 46
136	1875 63	420 85
137	1884 57	425 33
138	1893 47	429 89
139	1902 33	434 53
140	1911 14	439 25
141	1919 92	444 05
142	1928 65	448 93
143	1937 33	453 89
144	1945 97	458 93
145	1954 56	464 05
146	1963 10	469 24
147	1971 60	474 51
148	1980 05	479 87
149	1988 45	485 29
150	1996 79	490 80
151	2005 09	496 38
152	2013 34	502 03
153	2021 53	507 76
154	2029 68	513 57
155	2037 77	519 45
156	2045 80	525 40
157	2053 78	531 43
158	2061 71	537 53
159	2069 57	543 70
160	2077 39	549 94
161	2085 14	556 25
162	2092 84	562 64
163	2100 48	569 09
164	2108 06	675 62
165	2115 57	582 21
166	2123 03	588 87
167	2130 43	595 60
168	2137 77	602 40
169	2145 04	609 26
170	2162 25	616 19
171	2159 40	623 18
172	2155 48	630 24
173	2173 50	637 35

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   174        2180 45       644 55
   175        2187 34       651 80
   176        2194 16       659 12
   177        2200 91       666 49
   178        2204 07       670 00
Circle Center At X = 1389 8 , Y = 1402 4  and Radius, 1095 2
      ***       0 607    ***
```

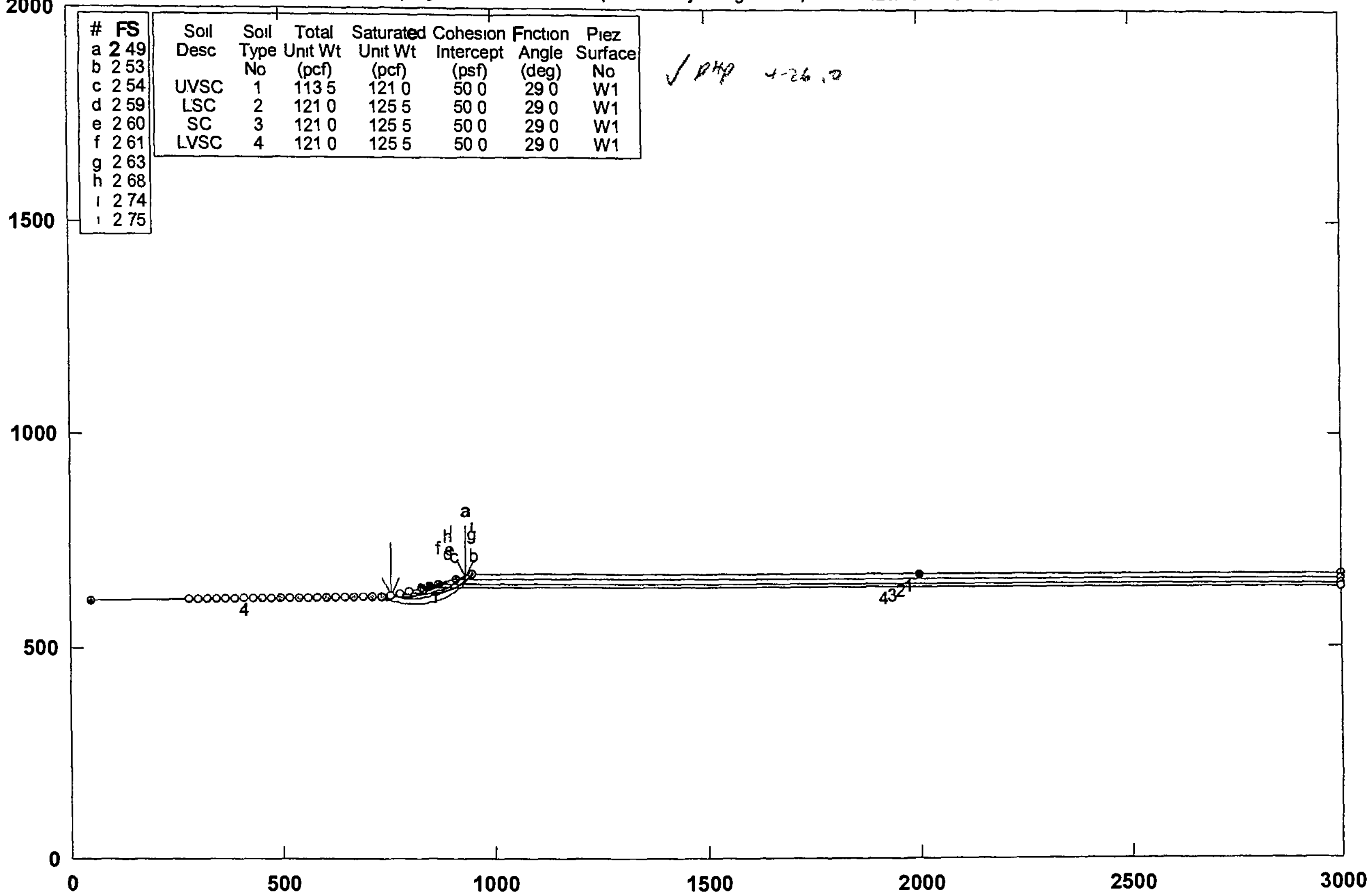
Intermountain Regional Landfill Cut slope 1

c \program files\stedwin\irl\4 pl2 Run By Greg Shafer, HDR 4/20/2010 02 56PM

#	FS
a	2 49
b	2 53
c	2 54
d	2 59
e	2 60
f	2 61
g	2 63
h	2 68
i	2 74
j	2 75

Soil Desc	Soil Type No	Total Unit Wt (pcf)	Saturated Unit Wt (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez Surface No
UVSC	1	113 5	121 0	50 0	29 0	W1
LSC	2	121 0	125 5	50 0	29 0	W1
SC	3	121 0	125 5	50 0	29 0	W1
LVSC	4	121 0	125 5	50 0	29 0	W1

✓ PHP 4-26-10



PCSTABL7 FSmin=2 49
Safety Factors Are Calculated By The Modified Bishop Method

STED

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** PCSTABL7 **
by
Purdue University
--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer s Method of Slices

Run Date 4/20/2010
Time of Run 02 56PM
Run By Greg Shafer, HDR
Input Data Filename C 4 in
Output Filename C 4 OUT
Unit ENGLISH
Plotted Output Filename C 4 PLT
PROBLEM DESCRIPTION Intermountain Regional Landfill
Cut slope 1

BOUNDARY COORDINATES
Note User origin value specified
Add 0 00 to X-values and 0 00 to Y-values listed

3 Top Boundaries
6 Total Boundaries

Boundary No	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	50 00	611 45	760 00	620 00	4
2	750 00	620 00	950 00	670 00	1
3	950 00	670 00	3000 00	670 00	1

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4	910 00	660 00	3000 00	660 00	2
5	870 00	650 00	3000 00	650 00	3
6	830 00	640 00	3000 00	640 00	4

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No	Total Unit Wt (pcf)	Saturated Unit Wt (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param	Pressure Constant (psf)	Piez Surface No
1	113 6	121 0	50 0	29 0	0 00	0 0	1
2	121 0	125 5	50 0	29 0	0 00	0 0	1
3	121 0	125 5	50 0	29 0	0 00	0 0	1
4	121 0	125 6	50 0	29 0	0 00	0 0	1

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified
525 Trial Surfaces Have Been Generated
25 Surfaces Initiate From Each Of 25 Points Equally Spaced
Along The Ground Surface Between X = 280 00 ft
and X = 800 00 ft
Each Surface Terminates Between X = 850 00 ft
and X =2000 00 ft
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0 00 ft
10 00 ft Line Segments Define Each Trial Failure Surface
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Examined They Are Ordered - Most Critical
First
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Failure Surface Specified By 20 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	756 67	621 67
2	766 61	620 61
3	776 59	619 96
4	786 59	619 70
5	796 59	619 85
6	806 57	620 40
7	816 53	621 34
8	826 44	622 68
9	836 28	624 42
10	846 05	626 66
11	855 73	629 08
12	865 30	631 98
13	874 74	635 27
14	884 05	638 94
15	893 20	642 97
16	902 18	547 36
17	910 98	652 12
18	919 58	657 22
19	927 97	662 66
20	931 98	555 50

Circle Center At X = 788 0 , Y = 869 0 and Radius, 249 3
*** 2 493 ***
Individual data on the 25 slices

Slice No	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Force Tnorm (lbs)	Force Ttan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	9 9	1997 7	0 0	0 0	0 0	0 0	0 0	0 0	0 0
2	10 0	6792 7	0 0	0 0	0 0	0 0	0 0	0 0	0 0
3	10 0	9152 3	0 0	0 0	0 0	0 0	0 0	0 0	0 0
4	10 0	12052 7	0 0	0 0	0 0	0 0	0 0	0 0	0 0
5	10 0	14474 9	0 0	0 0	0 0	0 0	0 0	0 0	0 0
6	10 0	16405 4	0 0	0 0	0 0	0 0	0 0	0 0	0 0
7	9 9	17835 4	0 0	0 0	0 0	0 0	0 0	0 0	0 0
8	3 6	6697 8	0 0	0 0	0 0	0 0	0 0	0 0	0 0
9	6 3	12824 2	0 0	0 0	0 0	0 0	0 0	0 0	0 0
10	9 8	20250 4	0 0	0 0	0 0	0 0	0 0	0 0	0 0
11	9 7	20002 5	0 0	0 0	0 0	0 0	0 0	0 0	0 0

12	9 6	19247 8	0 0	0 0	0 0	0 0	0 0	0 0	0 0
13	4 7	9117 7	0 0	0 0	0 0	0 0	0 0	0 0	0 0
14	4 7	9244 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
15	9 3	17000 3	0 0	0 0	0 0	0 0	0 0	0 0	0 0
16	2 4	4124 7	0 0	0 0	0 0	0 0	0 0	0 0	0 0
17	6 7	10729 1	0 0	0 0	0 0	0 0	0 0	0 0	0 0
18	9 0	12309 8	0 0	0 0	0 0	0 0	0 0	0 0	0 0
19	4 9	5571 1	0 0	0 0	0 0	0 0	0 0	0 0	0 0
20	2 9	2960 3	0 0	0 0	0 0	0 0	0 0	0 0	0 0
21	1 0	977 8	0 0	0 0	0 0	0 0	0 0	0 0	0 0
22	8 5	6838 3	0 0	0 0	0 0	0 0	0 0	0 0	0 0
23	4 3	2149 3	0 0	0 0	0 0	0 0	0 0	0 0	0 0
24	4 1	1233 4	0 0	0 0	0 0	0 0	0 0	0 0	0 0
25	4 0	417 4	0 0	0 0	0 0	0 0	0 0	0 0	0 0

Failure Surface Specified By 22 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	766 67	521 67
2	766 43	619 52
3	775 29	517 82
4	785 21	616 59
5	796 18	615 82
6	806 18	615 51
7	815 18	616 66
8	826 16	615 28
9	836 10	617 37
10	845 98	618 91
11	855 78	620 91
12	865 47	623 36
13	875 04	626 26
14	884 47	629 61
15	893 73	633 38
16	902 80	637 58
17	911 67	642 20
18	920 31	647 23
19	928 72	652 65
20	936 86	658 46
21	944 72	664 64
22	950 93	670 00

Circle Center At X = 807 8 Y = 830 6 and Radius, 215 1

*** 2 533 ***

Failure Surface Specified By 17 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	756 67	621 67
2	766 67	621 53
3	776 66	621 75
4	786 65	522 32
5	796 60	523 24
6	806 62	624 52
7	816 39	626 14
8	826 19	628 12
9	835 92	630 44
10	846 56	633 11
11	855 10	636 11
12	864 52	639 45
13	873 82	543 12
14	882 99	547 12
15	892 01	651 44
16	900 87	656 08
17	906 00	659 00

Circle Center At X = 765 5 , Y = 903 8 and Radius, 282 3

*** 2 536 ***

Failure Surface Specified By 15 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	766 67	621 67
2	765 67	621 88

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3	776 65	622 43
4	786 61	623 33
5	796 53	624 57
6	806 41	626 14
7	816 22	628 06
8	825 97	630 30
9	836 63	632 88
10	845 20	635 79
11	854 56	639 02
12	854 01	642 58
13	873 23	646 46
14	882 31	650 64
16	891 24	655 13
16	891 83	655 46

Circle Center At X = 755 5 , Y = 913 7 and Radius, 292 0

*** 2 591 ***

Failure Surface Specified By 14 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	778 33	527 08
2	788 33	626 88
3	798 33	627 15
4	808 30	627 90
5	818 23	629 11
6	828 09	630 78
7	837 85	632 92
8	847 51	635 52
9	857 04	638 57
10	866 41	642 06
11	875 60	645 99
12	884 60	650 35
13	893 38	655 13
14	895 39	656 35

Circle Center At X = 787 6 , Y = 838 6 and Radius, 211 8

*** 2 604 ***

Failure Surface Specified By 13 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	756 67	621 67
2	766 56	620 20
3	776 53	619 44
4	786 53	619 41
5	796 51	620 10
6	806 41	621 50
7	816 18	623 61
8	825 78	626 42
9	835 15	629 92
10	844 24	634 08
11	853 01	638 88
12	861 41	644 31
13	868 47	649 62

Circle Center At X = 782 0 , Y = 758 1 and Radius, 138 8

*** 2 609 ***

Failure Surface Specified By 18 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	800 00	532 50
2	809 68	630 00
3	819 51	628 15
4	829 44	626 96
5	839 43	626 42
6	849 42	626 55
7	859 39	627 33
8	869 29	628 77
9	879 07	630 87
10	888 69	633 60
11	898 10	636 97
12	907 28	640 95

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13	916 17	645 53
14	924 73	650 69
16	932 94	556 40
16	940 75	662 64
17	948 14	569 39
18	948 32	569 58

Circle Center At X = 842 6 , Y = 777 5 and Radius, 151 1

*** 2 631 ***

Failure Surface Specified By 12 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	800 00	632 50
2	809 84	630 69
3	819 80	629 82
4	829 80	629 89
5	839 75	630 90
6	849 55	532 86
7	859 14	535 71
8	868 40	639 46
9	877 28	644 07
10	885 68	649 50
11	893 52	655 70
12	893 78	655 95

Circle Center At X = 824 1 , Y = 735 5 and Radius, 105 8

*** 2 678 ***

Failure Surface Specified By 25 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	735 00	619 82
2	744 09	615 66
3	753 41	612 03
4	762 92	608 94
5	772 60	606 40
6	782 40	604 43
7	792 30	603 02
8	802 26	602 19
9	812 26	601 93
10	822 26	602 24
11	832 22	603 13
12	842 11	604 60
13	861 90	606 63
14	861 56	609 22
15	871 05	612 36
16	880 35	616 04
17	889 42	520 25
18	898 23	624 98
19	906 76	530 21
20	914 97	636 92
21	922 84	642 09
22	930 34	648 70
23	937 44	655 74
24	944 13	663 17
25	949 50	659 88

Circle Center At X = 811 8 , Y = 775 6 and Radius, 173 6

*** 2 736 ***

Failure Surface Specified By 22 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	713 33	619 55
2	722 97	616 87
3	732 72	614 66
4	742 57	612 95
5	752 50	611 72
6	762 47	610 99
7	772 47	610 76
8	782 46	611 02
9	792 44	611 78
10	802 36	613 04

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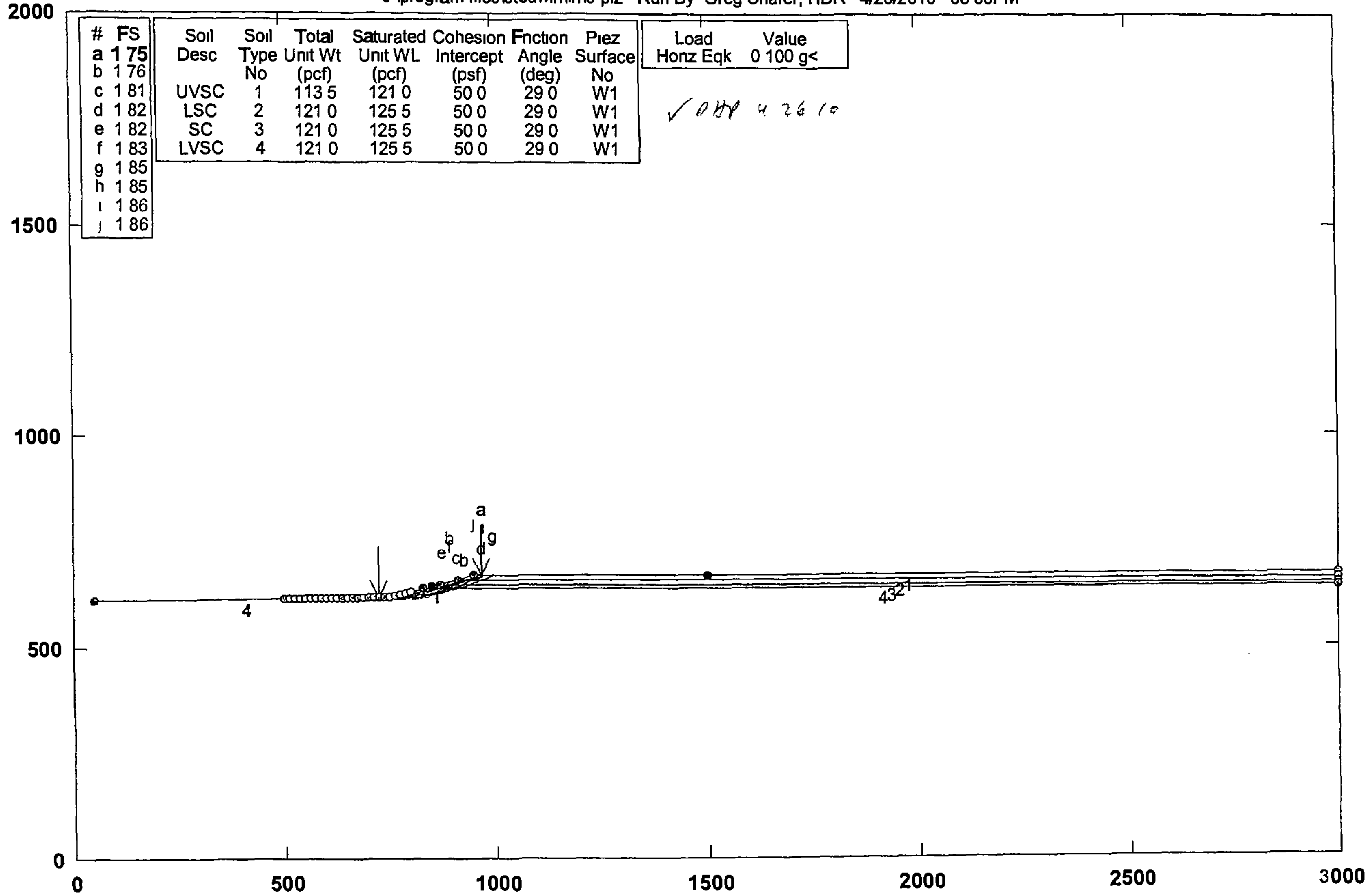
11	812 20	614 79
12	821 95	617 02
13	831 67	619 73
14	841 05	622 92
15	850 35	626 58
16	859 47	630 69
17	868 37	635 26
18	877 03	640 26
19	885 44	645 68
20	893 56	651 51
21	901 38	657 74
22	901 54	657 89

Circle Center At X = 772 2 , Y = 811 9 and Radius, 201 2

*** 2 749 ***

Intermountam Regional Landfill Cut slope 1

c \program files\stedwin\irl\5 pl2 Run By Greg Shafer, HDR 4/20/2010 03 00PM



PCSTABL7 FSmin=1 75

Safety Factors Are Calculated By The Modified Bishop Method

STED

98/130

** PCSTABL7 **
by
Purdue University
--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer s Method of Slices

Run Date 4/20/2010
Time of Run 03 00PM
Run By Greg Shafer, HDR
Input Data Filename C 5 in
Output Filename C 5 OUT
Unit ENGLISH
Plotted Output Filename C 5 PLT
PROBLEM DESCRIPTION Intermountain Regional Landfill
Cut slope 1

BOUNDARY COORDINATES
Note User origin value specified
Add 0 00 to X-values and 0 00 to Y-values listed

3 Top Boundaries
5 Total Boundaries

Boundary No	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	50 00	611 45	750 00	620 00	4
2	750 00	620 00	950 00	670 00	1
3	950 00	670 00	3000 00	670 00	1
4	910 00	650 00	3000 00	660 00	2
5	870 00	650 00	3000 00	650 00	3
6	830 00	640 00	3000 00	640 00	4

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type No	Total Unit Wt (pcf)	Saturated Unit Wt (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param	Pressure Constant (psf)	Piez Surface No
1	113 5	121 0	50 0	29 0	0 00	0 0	1
2	121 0	125 6	50 0	29 0	0 00	0 0	1
3	121 0	125 5	50 0	29 0	0 00	0 0	1
4	121 0	125 5	50 0	29 0	0 00	0 0	1

A Horizontal Earthquake Loading Coefficient
Of0 100 Has Been Assigned
A Vertical Earthquake Loading Coefficient
Of0 000 Has Been Assigned
Cavitation Pressure = 0 0 (psf)
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified
625 Trial Surfaces Have Been Generated
25 Surfaces Initiate From Each Of 25 Points Equally Spaced
Along The Ground Surface Between X = 500 00 ft
and X = 800 00 ft
Each Surface Terminates Between X = 850 00 ft
and X =1500 00 ft
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0 00 ft
10 00 ft Line Segments Define Each Trial Failure Surface
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Examined They Are Ordered - Most Critical
First
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Failure Surface Specified By 27 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	725 00	619 69
2	734 94	518 63
3	744 91	617 82
4	754 90	617 27
5	764 89	616 97
6	774 89	616 94
7	784 89	617 16
8	794 88	617 64

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9	804 85	618 37
10	814 80	619 37
11	824 72	620 62
12	834 61	622 12
13	844 45	623 88
14	854 25	625 89
15	863 99	628 16
16	873 67	630 67
17	883 28	633 44
18	892 81	636 45
19	902 27	639 70
20	911 54	643 20
21	920 91	646 94
22	930 09	650 92
23	939 16	655 13
24	948 11	659 58
25	956 95	564 26
26	965 67	669 15
27	957 10	670 00

Circle Center At X = 771 3 , Y = 1004 7 and Radius, 387 8

*** 1 754 ***

Individual data on the 34 slices

Slice No	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Force Tnorm (lbs)	Force Ttan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	9 9	714 3	0 0	0 0	0 0	0 0	71 4	0 0	0 0
2	10 0	1993 6	0 0	0 0	0 0	0 0	199 4	0 0	0 0
3	5 1	1410 4	0 0	0 0	0 0	0 0	141 0	0 0	0 0
4	4 9	1783 2	0 0	0 0	0 0	0 0	178 3	0 0	0 0
5	10 0	6073 3	0 0	0 0	0 0	0 0	607 3	0 0	0 0
6	10 0	9100 5	0 0	0 0	0 0	0 0	910 1	0 0	0 0
7	10 0	11830 0	0 0	0 0	0 0	0 0	1183 0	0 0	0 0
8	10 0	14254 4	0 0	0 0	0 0	0 0	1425 4	0 0	0 0
9	10 0	16368 4	0 0	0 0	0 0	0 0	1636 8	0 0	0 0
10	10 0	18167 4	0 0	0 0	0 0	0 0	1816 7	0 0	0 0
11	9 9	19649 0	0 0	0 0	0 0	0 0	1964 9	0 0	0 0
12	5 3	10975 6	0 0	0 0	0 0	0 0	1097 6	0 0	0 0
13	4 6	10465 6	0 0	0 0	0 0	0 0	1046 6	0 0	0 0
14	9 8	22909 3	0 0	0 0	0 0	0 0	2290 9	0 0	0 0
15	9 8	23289 8	0 0	0 0	0 0	0 0	2329 0	0 0	0 0
16	9 7	23337 5	0 0	0 0	0 0	0 0	2333 8	0 0	0 0
17	6 0	14357 2	0 0	0 0	0 0	0 0	1435 7	0 0	0 0
18	3 7	8975 2	0 0	0 0	0 0	0 0	897 5	0 0	0 0
19	9 6	23176 6	0 0	0 0	0 0	0 0	2317 7	0 0	0 0
20	9 5	22256 6	0 0	0 0	0 0	0 0	2225 6	0 0	0 0
21	9 5	21029 8	0 0	0 0	0 0	0 0	2103 0	0 0	0 0
22	0 8	1704 4	0 0	0 0	0 0	0 0	170 4	0 0	0 0
23	6 9	14505 0	0 0	0 0	0 0	0 0	1450 5	0 0	0 0
24	1 6	3423 1	0 0	0 0	0 0	0 0	342 3	0 0	0 0
26	9 3	18403 2	0 0	0 0	0 0	0 0	1840 3	0 0	0 0
26	7 1	12733 0	0 0	0 0	0 0	0 0	1273 3	0 0	0 0
27	2 1	3591 4	0 0	0 0	0 0	0 0	359 1	0 0	0 0
28	9 1	13990 9	0 0	0 0	0 0	0 0	1399 1	0 0	0 0
29	9 0	11418 2	0 0	0 0	0 0	0 0	1141 8	0 0	0 0
30	0 8	898 2	0 0	0 0	0 0	0 0	89 8	0 0	0 0
31	1 1	1178 0	0 0	0 0	0 0	0 0	117 8	0 0	0 0
32	7 0	5989 5	0 0	0 0	0 0	0 0	598 9	0 0	0 0
33	8 7	3265 2	0 0	0 0	0 0	0 0	326 5	0 0	0 0
34	1 4	68 7	0 0	0 0	0 0	0 0	6 9	0 0	0 0

Failure Surface Specified By 19 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	762 50	623 13
2	772 42	521 87
3	782 39	621 08
4	792 38	620 74
5	802 38	520 85

6	812 37	621 43
7	822 31	622 45
8	832 20	623 94
9	842 02	625 87
10	851 73	628 24
11	861 32	631 06
12	870 78	634 31
13	880 08	637 99
14	889 20	642 10
15	898 12	646 61
16	906 83	551 53
17	915 30	656 84
18	923 53	662 53
19	925 20	663 80

Circle Center At X = 794 8 , Y = 839 7 and Radius, 219 0
*** 1 762 ***

Failure Surface Specified By 18 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 00	620 00
2	769 73	517 68
3	769 58	615 95
4	779 51	614 82
5	789 50	614 28
6	799 50	614 35
7	809 48	615 01
8	819 40	616 27
9	829 22	618 13
10	838 92	620 57
11	848 45	623 59
12	857 79	627 17
13	866 89	631 31
14	875 73	635 99
15	884 27	641 19
16	892 48	646 90
17	900 34	653 08
18	907 38	659 34

Circle Center At X = 793 4 , Y = 780 7 and Radius, 166 5
*** 1 810 ***

Failure Surface Specified By 24 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 00	620 00
2	759 92	621 23
3	769 83	622 57
4	779 73	623 99
5	789 62	625 52
6	799 48	627 14
7	809 33	628 86
8	819 17	630 58
9	828 98	632 59
10	838 78	634 60
11	848 56	636 70
12	858 31	638 90
13	868 04	641 20
14	877 75	643 59
15	887 44	645 08
16	897 10	648 66
17	906 74	651 34
18	916 34	654 11
19	925 92	656 97
20	935 48	659 93
21	945 00	662 98
22	954 49	666 13
23	963 95	669 37
24	965 75	670 00

Circle Center At X = 629 3 , Y = 1631 4 and Radius, 1018 5
*** 1 818 ***

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Failure Surface Specified By 16 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	737 50	619 85
2	747 42	618 58
3	767 39	617 84
4	767 39	617 63
6	777 39	617 95
6	787 35	618 81
7	797 25	620 19
8	807 07	622 10
9	815 77	624 52
10	826 33	627 45
11	835 72	630 89
12	844 92	634 82
13	853 89	639 24
14	862 62	644 12
15	871 07	649 46
16	872 83	650 71

Circle Center At X = 766 3 , Y = 805 6 and Radius, 188 0

*** 1 823 ***

Failure Surface Specified By 13 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	787 50	629 38
2	797 45	628 36
3	807 44	628 03
4	817 44	628 38
5	827 38	629 41
6	837 24	631 12
7	846 95	533 51
8	856 47	636 55
9	865 77	640 23
10	874 79	644 54
11	883 50	649 46
12	891 86	654 96
13	892 83	655 71

Circle Center At X = 807 3 , Y = 774 2 and Radius, 146 1

*** 1 833 ***

Failure Surface Specified By 25 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	762 50	623 13
2	772 50	622 98
3	782 50	623 02
4	792 50	623 25
5	802 49	623 67
6	812 47	624 28
7	822 44	525 07
8	832 39	626 06
9	842 32	627 22
10	852 23	628 58
11	862 11	630 12
12	871 95	631 85
13	881 77	633 75
14	891 55	636 85
16	901 29	638 13
16	910 98	540 59
17	920 63	643 24
18	930 22	646 06
19	939 76	649 07
20	949 24	552 25
21	958 66	655 61
22	968 01	659 15
23	977 30	662 86
24	986 51	566 74
25	993 84	670 00

Circle Center At X = 775 2 , Y = 1154 9 and Radius, 532 0

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*** 1 850 ***

Failure Surface Specified By 14 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	775 00	626 26
2	784 73	623 95
3	794 62	622 44
4	804 59	621 74
5	814 59	621 85
5	824 55	522 77
7	834 40	624 49
8	844 08	627 00
9	853 52	630 29
10	862 67	634 33
11	871 46	639 10
12	879 83	544 57
13	887 74	650 70
14	893 37	655 84

Circle Center At X = 808 2 , Y = 744 8 and Radius, 123 1

*** 1 851 ***

Failure Surface Specified By 32 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	675 00	619 08
2	684 96	618 20
3	594 94	617 49
4	704 92	616 96
5	714 92	616 60
6	724 91	616 42
7	734 91	616 42
8	744 91	616 60
9	754 91	616 96
10	764 89	617 48
11	774 87	618 18
12	784 83	619 07
13	794 77	620 12
14	804 70	621 36
15	814 60	622 77
16	824 47	624 35
17	834 31	626 11
18	844 13	628 04
19	853 90	630 15
20	863 64	632 42
21	873 33	634 87
22	882 98	637 50
23	892 59	640 29
24	902 14	643 25
25	911 64	646 38
26	921 08	649 67
27	930 46	653 14
28	939 78	656 77
29	949 03	660 56
30	958 21	664 52
31	967 33	668 63
32	970 21	670 00

Circle Center At X = 730 0 , Y = 1181 4 and Radius, 565 0

*** 1 856 ***

Failure Surface Specified By 22 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	762 50	523 13
2	771 98	619 93
3	781 62	617 30
4	791 41	615 22
5	801 29	613 72
6	811 25	612 80
7	821 24	612 46
8	831 24	612 69

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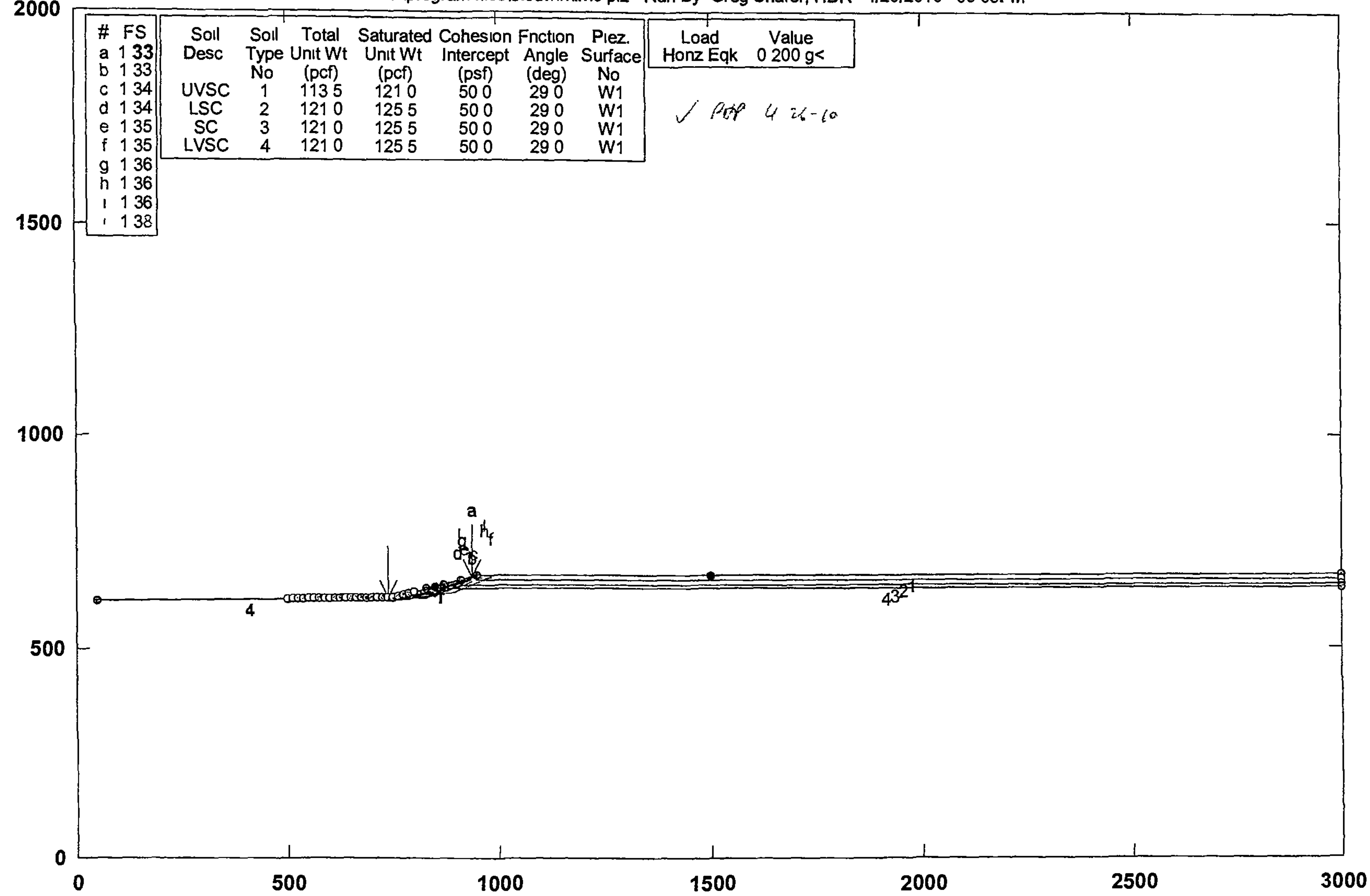
9	841 21	513 51
10	851 11	614 91
11	860 91	616 88
12	870 59	619 41
13	880 10	522 50
14	889 41	626 14
15	898 50	630 32
16	907 33	535 01
17	915 87	540 21
18	924 09	645 90
19	931 98	652 06
20	939 48	658 66
21	946 60	665 69
22	950 48	670 00

Circle Center At X = 822 1 , Y = 784 3 and Radius, 171 9

*** 1 858 ***

Intermountain Regional Landfill Cut slope 1

c \program files\stedwin\irl\6 pl2   Run By Greg Shafer, HDR   4/20/2010   03 03PM



PCSTABL7 FSmin=1 33

Safety Factors Are Calculated By The Modified Bishop Method

STED

105430

** PCSTABL7 **
by
Purdue University
--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer s Method of Slices

Run Date	4/20/2010
Time of Run	03 03PM
Run By	Greg Shafer, HDR
Input Data Filename	C 6 in
Output Filename	C 6 OUT
Unit	ENGLISH
Plotted Output Filename	C 5 PLT

PROBLEM DESCRIPTION Intermountain Regional Landfill
Cut slope 1

BOUNDARY COORDINATES
Note User origin value specified
Add 0 00 to X-values and 0 00 to Y-values listed

3 Top Boundaries
6 Total Boundaries

Boundary No	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	60 00	611 45	750 00	620 00	4
2	750 00	620 00	950 00	670 00	1
3	950 00	570 00	3000 00	670 00	1
4	910 00	660 00	3000 00	660 00	2
5	870 00	660 00	3000 00	650 00	3
6	830 00	640 00	3000 00	640 00	4

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type No	Total Unit Wt (pcf)	Saturated Unit Wt (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param	Pressure Constant (psf)	Piez Surface No
1	113 5	121 0	50 0	29 0	0 00	0 0	1
2	121 0	125 5	50 0	29 0	0 00	0 0	1
3	121 0	125 5	50 0	29 0	0 00	0 0	1
4	121 0	125 5	50 0	29 0	0 00	0 0	1

A Horizontal Earthquake Loading Coefficient
OfO 200 Has Been Assigned
A Vertical Earthquake Loading Coefficient
OfO 000 Has Been Assigned
Cavitation Pressure = 0 0 (psf)
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified
626 Trial Surfaces Have Been Generated
25 Surfaces Initiate From Each Of 25 Points Equally Spaced
Along The Ground Surface Between X = 500 00 ft
and X = 800 00 ft
Each Surface Terminates Between X = 850 00 ft
and X =1500 00 ft
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0 00 ft
10 00 ft Line Segments Define Each Trial Failure Surface
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Examined They Are Ordered - Most Critical
First
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Failure Surface Specified By 23 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	737 50	619 85
2	747 40	618 45
3	757 35	617 41
4	767 33	616 75
5	777 32	616 45
6	787 32	616 52
7	797 31	616 96
8	807 28	617 77

9	817 21	618 95
10	827 09	620 49
11	836 91	622 40
12	846 65	624 67
13	856 29	527 30
14	865 84	630 28
15	875 27	633 61
16	884 57	637 28
17	893 73	641 30
18	902 73	645 66
19	911 56	650 34
20	920 22	655 34
21	928 59	660 67
22	936 95	666 30
23	937 86	666 96

Circle Center At X = 780 4 , Y = 887 2 and Radius, 270 8

*** 1 331 ***

Individual data on the 29 slices

Slice No	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Force Tnorm (lbs)	Force Ttan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	9 9	911 2	0 0	0 0	0 0	0 0	182 2	0 0	0 0
2	2 6	525 6	0 0	0 0	0 0	0 0	105 1	0 0	0 0
3	7 3	2605 1	0 0	0 0	0 0	0 0	521 0	0 0	0 0
4	10 0	6799 5	0 0	0 0	0 0	0 0	1359 9	0 0	0 0
6	10 0	10190 3	0 0	0 0	0 0	0 0	2038 1	0 0	0 0
6	10 0	13158 9	0 0	0 0	0 0	0 0	2631 8	0 0	0 0
7	10 0	15688 4	0 0	0 0	0 0	0 0	3137 7	0 0	0 0
8	10 0	17766 5	0 0	0 0	0 0	0 0	3553 3	0 0	0 0
9	9 9	19384 4	0 0	0 0	0 0	0 0	3876 9	0 0	0 0
10	9 9	20537 8	0 0	0 0	0 0	0 0	4107 6	0 0	0 0
11	2 9	6229 8	0 0	0 0	0 0	0 0	1246 0	0 0	0 0
12	6 9	15942 9	0 0	0 0	0 0	0 0	3188 6	0 0	0 0
13	9 7	22656 9	0 0	0 0	0 0	0 0	4531 4	0 0	0 0
14	9 6	22243 7	0 0	0 0	0 0	0 0	4448 7	0 0	0 0
15	9 5	21366 5	0 0	0 0	0 0	0 0	4273 3	0 0	0 0
16	4 2	9000 9	0 0	0 0	0 0	0 0	1800 2	0 0	0 0
17	5 3	11437 6	0 0	0 0	0 0	0 0	2287 5	0 0	0 0
18	9 3	18993 9	0 0	0 0	0 0	0 0	3798 8	0 0	0 0
19	6 2	11607 5	0 0	0 0	0 0	0 0	2321 5	0 0	0 0
20	3 0	5231 0	0 0	0 0	0 0	0 0	1046 2	0 0	0 0
21	9 0	14314 4	0 0	0 0	0 0	0 0	2862 9	0 0	0 0
22	7 3	9630 3	0 0	0 0	0 0	0 0	1926 1	0 0	0 0
23	0 9	1160 9	0 0	0 0	0 0	0 0	232 2	0 0	0 0
24	0 6	781 3	0 0	0 0	0 0	0 0	156 3	0 0	0 0
25	8 7	8946 9	0 0	0 0	0 0	0 0	1789 4	0 0	0 0
26	7 4	5013 8	0 0	0 0	0 0	0 0	1002 8	0 0	0 0
27	1 1	505 5	0 0	0 0	0 0	0 0	101 1	0 0	0 0
28	8 3	2086 2	0 0	0 0	0 0	0 0	417 2	0 0	0 0
29	0 9	22 7	0 0	0 0	0 0	0 0	4 5	0 0	0 0

Failure Surface Specified By 21 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 00	520 00
2	759 99	620 33
3	769 98	620 89
4	779 95	621 67
5	789 90	622 59
6	799 82	623 92
7	809 71	625 38
8	819 57	627 06
9	829 39	628 97
10	839 16	631 10
11	848 88	533 45
12	858 54	635 02
13	868 15	638 81
14	877 68	541 81

15	887 15	645 03
16	896 54	648 47
17	905 85	552 11
18	915 08	655 97
19	924 22	660 03
20	933 26	664 30
21	939 31	667 33

Circle Center At X = 740 4 , Y = 1061 1 and Radius, 441 2

*** 1 333 ***

Failure Surface Specified By 19 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	775 00	626 25
2	784 95	625 29
3	794 94	624 75
4	804 94	624 61
5	814 94	624 89
6	824 91	625 57
7	834 85	626 67
8	844 74	628 17
9	854 55	630 08
10	864 28	632 38
11	873 91	635 09
12	883 42	638 19
13	892 79	641 68
14	902 01	645 54
15	911 07	649 79
15	919 94	654 40
17	928 62	559 37
18	937 08	664 70
19	941 82	667 96

Circle Center At X = 803 2 , Y = 858 1 and Radius, 243 5

*** 1 337 ***

Failure Surface Specified By 18 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 00	620 00
2	759 99	619 63
3	769 99	619 62
4	779 99	519 99
5	789 96	620 72
6	799 90	621 82
7	809 79	623 29
8	819 62	625 13
9	829 38	627 32
10	839 04	629 88
11	848 61	632 79
12	858 06	636 06
13	867 39	639 66
14	876 58	643 61
16	885 61	647 90
16	894 48	652 52
17	903 17	657 47
18	906 41	658 85

Circle Center At X = 765 1 , Y = 889 7 and Radius, 270 1

*** 1 342 ***

Failure Surface Specified By 19 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 00	620 00
2	759 88	618 44
3	769 82	617 35
4	779 80	616 74
6	789 80	616 61
6	799 79	616 95
7	809 75	517 78
8	819 67	619 08
9	829 52	620 85

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10	839 26	623 09
11	848 89	625.79
12	858 38	628 95
13	867 70	632 56
14	876 85	636 61
15	885 79	641 10
16	894 50	646 00
17	902 97	651 32
18	911 18	657 03
19	917 45	661 86

Circle Center At X = 787 6 , Y = 825 8 and Radius, 209 2

*** 1 348 ***

Failure Surface Specified By 26 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 00	620 00
2	759 97	619 19
3	769 95	618 63
4	779 95	618 32
5	789 95	618 26
5	799 94	618 45
7	809 93	618 90
8	819 91	619 60
9	829 86	620 56
10	839 79	621 75
11	849 69	623 20
12	859 54	624 91
13	869 35	626 86
14	879 10	629 05
15	888 80	631 49
16	898 43	534 18
17	908 00	637 11
18	917 48	640 27
19	926 88	543 68
20	936 20	647 32
21	945 41	651 20
22	954 53	555 31
23	963 64	659 64
24	972 44	664 21
25	981 22	668 99
26	982 97	670 00

Circle Center At X = 787 2 , Y = 1014 3 and Radius, 396 1

*** 1 348 ***

Failure Surface Specified By 17 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	762 50	623 13
2	772 50	623 22
3	782 49	623 63
4	792 47	624 36
5	802 41	625 40
6	812 32	626 75
7	822 18	628 42
8	831 98	630 40
9	841 72	632 69
10	851 37	635 28
11	850 94	638 18
12	870 42	641 38
13	879 79	644 88
14	889 04	648 67
15	898 17	652 76
16	907 16	657 13
17	915 00	661 25

Circle Center At X = 764 5 , Y = 939 2 and Radius, 316 1

*** 1 356 ***

Failure Surface Specified By 19 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)

110/130

1	800 00	632 50
2	809 99	532 02
3	819 99	631 87
4	829 99	632 03
5	839 97	632 51
6	849 94	633 32
7	859 88	634 44
8	869 78	635 88
9	879 62	637 63
10	889 40	639 70
11	899 12	642 09
12	908 75	644 78
13	918 29	647 78
14	927 73	651 08
15	937 05	654 68
16	945 26	658 58
17	955 34	662 77
18	964 28	667 26
19	959 35	670 00

Circle Center At X = 819 9 , Y = 944 2 and Radius, 312 3

*** 1 361 ***

Failure Surface Specified By 17 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	762 50	623 13
2	772 38	621 60
3	782 34	620 62
4	792 33	620 19
5	802 33	620 30
6	812 30	620 96
7	822 23	622 17
8	832 08	623 92
9	841 81	626 20
10	861 41	629 02
11	860 84	632 35
12	870 07	636 20
13	879 07	640 55
14	887 83	645 38
15	895 30	660 68
16	904 48	656 44
17	908 51	559 63

Circle Center At X = 795 2 , Y = 802 8 and Radius, 182 6

*** 1 361 ***

Failure Surface Specified By 19 Coordinate Points

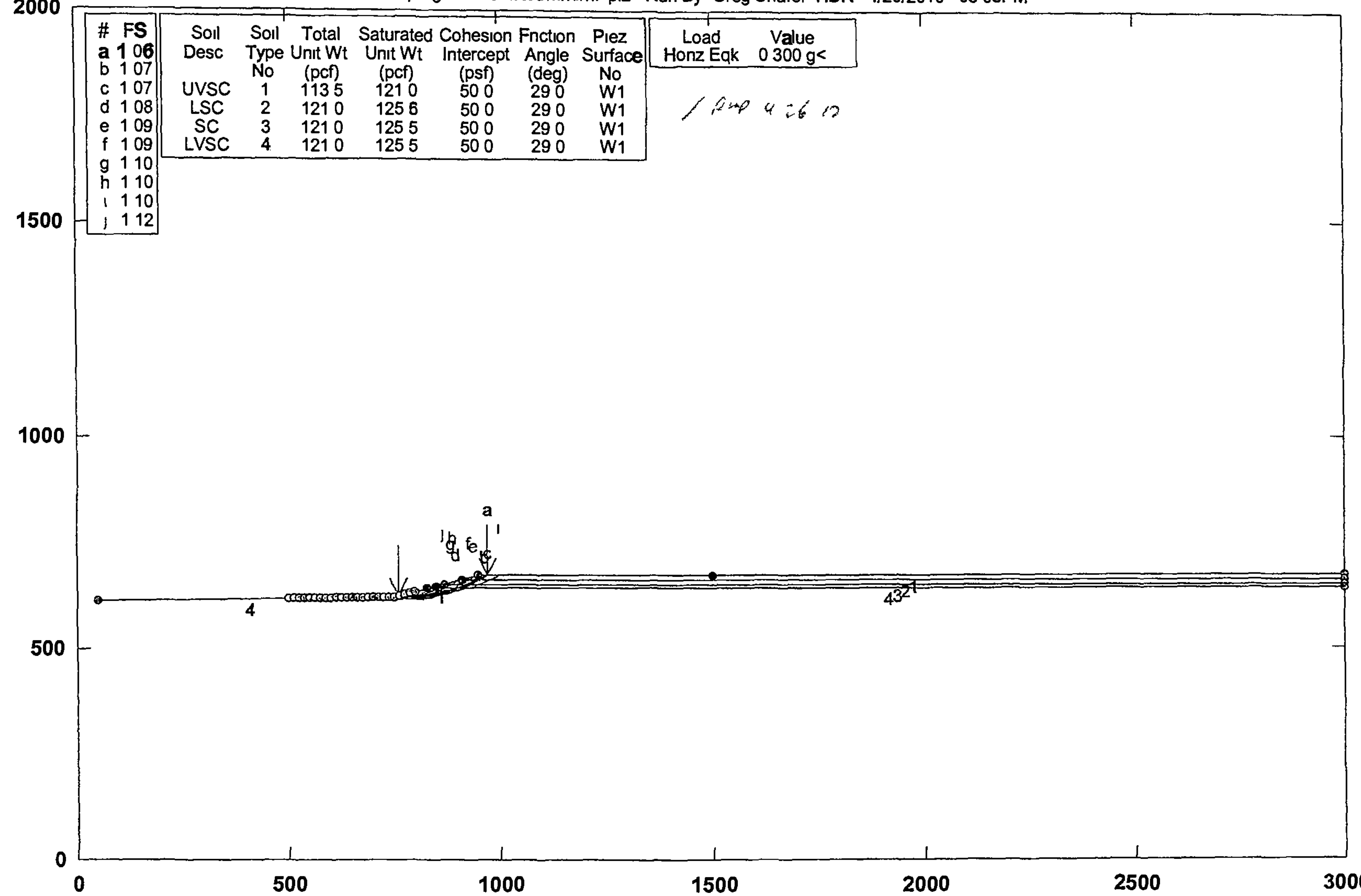
Point No	X-Surf (ft)	Y-Surf (ft)
1	800 00	632 50
2	809 98	633 11
3	819 95	633 91
4	829 90	634 90
5	839 83	636 09
6	849 73	637 47
7	859 61	639 05
8	859 45	640 81
9	879 26	642 77
10	889 03	644 92
11	898 75	647 25
12	908 42	649 78
13	918 05	652 49
14	927 62	656 39
16	937 13	658 47
16	946 58	661 74
17	955 97	665 19
18	965 29	668 83
19	968 13	670 00

Circle Center At X = 773 7 , Y = 1146 1 and Radius, 514 3

*** 1 381 ***

Intermountam Regıonal Landfıll Cut slope 1

c \program files\stedwın\ırl\7 pl2   Run By Greg Shafer HDR   4/20/2010   03 06PM



#	FS
a	1 06
b	1 07
c	1 07
d	1 08
e	1 09
f	1 09
g	1 10
h	1 10
ı	1 10
j	1 12

Soil Desc	Soil Type No	Total Unit Wt (pcf)	Saturated Unit Wt (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez Surface No
UVSC	1	113 5	121 0	50 0	29 0	W1
LSC	2	121 0	125 6	50 0	29 0	W1
SC	3	121 0	125 5	50 0	29 0	W1
LVSC	4	121 0	125 5	50 0	29 0	W1

Load	Value
Honz Eqk	0 300 g<

/ Amp 4 26 10

PCSTABL7 FSmin=1 06

Safety Factors Are Calculated By The Modified Bishop Method

STED

111/150

** PCSTABL7 **
by
Purdue University
--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer s Method of Slices

Run Date 4/20/2010
Time of Run 03 06PM
Run By Greg Shafer, HDR
Input Data Filename C 7 in
Output Filename C 7 OUT
Unit ENGLISH
Plotted Output Filename C 7 PLT
PROBLEM DESCRIPTION Intermountain Regional Landfill
Cut slope 1

BOUNDARY COORDINATES
Note User origin value specified
Add 0 00 to X-values and 0 00 to Y-values listed

3 Top Boundaries
5 Total Boundaries

Boundary No	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	60 00	611 45	760 00	620 00	4
2	750 00	620 00	950 00	670 00	1
3	950 00	670 00	3000 00	670 00	1
4	910 00	660 00	3000 00	660 00	2
5	870 00	650 00	3000 00	650 00	3
6	830 00	540 00	3000 00	640 00	4

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type No	Total Unit Wt (pcf)	Saturated Unit Wt (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param	Pressure Constant (psf)	Piez Surface No
1	113 5	121 0	50 0	29 0	0 00	0 0	1
2	121 0	125 5	50 0	29 0	0 00	0 0	1
3	121 0	125 6	50 0	29 0	0 00	0 0	1
4	121 0	125 5	50 0	29 0	0 00	0 0	1

A Horizontal Earthquake Loading Coefficient
Of0 300 Has Been Assigned
A Vertical Earthquake Loading Coefficient
Of0 000 Has Been Assigned
Cavitation Pressure = 0 0 (psf)
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified
625 Trial Surfaces Have Been Generated
25 Surfaces Initiate From Each Of 25 Points Equally Spaced
Along The Ground Surface Between X = 500 00 ft
and X = 800 00 ft
Each Surface Terminates Between X = 850 00 ft
and X =1500 00 ft
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0 00 ft
10 00 ft Line Segments Define Each Trial Failure Surface
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Examined They Are Ordered - Most Critical
First
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Failure Surface Specified By 23 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	762 50	623 13
2	772 49	622 60
3	782 48	622 34
4	792 48	622 36
5	802 48	622 63
6	812 46	623 18
7	822 43	623 99
8	832 37	625 08

9	842 28	626 42
10	852 15	628 04
11	861 97	529 92
12	871 74	632 06
13	881 45	634 46
14	891 09	637 12
15	900 65	640 04
16	910 13	643 21
17	919 63	646 64
18	928 83	650 32
19	938 02	654 25
20	947 11	658 42
21	956 08	662 84
22	964 93	667 49
23	969 41	670 00

Circle Center At X = 787 1 , Y = 995 0 and Radius, 372 6

*** 1 060 ***

Individual data on the 29 slices

Slice No	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Force Tnorm (lbs)	Force Ttan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	10 0	1712 8	0 0	0 0	0 0	0 0	513 8	0 0	0 0
2	10 0	4993 2	0 0	0 0	0 0	0 0	1498 0	0 0	0 0
3	10 0	7972 1	0 0	0 0	0 0	0 0	2391 6	0 0	0 0
4	10 0	10640 6	0 0	0 0	0 0	0 0	3192 2	0 0	0 0
5	10 0	12991 2	0 0	0 0	0 0	0 0	3897 4	0 0	0 0
6	10 0	15018 3	0 0	0 0	0 0	0 0	4505 5	0 0	0 0
7	7 6	12584 2	0 0	0 0	0 0	0 0	3775 2	0 0	0 0
8	2 4	4401 4	0 0	0 0	0 0	0 0	1320 4	0 0	0 0
9	9 9	19145 8	0 0	0 0	0 0	0 0	5743 7	0 0	0 0
10	9 9	20069 7	0 0	0 0	0 0	0 0	6020 9	0 0	0 0
11	9 8	20643 4	0 0	0 0	0 0	0 0	6193 0	0 0	0 0
12	8 0	17138 7	0 0	0 0	0 0	0 0	5141 6	0 0	0 0
13	1 7	3861 8	0 0	0 0	0 0	0 0	1158 5	0 0	0 0
14	9 7	21482 0	0 0	0 0	0 0	0 0	6444 6	0 0	0 0
15	9 6	21024 2	0 0	0 0	0 0	0 0	6307 3	0 0	0 0
16	9 4	19969 9	0 0	0 0	0 0	0 0	6991 0	0 0	0 0
17	0 1	267 3	0 0	0 0	0 0	0 0	80 2	0 0	0 0
18	9 3	18868 1	0 0	0 0	0 0	0 0	5660 4	0 0	0 0
19	0 1	272 1	0 0	0 0	0 0	0 0	81 6	0 0	0 0
20	9 4	18418 9	0 0	0 0	0 0	0 0	5525 7	0 0	0 0
21	8 5	15305 7	0 0	0 0	0 0	0 0	4591 7	0 0	0 0
22	0 8	1393 7	0 0	0 0	0 0	0 0	418 1	0 0	0 0
23	9 2	14697 1	0 0	0 0	0 0	0 0	4409 1	0 0	0 0
24	9 1	12427 3	0 0	0 0	0 0	0 0	3728 2	0 0	0 0
25	2 9	3464 2	0 0	0 0	0 0	0 0	1039 3	0 0	0 0
26	0 3	363 4	0 0	0 0	0 0	0 0	109 0	0 0	0 0
27	5 8	5515 7	0 0	0 0	0 0	0 0	1684 7	0 0	0 0
28	8 9	4857 9	0 0	0 0	0 0	0 0	1457 4	0 0	0 0
29	4 5	637 1	0 0	0 0	0 0	0 0	191 1	0 0	0 0

Failure Surface Specified By 28 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	712 50	519 54
2	722 44	618 46
3	732 41	617 61
4	742 39	617 01
5	752 38	616 66
6	762 38	616 53
7	772 38	616 65
8	782 37	617 02
9	792 35	617 63
10	802 32	618 48
11	812 26	519 57
12	822 17	620 90
13	832 04	622 47
14	841 88	624 28

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15	851 67	626 33
16	861 40	628 61
17	871 08	631 13
18	880 69	633 89
19	890 24	535 87
20	899 71	640 09
21	909 09	643 53
22	918 40	647 20
23	927 61	651 10
24	936 72	655 22
25	945 73	659 55
26	954 63	554 11
27	963 42	668 88
28	965 38	670 00

Circle Center At X = 762 3 , Y = 1028 9 and Radius, 412 4
*** 1 068 ***

Failure Surface Specified By 27 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	725 00	619 69
2	734 91	618 33
3	744 85	617 24
4	754 81	516 42
5	764 80	615 87
6	774 79	615 59
7	784 79	616 58
8	794 79	615 85
9	804 78	616 39
10	814 74	617 19
11	824 69	618 28
12	834 59	619 63
13	844 46	621 25
14	854 28	623 13
15	864 05	525 29
16	873 75	627 71
17	883 38	630 39
18	892 94	633 33
19	902 41	636 54
20	911 80	640 00
21	921 08	543 71
22	930 26	647 68
23	939 33	651 89
24	948 28	656 35
25	957 11	661 05
26	955 80	665 99
27	972 44	670 00

Circle Center At X = 780 0 , Y = 982 9 and Radius, 367 4
*** 1 070 ***

Failure Surface Specified By 17 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	760 00	520 00
2	759 95	619 01
3	769 94	618 50
4	779 94	518 47
5	789 93	618 90
6	799 89	619 82
7	809 79	621 20
8	819 62	623 06
9	829 34	625 38
10	838 95	528 16
11	848 41	631 40
12	857 71	635 08
13	866 82	639 19
14	876 73	643 74
15	884 41	548 71
16	892 84	664 08
17	896 42	555 60

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Circle Center At X = 775 7 , Y = 828 7 and Radius, 210 2
*** 1 083 ***
Failure Surface Specified By 21 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 00	620 00
2	759 97	620 76
3	769 93	621 70
4	779 86	622 82
5	789 78	624 13
6	799 67	625 61
7	809 53	627 28
8	819 36	629 12
9	829 15	631 15
10	838 90	633 35
11	848 61	635 74
12	858 28	638 30
13	867 90	641 03
14	877 47	643 94
15	886 98	647 03
16	896 43	650 29
17	905 83	653 72
18	915 15	657 32
19	924 42	661 10
20	933 61	665 04
21	937 91	666 98

Circle Center At X = 713 5 , Y = 1166 5 and Radius, 546 7
*** 1 088 ***
Failure Surface Specified By 20 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 00	620 00
2	759 81	618 06
3	769 70	616 60
4	779 66	615 64
5	789 65	515 18
6	799 65	615 22
7	809 63	615 75
8	819 58	516 78
9	829 45	518 31
10	839 26	620 32
11	848 94	622 82
12	858 49	625 80
13	857 87	629 25
14	877 08	633 15
15	886 07	637 63
16	894 84	642 33
17	903 36	647 57
18	911 60	663 23
19	919 56	659 29
20	924 78	653 70

Circle Center At X = 793 9 , Y = 815 7 and Radius, 200 6
*** 1 090 ***
Failure Surface Specified By 15 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 00	620 00
2	760 00	619 82
3	770 00	620 04
4	779 98	620 67
6	789 92	621 69
6	799 82	623 11
7	809 66	624 92
8	819 41	527 13
9	829 07	529 72
10	838 61	632 70
11	848 03	636 05
12	857 31	639 79

13	866 43	643 89
14	875 38	648 36
15	884 14	653 17
16	885 17	653 79

Circle Center At X = 759 5 , Y = 869 4 and Radius, 249 5
*** 1 095 ***

Failure Surface Specified By 15 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	752 50	623 13
2	772 44	621 99
3	782 42	621 43
4	792 42	621 44
5	802 40	622 03
5	812 33	623 20
7	822 18	624 93
8	831 92	627 23
9	841 50	630 08
10	850 90	633 48
11	860 10	637 42
12	869 05	641 88
13	877 72	646 85
14	886 10	652 31
15	889 63	654 91

Circle Center At X = 787 2 , Y = 795 0 and Radius, 173 6
*** 1 099 ***

Failure Surface Specified By 25 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	762 50	623 13
2	772 48	622 51
3	782 47	622 12
4	792 47	621 96
5	802 47	622 02
5	812 47	622 30
7	822 46	622 81
8	832 43	623 54
9	842 38	624 49
10	852 31	625 57
11	862 22	527 06
12	872 08	628 68
13	881 91	630 52
14	891 70	532 58
15	901 44	634 86
16	911 12	637 35
17	920 75	640 06
18	930 31	642 99
19	939 80	646 12
20	949 23	649 47
21	958 57	653 03
22	967 83	656 80
23	977 01	660 78
24	986 10	654 96
25	995 08	669 34
26	996 37	670 00

Circle Center At X = 794 8 , Y = 1068 6 and Radius, 446 7
*** 1 099 ***

Failure Surface Specified By 14 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 00	620 00
2	750 00	619 92
3	769 99	620 29
4	779 96	621 10
5	789 88	622 36
6	799 74	624 06
7	809 51	625 19
8	819 17	628 76

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9	828 71	531 76
10	838 11	635 18
11	847 34	639 01
12	856 40	543 25
13	865 25	647 90
14	868 00	649 50

Circle Center At X = 756 8 , Y = 843 5 and Radius, 223 6

*** 1 116 ***

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** PCSTABL7 **
by
Purdue University
--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer s Method of Slices

Run Date 4/20/2010
Time of Run 03 08PM
Run By Greg Shafer, HDR
Input Data Filename C 8 in
Output Filename C 8 OUT
Unit ENGLISH
Plotted Output Filename C 8 PLT
PROBLEM DESCRIPTION Intermountain Regional Landfill
Cut slope 1

BOUNDARY COORDINATES
Note User origin value specified
Add 0 00 to X-values and 0 00 to Y-values listed

3 Top Boundaries
6 Total Boundaries

Boundary No	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	50 00	611 45	750 00	620 00	4
2	750 00	620 00	950 00	670 00	1
3	950 00	670 00	3000 00	670 00	1
4	910 00	660 00	3000 00	660 00	2
5	870 00	650 00	3000 00	650 00	3
6	830 00	640 00	3000 00	640 00	4

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type No	Total Unit Wt (pcf)	Saturated Unit Wt (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param	Pressure Constant (psf)	Piez Surface No
1	113 5	121 0	50 0	29 0	0 00	0 0	1
2	121 0	125 5	50 0	29 0	0 00	0 0	1
3	121 0	125 5	50 0	29 0	0 00	0 0	1
4	121 0	126 5	50 0	29 0	0 00	0 0	1

A Horizontal Earthquake Loading Coefficient
Of0 400 Has Been Assigned
A Vertical Earthquake Loading Coefficient
Of0 000 Has Been Assigned
Cavitation Pressure = 0 0 (psf)
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified
625 Trial Surfaces Have Been Generated
25 Surfaces Initiate From Each Of 25 Points Equally Spaced
Along The Ground Surface Between X = 500 00 ft
and X = 800 00 ft
Each Surface Terminates Between X = 850 00 ft
and X =1500 00 ft
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0 00 ft
10 00 ft Line Segments Define Each Trial Failure Surface
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Examined They Are Ordered - Most Critical
First
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Failure Surface Specified By 24 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 00	620 00
2	759 97	619 26
3	769 96	618 81
4	779 95	618 64
5	789 96	618 77
6	799 95	619 17
7	809 93	619 87

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8	819 88	620 85
9	829 80	622 11
10	839 68	623 66
11	849 51	625 49
12	859 28	627 60
13	868 99	630 00
14	878 63	632 66
15	888 19	635 61
16	897 65	638 83
17	907 03	642 31
18	916 30	546 07
19	925 45	650 09
20	934 49	654 37
21	943 40	658 90
22	952 18	563 69
23	960 82	668 73
24	962 85	670 00

Circle Center At X = 780 8 , Y = 967 1 and Radius, 348 5

*** 0 870 ***

Individual data on the 30 slices

Slice No	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Force Tnorm (lbs)	Force Ttan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	10 0	1828 9	0 0	0 0	0 0	0 0	731 6	0 0	0 0
2	10 0	5336 2	0 0	0 0	0 0	0 0	2134 5	0 0	0 0
3	10 0	8527 0	0 0	0 0	0 0	0 0	3410 8	0 0	0 0
4	10 0	11389 8	0 0	0 0	0 0	0 0	4555 9	0 0	0 0
5	10 0	13915 1	0 0	0 0	0 0	0 0	5566 0	0 0	0 0
6	10 0	16095 2	0 0	0 0	0 0	0 0	6438 1	0 0	0 0
7	10 0	17924 8	0 0	0 0	0 0	0 0	7169 9	0 0	0 0
8	9 9	19399 8	0 0	0 0	0 0	0 0	7759 9	0 0	0 0
9	0 2	405 0	0 0	0 0	0 0	0 0	162 0	0 0	0 0
10	9 7	21354 9	0 0	0 0	0 0	0 0	8542 0	0 0	0 0
11	9 8	22418 5	0 0	0 0	0 0	0 0	8967 4	0 0	0 0
12	9 8	22676 4	0 0	0 0	0 0	0 0	9070 6	0 0	0 0
13	9 7	22564 8	0 0	0 0	0 0	0 0	9025 9	0 0	0 0
14	1 0	2327 4	0 0	0 0	0 0	0 0	931 0	0 0	0 0
15	8 6	20410 6	0 0	0 0	0 0	0 0	8164 2	0 0	0 0
16	9 6	21979 6	0 0	0 0	0 0	0 0	8791 9	0 0	0 0
17	9 5	20802 5	0 0	0 0	0 0	0 0	8321 0	0 0	0 0
18	3 2	6656 2	0 0	0 0	0 0	0 0	2562 5	0 0	0 0
19	6 2	12638 8	0 0	0 0	0 0	0 0	5055 5	0 0	0 0
20	3 0	5793 8	0 0	0 0	0 0	0 0	2317 5	0 0	0 0
21	6 3	12150 0	0 0	0 0	0 0	0 0	4860 0	0 0	0 0
22	9 0	15710 1	0 0	0 0	0 0	0 0	6284 0	0 0	0 0
23	0 2	325 5	0 0	0 0	0 0	0 0	130 2	0 0	0 0
24	9 0	13522 7	0 0	0 0	0 0	0 0	5449 1	0 0	0 0
25	8 9	10948 1	0 0	0 0	0 0	0 0	4379 2	0 0	0 0
25	2 0	2094 2	0 0	0 0	0 0	0 0	837 7	0 0	0 0
27	4 6	4256 6	0 0	0 0	0 0	0 0	1702 6	0 0	0 0
23	2 2	1708 7	0 0	0 0	0 0	0 0	683 5	0 0	0 0
29	8 6	3710 8	0 0	0 0	0 0	0 0	1484 3	0 0	0 0
30	2 0	145 9	0 0	0 0	0 0	0 0	58 4	0 0	0 0

Failure Surface Specified By 20 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	760 00	620 00
2	759 97	619 22
3	769 96	618 82
4	779 95	618 79
5	789 95	619 13
6	799 93	619 84
7	809 87	620 92
8	819 77	622 37
9	829 60	624 19
10	839 36	626 38
11	849 03	628 92

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12	858 50	631 82
13	868 05	635 08
14	877 38	638 69
15	886 57	642 64
16	895 60	645 93
17	904 47	651 55
18	913 16	556 50
19	921 65	661 77
20	924 36	663 59

Circle Center At X = 775 8 , Y = 887 1 and Radius, 268 4

*** 0 882 ***

Failure Surface Specified By 19 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	762 50	623 13
2	772 43	621 95
3	782 40	621 21
4	792 40	620 91
5	802 40	621 04
6	812 38	621 61
7	822 33	622 62
8	832 23	624 06
9	842 05	625 93
10	851 78	628 22
11	861 41	630 94
12	870 90	634 08
13	880 25	637 63
14	889 44	641 58
15	898 44	645 93
16	907 25	650 67
17	915 84	655 79
18	924 20	661 28
19	929 01	664 75

Circle Center At X = 794 3 , Y = 849 9 and Radius 229 0

*** 0 890 ***

Failure Surface Specified By 19 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	787 50	629 38
2	797 49	629 79
3	807 47	630 44
4	817 43	631 33
5	827 37	632 46
6	837 27	533 82
7	847 14	635 42
8	856 97	637 26
9	866 76	539 34
10	876 49	641 64
11	886 16	644 18
12	895 77	646 95
13	905 31	649 95
14	914 77	653 18
15	924 16	655 63
16	933 45	660 31
17	942 67	664 21
18	951 78	668 33
19	955 26	670 00

Circle Center At X = 775 3 , Y = 1046 7 and Radius, 417 5

*** 0 894 ***

Failure Surface Specified By 22 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	762 50	623 13
2	772 35	621 39
3	782 26	620 08
4	792 22	619 18
5	802 21	618 70
5	812 21	618 65

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7	822 20	619 01
8	832 17	619 80
9	842 10	621 01
10	851 97	622 63
11	861 76	624 67
12	871 45	627 12
13	881 04	629 97
14	890 49	633 23
15	899 80	636 88
16	908 95	640 92
17	917 92	645 34
18	926 69	650 14
19	935 26	555 30
20	943 60	660 82
21	951 70	666 68
22	955 89	570 00

Circle Center At X = 808 5 , Y = 855 6 and Radius, 237 0

*** 0 894 ***

Failure Surface Specified By 18 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	762 50	523 13
2	772 38	621 57
3	782 32	620 52
4	792 31	619 99
5	802 31	619 97
6	812 30	620 46
7	822 25	621 47
8	832 13	622 98
9	841 93	625 00
10	851 60	627 52
11	861 14	630 54
12	870 50	634 04
13	879 68	538 01
14	888 64	642 45
15	897 36	647 35
16	905 81	652 69
17	913 99	558 45
18	918 73	662 18

Circle Center At X = 797 7 , Y = 814 2 and Radius, 194 3

*** 0 902 ***

Failure Surface Specified By 27 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	737 50	619 85
2	747 30	617 87
3	757 17	616 23
4	767 08	614 91
5	777 03	613 91
6	787 01	613 26
7	797 00	612 91
8	807 00	612 91
9	817 00	613 23
10	826 98	613 89
11	836 93	614 87
12	846 84	616 19
13	856 71	617 83
14	856 51	619 79
15	876 25	622 08
16	885 90	624 68
17	895 46	627 61
18	904 92	630 84
19	914 27	634 39
20	923 50	638 25
21	932 60	642 40
22	941 55	645 86
23	950 35	651 61
24	958 99	656 55

```
   25        967 46      651 96
   26        975 74      657 56
   27        979 11      570 00
Circle Center At X =  802 1 , Y =  915 8  and Radius,   302 9
      ***     0 903     ***
Failure Surface Specified By 18 Coordinate Points
  Point       X-Surf      Y-Surf
   No          (ft)        (ft)
    1        762 50      623 13
    2        772 34      521 34
    3        782 25      520 10
    4        792 24      619 39
    5        802 24      619 24
    6        812 23      619 62
    7        822 19      620 56
    8        832 08      622 03
    9        841 87      624 04
   10        851 54      626 58
   11        861 06      629 64
   12        870 40      633 22
   13        879 53      637 30
   14        888 42      641 87
   15        897 06      646 92
   16        905 40      652 44
   17        913 43      658 40
   18        917 67      661 92
Circle Center At X =  800 1 , Y =  802 3  and Radius,   183 1
      ***     0 909     ***
Failure Surface Specified By 31 Coordinate Points
  Point       X-Surf      Y-Surf
   No          (ft)        (ft)
    1        725 00      519 69
    2        734 88      618 14
    3        744 79      616 83
    4        754 73      615 75
    5        764 70      614 90
    6        774 68      614 30
    7        784 67      613 93
    8        794 67      613 79
    9        804 67      613 90
   10        814 67      614 24
   11        824 65      614 82
   12        834 52      615 53
   13        844 56      616 68
   14        854 48      617 97
   15        864 36      619 49
   16        874 21      621 24
   17        884 01      523 23
   18        893 76      625 46
   19        903 45      627 90
   20        913 09      630 58
   21        922 65      633 49
   22        932 15      636 63
   23        941 57      639 98
   24        950 91      643 56
   25        960 16      647 37
   26        969 31      651 39
   27        978 37      655 62
   28        987 33      650 07
   29        996 17      664 73
   30       1004 91      669 60
   31       1005 59      670 00
Circle Center At X =  795 3 , Y = 1035 4  and Radius,   421 6
      ***     0 917     ***
Failure Surface Specified By 21 Coordinate Points
  Point       X-Surf      Y-Surf
   No          (ft)        (ft)
    1        762 50      623 13
```

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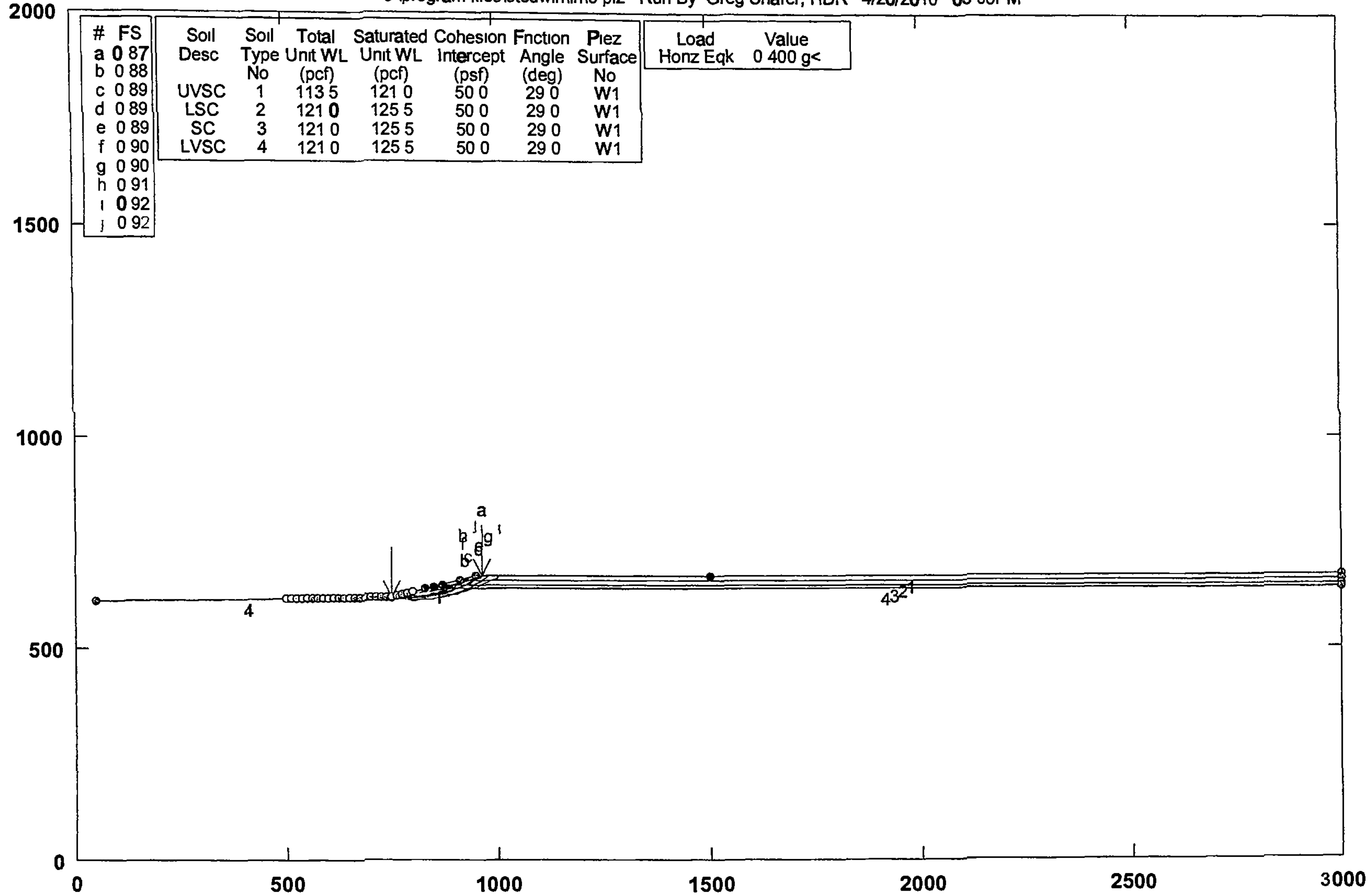
2	772 45	624 11
3	782 39	626 25
4	792 30	626 56
5	802 19	628 02
6	812 06	629 65
7	821 90	631 43
8	831 71	633 37
9	841 49	635 46
10	851 23	637 72
11	860 94	640 13
12	870 60	642 70
13	880 22	645 42
14	889 80	648 30
15	899 33	651 33
16	908 81	654 51
17	918 24	657 85
18	927 61	661 34
19	936 92	664 97
20	946 18	668 75
21	947 76	669 44

Circle Center At X = 706 4 , Y = 1241 5 and Radius, 621 0

*** 0 918 ***

Intermountain Regional Landfill Cut slope 1

c \program files\stedwin\irl\8 pl2 Run By Greg Shafer, HDR 4/20/2010 03 08PM



PCSTABL7 FSmin=0 87

Safety Factors Are Calculated By The Modified Bishop Method

STED

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** PCSTABL7 **
by
Purdue Unıversıty
--Slope Stabılıty Analysıs--
Sımplıfıed Janbu, Sımplıfıed Bıshop
or Spencer s Method of Slıces

Run Date 4/20/2010
Tıme of Run 03 08PM
Run By Greg Shafer, HDR
Input Data Fılename C 8 ın
Output Fılename C 8 OUT
Unıt ENGLISH
Plotted Output Fılename C 8 PLT
PROBLEM DESCRIPTION Intermountaın Regıonal Landfıll
Cut slope 1

BOUNDARY COORDINATES
Note User orıgın value specıfıed
Add 0 00 to X-values and 0 00 to Y-values lısted

3 Top Boundarıes
6 Total Boundarıes

Boundary No	X-Left (ft)	Y-Left (ft)	X-Rıght (ft)	Y-Rıght (ft)	Soıl Type Below Bnd
1	50 00	611 45	750 00	620 00	4
2	750 00	620 00	950 00	670 00	1
3	950 00	670 00	3000 00	670 00	1
4	910 00	660 00	3000 00	660 00	2
5	870 00	650 00	3000 00	650 00	3
6	830 00	540 00	3000 00	640 00	4

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soıl

Soıl Type No	Total Unıt Wt (pcf)	Saturated Unıt Wt (pcf)	Cohesıon Intercept (psf)	Frıctıon Angle (deg)	Pore Pressure Param	Pressure Constant (psf)	Pıez Surface No
1	113 5	121 0	50 0	29 0	0 00	0 0	1
2	121 0	125 5	60 0	29 0	0 00	0 0	1
3	121 0	125 5	50 0	29 0	0 00	0 0	1
4	121 0	125 5	50 0	29 0	0 00	0 0	1

A Horızontal Earthquake Loadıng Coeffıcıent
Of0 400 Has Been Assıgned
A Vertıcal Earthquake Loadıng Coeffıcıent
Of0 000 Has Been Assıgned
Cavıtatıon Pressure = 0 0 (psf)
A Crıtıcal Faılure Surface Searchıng Method, Usıng A Random
Technıque For Generatıng Cırcular Surfaces, Has Been Specıfıed
525 Trıal Surfaces Have Been Generated
25 Surfaces Inıtıate From Each Of 25 Poınts Equally Spaced
Along The Ground Surface Between X = 500 00 ft
and X = 800 00 ft
Each Surface Termınates Between X = 850 00 ft
and X =1500 00 ft
Unless Further Lımıtatıons Were Imposed The Mınımum Elevatıon
At Whıch A Surface Extends Is Y = 0 00 ft
10 00 ft Lıne Segments Defıne Each Trıal Faılure Surface
Followıng Are Dısplayed The Ten Most Crıtıcal Of The Trıal
Faılure Surfaces Examıned They Are Ordered - Most Crıtıcal
Fırst
* * Safety Factors Are Calculated By The Modıfıed Bıshop Method * *
Faılure Surface Specıfıed By 24 Coordınate Poınts

Poınt No	X-Surf (ft)	Y-Surf (ft)
1	750 00	620 00
2	769 97	619 26
3	769 95	618 81
4	779 95	618 54
5	789 96	518 77
6	799 95	619 17
7	809 93	519 87

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8	819 88	620 85
9	829 80	622 11
10	839 68	623 66
11	849 51	625 49
12	859 28	627 60
13	868 99	630 00
14	878 63	632 66
15	888 19	635 61
16	897 66	638 83
17	907 03	642 31
18	916 30	546 07
19	925 45	650 09
20	934 49	654 37
21	943 40	658 90
22	952 18	663 69
23	960 82	668 73
24	962 85	670 00

Circle Center At X = 780 8 , Y = 967 1 and Radius, 348 5

*** 0 870 ***

Individual data on the 30 slices

Slice No	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Force Tnorm (lbs)	Force Ttan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	10 0	1828 9	0 0	0 0	0 0	0 0	731 6	0 0	0 0
2	10 0	5336 2	0 0	0 0	0 0	0 0	2134 5	0 0	0 0
3	10 0	8527 0	0 0	0 0	0 0	0 0	3410 8	0 0	0 0
4	10 0	11389 8	0 0	0 0	0 0	0 0	4555 9	0 0	0 0
5	10 0	13915 1	0 0	0 0	0 0	0 0	5566 0	0 0	0 0
6	10 0	16095 2	0 0	0 0	0 0	0 0	6438 1	0 0	0 0
7	10 0	17924 8	0 0	0 0	0 0	0 0	7169 9	0 0	0 0
8	9 9	19399 8	0 0	0 0	0 0	0 0	7759 9	0 0	0 0
9	0 2	405 0	0 0	0 0	0 0	0 0	162 0	0 0	0 0
10	9 7	21354 9	0 0	0 0	0 0	0 0	8542 0	0 0	0 0
11	9 8	22418 6	0 0	0 0	0 0	0 0	8967 4	0 0	0 0
12	9 8	22676 4	0 0	0 0	0 0	0 0	9070 6	0 0	0 0
13	9 7	22554 8	0 0	0 0	0 0	0 0	9025 9	0 0	0 0
14	1 0	2327 4	0 0	0 0	0 0	0 0	931 0	0 0	0 0
15	8 6	20410 6	0 0	0 0	0 0	0 0	8164 2	0 0	0 0
15	9 6	21979 6	0 0	0 0	0 0	0 0	8791 9	0 0	0 0
17	9 5	20802 6	0 0	0 0	0 0	0 0	8321 0	0 0	0 0
18	3 2	6656 2	0 0	0 0	0 0	0 0	2662 5	0 0	0 0
19	6 2	12638 8	0 0	0 0	0 0	0 0	5055 5	0 0	0 0
20	3 0	5793 8	0 0	0 0	0 0	0 0	2317 5	0 0	0 0
21	6 3	12150 0	0 0	0 0	0 0	0 0	4860 0	0 0	0 0
22	9 0	15710 1	0 0	0 0	0 0	0 0	6284 0	0 0	0 0
23	0 2	325 5	0 0	0 0	0 0	0 0	130 2	0 0	0 0
24	9 0	13622 7	0 0	0 0	0 0	0 0	5449 1	0 0	0 0
25	8 9	10948 1	0 0	0 0	0 0	0 0	4379 2	0 0	0 0
26	2 0	2094 2	0 0	0 0	0 0	0 0	837 7	0 0	0 0
27	4 6	4255 5	0 0	0 0	0 0	0 0	1702 6	0 0	0 0
28	2 2	1708 7	0 0	0 0	0 0	0 0	683 5	0 0	0 0
29	8 6	3710 8	0 0	0 0	0 0	0 0	1484 3	0 0	0 0
30	2 0	145 9	0 0	0 0	0 0	0 0	58 4	0 0	0 0

Failure Surface Specified By 20 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 00	620 00
2	759 97	619 22
3	769 96	618 82
4	779 96	618 79
5	789 96	619 13
6	799 93	619 84
7	809 87	620 92
8	819 77	622 37
9	829 60	624 19
10	839 36	626 38
11	849 03	628 92

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12	858 60	631 82
13	868 05	635 08
14	877 38	638 69
15	886 57	642 64
16	895 60	646 93
17	904 47	651 55
18	913 16	656 50
19	921 65	661 77
20	924 36	663 59

Circle Center At X = 775 8 , Y = 887 1 and Radius, 268 4
*** 0 882 ***
Failure Surface Specified By 19 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	762 50	623 13
2	772 43	621 95
3	782 40	621 21
4	792 40	520 91
5	802 40	621 04
6	812 38	521 51
7	822 33	622 62
8	832 23	624 06
9	842 05	625 93
10	851 78	628 22
11	861 41	630 94
12	870 90	634 08
13	880 25	637 63
14	889 44	641 58
15	898 44	645 93
16	907 25	650 57
17	915 84	655 79
18	924 20	661 28
19	929 01	654 75

Circle Center At X = 794 3 , Y = 849 9 and Radius, 229 0
*** 0 890 ***
Failure Surface Specified By 19 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	787 50	629 38
2	797 49	629 79
3	807 47	630 44
4	817 43	631 33
5	827 37	632 45
5	837 27	633 82
7	847 14	635 42
8	856 97	637 25
9	866 76	639 34
10	876 49	641 64
11	885 16	644 18
12	895 77	646 95
13	905 31	649 95
14	914 77	653 18
15	924 16	656 63
16	933 46	660 31
17	942 67	664 21
18	951 78	668 33
19	955 26	670 00

Circle Center At X = 775 3 , Y = 1046 7 and Radius, 417 5
*** 0 894 ***
Failure Surface Specified By 22 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	762 50	623 13
2	772 35	621 39
3	782 26	620 08
4	792 22	619 18
5	802 21	618 70
5	812 21	618 65

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7	822 20	619 01
8	832 17	619 80
9	842 10	621 01
10	851 97	622 63
11	861 76	624 67
12	871 45	627 12
13	881 04	629 97
14	890 49	633 23
15	899 80	636 88
16	908 95	640 92
17	917 92	645 34
18	925 69	650 14
19	936 26	655 30
20	943 60	660 82
21	951 70	666 68
22	955 89	670 00

Circle Center At X = 808 5 , Y = 855 6 and Radius, 237 0
*** 0 894 ***
Failure Surface Specified By 18 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	762 50	623 13
2	772 38	621 57
3	782 32	620 52
4	792 31	619 99
5	802 31	519 97
6	812 30	620 46
7	822 25	621 47
8	832 13	622 98
9	841 93	625 00
10	851 60	627 52
11	861 14	630 54
12	870 50	634 04
13	879 58	638 01
14	888 64	642 45
15	897 36	647 35
16	905 81	652 69
17	913 99	658 45
18	918 73	662 18

Circle Center At X = 797 7 , Y = 814 2 and Radius, 194 3
*** 0 902 ***
Failure Surface Specified By 27 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	737 50	619 85
2	747 30	617 87
3	757 17	616 23
4	767 08	614 91
5	777 03	613 91
6	787 01	613 25
7	797 00	612 91
8	807 00	612 91
9	817 00	613 23
10	826 98	613 89
11	836 93	614 87
12	846 84	615 19
13	856 71	517 83
14	866 51	619 79
15	876 25	622 08
16	885 90	624 68
17	895 46	627 61
18	904 92	630 84
19	914 27	634 39
20	923 60	538 25
21	932 60	642 40
22	941 55	646 86
23	960 35	651 61
24	958 99	556 65

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25	957 46	661 96
26	975 74	657 56
27	979 11	670 00

Cırcle Center At X = 802 1 , Y = 915 8 and Radıus, 302 9
*** 0 903 ***
Faılure Surface Specıfıed By 18 Coordınate Poınts

Poınt No	X-Surf (ft)	Y-Surf (ft)
1	762 50	623 13
2	772 34	621 34
3	782 26	520 10
4	792 24	619 39
5	802 24	619 24
6	812 23	619 62
7	822 19	620 56
8	832 08	622 03
9	841 87	624 04
10	851 54	626 58
11	861 06	629 64
12	870 40	633 22
13	879 53	637 30
14	888 42	641 87
15	897 05	645 92
16	905 40	652 44
17	913 43	658 40
18	917 67	661 92

Cırcle Center At X = 800 1 , Y = 802 3 and Radıus, 183 1
*** 0 909 ***
Faılure Surface Specıfıed By 31 Coordınate Poınts

Poınt No	X-Surf (ft)	Y-Surf (ft)
1	725 00	619 69
2	734 88	618 14
3	744 79	616 83
4	754 73	615 75
5	764 70	614 90
6	774 68	614 30
7	784 67	613 93
8	794 57	613 79
9	804 67	613 90
10	814 67	614 24
11	824 65	614 82
12	834 62	615 63
13	844 56	616 68
14	854 48	617 97
15	864 36	619 49
15	874 21	621 24
17	884 01	623 23
18	893 76	625 45
19	903 45	627 90
20	913 09	630 58
21	922 65	633 49
22	932 15	636 63
23	941 57	639 98
24	950 91	643 56
25	960 16	647 37
26	969 31	651 39
27	978 37	665 62
28	987 33	660 07
29	996 17	664 73
30	1004 91	659 60
31	1005 59	670 00

Cırcle Center At X = 795 3 , Y = 1035 4 and Radıus, 421 6
*** 0 917 ***
Faılure Surface Specıfıed By 21 Coordınate Poınts

Poınt No	X-Surf (ft)	Y-Surf (ft)
1	762 60	623 13

2	772 45	624 11
3	782 39	625 25
4	792 30	626 56
5	802 19	628 02
6	812 06	629 65
7	821 90	531 43
8	831 71	533 37
9	841 49	635 46
10	851 23	637 72
11	860 94	640 13
12	870 60	642 70
13	880 22	645 42
14	889 80	548 30
15	899 33	651 33
16	908 81	654 51
17	918 24	657 85
18	927 61	661 34
19	936 92	664 97
20	946 18	668 76
21	947 76	669 44

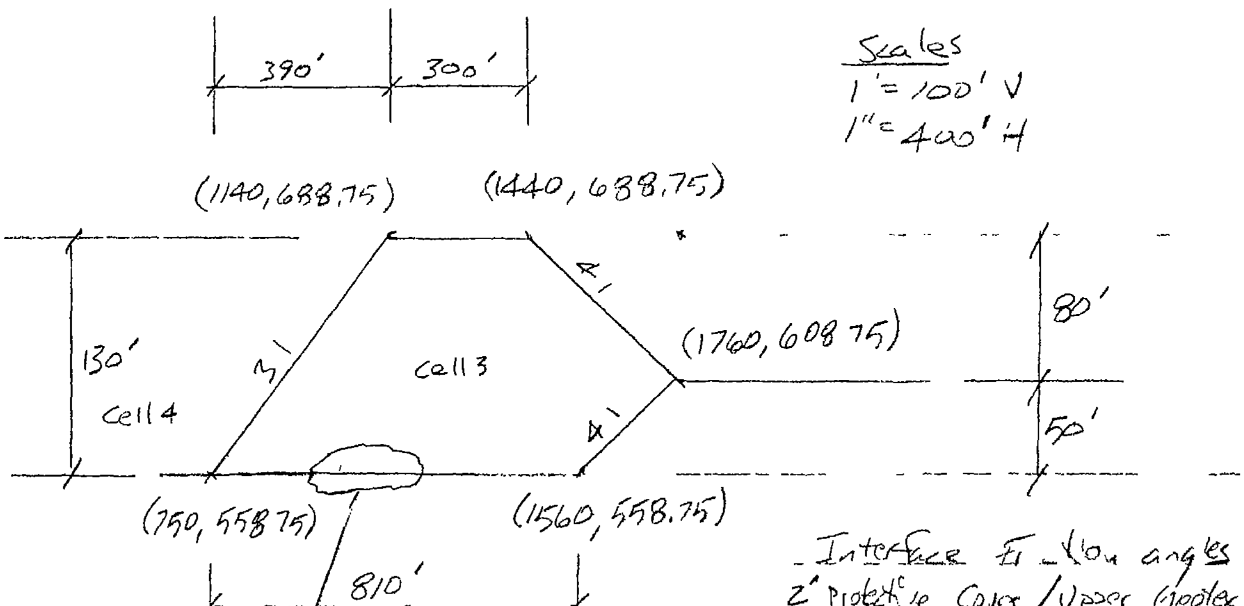
Circle Center At X = 706 4 , Y = 1241 5 and Radius, 621 0

*** 0 918 ***

ATTACHMENT 2C-3: SLOPE STABILITY RUNS & RESULTS – WASTE MASS SLIDING BLOCK

Liner stability - Sliding Block

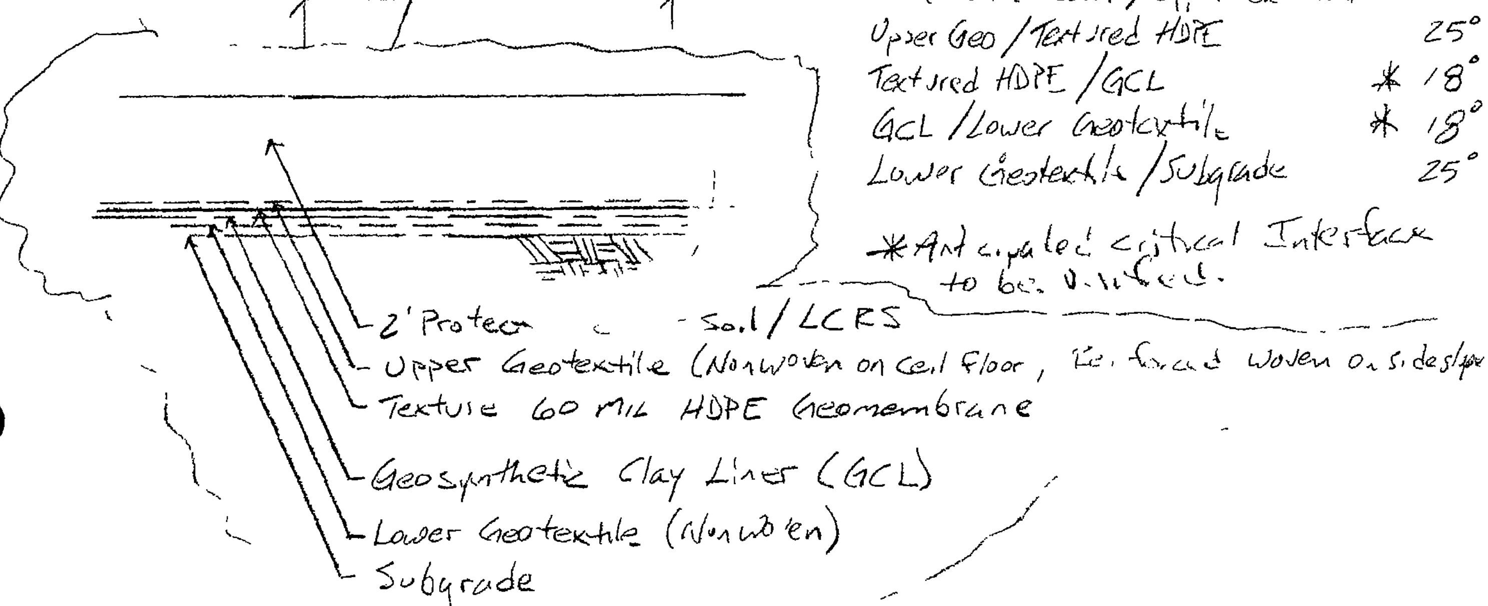
Worst case @ Cell 3 / Cell 4 - 130 ft from top of Waste to cell floor



Scales
1" = 100' V
1" = 400' H

Interface Friction angles	δ
2' Protective Cover / Upper Geotextile	25°
Upper Geo / Textured HDPE	25°
Textured HDPE / GCL	* 18°
GCL / Lower Geotextile	* 18°
Lower Geotextile / Subgrade	25°

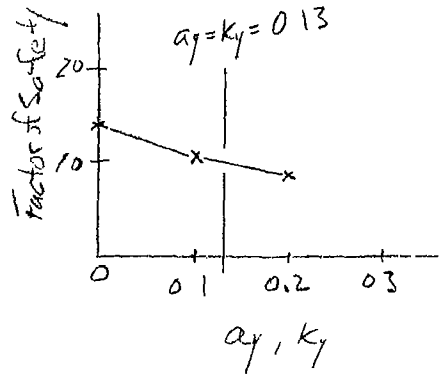
* Anticipated critical Interface to be verified.



HDR | ONE COMPANY *Many Solutions*

Project	IRL	Computed	GMS	Date	3/2010
Subject	Slope Stability	Checked	PVP	Date	4-9-10
Task	Sliding Block	Page	2	of	22
Job #	125184 Dept. 143	No			

Results



acceleration, g	FS
0 (static)	1.4
0.1g	1.07
0.2g	0.83

x → 0.1g; 1.0 → 1.07

@ FS = 1.0

$$\frac{1.07-0.83}{0.1-0.2} = \frac{1.07-1.0}{0.1-x} \Rightarrow \frac{0.24}{-0.1} = \frac{0.07}{0.1-x}$$

$$0.22(0.1-x) = (-0.1)(0.06) \Rightarrow 0.022 - 0.22x = -0.006$$

$$-0.22x = -0.028 \qquad x = 0.13$$

Liner stability Max Waste - Sliding Block / Displacement

$a_{max} - 0.28$ (Reference E)

$a_y = 0.13$ (Previous page)

$\frac{a_y}{a_{max}} = \frac{0.13}{0.28} = 0.46$ @ $M = 7.0$

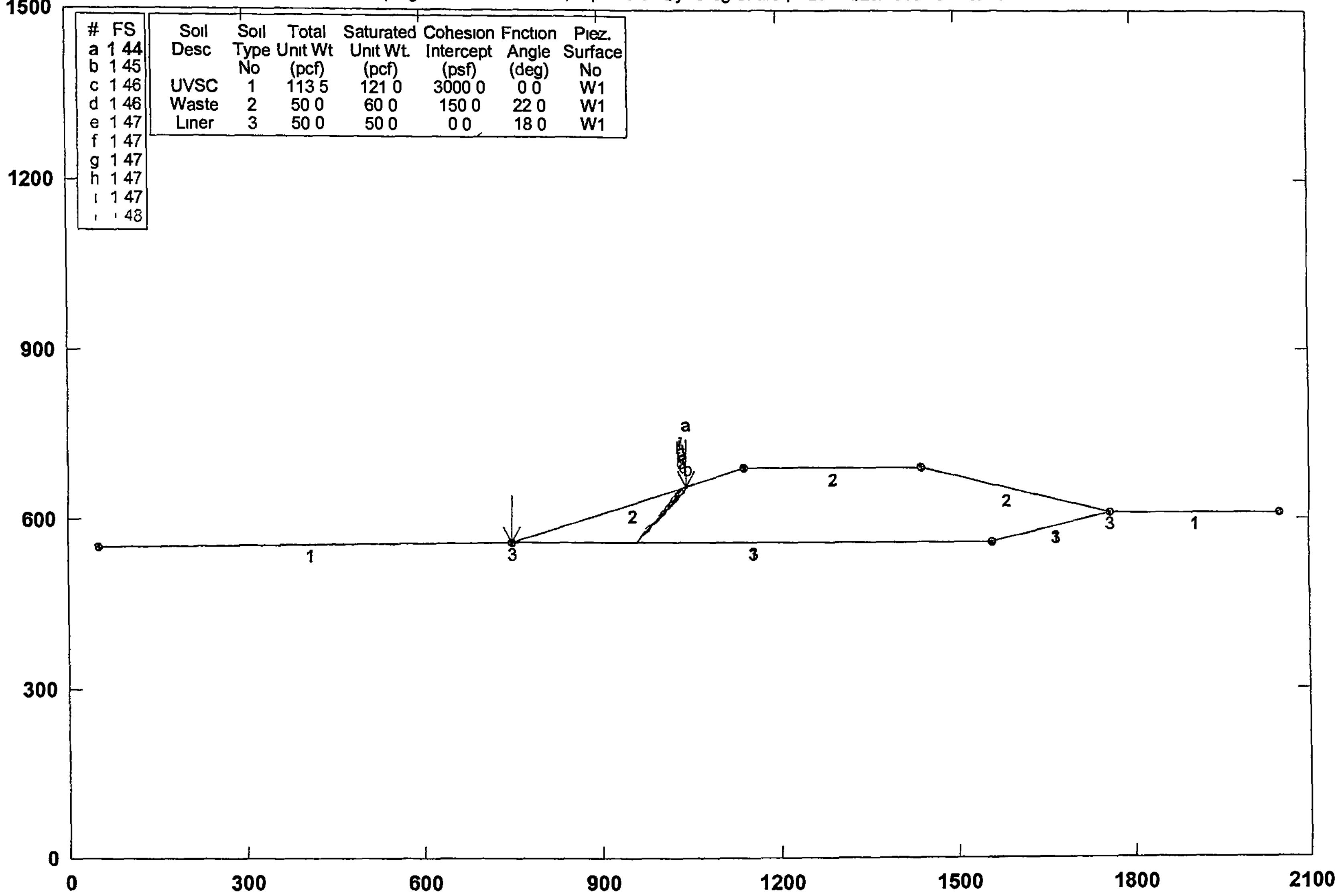
See Attachment 2B (Reference A)

@ $M = 7.0$ $U_{max} = 8.0$ cm < 30 cm (allow) OK

(Blank)

Intermountain Regional Landfill Sliding Block

c \program files\stedwin\irt\21 pl2 Run By Greg Shafer, HDR 4/20/2010 04 10PM



PCSTABL7 FSmin=1 44

Safety Factors Are Calculated By The Modified Janbu Method

STED

5/22

6/22


```
                    ** PCSTABL7 **
                          by
                   Purdue University
              --Slope Stability Analysis--
          Simplified Janbu, Simplified Bishop
             or Spencer s Method of Slices
Run Date                     4/20/2010
Time of Run                  04 10PM
Run By                       Greg Shafer, HDR
Input Data Filename          C 21 in
Output Filename              C 21 OUT
Unit                         ENGLISH
Plotted Output Filename      C 21 PLT
PROBLEM DESCRIPTION    Intermountain Regional Landfill
                       Sliding Block
BOUNDARY COORDINATES
     Note  User origin value specified
     Add 0 00 to X-values and 0 00 to Y-values listed

    5 Top   Boundaries
   12 Total Boundaries
```

Boundary No	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	50 00	550 00	750 00	558 75	1
2	750 00	558 75	1140 00	688 75	2
3	1140 00	688 75	1440 00	688 75	2
4	1440 00	688 75	1760 00	608 75	2
5	1760 00	608 75	2050 00	608 75	1
6	750 00	558 75	750 30	558 85	3
7	750 30	558 85	1560 00	558 85	3
8	1560 00	558 85	1759 90	608 75	3
9	1759 90	608 75	1760 00	608 75	3
10	750 00	558 75	1560 00	558 75	1
11	1560 00	558 75	1760 00	608 75	1
12	1760 00	608 75	2050 00	608 75	1

ISOTROPIC SOIL PARAMETERS
 3 Type(s) of Soil

Soil Type No	Total Unit Wt (pcf)	Saturated Unit Wt (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param	Pressure Constant (psf)	Piez Surface No
1	113 5	121 0	3000 0	0 0	0 00	0 0	1
2	50 0	60 0	150 0	22 0	0 00	0 0	1
3	50 0	50 0	0 0	18 0	0 00	0 0	1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified
1000 Trial Surfaces Have Been Generated
6 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 10 0

Box No	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	751 00	558 84	751 00	558 84	0 00
2	800 00	558 84	800 00	558 84	0 00
3	850 00	558 84	850 00	558 84	0 00
4	900 00	558 84	900 00	558 84	0 00
5	950 00	558 84	950 00	558 84	0 00
6	960 00	558 84	960 00	558 84	0 00

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined They Are Ordered - Most Critical First
* * Safety Factors Are Calculated By The Modified Janbu Method * *
Failure Surface Specified By 20 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 81	559 02
2	751 00	558 84
3	800 00	558 84
4	850 00	558 84

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5	900 00	558 84
6	950 00	558 84
7	960 00	558 84
8	967 00	565 99
9	972 39	574 41
10	979 45	581 49
11	986 45	588 63
12	993 17	596 04
13	1000 13	603 22
14	1007 18	610 31
15	1013 23	618 27
16	1019 88	625 74
17	1026 86	632 90
18	1032 31	641 28
19	1039 31	648 42
20	1041 75	656 00

*** 1 444 ***

Individual data on the 21 slices

Slice No	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Force Tnorm (lbs)	Force Ttan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	0 2	1 1	0 0	0 0	0 0	0 0	0 0	0 0	0 0
2	0 0	0 1	0 0	0 0	0 0	0 0	0 0	0 0	0 0
3	49 0	20604 4	0 0	0 0	0 0	0 0	0 0	0 0	0 0
4	50 0	62274 9	0 0	0 0	0 0	0 0	0 0	0 0	0 0
5	50 0	103941 6	0 0	0 0	0 0	0 0	0 0	0 0	0 0
6	50 0	145608 2	0 0	0 0	0 0	0 0	0 0	0 0	0 0
7	10 0	34121 6	0 0	0 0	0 0	0 0	0 0	0 0	0 0
8	0 0	34 1	0 0	0 0	0 0	0 0	0 0	0 0	0 0
9	7 0	23575 6	0 0	0 0	0 0	0 0	0 0	0 0	0 0
10	5 4	16663 3	0 0	0 0	0 0	0 0	0 0	0 0	0 0
11	7 1	19811 5	0 0	0 0	0 0	0 0	0 0	0 0	0 0
12	7 0	17977 4	0 0	0 0	0 0	0 0	0 0	0 0	0 0
13	6 7	15558 4	0 0	0 0	0 0	0 0	0 0	0 0	0 0
14	7 0	14385 3	0 0	0 0	0 0	0 0	0 0	0 0	0 0
15	7 1	12879 4	0 0	0 0	0 0	0 0	0 0	0 0	0 0
16	6 1	9449 7	0 0	0 0	0 0	0 0	0 0	0 0	0 0
17	6 6	8500 2	0 0	0 0	0 0	0 0	0 0	0 0	0 0
18	7 0	7178 4	0 0	0 0	0 0	0 0	0 0	0 0	0 0
19	5 5	4050 2	0 0	0 0	0 0	0 0	0 0	0 0	0 0
20	7 0	3208 7	0 0	0 0	0 0	0 0	0 0	0 0	0 0
21	2 4	411 4	0 0	0 0	0 0	0 0	0 0	0 0	0 0

Failure Surface Specified By 20 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 80	559 02
2	751 00	558 84
3	800 00	558 84
4	850 00	558 84
5	900 00	558 84
6	950 00	558 84
7	960 00	558 84
8	966 09	566 78
9	972 91	574 08
10	978 87	582 11
11	985 69	589 43
12	991 48	597 58
13	998 08	605 09
14	1004 94	612 37
15	1012 01	619 44
16	1019 08	626 51
17	1026 15	633 59
18	1033 20	640 68
19	1038 93	648 87
20	1044 53	656 93

*** 1 449 ***

Failure Surface Specified By 20 Coordinate Points

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Point No	X-Surf (ft)	Y-Surf (ft)
1	750 79	559 01
2	751 00	558 84
3	800 00	558 84
4	850 00	558 84
5	900 00	558 84
6	950 00	558 84
7	960 00	558 84
8	966 96	566 02
9	972 37	574 43
10	977 89	582 77
11	984 95	589 85
12	992 02	596 92
13	998 89	604 19
14	1005 95	611 27
15	1012 08	619 17
16	1018 78	626 59
17	1024 95	634 47
18	1030 69	642 65
19	1036 37	650 88
20	1036 89	654 38

*** 1 458 ***

Failure Surface Specified By 20 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 80	559 02
2	751 00	558 84
3	800 00	558 84
4	850 00	558 84
5	900 00	558 84
6	950 00	558 84
7	960 00	558 84
8	966 98	566 00
9	972 83	574 11
10	979 85	581 24
11	985 80	589 27
12	992 85	596 36
13	999 92	603 43
14	1005 88	611 47
15	1012 34	619 10
16	1016 21	628 32
17	1022 75	635 89
18	1029 67	643 11
19	1034 59	651 81
20	1034 59	653 61

*** 1 464 ***

Failure Surface Specified By 20 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 79	559 01
2	751 00	558 84
3	800 00	558 84
4	850 00	558 84
5	900 00	558 84
6	950 00	558 84
7	960 00	558 84
8	966 99	565 99
9	974 05	573 08
10	979 99	581 12
11	986 46	588 74
12	992 33	596 84
13	997 72	605 26
14	1004 76	612 36
15	1011 22	620 00
16	1018 02	627 33
17	1024 85	634 63
18	1031 80	641 83

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19	1038 73	649 03
20	1038 81	655 02

*** 1 465 ***

Failure Surface Specified By 19 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 79	559 01
2	751 00	558 84
3	800 00	558 84
4	850 00	558 84
5	900 00	558 84
6	950 00	558 84
7	960 00	558 84
8	966 17	566 71
9	973 11	573 91
10	980 18	580 99
11	987 03	588 27
12	994 10	595 34
13	1000 41	603 10
14	1007 31	610 33
15	1011 73	619 31
16	1015 48	628 58
17	1022 13	636 04
18	1028 64	643 63
19	1030 87	652 38

*** 1 469 ***

Failure Surface Specified By 20 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 66	558 97
2	751 00	558 84
3	800 00	558 84
4	850 00	558 84
5	900 00	558 84
6	950 00	558 84
7	960 00	558 84
8	966 70	566 26
9	973 14	573 91
10	979 70	581 46
11	986 77	588 53
12	992 71	596 58
13	999 27	604 12
14	1004 68	612 54
15	1008 95	621 58
16	1015 71	628 95
17	1020 46	637 75
18	1027 53	644 82
19	1034 58	651 91
20	1035 07	653 77

*** 1 469 ***

Failure Surface Specified By 20 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 82	559 02
2	751 00	558 84
3	800 00	558 84
4	850 00	558 84
5	900 00	558 84
6	950 00	558 84
7	960 00	558 84
8	966 84	566 14
9	973 87	573 25
10	980 90	580 36
11	987 03	588 26
12	992 93	596 33
13	999 90	603 50
14	1004 94	612 14
15	1011 74	619 48

16	1018 69	626 66
17	1024 54	634 77
18	1026 24	644 63
19	1032 55	652 38
20	1033 11	653 12
***	1 471	***

Failure Surface Specified By 19 Coordinate Points

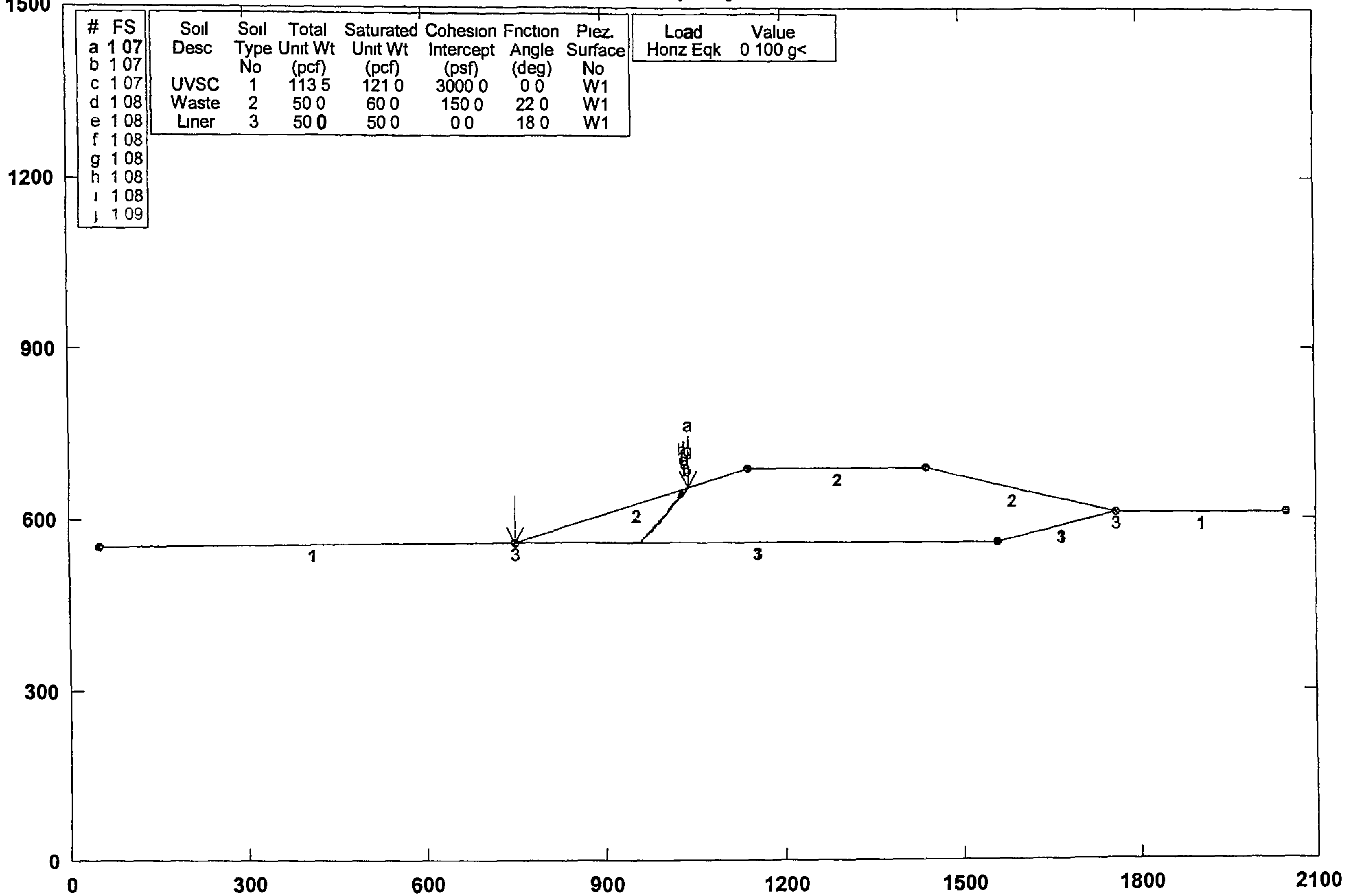
Point No	X-Surf (ft)	Y-Surf (ft)
1	750 49	558 91
2	751 00	558 84
3	800 00	558 84
4	850 00	558 84
5	900 00	558 84
6	950 00	558 84
7	960 00	558 84
8	966 72	566 25
9	973 01	574 02
10	980 01	581 16
11	987 06	588 25
12	993 57	595 84
13	997 83	604 89
14	1002 99	613 46
15	1009 75	620 83
16	1016 68	628 03
17	1022 52	636 15
18	1029 27	643 53
19	1031 89	652 71
***	1 472	***

Failure Surface Specified By 20 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 58	558 94
2	751 00	558 84
3	800 00	558 84
4	850 00	558 84
5	900 00	558 84
6	950 00	558 84
7	960 00	558 84
8	965 21	567 38
9	971 78	574 91
10	977 37	583 21
11	983 95	590 74
12	990 76	598 06
13	997 83	605 13
14	1004 42	612 65
15	1010 81	620 34
16	1016 86	628 30
17	1022 82	636 33
18	1027 05	645 40
19	1034 11	652 47
20	1034 17	653 47
***	1 476	***

Intermountam Regional Landfill Sliding Block

c \program files\stedwin\irl\22 pl2 Run By Greg Shafer HDR 4/20/2010 04 14PM



#	FS
a	1 07
b	1 07
c	1 07
d	1 08
e	1 08
f	1 08
g	1 08
h	1 08
i	1 08
j	1 09

Soil Desc	Soil Type No	Total Unit Wt (pcf)	Saturated Unit Wt (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No
UVSC	1	113 5	121 0	3000 0	0 0	W1
Waste	2	50 0	60 0	150 0	22 0	W1
Liner	3	50 0	50 0	0 0	18 0	W1

Load	Value
Horiz Eqk	0 100 g<

PCSTABL7 FSmin=1 07

Safety Factors Are Calculated By The Modified Janbu Method

STED

11/22

12/22

** PCSTABL7 **
by
Purdue University
--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer s Method of Slices

Run Date 4/20/2010
Time of Run 04 14PM
Run By Greg Shafer, HDR
Input Data Filename C 22 in
Output Filename C 22 OUT
Unit ENGLISH
Plotted Output Filename C 22 PLT
PROBLEM DESCRIPTION Intermountain Regional Landfill
Sliding Block

BOUNDARY COORDINATES
Note User origin value specified
Add 0 00 to X-values and 0 00 to Y-values listed

5 Top Boundaries
12 Total Boundaries

Boundary No	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	50 00	550 00	750 00	558 75	1
2	750 00	558 75	1140 00	688 75	2
3	1140 00	688 75	1440 00	688 75	2
4	1440 00	688 75	1760 00	608 75	2
5	1760 00	608 75	2050 00	608 75	1
6	750 00	558 75	750 30	558 85	3
7	750 30	558 85	1560 00	558 85	3
8	1560 00	558 85	1759 90	608 75	3
9	1759 90	608 75	1760 00	608 75	3
10	750 00	558 75	1560 00	558 75	1
11	1560 00	558 75	1760 00	608 75	1
12	1760 00	608 75	2050 00	608 75	1

ISOTROPIC SOIL PARAMETERS
3 Type(s) of Soil

Soil Type No	Total Unit Wt (pcf)	Saturated Unit Wt (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param	Pressure Constant (psf)	Piez Surface No
1	113 5	121 0	3000 0	0 0	0 00	0 0	1
2	50 0	60 0	150 0	22 0	0 00	0 0	1
3	50 0	50 0	0 0	18 0	0 00	0 0	1

A Horizontal Earthquake Loading Coefficient
Of0 100 Has Been Assigned
A Vertical Earthquake Loading Coefficient
Of0 000 Has Been Assigned
Cavitation Pressure = 0 0 (psf)
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Sliding Block Surfaces, Has Been
Specified
1000 Trial Surfaces Have Been Generated
6 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is 10 0

Box No	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	751 00	558 84	751 00	558 84	0 00
2	800 00	558 84	800 00	558 84	0 00
3	850 00	558 84	850 00	558 84	0 00
4	900 00	558 84	900 00	558 84	0 00
5	950 00	558 84	950 00	558 84	0 00
6	960 00	558 84	960 00	558 84	0 00

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Examined They Are Ordered - Most Critical
First
* * Safety Factors Are Calculated By The Modified Janbu Method * *
Failure Surface Specified By 20 Coordinate Points
Point X-Surf Y-Surf

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No	(ft)	(ft)
1	750 44	558 90
2	751 00	558 84
3	800 00	558 84
4	850 00	558 84
5	900 00	558 84
6	950 00	558 84
7	960 00	558 84
8	967 07	565 91
9	972 96	573 99
10	979 03	581 94
11	985 98	589 13
12	992 75	596 49
13	999 58	603 80
14	1005 98	611 48
15	1012 13	619 37
16	1017 76	627 63
17	1024 20	635 28
18	1031 24	642 38
19	1037 61	650 09
20	1039 59	655 28

*** 1 067 ***

Individual data on the 21 slices

Slice No	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Force Tnorm (lbs)	Force Ttan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	0 5	2 3	0 0	0 0	0 0	0 0	0 2	0 0	0 0
2	0 1	1 1	0 0	0 0	0 0	0 0	0 1	0 0	0 0
3	49 0	20604 4	0 0	0 0	0 0	0 0	2060 4	0 0	0 0
4	50 0	62274 9	0 0	0 0	0 0	0 0	6227 5	0 0	0 0
5	50 0	103941 6	0 0	0 0	0 0	0 0	10394 2	0 0	0 0
6	50 0	145608 2	0 0	0 0	0 0	0 0	14560 8	0 0	0 0
7	10 0	34121 6	0 0	0 0	0 0	0 0	3412 2	0 0	0 0
8	0 0	34 6	0 0	0 0	0 0	0 0	3 5	0 0	0 0
9	7 1	23844 5	0 0	0 0	0 0	0 0	2384 5	0 0	0 0
10	5 9	18298 7	0 0	0 0	0 0	0 0	1829 9	0 0	0 0
11	6 1	17020 4	0 0	0 0	0 0	0 0	1702 0	0 0	0 0
12	7 0	17640 9	0 0	0 0	0 0	0 0	1764 1	0 0	0 0
13	6 8	15483 5	0 0	0 0	0 0	0 0	1548 4	0 0	0 0
14	6 8	13874 9	0 0	0 0	0 0	0 0	1387 5	0 0	0 0
15	6 4	11318 5	0 0	0 0	0 0	0 0	1131 9	0 0	0 0
16	6 1	9124 3	0 0	0 0	0 0	0 0	912 4	0 0	0 0
17	5 6	6637 1	0 0	0 0	0 0	0 0	663 7	0 0	0 0
18	6 4	5678 5	0 0	0 0	0 0	0 0	567 8	0 0	0 0
19	7 0	4393 2	0 0	0 0	0 0	0 0	439 3	0 0	0 0
20	6 4	2331 1	0 0	0 0	0 0	0 0	233 1	0 0	0 0
21	2 0	224 2	0 0	0 0	0 0	0 0	22 4	0 0	0 0

Failure Surface Specified By 20 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 81	559 02
2	751 00	558 84
3	800 00	558 84
4	850 00	558 84
5	900 00	558 84
6	950 00	558 84
7	960 00	558 84
8	967 02	565 96
9	973 57	573 52
10	979 85	581 30
11	986 80	588 49
12	992 13	596 95
13	998 36	604 78
14	1004 16	612 92
15	1011 21	620 01
16	1017 54	627 75
17	1024 59	634 85

18	1031 59	641 99
19	1037 22	650 25
20	1038 88	655 04

*** 1 070 ***

Failure Surface Specified By 20 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 74	559 00
2	751 00	558 84
3	800 00	558 84
4	850 00	558 84
5	900 00	558 84
6	950 00	558 84
7	960 00	558 84
8	967 03	565 95
9	974 09	573 03
10	981 04	580 23
11	987 13	588 16
12	993 04	596 23
13	1000 11	603 30
14	1006 29	611 16
15	1011 81	619 49
16	1018 14	627 24
17	1025 16	634 36
18	1032 23	641 43
19	1034 13	651 25
20	1037 42	654 56

*** 1 071 ***

Failure Surface Specified By 20 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 81	559 02
2	751 00	558 84
3	800 00	558 84
4	850 00	558 84
5	900 00	558 84
6	950 00	558 84
7	960 00	558 84
8	967 04	565 95
9	974 09	573 03
10	980 44	580 76
11	987 42	587 92
12	992 15	596 73
13	999 19	603 83
14	1005 67	611 45
15	1012 16	619 05
16	1017 96	627 20
17	1024 95	634 35
18	1028 08	643 85
19	1034 26	651 71
20	1034 46	653 57

*** 1 075 ***

Failure Surface Specified By 20 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 74	559 00
2	751 00	558 84
3	800 00	558 84
4	850 00	558 84
5	900 00	558 84
6	950 00	558 84
7	960 00	558 84
8	966 91	566 07
9	973 88	573 24
10	980 94	580 32
11	987 13	588 17
12	994 17	595 28
13	999 01	604 03

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14	1006 02	611 16
15	1012 22	619 00
16	1017 65	627 40
17	1021 36	636 69
18	1025 70	645 70
19	1032 66	652 88
20	1032 74	653 00

*** 1 077 ***

Failure Surface Specified By 19 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 71	558 99
2	751 00	558 84
3	800 00	558 84
4	850 00	558 84
5	900 00	558 84
6	950 00	558 84
7	960 00	558 84
8	966 77	566 20
9	973 81	573 30
10	980 05	581 11
11	986 97	588 33
12	994 04	595 41
13	998 15	604 52
14	1005 13	611 69
15	1010 93	619 83
16	1015 61	628 67
17	1021 50	636 75
18	1026 92	645 15
19	1030 58	652 28

*** 1 079 ***

Failure Surface Specified By 20 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 82	559 02
2	751 00	558 84
3	800 00	558 84
4	850 00	558 84
5	900 00	558 84
6	950 00	558 84
7	960 00	558 84
8	967 06	565 92
9	972 30	574 44
10	978 94	581 92
11	984 16	590 44
12	990 56	598 13
13	997 56	605 27
14	1004 43	612 54
15	1011 27	619 83
16	1018 27	626 98
17	1023 57	635 46
18	1028 88	643 93
19	1035 95	651 01
20	1039 21	655 15

*** 1 079 ***

Failure Surface Specified By 19 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 60	558 95
2	751 00	558 84
3	800 00	558 84
4	850 00	558 84
5	900 00	558 84
6	950 00	558 84
7	960 00	558 84
8	966 83	566 14
9	973 63	573 48
10	980 29	580 93

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11	986 44	588 82
12	993 27	596 13
13	1000 10	603 43
14	1004 83	612 24
15	1011 89	619 32
16	1015 00	628 83
17	1022 01	635 96
18	1027 79	644 12
19	1030 10	652 12

*** 1 082 ***

Failure Surface Specified By 20 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 61	558 95
2	751 00	558 84
3	800 00	558 84
4	850 00	558 84
5	900 00	558 84
6	950 00	558 84
7	960 00	558 84
8	966 49	566 45
9	972 06	574 75
10	978 99	581 96
11	985 95	589 15
12	992 90	596 33
13	999 57	603 78
14	1003 98	612 76
15	1010 23	620 57
16	1017 26	627 68
17	1023 65	635 37
18	1030 72	642 45
19	1032 14	652 34
20	1032 64	652 96

*** 1 084 ***

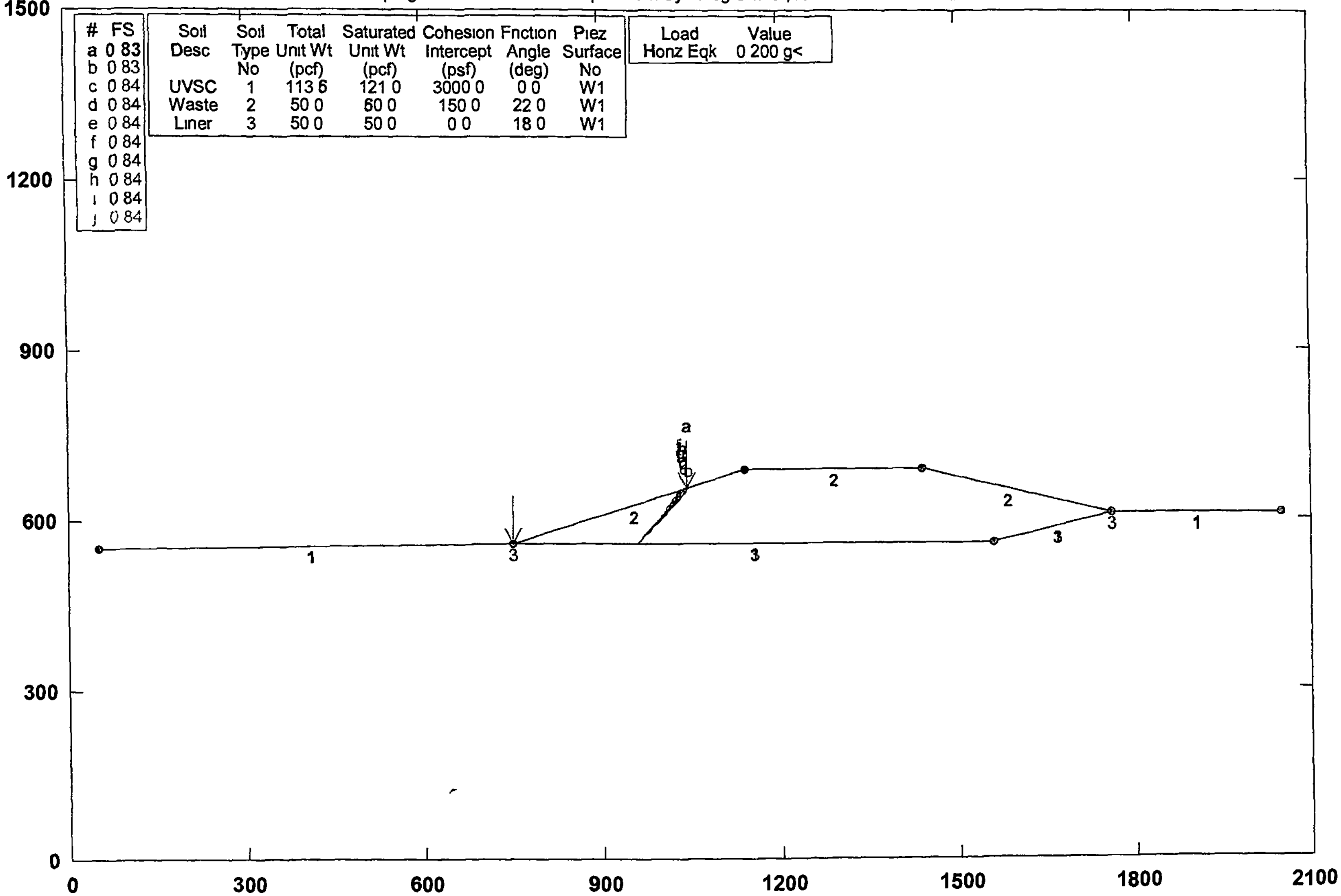
Failure Surface Specified By 20 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 37	558 87
2	751 00	558 84
3	800 00	558 84
4	850 00	558 84
5	900 00	558 84
6	950 00	558 84
7	960 00	558 84
8	967 01	565 98
9	973 01	573 97
10	977 24	583 04
11	984 24	590 17
12	990 47	598 00
13	997 46	605 14
14	1004 10	612 62
15	1011 17	619 70
16	1017 47	627 46
17	1022 70	635 98
18	1028 48	644 15
19	1035 55	651 22
20	1039 41	655 22

*** 1 085 ***

Intermountain Regional Landfill Sliding Block

c:\program files\stedwin\irl\23.pl2 Run By: Greg Shafer, HDR 4/20/2010 04:18PM



#	FS
a	0.83
b	0.83
c	0.84
d	0.84
e	0.84
f	0.84
g	0.84
h	0.84
i	0.84
j	0.84

Soil Desc	Soil Type No	Total Unit Wt (pcf)	Saturated Unit Wt (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez Surface No
UVSC	1	113.6	121.0	3000.0	0.0	W1
Waste	2	50.0	60.0	150.0	22.0	W1
Liner	3	50.0	50.0	0.0	18.0	W1

Load	Value
Horiz Eqk	0.200 g<

PCSTABL7 FSmin=0.83

Safety Factors Are Calculated By The Modified Janbu Method

STED

17/22

** PCSTABL7 **
by
Purdue University
--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer s Method of Slices

Run Date 4/20/2010
Time of Run 04 18PM
Run By Greg Shafer, HDR
Input Data Filename C 23 in
Output Filename C 23 OUT
Unit ENGLISH
Plotted Output Filename C 23 PLT
PROBLEM DESCRIPTION Intermountain Regional Landfill
Sliding Block

BOUNDARY COORDINATES
Note User origin value specified
Add 0 00 to X-values and 0 00 to Y-values listed

5 Top Boundaries
12 Total Boundaries

Boundary No	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	50 00	550 00	750 00	558 75	1
2	750 00	558 75	1140 00	688 75	2
3	1140 00	688 75	1440 00	688 75	2
4	1440 00	688 75	1760 00	608 75	2
5	1760 00	608 75	2050 00	608 75	1
6	750 00	558 75	750 30	558 85	3
7	750 30	558 85	1560 00	558 85	3
8	1560 00	558 85	1759 90	608 75	3
9	1759 90	608 75	1760 00	608 75	3
10	750 00	558 75	1560 00	558 75	1
11	1560 00	558 75	1760 00	608 75	1
12	1760 00	608 75	2050 00	608 75	1

ISOTROPIC SOIL PARAMETERS
3 Type(s) of Soil

Soil Type No	Total Unit Wt (pcf)	Saturated Unit Wt (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param	Pressure Constant (psf)	Piez Surface No
1	113 5	121 0	3000 0	0 0	0 00	0 0	1
2	50 0	60 0	150 0	22 0	0 00	0 0	1
3	50 0	50 0	0 0	18 0	0 00	0 0	1

A Horizontal Earthquake Loading Coefficient
Of0 200 Has Been Assigned
A Vertical Earthquake Loading Coefficient
Of0 000 Has Been Assigned
Cavitation Pressure = 0 0 (psf)
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified
1000 Trial Surfaces Have Been Generated
6 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 10 0

Box No	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	751 00	558 84	751 00	558 84	0 00
2	800 00	558 84	800 00	558 84	0 00
3	850 00	558 84	850 00	558 84	0 00
4	900 00	558 84	900 00	558 84	0 00
5	950 00	558 84	950 00	558 84	0 00
6	960 00	558 84	960 00	558 84	0 00

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined They Are Ordered - Most Critical First
* * Safety Factors Are Calculated By The Modified Janbu Method * *
Failure Surface Specified By 20 Coordinate Points
Point X-Surf Y-Surf

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No	(ft)	(ft)
1	750 81	559 02
2	751 00	558 84
3	800 00	558 84
4	850 00	558 84
5	900 00	558 84
6	950 00	558 84
7	960 00	558 84
8	967 00	565 99
9	972 39	574 41
10	979 45	581 49
11	986 45	588 63
12	993 17	596 04
13	1000 13	603 22
14	1007 18	610 31
15	1013 23	618 27
16	1019 88	625 74
17	1026 86	632 90
18	1032 31	641 28
19	1039 31	648 42
20	1041 75	656 00

*** 0 830 ***

Individual data on the 21 slices

Slice No	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Force Tnorm (lbs)	Force Ttan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	0 2	1 1	0 0	0 0	0 0	0 0	0 2	0 0	0 0
2	0 0	0 1	0 0	0 0	0 0	0 0	0 0	0 0	0 0
3	49 0	20604 4	0 0	0 0	0 0	0 0	4120 9	0 0	0 0
4	50 0	62274 9	0 0	0 0	0 0	0 0	12455 0	0 0	0 0
5	50 0	103941 6	0 0	0 0	0 0	0 0	20788 3	0 0	0 0
6	50 0	145608 2	0 0	0 0	0 0	0 0	29121 6	0 0	0 0
7	10 0	34121 6	0 0	0 0	0 0	0 0	6824 3	0 0	0 0
8	0 0	34 1	0 0	0 0	0 0	0 0	6 8	0 0	0 0
9	7 0	23575 6	0 0	0 0	0 0	0 0	4715 1	0 0	0 0
10	5 4	16663 3	0 0	0 0	0 0	0 0	3332 7	0 0	0 0
11	7 1	19811 5	0 0	0 0	0 0	0 0	3962 3	0 0	0 0
12	7 0	17977 4	0 0	0 0	0 0	0 0	3595 5	0 0	0 0
13	6 7	15558 4	0 0	0 0	0 0	0 0	3111 7	0 0	0 0
14	7 0	14385 3	0 0	0 0	0 0	0 0	2877 1	0 0	0 0
15	7 1	12879 4	0 0	0 0	0 0	0 0	2575 9	0 0	0 0
16	6 1	9449 7	0 0	0 0	0 0	0 0	1889 9	0 0	0 0
17	6 6	8500 2	0 0	0 0	0 0	0 0	1700 0	0 0	0 0
18	7 0	7178 4	0 0	0 0	0 0	0 0	1435 7	0 0	0 0
19	5 5	4050 2	0 0	0 0	0 0	0 0	810 0	0 0	0 0
20	7 0	3208 7	0 0	0 0	0 0	0 0	641 7	0 0	0 0
21	2 4	411 4	0 0	0 0	0 0	0 0	82 3	0 0	0 0

Failure Surface Specified By 20 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 80	559 02
2	751 00	558 84
3	800 00	558 84
4	850 00	558 84
5	900 00	558 84
6	950 00	558 84
7	960 00	558 84
8	966 09	566 78
9	972 91	574 08
10	978 87	582 11
11	985 69	589 43
12	991 48	597 58
13	998 08	605 09
14	1004 94	612 37
15	1012 01	619 44
16	1019 08	626 51
17	1026 15	633 59

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18	1033 20	640 68
19	1038 93	648 87
20	1044 53	656 93

*** 0 833 ***

Failure Surface Specified By 20 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 79	559 01
2	751 00	558 84
3	800 00	558 84
4	850 00	558 84
5	900 00	558 84
6	950 00	558 84
7	960 00	558 84
8	966 96	566 02
9	972 37	574 43
10	977 89	582 77
11	984 95	589 85
12	992 02	596 92
13	998 89	604 19
14	1005 95	611 27
15	1012 08	619 17
16	1018 78	626 59
17	1024 95	634 47
18	1030 69	642 65
19	1036 37	650 88
20	1036 89	654 38

*** 0 836 ***

Failure Surface Specified By 20 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 79	559 01
2	751 00	558 84
3	800 00	558 84
4	850 00	558 84
5	900 00	558 84
6	950 00	558 84
7	960 00	558 84
8	966 99	565 99
9	974 05	573 08
10	979 99	581 12
11	986 46	588 74
12	992 33	596 84
13	997 72	605 26
14	1004 76	612 36
15	1011 22	620 00
16	1018 02	627 33
17	1024 85	634 63
18	1031 80	641 83
19	1038 73	649 03
20	1038 81	655 02

*** 0 837 ***

Failure Surface Specified By 20 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 80	559 02
2	751 00	558 84
3	800 00	558 84
4	850 00	558 84
5	900 00	558 84
6	950 00	558 84
7	960 00	558 84
8	966 98	566 00
9	972 83	574 11
10	979 85	581 24
11	985 80	589 27
12	992 85	596 36
13	999 92	603 43

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14	1005 88	611 47
15	1012 34	619 10
16	1016 21	628 32
17	1022 75	635 89
18	1029 67	643 11
19	1034 59	651 81
20	1034 59	653 61

*** 0 838 ***

Failure Surface Specified By 19 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 79	559 01
2	751 00	558 84
3	800 00	558 84
4	850 00	558 84
5	900 00	558 84
6	950 00	558 84
7	960 00	558 84
8	966 17	566 71
9	973 11	573 91
10	980 18	580 99
11	987 03	588 27
12	994 10	595 34
13	1000 41	603 10
14	1007 31	610 33
15	1011 73	619 31
16	1015 48	628 58
17	1022 13	636 04
18	1028 64	643 63
19	1030 87	652 38

*** 0 840 ***

Failure Surface Specified By 20 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 82	559 02
2	751 00	558 84
3	800 00	558 84
4	850 00	558 84
5	900 00	558 84
6	950 00	558 84
7	960 00	558 84
8	966 84	566 14
9	973 87	573 25
10	980 90	580 36
11	987 03	588 26
12	992 93	596 33
13	999 90	603 50
14	1004 94	612 14
15	1011 74	619 48
16	1018 69	626 66
17	1024 54	634 77
18	1026 24	644 63
19	1032 55	652 38
20	1033 11	653 12

*** 0 840 ***

Failure Surface Specified By 20 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 66	558 97
2	751 00	558 84
3	800 00	558 84
4	850 00	558 84
5	900 00	558 84
6	950 00	558 84
7	960 00	558 84
8	966 70	566 26
9	973 14	573 91
10	979 70	581 46

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11	986 77	588 53
12	992 71	596 58
13	999 27	604 12
14	1004 68	612 54
15	1008 95	621 58
16	1015 71	628 95
17	1020 46	637 75
18	1027 53	644 82
19	1034 58	651 91
20	1035 07	653 77
***	0 842	***

Failure Surface Specified By 19 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	750 49	558 91
2	751 00	558 84
3	800 00	558 84
4	850 00	558 84
5	900 00	558 84
6	950 00	558 84
7	960 00	558 84
8	966 72	566 25
9	973 01	574 02
10	980 01	581 16
11	987 06	588 25
12	993 57	595 84
13	997 83	604 89
14	1002 99	613 46
15	1009 75	620 83
16	1016 68	628 03
17	1022 52	635 15
18	1029 27	643 53
19	1031 89	652 71
***	0 842	***

Failure Surface Specified By 19 Coordinate Points

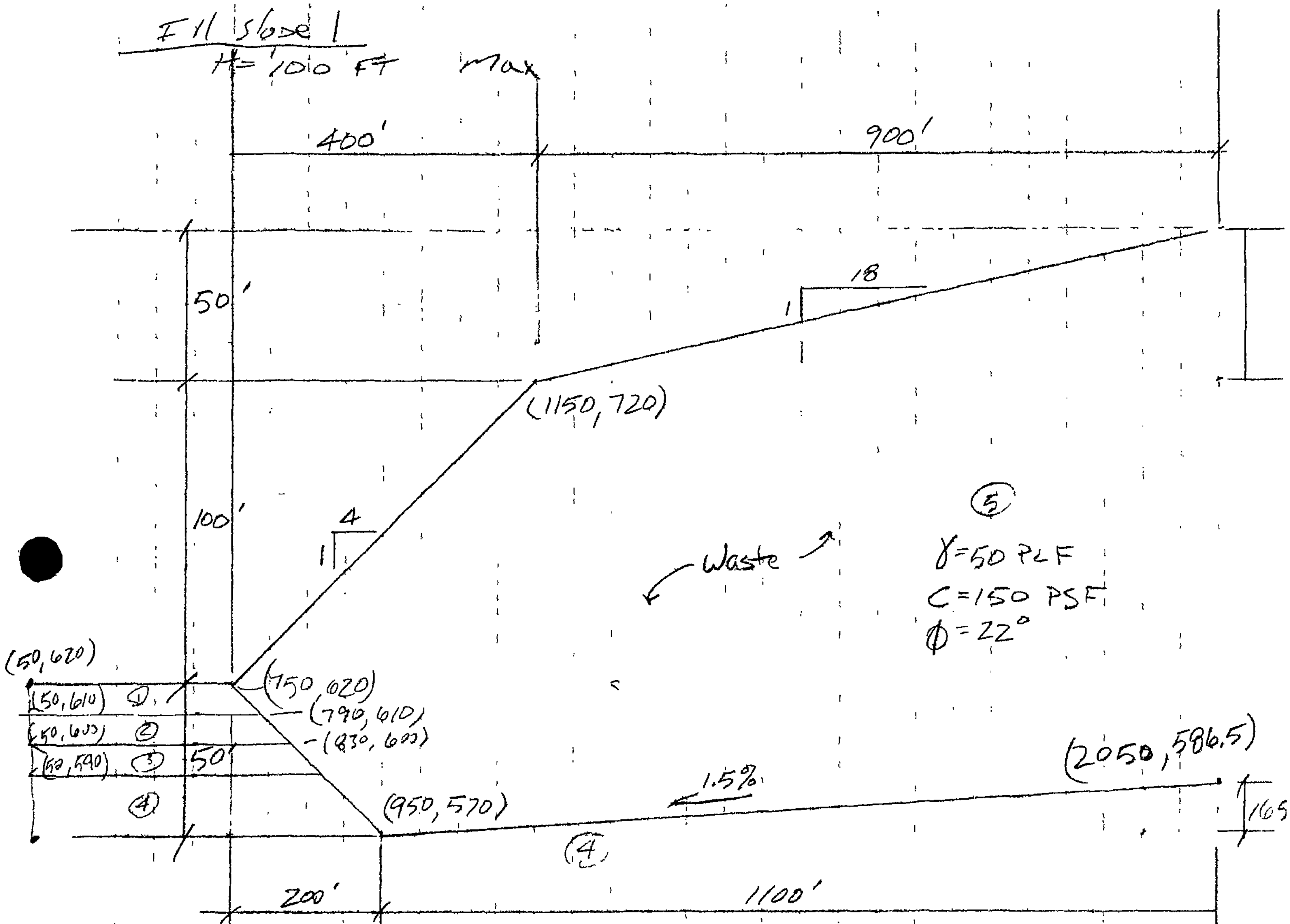
Point No	X-Surf (ft)	Y-Surf (ft)
1	750 79	559 01
2	751 00	558 84
3	800 00	558 84
4	850 00	558 84
5	900 00	558 84
6	950 00	558 84
7	960 00	558 84
8	965 59	566 36
9	973 16	573 90
10	979 21	581 86
11	986 24	588 98
12	991 11	597 71
13	997 67	605 26
14	1003 09	613 66
15	1010 12	620 78
16	1016 97	628 06
17	1022 16	636 61
18	1026 22	645 75
19	1026 69	650 98
***	0 844	***

ATTACHMENT 2C-2: SLOPE STABILITY RUNS & RESULTS – FILL SLOPE

Project IRL		Computed GMS	Date 3/2010 - 4/2010
Subject Slope Stability		Checked	Date
Task Waste Mass		Page 1	of 46
Job # 125184 Dept 143		No	

HDR | ONE COMPANY *Many Solutions*

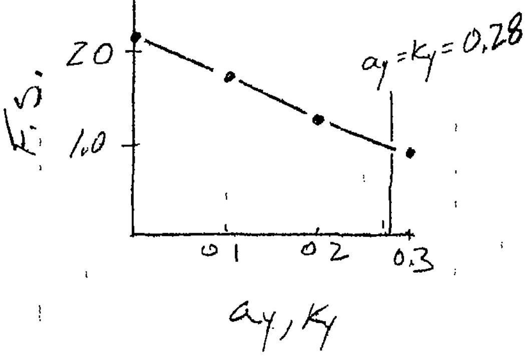
Fill Slope 1
H = 100 FT Max



Horizontal Accel g	F.S.
static	2.18
0.1	1.75
0.2	1.33
0.3	0.94

1.0

x



1" = 200' H
1" = 50' V

$$\frac{1.33-0.94}{0.2-0.3} = \frac{1.33-1.0}{0.2-x} \rightarrow \frac{0.39}{-0.1} = \frac{0.33}{0.2-x}$$

$$\rightarrow \frac{-0.033}{0.39} = 0.2 - x$$

$\boxed{x = 0.28}$

Maximum Fill Slope Results / Displacement

$a_{max} = 0.28$ (Reference E)

$a_y = 0.28$ (Previous page)

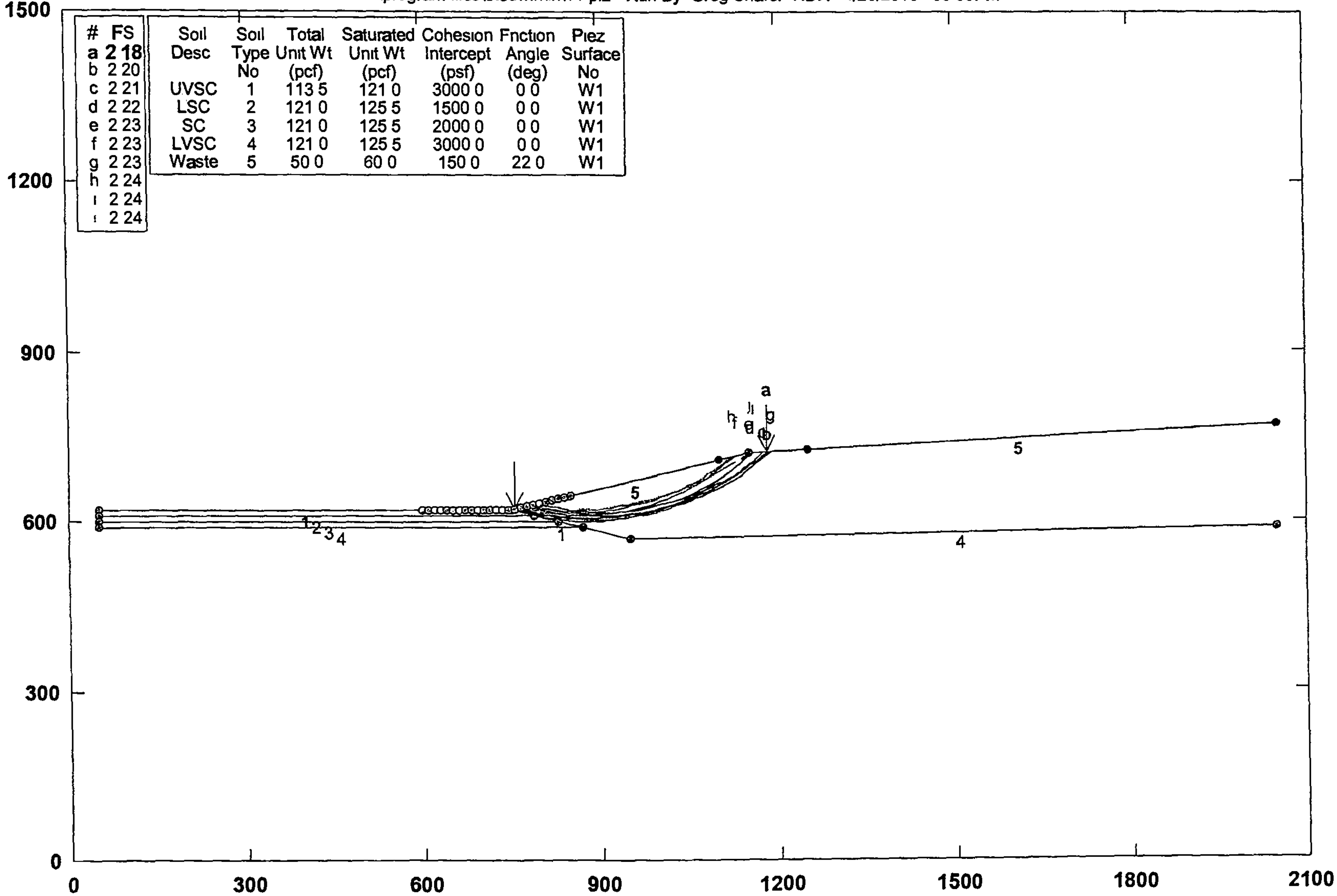
$\frac{a_y}{a_{max}} = \frac{0.28}{0.28} = 1.0$ @ $M = 7.0$

See Attachment 2B (Reference A)

$u_{max} = 0.05$ cm < 30 cm (allowable) OK

Intermountam Regional Landfill Fill Slope 1

c \program files\stedwin\irl\11 pl2 Run By Greg Shafer HDR 4/20/2010 03 35PM



#	FS
a	2 18
b	2 20
c	2 21
d	2 22
e	2 23
f	2 23
g	2 23
h	2 24
i	2 24
j	2 24

Soil Desc	Soil Type No	Total Unit Wt (pcf)	Saturated Unit Wt (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez Surface No
UVSC	1	113 5	121 0	3000 0	0 0	W1
LSC	2	121 0	125 5	1500 0	0 0	W1
SC	3	121 0	125 5	2000 0	0 0	W1
LVSC	4	121 0	125 5	3000 0	0 0	W1
Waste	5	50 0	60 0	150 0	22 0	W1

PCSTABL7 FSmin=2 18

Safety Factors Are Calculated By The Modified Bishop Method

STED

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                    ** PCSTABL7 **
                          by
                   Purdue University
              --Slope Stability Analysis--
           Simplified Janbu, Simplified Bishop
              or Spencer s Method of Slices
 Run Date                 4/20/2010
 Time of Run              03 35PM
 Run By                   Greg Shafer, HDR
 Input Data Filename      C 11 in
 Output Filename          C 11 OUT
 Unit                     ENGLISH
 Plotted Output Filename  C 11 PLT
 PROBLEM DESCRIPTION   Intermountain Regional Landfill
                       Fill Slope 1
 BOUNDARY COORDINATES
      Note  User origin value specified
      Add 0 00 to X-values and 0 00 to Y-values listed

     3 Top   Boundaries
     8 Total Boundaries
 Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
    No         (ft)        (ft)        (ft)        (ft)      Below Bnd
     1         50 00      620 00      750 00      620 00         1
     2        750 00      620 00     1150 00      720 00         5
     3       1150 00      720 00     2050 00      770 00         5
     4        750 00      620 00      950 00      570 00         1
     5        950 00      570 00     2050 00      586 50         4
     6         50 00      610 00      790 00      610 00         2
     7         50 00      600 00      830 00      600 00         3
     8         50 00      590 00      870 00      590 00         4
ISOTROPIC SOIL PARAMETERS
  5 Type(s) of Soil
 Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez
 Type Unit Wt  Unit Wt  Intercept   Angle  Pressure Constant  Surface
  No   (pcf)    (pcf)     (psf)     (deg)    Param    (psf)      No
   1   113 5    121 0    3000 0      0 0     0 00      0 0        1
   2   121 0    125 5    1500 0      0 0     0 00      0 0        1
   3   121 0    125 5    2000 0      0 0     0 00      0 0        1
   4   121 0    125 5    3000 0      0 0     0 00      0 0        1
   5    50 0     60 0     150 0     22 0     0 00      0 0        1
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Circular Surfaces, Has Been Specified
 625 Trial Surfaces Have Been Generated
  25 Surfaces Initiate From Each Of 25 Points Equally Spaced
 Along The Ground Surface Between  X = 600 00 ft
                              and  X = 850 00 ft
 Each Surface Terminates Between   X =1100 00 ft
                              and  X =1250 00 ft
 Unless Further Limitations Were Imposed, The Minimum Elevation
 At Which A Surface Extends Is  Y =  0 00 ft
 10 00 ft  Line Segments Define Each Trial Failure Surface
 Following Are Displayed The Ten Most Critical Of The Trial
       Failure Surfaces Examined   They Are Ordered - Most Critical
       First
       * * Safety Factors Are Calculated By The Modified Bishop Method * *
       Failure Surface Specified By 47 Coordinate Points
         Point       X-Surf      Y-Surf
          No          (ft)        (ft)
           1        756 25      621 56
           2        765 92      619 02
           3        775 65      616 69
           4        785 42      614 58
           5        795 24      612 67
           6        805 10      610 99
           7        814 99      609 52
           8        824 91      608 26
           9        834 85      607 22
          10        844 82      606 40
```

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11	854 80	605 80
12	864 79	605 42
13	874 79	605 25
14	884 79	605 30
15	894 79	605 58
16	904 78	606 07
17	914 75	606 77
18	924 71	607 70
19	934 64	608 84
20	944 55	610 20
21	954 43	611 78
22	964 26	613 57
23	974 06	615 57
24	983 81	617 79
25	993 51	620 23
26	1003 16	622 87
27	1012 74	625 72
28	1022 26	628 78
29	1031 71	632 05
30	1041 09	635 53
31	1050 39	639 21
32	1059 60	643 09
33	1068 73	647 17
34	1077 77	651 45
35	1086 71	655 93
36	1095 55	660 60
37	1104 29	665 46
38	1112 92	670 51
39	1121 44	675 75
40	1129 84	681 18
41	1138 12	586 78
42	1146 27	692 57
43	1154 30	698 53
44	1162 20	704 67
45	1169 96	710 98
46	1177 58	717 46
47	1182 47	721 80

Circle Center At X = 877 4 , Y = 1062 9 and Radius, 457 7

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Individual data on the 47 slices

Slice No	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Force Tnorm (lbs)	Force Ttan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	9 7	1199 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
2	9 7	3568 6	0 0	0 0	0 0	0 0	0 0	0 0	0 0
3	9 8	5863 5	0 0	0 0	0 0	0 0	0 0	0 0	0 0
4	9 8	8078 1	0 0	0 0	0 0	0 0	0 0	0 0	0 0
5	9 9	10206 8	0 0	0 0	0 0	0 0	0 0	0 0	0 0
6	9 9	12244 3	0 0	0 0	0 0	0 0	0 0	0 0	0 0
7	9 9	14185 7	0 0	0 0	0 0	0 0	0 0	0 0	0 0
8	9 9	16026 5	0 0	0 0	0 0	0 0	0 0	0 0	0 0
9	10 0	17762 5	0 0	0 0	0 0	0 0	0 0	0 0	0 0
10	10 0	19389 7	0 0	0 0	0 0	0 0	0 0	0 0	0 0
11	10 0	20904 4	0 0	0 0	0 0	0 0	0 0	0 0	0 0
12	10 0	22303 7	0 0	0 0	0 0	0 0	0 0	0 0	0 0
13	10 0	23584 6	0 0	0 0	0 0	0 0	0 0	0 0	0 0
14	10 0	24744 5	0 0	0 0	0 0	0 0	0 0	0 0	0 0
15	10 0	25781 3	0 0	0 0	0 0	0 0	0 0	0 0	0 0
16	10 0	26693 5	0 0	0 0	0 0	0 0	0 0	0 0	0 0
17	10 0	27479 6	0 0	0 0	0 0	0 0	0 0	0 0	0 0
18	9 9	28138 5	0 0	0 0	0 0	0 0	0 0	0 0	0 0
19	9 9	28670 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
20	9 9	29073 3	0 0	0 0	0 0	0 0	0 0	0 0	0 0
21	9 8	29349 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
22	9 8	29497 7	0 0	0 0	0 0	0 0	0 0	0 0	0 0
23	9 8	29520 2	0 0	0 0	0 0	0 0	0 0	0 0	0 0
24	9 7	29417 6	0 0	0 0	0 0	0 0	0 0	0 0	0 0

25	9 6	29191 9	0 0	0 0	0 0	0 0	0 0	0 0	0 0
26	9 6	28845 1	0 0	0 0	0 0	0 0	0 0	0 0	0 0
27	9 5	28379 5	0 0	0 0	0 0	0 0	0 0	0 0	0 0
28	9 5	27797 8	0 0	0 0	0 0	0 0	0 0	0 0	0 0
29	9 4	27103 6	0 0	0 0	0 0	0 0	0 0	0 0	0 0
30	9 3	26300 2	0 0	0 0	0 0	0 0	0 0	0 0	0 0
31	9 2	25391 1	0 0	0 0	0 0	0 0	0 0	0 0	0 0
32	9 1	24381 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
33	9 0	23273 8	0 0	0 0	0 0	0 0	0 0	0 0	0 0
34	8 9	22074 9	0 0	0 0	0 0	0 0	0 0	0 0	0 0
35	8 8	20789 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
36	8 7	19421 6	0 0	0 0	0 0	0 0	0 0	0 0	0 0
37	8 6	17978 2	0 0	0 0	0 0	0 0	0 0	0 0	0 0
38	8 5	16465 2	0 0	0 0	0 0	0 0	0 0	0 0	0 0
39	8 4	14888 6	0 0	0 0	0 0	0 0	0 0	0 0	0 0
40	8 3	13254 5	0 0	0 0	0 0	0 0	0 0	0 0	0 0
41	8 2	11570 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
42	3 7	4764 9	0 0	0 0	0 0	0 0	0 0	0 0	0 0
43	4 3	4986 9	0 0	0 0	0 0	0 0	0 0	0 0	0 0
44	7 9	7443 7	0 0	0 0	0 0	0 0	0 0	0 0	0 0
45	7 8	5070 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
46	7 6	2706 2	0 0	0 0	0 0	0 0	0 0	0 0	0 0
47	4 9	499 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0

Failure Surface Specified By 45 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	777 08	626 77
2	786 83	624 51
3	796 61	622 47
4	806 44	620 63
5	816 31	619 01
6	826 21	617 61
7	836 14	616 42
8	846 10	615 45
9	856 07	614 69
10	866 05	614 15
11	876 05	613 83
12	886 05	613 72
13	896 05	613 84
14	906 04	614 16
15	916 03	614 71
16	926 00	615 47
17	935 95	616 45
18	945 88	617 65
19	955 78	619 06
20	965 64	620 69
21	975 47	622 53
22	985 26	624 58
23	995 00	626 84
24	1004 69	629 32
25	1014 32	632 01
26	1023 89	634 90
27	1033 40	638 00
28	1042 84	641 31
29	1052 20	644 82
30	1061 48	648 54
31	1070 69	652 45
32	1079 80	656 57
33	1088 82	660 88
34	1097 75	665 39
35	1106 58	670 09
36	1115 30	674 98
37	1123 91	680 05
38	1132 41	685 32
39	1140 80	690 77
40	1149 07	696 40
41	1157 21	702 20
42	1165 22	708 19

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43	1173 10	714 34
44	1180 85	720 67
45	1182 16	721 79

C1rcle Center At X = 885 9 , Y = 1073 9 and Rad1us, 460 2

*** 2 200 ***

Fa1lure Surface Spec1f1ed By 46 Coord1nate Po1nts

Po1nt No	X-Surf (ft)	Y-Surf (ft)
1	766 67	624 17
2	776 16	621 03
3	785 74	618 15
4	795 38	615 50
5	805 09	613 11
6	814 86	610 96
7	824 68	609 07
8	834 54	607 42
9	844 44	606 03
10	854 38	604 89
11	864 34	604 01
12	874 32	603 38
13	884 31	603 01
14	894 31	602 89
15	904 31	603 03
16	914 30	603 43
17	924 28	604 08
18	934 24	604 98
19	944 17	606 14
20	954 07	607 56
21	963 93	609 22
22	973 75	611 14
23	983 51	613 31
24	993 21	615 73
25	1002 85	618 39
26	1012 42	621 31
27	1021 91	624 46
28	1031 31	627 86
29	1040 63	631 49
30	1049 85	635 36
31	1058 97	639 47
32	1067 98	643 81
33	1076 87	648 38
34	1085 65	653 17
35	1094 30	658 19
36	1102 82	663 43
37	1111 20	668 88
38	1119 44	674 55
39	1127 53	680 42
40	1135 47	686 50
41	1143 25	692 78
42	1150 87	699 26
43	1158 32	705 93
44	1165 60	712 79
45	1172 70	719 83
46	1174 14	721 34

C1rcle Center At X = 893 9 , Y = 993 7 and Rad1us, 390 8

*** 2 214 ***

Fa1lure Surface Spec1f1ed By 45 Coord1nate Po1nts

Po1nt No	X-Surf (ft)	Y-Surf (ft)
1	756 25	621 56
2	765 70	618 30
3	775 24	615 30
4	784 86	612 56
5	794 55	610 09
6	804 30	607 87
7	814 11	605 92
8	823 97	604 24
9	833 87	602 83

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10	843 80	601 69
11	853 76	600 81
12	863 75	600 21
13	873 74	599 88
14	883 74	599 82
15	893 74	600 04
16	903 73	600 52
17	913 70	601 28
18	923 64	602 30
19	933 56	603 60
20	943 44	605 16
21	953 27	607 00
22	963 04	609 10
23	972 76	611 46
24	982 41	614 09
25	991 98	616 98
26	1001 47	620 13
27	1010 88	623 53
28	1020 18	627 19
29	1029 39	631 10
30	1038 48	635 26
31	1047 46	639 66
32	1056 32	644 31
33	1065 04	649 19
34	1073 63	654 31
35	1082 08	659 67
36	1090 38	665 25
37	1098 52	671 05
38	1106 50	677 07
39	1114 32	683 31
40	1121 96	689 75
41	1129 43	696 41
42	1136 71	703 26
43	1143 81	710 31
44	1150 71	717 55
45	1153 08	720 17

Circle Center At X = 880 9 , Y = 967 8 and Radius, 368 0

*** 2 219 ***

Failure Surface Specified By 42 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	766 67	624 17
2	776 57	622 80
3	786 51	621 63
4	796 46	620 65
5	806 43	619 86
6	816 41	619 27
7	826 40	618 86
8	836 40	618 65
9	846 40	618 63
10	856 40	618 80
11	866 39	619 16
12	876 37	619 71
13	886 35	620 46
14	896 30	621 40
15	906 24	622 53
16	916 15	623 85
17	926 04	625 36
18	935 89	627 06
19	945 71	628 94
20	955 49	631 02
21	965 23	633 29
22	974 93	635 74
23	984 57	638 37
24	994 17	641 20
25	1003 71	644 20
26	1013 18	647 39
27	1022 60	650 76

28	1031 95	654 31
29	1041 23	658 04
30	1050 43	661 94
31	1059 56	666 03
32	1068 61	670 28
33	1077 57	674 71
34	1086 45	679 32
35	1095 24	684 09
36	1103 94	689 03
37	1112 53	694 13
38	1121 03	699 40
39	1129 43	704 83
40	1137 72	710 43
41	1145 90	716 18
42	1151 22	720 07

Cırcle Center At X = 842 5 , Y = 1139 0 and Radıus, 520 3

*** 2 227 ***

Faılure Surface Specıfıed By 40 Coordınate Poınts

Poınt No	X-Surf (ft)	Y-Surf (ft)
1	766 67	624 17
2	776 33	621 61
3	786 07	619 30
4	795 85	617 26
5	805 69	615 48
6	815 58	613 96
7	825 50	612 70
8	835 45	611 71
9	845 42	610 99
10	855 41	610 53
11	865 41	610 33
12	875 41	610 40
13	885 41	610 74
14	895 39	611 35
15	905 35	612 22
16	915 28	613 35
17	925 19	614 75
18	935 05	616 41
19	944 86	618 33
20	954 62	620 52
21	964 32	622 96
22	973 94	625 66
23	983 50	628 62
24	992 97	631 82
25	1002 35	635 28
26	1011 64	638 99
27	1020 82	642 94
28	1029 90	647 14
29	1038 86	651 58
30	1047 70	656 25
31	1056 42	661 16
32	1065 00	666 30
33	1073 44	671 66
34	1081 73	677 25
35	1089 87	683 05
36	1097 86	689 07
37	1105 68	695 30
38	1113 33	701 74
39	1120 81	708 38
40	1127 11	714 28

Cırcle Center At X = 867 7 , Y = 986 0 and Radıus, 375 6

*** 2 233 ***

Faılure Surface Specıfıed By 45 Coordınate Poınts

Poınt No	X-Surf (ft)	Y-Surf (ft)
1	787 50	629 38
2	797 06	626 45
3	806 69	623 75

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4	816 39	621 30
5	826 14	619 09
6	835 95	517 13
7	845 80	615 41
8	855 69	613 93
9	865 61	612 70
10	875 56	611 72
11	885 54	610 99
12	895 52	610 50
13	905 52	610 26
14	915 52	610 28
15	925 52	610 54
16	935 51	611 05
17	945 48	611 80
18	955 43	612 81
19	965 35	614 06
20	975 23	615 56
21	985 08	617 30
22	994 88	619 29
23	1004 63	621 52
24	1014 32	624 00
25	1023 94	626 71
26	1033 50	629 67
27	1042 97	632 85
28	1052 37	636 28
29	1061 68	639 94
30	1070 89	643 82
31	1080 00	647 94
32	1089 01	652 28
33	1097 91	656 84
34	1106 69	661 63
35	1115 35	666 63
36	1123 89	671 84
37	1132 29	677 27
38	1140 55	682 90
39	1148 67	688 74
40	1156 64	694 77
41	1164 46	701 00
42	1172 12	707 43
43	1179 62	714 04
44	1186 96	720 84
45	1188 28	722 13

Circle Center At X = 910 0 , Y = 1012 2 and Radius, 401 9

*** 2 233 ***

Failure Surface Specified By 40 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	766 67	624 17
2	776 47	622 17
3	786 31	620 41
4	796 19	618 89
5	806 11	617 61
6	816 06	616 56
7	826 02	615 76
8	836 01	615 19
9	846 00	614 87
10	856 00	614 78
11	866 00	614 94
12	875 99	615 33
13	885 97	615 97
14	895 93	616 85
15	905 87	617 97
16	915 78	619 32
17	925 65	620 92
18	935 48	622 75
19	945 27	624 81
20	955 00	627 11
21	964 67	629 65

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   22        974 28       632 42
   23        983 82       635 41
   24        993 29       638 64
   25       1002 67       642 09
   26       1011 97       645 77
   27       1021 18       649 67
   28       1030 29       653 79
   29       1039 30       658 13
   30       1048 20       662 69
   31       1055 99       667 45
   32       1065 67       672 43
   33       1074 22       677 62
   34       1082 64       683 00
   35       1090 93       688 59
   36       1099 09       694 38
   37       1107 10       700 37
   38       1114 97       706 54
   39       1122 68       712 90
   40       1123 12       713 28
Circle Center At X =  854 5 , Y = 1030 3  and Radius,   415 5
      ***      2 240      ***
Failure Surface Specified By 40 Coordinate Points
  Point       X-Surf       Y-Surf
   No          (ft)         (ft)
    1        797 92       631 98
    2        807 48       629 06
    3        817 12       626 41
    4        826 84       624 04
    5        836 62       621 94
    6        846 45       620 12
    7        856 33       618 58
    8        866 25       617 32
    9        876 20       616 35
   10        886 18       615 65
   11        896 17       615 24
   12        906 17       615 11
   13        916 17       615 27
   14        926 16       615 71
   15        936 13       616 43
   16        946 08       617 43
   17        956 00       618 72
   18        965 88       620 29
   19        975 70       622 13
   20        985 48       624 26
   21        995 18       626 66
   22       1004 82       629 33
   23       1014 37       632 28
   24       1023 84       635 50
   25       1033 22       638 98
   26       1042 49       642 73
   27       1051 65       646 74
   28       1060 69       651 00
   29       1069 61       655 53
   30       1078 40       660 30
   31       1087 05       665 32
   32       1095 55       670 59
   33       1103 90       676 09
   34       1112 09       681 83
   35       1120 11       687 79
   36       1127 97       693 98
   37       1135 64       700 40
   38       1143 13       707 02
   39       1150 43       713 86
   40       1157 01       720 39
Circle Center At X =  905 7 , Y =  967 7  and Radius,   352 6
      ***      2 241      ***
Failure Surface Specified By 41 Coordinate Points
  Point       X-Surf       Y-Surf
```

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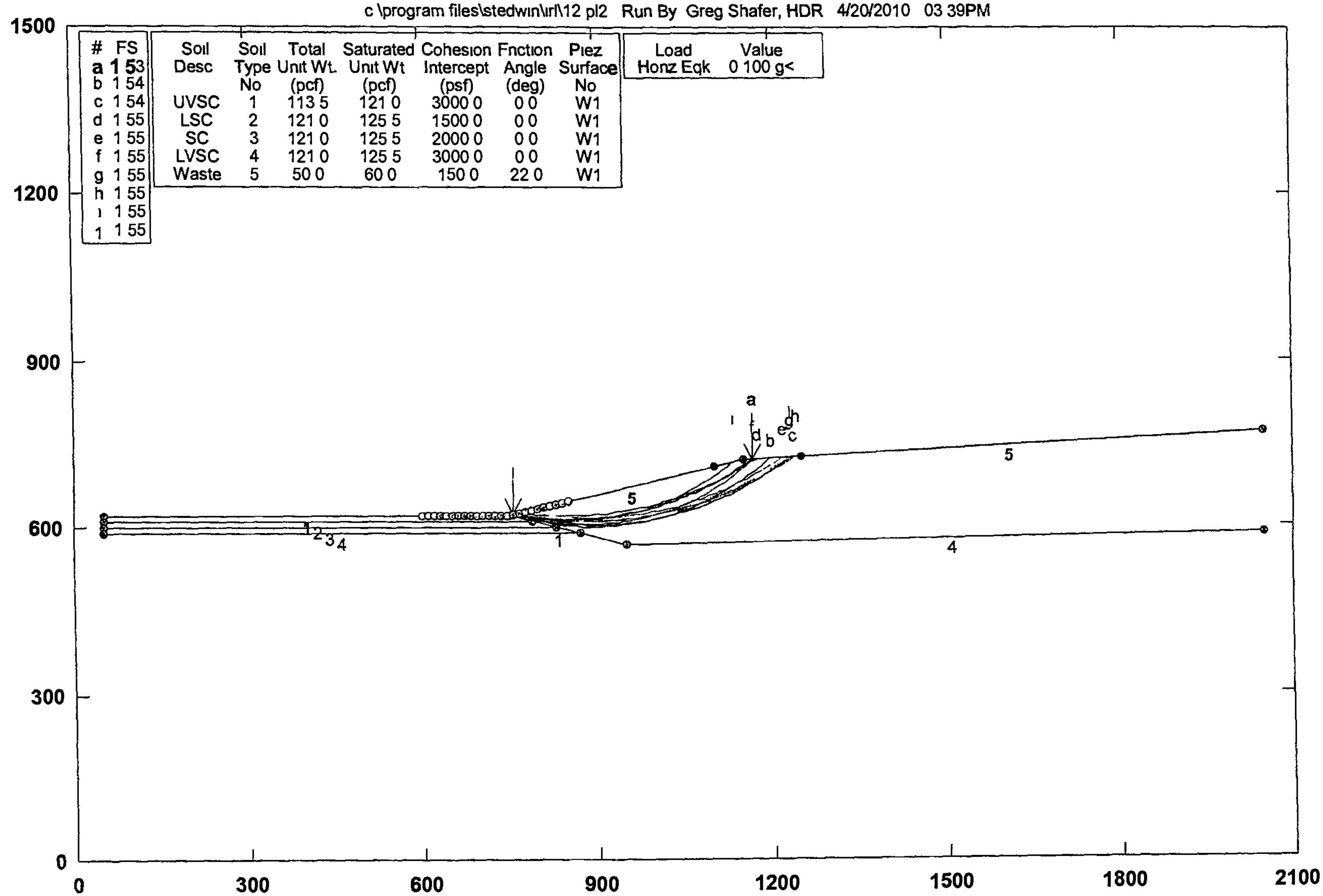
No	(ft)	(ft)
1	777 08	626 77
2	787 00	625 49
3	796 94	624 40
4	806 90	623 50
5	816 88	622 80
6	826 86	622 29
7	836 86	621 97
8	846 86	621 84
9	856 86	621 90
10	866 85	622 16
11	876 84	622 61
12	886 82	623 26
13	896 79	624 09
14	906 74	625 12
15	916 66	626 34
16	926 56	627 75
17	936 43	629 35
18	946 27	631 14
19	956 07	633 12
20	965 83	635 29
21	975 55	637 64
22	985 22	640 18
23	994 85	642 91
24	1004 41	645 83
25	1013 92	648 92
26	1023 37	652 21
27	1032 75	655 67
28	1042 06	659 31
29	1051 30	663 13
30	1060 47	667 13
31	1069 56	671 30
32	1078 56	675 65
33	1087 48	680 17
34	1096 31	684 87
35	1105 05	689 73
36	1113 69	694 76
37	1122 24	699 95
38	1130 68	705 31
39	1139 02	710 83
40	1147 25	716 51
41	1152 28	720 13

Circle Center At X = 848 5 , Y = 1140 6 and Radius, 518 8

*** 2 244 ***

Intermountam Regıonal Landfill Fıll Slope 1

c \program files\stedwın\irl\12 pl2 Run By Greg Shafer, HDR 4/20/2010 03 39PM



#	FS
a	1 53
b	1 54
c	1 54
d	1 55
e	1 55
f	1 55
g	1 55
h	1 55
ı	1 55
1	1 55

Soıl Desc	Soıl Type No	Total Unıt Wt. (pcf)	Saturated Unıt Wt (pcf)	Cohesıon Intercept (psf)	Fnctıon Angle (deg)	Pıez Surface No
UVSC	1	113 5	121 0	3000 0	0 0	W1
LSC	2	121 0	125 5	1500 0	0 0	W1
SC	3	121 0	125 5	2000 0	0 0	W1
LVSC	4	121 0	125 5	3000 0	0 0	W1
Waste	5	50 0	60 0	150 0	22 0	W1

Load	Value
Honz Eqk	0 100 g<

PCSTABL7 FSmın=1 53

Safety Factors Are Calculated By The Modıfied Bıshop Method

STED

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** PCSTABL7 **
by
Purdue University
--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer s Method of Slices

Run Date   4/20/2010
Time of Run   03 39PM
Run By   Greg Shafer, HDR
Input Data Filename   C 12 in
Output Filename   C 12 OUT
Unit   ENGLISH
Plotted Output Filename   C 12 PLT
PROBLEM DESCRIPTION   Intermountain Regional Landfill
Fill Slope 1

BOUNDARY COORDINATES
Note User origin value specified
Add 0 00 to X-values and 0 00 to Y-values listed

3 Top   Boundaries
8 Total Boundaries

Boundary No	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	50 00	620 00	750 00	620 00	1
2	750 00	620 00	1150 00	720 00	5
3	1150 00	720 00	2050 00	770 00	5
4	750 00	620 00	950 00	570 00	1
5	950 00	570 00	2050 00	586 50	4
6	50 00	610 00	790 00	610 00	2
7	50 00	600 00	830 00	600 00	3
8	50 00	590 00	870 00	590 00	4

ISOTROPIC SOIL PARAMETERS
5 Type(s) of Soil

Soil Type No	Total Unit Wt (pcf)	Saturated Unit Wt (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param	Pressure Constant (psf)	Piez Surface No
1	113 5	121 0	3000 0	0 0	0 00	0 0	1
2	121 0	125 5	1500 0	0 0	0 00	0 0	1
3	121 0	125 5	2000 0	0 0	0 00	0 0	1
4	121 0	125 5	3000 0	0 0	0 00	0 0	1
5	50 0	60 0	150 0	22 0	0 00	0 0	1

A Horizontal Earthquake Loading Coefficient
Of0 100 Has Been Assigned
A Vertical Earthquake Loading Coefficient
Of0 000 Has Been Assigned
Cavitation Pressure =   0 0 (psf)
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified
625 Trial Surfaces Have Been Generated
25 Surfaces Initiate From Each Of 25 Points Equally Spaced
Along The Ground Surface Between X = 600 00 ft
and X = 850 00 ft
Each Surface Terminates Between   X =1100 00 ft
and   X =1250 00 ft
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0 00 ft
10 00 ft Line Segments Define Each Trial Failure Surface
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Examined They Are Ordered - Most Critical
First
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Failure Surface Specified By 45 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	756 25	621 56
2	766 11	619 87
3	775 99	618 37
4	785 91	617 06
5	795 84	615 93

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6	805 80	615 00
7	815 77	614 27
8	825 76	613 72
9	835 75	613 36
10	845 75	613 20
11	855 75	613 23
12	865 75	613 45
13	875 74	613 87
14	885 72	614 47
15	895 69	615 27
16	905 64	616 26
17	915 57	617 44
18	925 48	618 81
19	935 35	620 37
20	945 20	622 12
21	955 01	624 06
22	964 78	626 18
23	974 51	628 50
24	984 19	631 00
25	993 82	633 68
26	1003 40	636 56
27	1012 92	639 61
28	1022 39	642 85
29	1031 78	646 26
30	1041 11	649 86
31	1050 37	653 64
32	1059 56	557 59
33	1068 67	661 72
34	1077 69	666 03
35	1086 63	670 50
36	1095 49	675 15
37	1104 25	679 97
38	1112 92	684 95
39	1121 49	690 10
40	1129 96	695 42
41	1138 33	700 89
42	1146 59	706 53
43	1154 74	712 32
44	1162 78	718 27
45	1166 19	720 90

Circle Center At X = 849 2 , Y = 1133 5 and Radius, 520 4

*** 1 528 ***

Individual data on the 45 slices

Slice No	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Force Tnorm (lbs)	Force Ttan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	9 9	1024 0	0 0	0 0	0 0	0 0	102 4	0 0	0 0
2	9 9	3036 7	0 0	0 0	0 0	0 0	303 7	0 0	0 0
3	9 9	4969 3	0 0	0 0	0 0	0 0	496 9	0 0	0 0
4	9 9	6818 5	0 0	0 0	0 0	0 0	681 8	0 0	0 0
5	10 0	8580 7	0 0	0 0	0 0	0 0	858 1	0 0	0 0
6	10 0	10252 7	0 0	0 0	0 0	0 0	1025 3	0 0	0 0
7	10 0	11831 9	0 0	0 0	0 0	0 0	1183 2	0 0	0 0
8	10 0	13315 4	0 0	0 0	0 0	0 0	1331 5	0 0	0 0
9	10 0	14700 8	0 0	0 0	0 0	0 0	1470 1	0 0	0 0
10	10 0	15985 9	0 0	0 0	0 0	0 0	1598 6	0 0	0 0
11	10 0	17169 0	0 0	0 0	0 0	0 0	1716 9	0 0	0 0
12	10 0	18248 1	0 0	0 0	0 0	0 0	1824 8	0 0	0 0
13	10 0	19221 9	0 0	0 0	0 0	0 0	1922 2	0 0	0 0
14	10 0	20089 4	0 0	0 0	0 0	0 0	2008 9	0 0	0 0
15	10 0	20849 3	0 0	0 0	0 0	0 0	2084 9	0 0	0 0
16	9 9	21501 3	0 0	0 0	0 0	0 0	2150 1	0 0	0 0
17	9 9	22044 9	0 0	0 0	0 0	0 0	2204 5	0 0	0 0
18	9 9	22479 7	0 0	0 0	0 0	0 0	2248 0	0 0	0 0
19	9 8	22806 3	0 0	0 0	0 0	0 0	2280 6	0 0	0 0
20	9 8	23024 6	0 0	0 0	0 0	0 0	2302 5	0 0	0 0
21	9 8	23135 6	0 0	0 0	0 0	0 0	2313 6	0 0	0 0

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22	9 7	23140 1	0 0	0 0	0 0	0 0	2314 0	0 0	0 0
23	9 7	23039 1	0 0	0 0	0 0	0 0	2303 9	0 0	0 0
24	9 6	22834 1	0 0	0 0	0 0	0 0	2283 4	0 0	0 0
25	9 6	22526 8	0 0	0 0	0 0	0 0	2252 7	0 0	0 0
26	9 5	22119 0	0 0	0 0	0 0	0 0	2211 9	0 0	0 0
27	9 5	21613 0	0 0	0 0	0 0	0 0	2161 3	0 0	0 0
28	9 4	21011 0	0 0	0 0	0 0	0 0	2101 1	0 0	0 0
29	9 3	20315 7	0 0	0 0	0 0	0 0	2031 6	0 0	0 0
30	9 3	19530 1	0 0	0 0	0 0	0 0	1953 0	0 0	0 0
31	9 2	18656 9	0 0	0 0	0 0	0 0	1865 7	0 0	0 0
32	9 1	17699 8	0 0	0 0	0 0	0 0	1770 0	0 0	0 0
33	9 0	16662 1	0 0	0 0	0 0	0 0	1666 2	0 0	0 0
34	8 9	15547 4	0 0	0 0	0 0	0 0	1554 7	0 0	0 0
35	8 9	14360 1	0 0	0 0	0 0	0 0	1436 0	0 0	0 0
36	8 8	13103 9	0 0	0 0	0 0	0 0	1310 4	0 0	0 0
37	8 7	11783 2	0 0	0 0	0 0	0 0	1178 3	0 0	0 0
38	8 6	10402 8	0 0	0 0	0 0	0 0	1040 3	0 0	0 0
39	8 5	8966 9	0 0	0 0	0 0	0 0	896 7	0 0	0 0
40	8 4	7480 7	0 0	0 0	0 0	0 0	748 1	0 0	0 0
41	8 3	5949 0	0 0	0 0	0 0	0 0	594 9	0 0	0 0
42	3 4	2016 2	0 0	0 0	0 0	0 0	201 6	0 0	0 0
43	4 7	2251 5	0 0	0 0	0 0	0 0	225 1	0 0	0 0
44	8 0	2085 4	0 0	0 0	0 0	0 0	208 5	0 0	0 0
45	3 4	207 8	0 0	0 0	0 0	0 0	20 8	0 0	0 0

Failure Surface Specified By 49 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	756 25	621 56
2	765 81	618 62
3	775 43	615 89
4	785 11	613 38
5	794 84	611 09
6	804 62	609 02
7	814 45	607 17
8	824 32	605 55
9	834 22	604 15
10	844 15	602 97
11	854 11	602 02
12	864 08	601 30
13	874 07	600 80
14	884 06	600 53
15	894 06	600 48
16	904 06	600 66
17	914 05	601 07
18	924 03	601 70
19	934 00	602 56
20	943 94	603 65
21	953 85	604 96
22	963 73	606 49
23	973 58	608 25
24	983 38	610 23
25	993 13	612 43
26	1002 84	614 86
27	1012 48	617 50
28	1022 06	620 36
29	1031 58	623 43
30	1041 02	626 72
31	1050 39	630 23
32	1059 67	633 94
33	1068 87	637 87
34	1077 98	642 00
35	1085 99	546 34
36	1095 90	650 88
37	1104 70	655 62
38	1113 40	660 55
39	1121 98	665 69
40	1130 44	671 02
41	1138 78	676 54

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42	1146 99	682 24
43	1155 08	688 13
44	1163 02	694 20
45	1170 83	700 45
46	1178 49	706 88
47	1186 00	713 48
48	1193 37	720 24
49	1195 76	722 54

Circle Center At X = 891 1 Y = 1041 9 and Radius, 441 4

*** 1 540 ***

Failure Surface Specified By 52 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	756 25	621 56
2	766 07	619 66
3	775 91	617 91
4	785 79	616 33
5	795 69	614 91
6	805 61	613 65
7	815 55	612 55
8	825 50	611 62
9	835 47	610 85
10	845 45	610 24
11	855 44	609 79
12	865 44	609 51
13	875 44	609 39
14	885 44	609 44
15	895 44	609 65
16	905 43	610 02
17	915 42	610 55
18	925 39	611 25
19	935 36	612 11
20	945 30	613 13
21	955 23	614 32
22	965 14	615 67
23	975 03	617 18
24	984 89	618 85
25	994 72	620 68
26	1004 52	622 67
27	1014 28	624 83
28	1024 01	627 14
29	1033 70	629 61
30	1043 35	632 23
31	1052 95	635 02
32	1062 51	637 96
33	1072 02	641 06
34	1081 48	644 31
35	1090 88	647 72
36	1100 22	651 28
37	1109 51	654 99
38	1118 73	658 86
39	1127 89	662 87
40	1136 98	667 03
41	1146 01	671 34
42	1154 96	675 80
43	1163 83	680 40
44	1172 64	685 15
45	1181 36	690 04
46	1190 00	695 08
47	1198 56	700 25
48	1207 03	705 56
49	1215 41	711 01
50	1223 71	716 60
51	1231 91	722 32
52	1235 25	724 74

Circle Center At X = 877 7 , Y = 1221 2 and Radius, 611 8

*** 1 541 ***

Failure Surface Specified By 44 Coordinate Points

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Point No	X-Surf (ft)	Y-Surf (ft)
1	766 67	624 17
2	776 59	622 95
3	786 54	621 89
4	796 50	621 01
5	806 47	520 30
6	816 46	619 76
7	826 45	619 39
8	836 45	619 20
9	845 45	619 17
10	856 45	619 31
11	866 44	619 63
12	876 43	620 12
13	886 41	620 77
14	896 38	621 60
15	906 33	622 60
16	916 26	623 77
17	926 17	625 11
18	936 05	626 61
19	945 91	628 29
20	955 74	630 13
21	965 54	632 15
22	975 30	634 33
23	985 02	636 67
24	994 70	639 19
25	1004 33	641 86
26	1013 92	644 71
27	1023 46	647 71
28	1032 94	650 88
29	1042 37	654 21
30	1051 74	657 70
31	1061 05	661 35
32	1070 30	665 16
33	1079 47	669 13
34	1088 59	673 25
35	1097 62	677 53
36	1106 59	681 96
37	1115 47	686 55
38	1124 28	691 29
39	1133 01	696 17
40	1141 64	701 21
41	1150 20	706 39
42	1158 66	711 72
43	1167 03	717 19
44	1173 05	721 28

Circle Center At X = 843 0 , Y = 1203 5 and Radius, 584 4

*** 1 545 ***

Failure Surface Specified By 48 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	777 08	626 77
2	786 91	624 91
3	796 77	623 23
4	806 65	621 72
5	816 56	620 39
6	826 50	619 24
7	836 45	618 27
8	846 42	617 47
9	856 40	616 85
10	866 39	616 41
11	876 39	616 14
12	886 39	616 06
13	896 39	616 15
14	906 38	616 42
15	916 37	616 87
16	926 35	617 50
17	936 32	618 31

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18	946 27	619 29
19	956 20	620 45
20	966 11	621 79
21	976 00	623 31
22	985 85	625 00
23	995 68	626 86
24	1005 47	628 91
25	1016 22	631 12
26	1024 93	633 51
27	1034 59	636 07
28	1044 21	638 81
29	1053 78	641 71
30	1063 30	644 79
31	1072 76	648 04
32	1082 16	651 45
33	1091 49	655 03
34	1100 76	658 78
35	1109 97	662 69
36	1119 10	666 76
37	1128 16	671 00
38	1137 14	675 40
39	1146 04	679 95
40	1154 86	684 67
41	1163 59	689 54
42	1172 24	694 57
43	1180 79	699 75
44	1189 25	705 08
45	1197 61	710 56
46	1205 88	716 20
47	1214 04	721 97
48	1216 37	723 69

Circle Center At X = 886 1 , Y = 1176 5 and Radius, 560 4
*** 1 545 ***
Failure Surface Specified By 45 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	766 67	624 17
2	776 22	621 21
3	785 85	618 51
4	795 54	616 04
5	805 29	613 83
6	815 10	611 86
7	824 95	610 14
8	834 84	608 68
9	844 77	607 46
10	854 72	606 50
11	864 69	605 80
12	874 68	605 34
13	884 68	605 14
14	894 68	605 20
15	904 68	605 51
16	914 66	606 07
17	924 63	606 89
18	934 57	607 96
19	944 48	609 28
20	954 36	610 86
21	964 19	612 68
22	973 97	614 76
23	983 70	617 08
24	993 36	619 65
25	1002 96	622 46
26	1012 48	625 52
27	1021 92	628 82
28	1031 27	632 35
29	1040 53	636 13
30	1049 70	640 14
31	1058 75	644 38
32	1067 70	648 85

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33	1076 53	653 54
34	1086 23	658 46
35	1093 81	663 60
36	1102 25	668 95
37	1110 57	674 52
38	1118 73	680 30
39	1126 74	686 28
40	1134 60	692 46
41	1142 30	698 84
42	1149 83	705 42
43	1157 20	712 19
44	1164 39	719 14
45	1166 12	720 90

Circle Center At X = 887 5 , Y = 998 3 and Radius, 393 2

*** 1 546 ***

Failure Surface Specified By 52 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	756 25	621 56
2	765 93	619 04
3	775 65	616 69
4	785 41	614 54
5	795 22	612 56
6	805 06	610 78
7	814 93	609 18
8	824 83	607 77
9	834 75	606 55
10	844 70	605 51
11	854 66	604 67
12	864 64	604 01
13	874 63	603 54
14	884 63	603 27
15	894 63	603 18
16	904 63	603 28
17	914 62	603 57
18	924 61	604 06
19	934 59	604 73
20	944 55	605 59
21	954 49	606 64
22	964 42	607 88
23	974 32	609 30
24	984 18	610 91
25	994 02	612 71
26	1003 82	614 70
27	1013 58	616 87
28	1023 30	619 23
29	1032 97	621 77
30	1042 59	624 50
31	1052 16	627 40
32	1061 67	630 49
33	1071 13	633 76
34	1080 51	637 20
35	1089 83	640 83
36	1099 08	644 63
37	1108 26	648 60
38	1117 36	652 75
39	1126 38	657 07
40	1135 31	661 56
41	1144 16	666 22
42	1152 92	671 05
43	1161 58	676 04
44	1170 15	681 19
45	1178 62	686 51
46	1186 99	691 99
47	1195 25	697 62
48	1203 40	703 41
49	1211 45	709 35
50	1219 37	715 45

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51	1227 18	721 69
52	1230 53	724 47

Circle Center At X = 894 2 , Y = 1130 0 and Radius, 526 9

*** 1 546 ***

Failure Surface Specified By 51 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	766 67	624 17
2	776 47	622 18
3	786 30	620 35
4	796 16	618 69
5	806 05	617 20
6	815 96	615 88
7	825 89	614 72
3	835 84	613 73
9	845 81	612 90
10	855 79	612 25
11	865 78	611 75
12	875 77	611 44
13	885 77	611 29
14	895 77	611 30
15	905 77	611 49
16	915 76	611 84
17	925 75	612 36
18	935 73	613 05
19	945 69	613 91
20	955 64	614 93
21	965 56	616 12
22	975 47	617 48
23	985 36	619 00
24	995 21	620 69
25	1005 04	622 55
26	1014 83	624 57
27	1024 59	626 76
28	1034 31	629 11
29	1043 99	631 62
30	1053 62	634 30
31	1063 21	637 13
32	1072 75	640 13
33	1082 24	643 29
34	1091 67	646 61
35	1101 05	650 08
36	1110 37	653 72
37	1119 62	657 51
38	1128 81	661 45
39	1137 93	665 55
40	1146 98	669 80
41	1155 96	674 20
42	1164 87	678 76
43	1173 69	683 46
44	1182 44	688 31
45	1191 10	693 31
46	1199 67	698 45
47	1208 16	703 73
48	1216 56	709 15
49	1224 87	714 73
50	1233 08	720 44
51	1239 36	724 96

Circle Center At X = 889 8 , Y = 1205 6 and Radius, 594 3

*** 1 553 ***

Failure Surface Specified By 42 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	756 25	621 56
2	766 02	619 41
3	775 83	617 48
4	785 68	615 78
5	795 58	614 32

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6	805 50	613 09
7	815 45	612 10
8	825 42	611 34
9	835 41	610 81
10	845 40	610 53
11	855 40	610 47
12	865 40	610 65
13	875 39	611 07
14	885 37	611 72
15	895 33	612 61
16	905 27	613 73
17	915 18	615 09
18	925 05	616 68
19	934 88	618 50
20	944 67	620 55
21	954 41	622 84
22	964 08	625 35
23	973 70	628 09
24	983 25	631 05
25	992 73	634 24
26	1002 13	637 65
27	1011 45	641 28
28	1020 68	645 13
29	1029 81	649 20
30	1038 85	653 48
31	1047 78	657 97
32	1056 61	662 68
33	1065 32	667 58
34	1073 92	672 70
35	1082 39	678 01
36	1090 73	683 52
37	1098 94	689 23
38	1107 02	695 13
39	1114 95	701 21
40	1122 74	707 49
41	1130 38	713 94
42	1132 19	715 55

Circle Center At X = 852 7 , Y = 1034 7 and Radius, 424 3

*** 1 553 ***

Failure Surface Specified By 49 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	777 08	626 77
2	786 91	624 89
3	796 76	623 18
4	806 64	621 64
5	816 54	620 26
6	826 47	619 06
7	836 42	618 03
8	846 38	617 17
9	856 36	616 49
10	866 34	615 97
11	876 34	615 63
12	886 34	615 45
13	896 34	615 45
14	906 34	615 63
15	916 33	615 97
16	926 32	616 49
17	936 29	617 17
18	946 26	618 03
19	956 20	619 06
20	966 13	620 26
21	976 04	621 64
22	985 92	623 18
23	995 77	624 89
24	1005 59	626 77
25	1015 38	628 82
26	1025 13	631 04

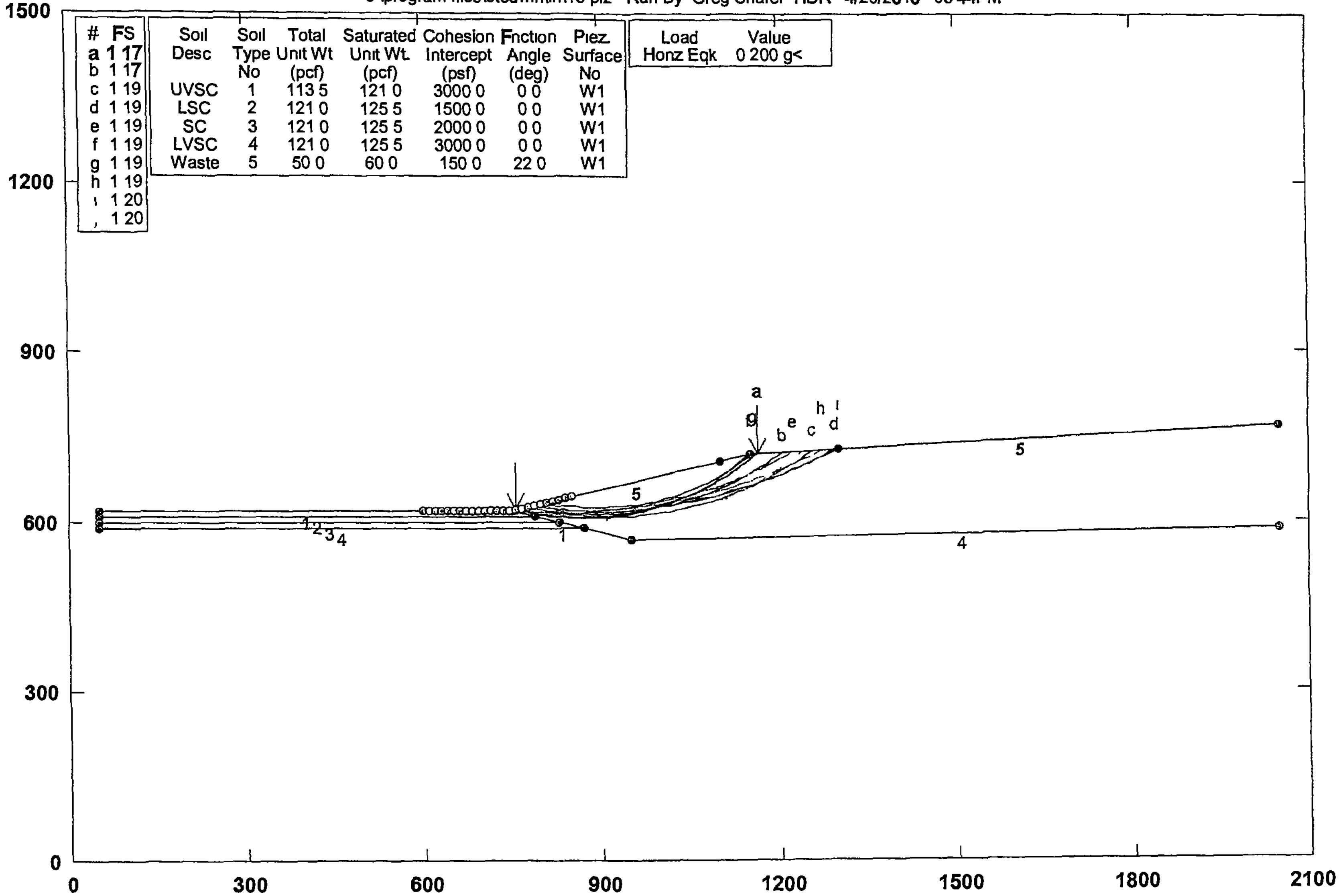
27	1034 84	633 42
28	1044 51	635 97
29	1054 13	638 69
30	1063 71	641 58
31	1073 23	644 62
32	1082 70	647 83
33	1092 12	651 21
34	1101 47	654 74
35	1110 76	658 44
36	1119 99	662 29
37	1129 15	666 30
38	1138 24	670 47
39	1147 26	674 80
40	1156 20	679 28
41	1165 06	683 91
42	1173 84	688 69
43	1182 54	693 63
44	1191 15	698 71
45	1199 67	703 94
46	1208 10	709 32
47	1216 44	714 84
48	1224 68	720 51
49	1230 22	724 46

Circle Center At X = 891 3 , Y = 1196 7 and Radius, 581 3

*** 1 554 ***

Intermountain Regional Landfill Fill Slope 1

c \program files\stedwin\irl\13 pl2 Run By Greg Shafer HDR 4/20/2010 03 44PM



#	FS
a	1 17
b	1 17
c	1 19
d	1 19
e	1 19
f	1 19
g	1 19
h	1 19
i	1 20
j	1 20

Soil Desc	Soil Type No	Total Unit Wt (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No
UVSC	1	113 5	121 0	3000 0	0 0	W1
LSC	2	121 0	125 5	1500 0	0 0	W1
SC	3	121 0	125 5	2000 0	0 0	W1
LVSC	4	121 0	125 5	3000 0	0 0	W1
Waste	5	50 0	60 0	150 0	22 0	W1

Load	Value
Horiz Eqk	0 200 g<

PCSTABL7 FSmin=1 17

Safety Factors Are Calculated By The Modified Bishop Method

STED

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** PCSTABL7 **
by
Purdue University
--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer s Method of Slices

Run Date 4/20/2010
Time of Run 03 44PM
Run By Greg Shafer, HDR
Input Data Filename C 13 in
Output Filename C 13 OUT
Unit ENGLISH
Plotted Output Filename C 13 PLT
PROBLEM DESCRIPTION Intermountain Regional Landfill
Fill Slope 1

BOUNDARY COORDINATES
Note User origin value specified
Add 0 00 to X-values and 0 00 to Y-values listed

3 Top Boundaries
8 Total Boundaries

Boundary No	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	50 00	620 00	750 00	620 00	1
2	750 00	620 00	1150 00	720 00	5
3	1150 00	720 00	2050 00	770 00	5
4	750 00	620 00	950 00	570 00	1
5	950 00	570 00	2050 00	586 50	4
6	50 00	610 00	790 00	610 00	2
7	50 00	600 00	830 00	600 00	3
8	50 00	590 00	870 00	590 00	4

ISOTROPIC SOIL PARAMETERS
5 Type(s) of Soil

Soil Type No	Total Unit Wt (pcf)	Saturated Unit Wt (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param	Pressure Constant (psf)	Piez Surface No
1	113 5	121 0	3000 0	0 0	0 00	0 0	1
2	121 0	125 5	1500 0	0 0	0 00	0 0	1
3	121 0	125 5	2000 0	0 0	0 00	0 0	1
4	121 0	125 5	3000 0	0 0	0 00	0 0	1
5	50 0	60 0	150 0	22 0	0 00	0 0	1

A Horizontal Earthquake Loading Coefficient
Of0 200 Has Been Assigned
A Vertical Earthquake Loading Coefficient
Of0 000 Has Been Assigned
Cavitation Pressure = 0 0 (psf)
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified
625 Trial Surfaces Have Been Generated
25 Surfaces Initiate From Each Of 25 Points Equally Spaced
Along The Ground Surface Between X = 600 00 ft
and X = 850 00 ft
Each Surface Terminates Between X =1100 00 ft
and X =1300 00 ft
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0 00 ft
10 00 ft Line Segments Define Each Trial Failure Surface
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Examined They Are Ordered - Most Critical
First
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Failure Surface Specified By 45 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	756 25	621 56
2	765 98	619 23
3	775 75	617 12
4	785 57	615 23
5	795 43	613 55

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6	805 32	612 10
7	815 24	610 86
8	825 19	609 85
9	835 16	609 06
10	845 15	608 49
11	855 14	608 15
12	865 14	608 03
13	875 14	608 13
14	885 13	608 45
15	895 12	609 00
16	905 09	609 77
17	915 04	610 76
18	924 97	611 97
19	934 86	613 41
20	944 73	615 06
21	954 55	616 93
22	964 33	619 03
23	974 06	621 34
24	983 73	623 86
25	993 35	626 60
26	1002 90	629 56
27	1012 39	632 72
28	1021 80	636 10
29	1031 13	639 69
30	1040 39	643 48
31	1049 55	647 48
32	1058 63	651 69
33	1067 60	656 09
34	1076 48	660 69
35	1085 25	665 49
36	1093 92	670 49
37	1102 47	675 67
38	1110 90	681 05
39	1119 21	686 61
40	1127 40	692 36
41	1135 45	698 28
42	1143 37	704 39
43	1151 15	710 67
44	1158 79	717 12
45	1162 86	720 71

Circle Center At X = 865 6 , Y = 1056 5 and Radius, 448 5

*** 1 168 ***

Individual data on the 45 slices

Slice No	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Force Tnorm (lbs)	Force Ttan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	9 7	1157 5	0 0	0 0	0 0	0 0	231 5	0 0	0 0
2	9 8	3440 2	0 0	0 0	0 0	0 0	688 0	0 0	0 0
3	9 8	5641 9	0 0	0 0	0 0	0 0	1128 4	0 0	0 0
4	9 9	7756 8	0 0	0 0	0 0	0 0	1551 4	0 0	0 0
5	9 9	9779 7	0 0	0 0	0 0	0 0	1955 9	0 0	0 0
6	9 9	11705 3	0 0	0 0	0 0	0 0	2341 1	0 0	0 0
7	9 9	13529 0	0 0	0 0	0 0	0 0	2705 8	0 0	0 0
8	10 0	15246 4	0 0	0 0	0 0	0 0	3049 3	0 0	0 0
9	10 0	16853 4	0 0	0 0	0 0	0 0	3370 7	0 0	0 0
10	10 0	18346 4	0 0	0 0	0 0	0 0	3669 3	0 0	0 0
11	10 0	19722 1	0 0	0 0	0 0	0 0	3944 4	0 0	0 0
12	10 0	20977 6	0 0	0 0	0 0	0 0	4195 5	0 0	0 0
13	10 0	22110 4	0 0	0 0	0 0	0 0	4422 1	0 0	0 0
14	10 0	23118 5	0 0	0 0	0 0	0 0	4623 7	0 0	0 0
15	10 0	24000 1	0 0	0 0	0 0	0 0	4800 0	0 0	0 0
16	10 0	24753 8	0 0	0 0	0 0	0 0	4950 8	0 0	0 0
17	9 9	25378 7	0 0	0 0	0 0	0 0	5075 7	0 0	0 0
18	9 9	25874 6	0 0	0 0	0 0	0 0	5174 9	0 0	0 0
19	9 9	26241 2	0 0	0 0	0 0	0 0	5248 2	0 0	0 0
20	9 8	26478 6	0 0	0 0	0 0	0 0	5295 7	0 0	0 0
21	9 8	26588 0	0 0	0 0	0 0	0 0	5317 6	0 0	0 0

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22	9 7	26570 1	0 0	0 0	0 0	0 0	5314 0	0 0	0 0
23	9 7	26426 8	0 0	0 0	0 0	0 0	5285 4	0 0	0 0
24	9 6	26159 7	0 0	0 0	0 0	0 0	5231 9	0 0	0 0
25	9 6	25771 1	0 0	0 0	0 0	0 0	5154 2	0 0	0 0
26	9 5	25264 0	0 0	0 0	0 0	0 0	5052 8	0 0	0 0
27	9 4	24641 3	0 0	0 0	0 0	0 0	4928 3	0 0	0 0
28	9 3	23906 6	0 0	0 0	0 0	0 0	4781 3	0 0	0 0
29	9 3	23063 3	0 0	0 0	0 0	0 0	4612 7	0 0	0 0
30	9 2	22116 0	0 0	0 0	0 0	0 0	4423 2	0 0	0 0
31	9 1	21069 1	0 0	0 0	0 0	0 0	4213 8	0 0	0 0
32	9 0	19927 5	0 0	0 0	0 0	0 0	3985 5	0 0	0 0
33	8 9	18696 5	0 0	0 0	0 0	0 0	3739 3	0 0	0 0
34	8 8	17381 3	0 0	0 0	0 0	0 0	3476 3	0 0	0 0
35	8 7	15987 7	0 0	0 0	0 0	0 0	3197 5	0 0	0 0
35	8 6	14522 2	0 0	0 0	0 0	0 0	2904 4	0 0	0 0
37	8 4	12990 7	0 0	0 0	0 0	0 0	2598 1	0 0	0 0
38	8 3	11400 1	0 0	0 0	0 0	0 0	2280 0	0 0	0 0
39	8 2	9757 2	0 0	0 0	0 0	0 0	1951 4	0 0	0 0
40	8 1	8069 0	0 0	0 0	0 0	0 0	1613 8	0 0	0 0
41	7 9	6343 0	0 0	0 0	0 0	0 0	1268 6	0 0	0 0
42	6 6	4014 0	0 0	0 0	0 0	0 0	802 8	0 0	0 0
43	1 2	566 2	0 0	0 0	0 0	0 0	113 2	0 0	0 0
44	7 6	2438 1	0 0	0 0	0 0	0 0	487 6	0 0	0 0
45	4 1	342 7	0 0	0 0	0 0	0 0	68 5	0 0	0 0

Failure Surface Specified By 47 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	777 08	626 77
2	786 84	624 58
3	796 64	622 59
4	806 48	620 79
5	816 35	619 19
6	826 25	617 79
7	836 18	616 59
8	846 13	615 58
9	856 10	614 78
10	866 08	614 17
11	876 07	613 76
12	886 07	613 55
13	896 07	613 55
14	906 06	613 74
15	916 06	614 13
16	926 04	614 72
17	936 01	615 51
18	945 96	616 50
19	955 89	617 69
20	965 79	619 07
21	975 67	620 66
22	985 51	622 44
23	995 31	624 41
24	1005 07	626 58
25	1014 79	628 95
26	1024 45	631 51
27	1034 07	634 26
28	1043 62	637 21
29	1053 12	640 34
30	1062 55	643 67
31	1071 91	647 18
32	1081 20	650 88
33	1090 42	654 76
34	1099 56	658 83
35	1108 61	663 07
36	1117 57	667 50
37	1126 45	672 11
38	1135 23	676 89
39	1143 92	681 85
40	1152 50	686 98
41	1160 98	692 28

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42	1169 35	697 75
43	1177 62	703 38
44	1185 75	709 18
45	1193 79	715 14
46	1201 70	721 26
47	1203 85	722 99

Circle Center At X = 891 5 , Y = 1114 1 and Radius, 500 5
*** 1 170 ***
Failure Surface Specified By 52 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	777 08	626 77
2	786 79	624 37
3	796 54	622 15
4	806 33	620 10
5	816 15	618 23
6	826 01	616 53
7	835 89	615 01
8	845 80	613 68
9	855 73	612 52
10	865 69	611 54
11	875 65	610 74
12	885 64	610 12
13	895 63	609 67
14	905 62	609 41
15	915 62	609 33
16	925 62	609 43
17	935 62	609 71
18	945 61	610 17
19	955 59	610 81
20	965 55	611 63
21	975 50	612 63
22	985 43	613 81
23	995 34	615 17
24	1005 22	616 70
25	1015 07	618 41
26	1024 89	620 30
27	1034 68	622 37
28	1044 42	624 61
29	1054 13	627 03
30	1063 78	629 62
31	1073 39	632 39
32	1082 95	635 33
33	1092 46	638 44
34	1101 90	641 72
35	1111 29	645 17
36	1120 61	648 79
37	1129 86	652 58
38	1139 05	656 54
39	1148 16	660 65
40	1157 20	664 94
41	1166 16	669 38
42	1175 03	673 99
43	1183 83	678 75
44	1192 53	683 67
45	1201 15	688 75
46	1209 67	693 98
47	1218 09	699 37
48	1226 42	704 90
49	1234 65	710 59
50	1242 77	716 42
51	1250 79	722 40
52	1255 24	725 85

Circle Center At X = 915 1 , Y = 1164 1 and Radius, 554 8
*** 1 189 ***
Failure Surface Specified By 57 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)

1	756 25	621 56
2	766 18	620 42
3	776 13	619 38
4	786 09	618 45
5	796 06	617 65
6	806 03	616 96
7	816 01	616 38
8	826 00	615 91
9	836 00	615 55
10	845 99	615 31
11	855 99	615 19
12	865 99	615 18
13	875 99	615 28
14	885 99	615 49
15	895 99	615 82
16	905 98	616 26
17	915 96	616 82
18	925 94	617 49
19	935 91	618 27
20	945 87	619 16
21	955 82	620 17
22	965 75	621 29
23	975 68	622 53
24	985 59	623 88
25	995 48	625 34
26	1005 35	626 91
27	1015 21	628 59
28	1025 05	630 39
29	1034 86	632 30
30	1044 66	634 32
31	1054 43	636 45
32	1064 17	638 69
33	1073 89	641 04
34	1083 58	643 51
35	1093 25	646 08
36	1102 88	648 76
37	1112 48	651 56
38	1122 05	654 46
39	1131 59	657 47
40	1141 09	660 59
41	1150 56	663 81
42	1159 99	667 14
43	1169 37	670 58
44	1178 72	674 13
45	1188 03	677 78
46	1197 30	681 54
47	1206 52	685 41
48	1215 70	689 38
49	1224 84	693 45
50	1233 92	697 62
51	1242 96	701 90
52	1251 95	706 28
53	1260 89	710 77
54	1269 77	715 35
55	1278 61	720 04
56	1287 39	724 82
57	1292 96	727 94

Circle Center At X = 862 1 Y = 1494 6 and Radius 879 5

*** 1 191 ***

Failure Surface Specified By 46 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	797 92	631 98
2	807 83	630 69
3	817 77	629 55
4	827 72	628 57
5	837 69	627 74
6	847 66	627 08

7	857 65	626 57
8	867 65	625 22
9	877 64	626 03
10	887 64	626 00
11	897 64	626 12
12	907 64	626 41
13	917 63	626 85
14	927 51	627 44
15	937 58	628 20
16	947 54	629 11
17	957 48	630 19
18	967 41	631 41
19	977 31	632 80
20	987 19	634 34
21	997 05	636 04
22	1006 87	637 89
23	1016 67	639 90
24	1026 43	642 06
25	1036 16	644 38
26	1045 85	646 84
27	1055 50	649 47
28	1065 11	652 24
29	1074 67	655 17
30	1084 19	658 25
31	1093 65	661 47
32	1103 06	664 85
33	1112 42	668 37
34	1121 72	672 05
35	1130 97	675 86
36	1140 15	679 83
37	1149 26	683 94
38	1158 31	688 19
39	1167 30	692 58
40	1176 21	697 12
41	1185 05	701 80
42	1193 81	706 61
43	1202 50	711 57
44	1211 11	716 66
45	1219 63	721 88
46	1223 06	724 06

Circle Center At X = 884 8 Y = 1258 5 and Radius, 632 5

*** 1 191 ***

Failure Surface Specified By 43 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	766 67	624 17
2	776 24	621 28
3	785 89	618 64
4	795 60	616 27
5	805 38	614 15
6	815 20	612 30
7	825 08	610 71
8	834 99	609 39
9	844 93	608 33
10	854 90	607 53
11	864 89	607 00
12	874 88	606 74
13	884 88	606 75
14	894 88	607 03
15	904 86	607 57
16	914 83	608 37
17	924 77	609 45
18	934 68	610 79
19	944 55	612 39
20	954 38	614 26
21	964 15	616 38
22	973 86	618 77
23	983 50	621 42

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24	993 07	624 32
25	1002 56	627 48
26	1011 96	630 89
27	1021 27	634 55
28	1030 47	638 46
29	1039 57	642 61
30	1048 55	647 01
31	1057 41	651 64
32	1066 15	656 51
33	1074 75	661 60
34	1083 21	666 93
35	1091 53	672 48
36	1099 70	678 25
37	1107 71	684 24
38	1115 55	690 44
39	1123 23	696 85
40	1130 74	703 46
41	1138 06	710 27
42	1145 20	717 27
43	1147 16	719 29

Circle Center At X = 879 6 Y = 981 0 and Radius 374 3
*** 1 192 ***
Failure Surface Specified By 41 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	787 50	629 38
2	797 31	627 45
3	807 17	625 76
4	817 06	624 29
5	826 98	623 04
6	836 93	622 02
7	846 90	621 23
8	856 88	620 67
9	866 88	620 34
10	876 88	620 23
11	886 88	620 36
12	896 87	620 71
13	906 85	621 29
14	916 82	622 10
15	926 77	623 14
16	936 69	624 40
17	946 58	625 89
18	956 43	627 61
19	966 24	629 55
20	976 00	631 71
21	985 71	634 10
22	995 37	636 70
23	1004 96	639 53
24	1014 48	642 58
25	1023 93	645 84
26	1033 31	649 32
27	1042 60	653 01
28	1051 81	656 91
29	1060 93	661 03
30	1069 94	665 35
31	1078 86	669 87
32	1087 67	674 60
33	1096 38	679 53
34	1104 96	684 65
35	1113 43	689 97
36	1121 77	695 49
37	1129 99	701 19
38	1138 07	707 08
39	1146 02	713 15
40	1153 82	719 40
41	1154 86	720 27

Circle Center At X = 876 5 Y = 1057 7 and Radius 437 5
*** 1 193 ***

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Failure Surface Specified By 54 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	766 67	624 17
2	776 62	623 23
3	786 59	622 40
4	796 56	621 69
5	806 55	621 09
6	816 53	620 61
7	826 53	620 24
8	836 52	619 99
9	846 52	619 85
10	856 52	619 83
11	866 52	619 92
12	876 52	620 13
13	886 52	620 45
14	896 51	620 89
15	906 49	621 44
16	916 47	622 11
17	926 44	622 89
18	936 40	623 78
19	946 35	624 79
20	956 28	625 91
21	966 21	627 15
22	976 12	628 50
23	986 01	629 97
24	995 88	631 55
25	1005 74	633 24
26	1015 57	635 04
27	1025 39	636 96
28	1035 18	638 99
29	1044 95	641 13
30	1054 69	643 39
31	1064 41	645 75
32	1074 09	648 23
33	1083 75	650 82
34	1093 38	653 52
35	1102 98	656 33
36	1112 54	659 25
37	1122 07	662 28
38	1131 57	665 41
39	1141 03	668 66
40	1150 45	672 02
41	1159 83	675 48
42	1169 17	679 05
43	1178 47	682 73
44	1187 72	686 52
45	1196 94	690 41
46	1206 10	694 40
47	1215 22	698 50
48	1224 30	702 71
49	1233 32	707 02
50	1242 29	711 43
51	1251 21	715 95
52	1260 08	720 57
53	1268 90	725 29
54	1271 57	726 75

Circle Center At X = 853 5 , Y = 1490 5 and Radius 870 7

*** 1 193 ***

Failure Surface Specified By 58 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	756 25	621 56
2	766 20	620 53
3	776 15	619 61
4	786 12	618 79
5	796 10	618 08
6	806 08	617 48

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7	816 07	616 99
8	826 06	616 60
9	836 05	616 32
10	846 05	616 15
11	856 05	616 09
12	866 05	616 14
13	876 05	616 30
14	886 05	616 56
15	896 04	616 93
16	906 03	617 41
17	916 01	618 00
18	925 99	618 69
19	935 96	619 49
20	945 91	620 40
21	955 86	621 42
22	965 80	622 55
23	975 72	623 78
24	985 63	625 12
25	995 53	526 57
26	1005 41	628 12
27	1015 27	629 78
28	1025 11	631 55
29	1034 93	633 42
30	1044 74	635 40
31	1054 52	637 48
32	1064 27	639 67
33	1074 01	641 97
34	1083 71	644 37
35	1093 39	646 88
36	1103 05	649 49
37	1112 67	652 20
38	1122 27	655 02
39	1131 83	657 94
40	1141 36	660 97
41	1150 86	664 09
42	1160 32	667 32
43	1169 75	670 66
44	1179 14	674 09
45	1188 50	677 63
46	1197 81	681 26
47	1207 09	685 00
48	1216 32	688 84
49	1225 52	692 77
50	1234 67	696 81
51	1243 77	700 94
52	1252 83	705 17
53	1261 85	709 50
54	1270 81	713 93
55	1279 73	718 45
56	1288 60	723 07
57	1297 42	727 79
58	1298 23	728 23

Circle Center At X = 856 7 Y = 1541 3 and Radius 925 2

*** 1 196 ***

Failure Surface Specified By 51 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	777 08	626 77
2	786 61	623 73
3	796 20	620 90
4	805 85	618 28
5	815 55	615 86
6	825 31	613 65
7	835 10	611 64
8	844 94	609 85
9	854 82	608 27
10	864 72	606 90
11	874 66	605 74

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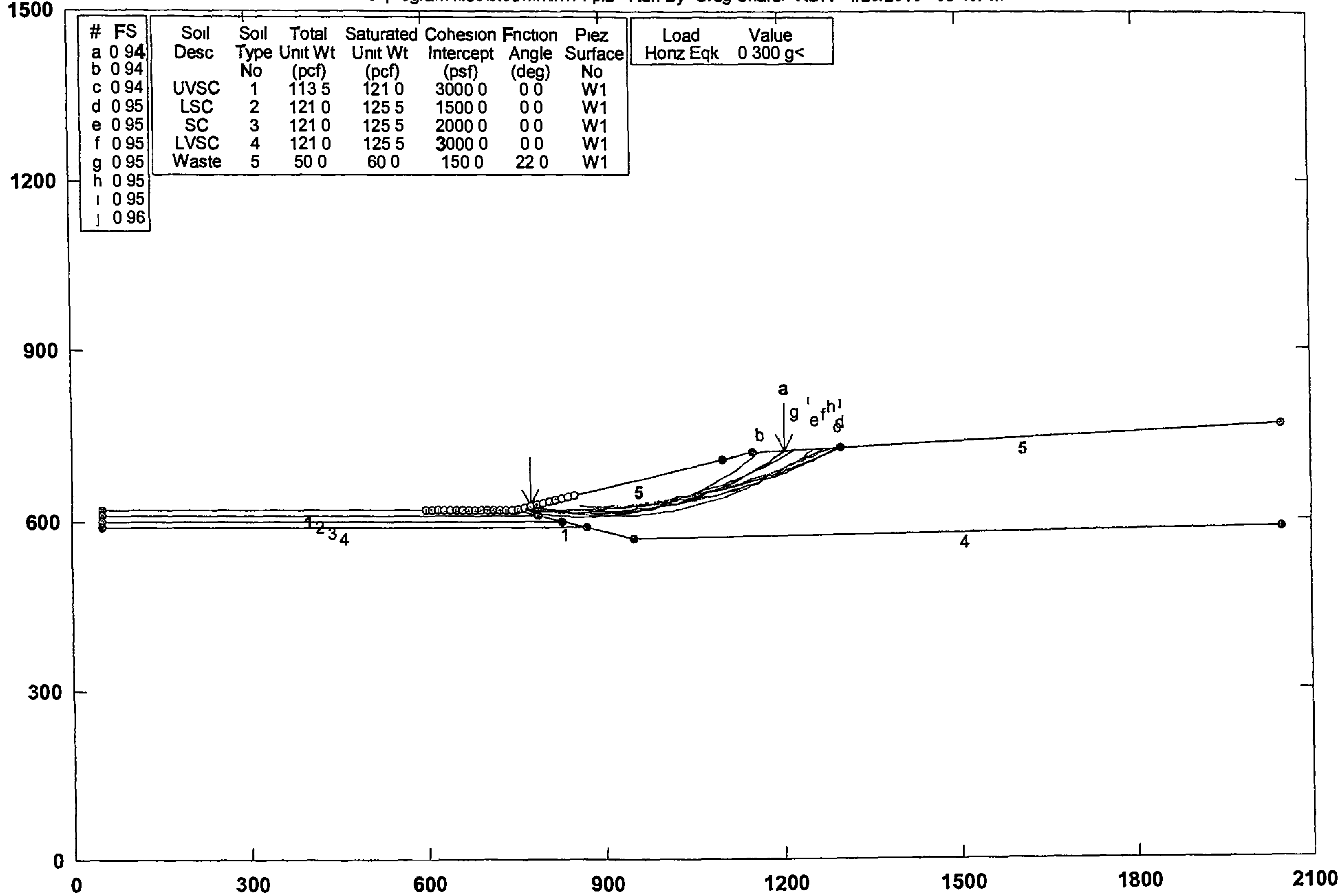
12	884 61	604 80
13	894 58	604 07
14	904 57	603 55
15	914 57	603 25
16	924 57	603 16
17	934 56	603 28
18	944 56	603 62
19	954 54	604 17
20	964 51	604 94
21	974 47	605 91
22	984 40	607 11
23	994 30	608 51
24	1004 17	610 12
25	1014 00	611 95
26	1023 79	613 98
27	1033 53	616 23
28	1043 23	618 68
29	1052 87	621 34
30	1062 45	624 20
31	1071 97	627 27
32	1081 42	630 54
33	1090 79	634 02
34	1100 09	637 69
35	1109 31	641 56
36	1118 45	645 63
37	1127 50	649 89
38	1136 45	654 35
39	1145 30	658 99
40	1154 06	663 83
41	1162 71	668 84
42	1171 25	674 05
43	1179 67	679 43
44	1187 98	685 00
45	1196 17	690 74
46	1204 23	696 65
47	1212 17	702 74
48	1219 97	708 99
49	1227 64	715 41
50	1235 17	721 99
51	1238 36	724 91

Circle Center At X = 923 8 Y = 1070 6 and Radius 467 4

*** 1 197 ***

Intermountain Regional Landfill Fill Slope 1

c \program files\stedwin\irl\14 pl2 Run By Greg Shafer HDR 4/20/2010 03 48PM



#	FS
a	0 94
b	0 94
c	0 94
d	0 95
e	0 95
f	0 95
g	0 95
h	0 95
i	0 95
j	0 96

Soil Desc	Soil Type No	Total Unit Wt (pcf)	Saturated Unit Wt (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez Surface No
UVSC	1	113 5	121 0	3000 0	0 0	W1
LSC	2	121 0	125 5	1500 0	0 0	W1
SC	3	121 0	125 5	2000 0	0 0	W1
LVSC	4	121 0	125 5	3000 0	0 0	W1
Waste	5	50 0	60 0	150 0	22 0	W1

Load	Value
Horiz Eqk	0 300 g<

PCSTABL7 FSmin=0 94

Safety Factors Are Calculated By The Modified Bishop Method

STED

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** PCSTABL7 **
by
Purdue Unıversıty
--Slope Stabılıty Analysıs--
Sımplıfıed Janbu Sımplıfıed Bıshop
or Spencer s Method of Slıces

Run Date	4/20/2010
Tıme of Run	03 48PM
Run By	Greg Shafer HDR
Input Data Fılename	C 14 ın
Output Fılename	C 14 OUT
Unıt	ENGLISH
Plotted Output Fılename	C 14 PLT
PROBLEM DESCRIPTION	Intermountaın Regıonal Landfıll Fıll Slope 1

BOUNDARY COORDINATES
Note User orıgın value specıfıed
Add 0 00 to X-values and 0 00 to Y-values lısted

3 Top Boundarıes
8 Total Boundarıes

Boundary No	X-Left (ft)	Y-Left (ft)	X-Rıght (ft)	Y-Rıght (ft)	Soıl Type Below Bnd
1	50 00	620 00	750 00	620 00	1
2	750 00	620 00	1150 00	720 00	5
3	1150 00	720 00	2050 00	770 00	5
4	750 00	620 00	950 00	570 00	1
5	950 00	570 00	2050 00	586 50	4
6	50 00	610 00	790 00	610 00	2
7	50 00	600 00	830 00	600 00	3
8	50 00	590 00	870 00	590 00	4

ISOTROPIC SOIL PARAMETERS
5 Type(s) of Soıl

Soıl Type No	Total Unıt Wt (pcf)	Saturated Unıt Wt (pcf)	Cohesıon Intercept (psf)	Frıctıon Angle (deg)	Pore Pressure Param	Pressure Constant (psf)	Pıez Surface No
1	113 5	121 0	3000 0	0 0	0 00	0 0	1
2	121 0	125 5	1500 0	0 0	0 00	0 0	1
3	121 0	125 5	2000 0	0 0	0 00	0 0	1
4	121 0	125 5	3000 0	0 0	0 00	0 0	1
5	50 0	60 0	150 0	22 0	0 00	0 0	1

A Horızontal Earthquake Loadıng Coeffıcıent
Of0 300 Has Been Assıgned
A Vertıcal Earthquake Loadıng Coeffıcıent
Of0 000 Has Been Assıgned
Cavıtatıon Pressure = 0 0 (psf)
A Crıtıcal Faılure Surface Searchıng Method Usıng A Random
Technıque For Generatıng Cırcular Surfaces Has Been Specıfıed
625 Trıal Surfaces Have Been Generated
25 Surfaces Inıtıate From Each Of 25 Poınts Equally Spaced
Along The Ground Surface Between X = 600 00 ft
and X = 850 00 ft
Each Surface Termınates Between X =1100 00 ft
and X =1300 00 ft
Unless Further Lımıtatıons Were Imposed The Mınımum Elevatıon
At Whıch A Surface Extends Is Y = 0 00 ft
10 00 ft Lıne Segments Defıne Each Trıal Faılure Surface
Followıng Are Dısplayed The Ten Most Crıtıcal Of The Trıal
Faılure Surfaces Examıned They Are Ordered - Most Crıtıcal
Fırst
* * Safety Factors Are Calculated By The Modıfıed Bıshop Method * *
Faılure Surface Specıfıed By 47 Coordınate Poınts

Poınt No	X-Surf (ft)	Y-Surf (ft)
1	777 08	626 77
2	786 84	624 58
3	796 64	622 59
4	806 48	620 79
5	816 35	619 19

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6	826 25	617 79
7	836 18	616 59
8	846 13	615 58
9	856 10	614 78
10	866 08	614 17
11	876 07	613 76
12	886 07	613 55
13	896 07	613 55
14	906 06	613 74
15	916 06	614 13
16	926 04	614 72
17	936 01	615 51
18	945 96	616 50
19	955 89	617 69
20	965 79	619 07
21	975 67	620 66
22	985 51	622 44
23	995 31	624 41
24	1005 07	626 58
25	1014 79	628 95
26	1024 45	631 51
27	1034 07	634 26
28	1043 62	637 21
29	1053 12	640 34
30	1062 55	643 67
31	1071 91	647 18
32	1081 20	650 88
33	1090 42	654 76
34	1099 56	658 83
35	1108 61	663 07
36	1117 57	667 50
37	1126 45	672 11
38	1135 23	676 89
39	1143 92	681 85
40	1152 50	686 98
41	1160 98	692 28
42	1169 35	697 75
43	1177 62	703 38
44	1185 76	709 18
45	1193 79	715 14
46	1201 70	721 26
47	1203 85	722 99

Circle Center At X = 891 5 Y = 1114 1 and Radius 500 5

*** 0 938 ***

Individual data on the 47 slices

Slice No	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Force Tnorm (lbs)	Force Ttan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	9 8	1128 8	0 0	0 0	0 0	0 0	338 6	0 0	0 0
2	9 8	3355 7	0 0	0 0	0 0	0 0	1006 7	0 0	0 0
3	9 8	5507 9	0 0	0 0	0 0	0 0	1652 4	0 0	0 0
4	9 9	7580 8	0 0	0 0	0 0	0 0	2274 3	0 0	0 0
5	9 9	9570 5	0 0	0 0	0 0	0 0	2871 1	0 0	0 0
6	9 9	11472 7	0 0	0 0	0 0	0 0	3441 8	0 0	0 0
7	9 9	13283 8	0 0	0 0	0 0	0 0	3985 1	0 0	0 0
8	10 0	15000 1	0 0	0 0	0 0	0 0	4500 0	0 0	0 0
9	10 0	16618 7	0 0	0 0	0 0	0 0	4985 6	0 0	0 0
10	10 0	18136 4	0 0	0 0	0 0	0 0	5440 9	0 0	0 0
11	10 0	19550 5	0 0	0 0	0 0	0 0	5865 2	0 0	0 0
12	10 0	20858 6	0 0	0 0	0 0	0 0	6257 6	0 0	0 0
13	10 0	22058 6	0 0	0 0	0 0	0 0	6617 6	0 0	0 0
14	10 0	23148 6	0 0	0 0	0 0	0 0	6944 6	0 0	0 0
15	10 0	24127 0	0 0	0 0	0 0	0 0	7238 1	0 0	0 0
16	10 0	24992 5	0 0	0 0	0 0	0 0	7497 8	0 0	0 0
17	10 0	25744 0	0 0	0 0	0 0	0 0	7723 2	0 0	0 0
18	9 9	26381 2	0 0	0 0	0 0	0 0	7914 3	0 0	0 0
19	9 9	26903 2	0 0	0 0	0 0	0 0	8071 0	0 0	0 0

20	9 9	27310 2	0 0	0 0	0 0	0 0	8193 1	0 0	0 0
21	9 8	27602 0	0 0	0 0	0 0	0 0	8280 6	0 0	0 0
22	9 8	27779 5	0 0	0 0	0 0	0 0	8333 8	0 0	0 0
23	9 8	27843 1	0 0	0 0	0 0	0 0	8352 9	0 0	0 0
24	9 7	27794 0	0 0	0 0	0 0	0 0	8338 2	0 0	0 0
25	9 7	27633 6	0 0	0 0	0 0	0 0	8290 1	0 0	0 0
26	9 6	27363 5	0 0	0 0	0 0	0 0	8209 1	0 0	0 0
27	9 6	26985 1	0 0	0 0	0 0	0 0	8095 5	0 0	0 0
28	9 5	26501 3	0 0	0 0	0 0	0 0	7950 4	0 0	0 0
29	9 4	25913 9	0 0	0 0	0 0	0 0	7774 2	0 0	0 0
30	9 4	25226 3	0 0	0 0	0 0	0 0	7567 9	0 0	0 0
31	9 3	24440 9	0 0	0 0	0 0	0 0	7332 3	0 0	0 0
32	9 2	23561 2	0 0	0 0	0 0	0 0	7068 4	0 0	0 0
33	9 1	22590 3	0 0	0 0	0 0	0 0	6777 1	0 0	0 0
34	9 1	21532 5	0 0	0 0	0 0	0 0	6459 8	0 0	0 0
35	9 0	20391 5	0 0	0 0	0 0	0 0	6117 4	0 0	0 0
36	8 9	19171 2	0 0	0 0	0 0	0 0	5751 4	0 0	0 0
37	8 8	17876 6	0 0	0 0	0 0	0 0	5363 0	0 0	0 0
38	8 7	16512 0	0 0	0 0	0 0	0 0	4953 6	0 0	0 0
39	6 1	10818 3	0 0	0 0	0 0	0 0	3245 5	0 0	0 0
40	2 5	4233 5	0 0	0 0	0 0	0 0	1270 0	0 0	0 0
41	8 5	13036 7	0 0	0 0	0 0	0 0	3911 0	0 0	0 0
42	8 4	10813 4	0 0	0 0	0 0	0 0	3244 0	0 0	0 0
43	8 3	8567 8	0 0	0 0	0 0	0 0	2570 3	0 0	0 0
44	8 1	6306 2	0 0	0 0	0 0	0 0	1891 9	0 0	0 0
45	8 0	4035 3	0 0	0 0	0 0	0 0	1210 6	0 0	0 0
46	7 9	1761 3	0 0	0 0	0 0	0 0	528 4	0 0	0 0
47	2 2	86 7	0 0	0 0	0 0	0 0	26 0	0 0	0 0

Failure Surface Specified By 45 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	756 25	621 56
2	765 98	619 23
3	775 75	617 12
4	785 57	615 23
5	795 43	613 55
6	805 32	612 10
7	815 24	610 86
8	825 19	609 85
9	835 16	609 06
10	845 15	608 49
11	855 14	608 15
12	865 14	608 03
13	875 14	608 13
14	885 13	608 45
15	895 12	609 00
16	905 09	609 77
17	915 04	610 76
18	924 97	611 97
19	934 86	613 41
20	944 73	615 06
21	954 55	616 93
22	964 33	619 03
23	974 06	621 34
24	983 73	623 86
25	993 35	626 60
26	1002 90	629 56
27	1012 39	632 72
28	1021 80	636 10
29	1031 13	639 69
30	1040 39	643 48
31	1049 55	647 48
32	1058 63	651 69
33	1067 60	656 09
34	1076 48	660 69
35	1085 25	665 49
36	1093 92	670 49
37	1102 47	675 67

38	1110 90	681 05
39	1119 21	686 61
40	1127 40	692 36
41	1135 45	698 28
42	1143 37	704 39
43	1151 15	710 67
44	1158 79	717 12
45	1162 86	720 71

Circle Center At X = 865 6 Y = 1056 5 and Radius 448 5

*** 0 939 ***

Failure Surface Specified By 57 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	756 25	621 56
2	766 18	620 42
3	776 13	619 38
4	786 09	618 46
5	796 06	617 65
6	806 03	616 96
7	816 01	616 38
8	826 00	615 91
9	836 00	615 55
10	845 99	615 31
11	855 99	615 19
12	865 99	615 18
13	875 99	615 28
14	885 99	615 49
15	895 99	615 82
16	905 98	616 26
17	915 96	616 82
18	925 94	617 49
19	935 91	618 27
20	945 87	619 16
21	955 82	620 17
22	965 75	621 29
23	975 68	622 53
24	985 59	623 88
25	995 48	625 34
26	1005 35	626 91
27	1015 21	628 59
28	1025 05	630 39
29	1034 86	632 30
30	1044 66	634 32
31	1054 43	636 45
32	1064 17	638 69
33	1073 89	641 04
34	1083 58	643 51
35	1093 25	646 08
36	1102 88	648 76
37	1112 48	651 56
38	1122 05	654 46
39	1131 59	657 47
40	1141 09	660 59
41	1150 56	663 81
42	1159 99	667 14
43	1169 37	670 58
44	1178 72	674 13
45	1188 03	677 78
46	1197 30	681 54
47	1206 52	685 41
48	1215 70	689 38
49	1224 84	693 45
50	1233 92	697 62
51	1242 96	701 90
52	1251 95	706 28
53	1260 89	710 77
54	1269 77	715 35
55	1278 61	720 04

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56	1287 39	724 82
57	1292 96	727 94

Circle Center At X = 862 1 Y = 1494 6 and Radius 879 5
*** 0 943 ***
Failure Surface Specified By 58 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	756 25	621 56
2	766 20	620 53
3	776 15	619 61
4	786 12	618 79
5	796 10	618 08
6	806 08	617 48
7	816 07	616 99
8	826 06	616 60
9	836 05	616 32
10	846 05	616 15
11	856 05	616 09
12	866 05	616 14
13	876 05	616 30
14	886 05	616 56
15	896 04	616 93
16	906 03	617 41
17	916 01	618 00
18	925 99	618 69
19	935 96	619 49
20	945 91	620 40
21	955 86	621 42
22	965 80	622 55
23	975 72	623 78
24	985 63	625 12
25	995 53	626 57
26	1005 41	628 12
27	1015 27	629 78
23	1025 11	631 55
29	1034 93	633 42
30	1044 74	635 40
31	1054 52	637 48
32	1064 27	639 67
33	1074 01	641 97
34	1083 71	644 37
35	1093 39	646 88
36	1103 05	649 49
37	1112 67	652 20
38	1122 27	655 02
39	1131 83	657 94
40	1141 36	660 97
41	1150 86	664 09
42	1160 32	667 32
43	1169 75	670 66
44	1179 14	674 09
45	1188 50	677 63
46	1197 81	681 26
47	1207 09	685 00
48	1216 32	688 84
49	1225 52	692 77
50	1234 67	696 81
51	1243 77	700 94
52	1252 83	705 17
53	1261 85	709 50
54	1270 81	713 93
55	1279 73	718 45
56	1288 60	723 07
57	1297 42	727 79
58	1298 23	728 23

Circle Center At X = 856 7 Y = 1541 3 and Radius 925 2
*** 0 946 ***
Failure Surface Specified By 52 Coordinate Points

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Point No	X-Surf (ft)	Y-Surf (ft)
1	777 08	626 77
2	786 79	624 37
3	796 54	622 15
4	806 33	620 10
5	816 15	618 23
6	826 01	616 53
7	835 89	615 01
8	845 80	613 68
9	855 73	612 52
10	865 69	611 54
11	875 65	610 74
12	885 64	610 12
13	895 63	609 67
14	905 62	609 41
15	915 62	609 33
16	925 62	609 43
17	935 62	609 71
18	945 61	610 17
19	955 59	610 81
20	965 55	611 63
21	975 50	612 63
22	985 43	613 81
23	995 34	615 17
24	1005 22	616 70
25	1015 07	618 41
26	1024 89	620 30
27	1034 68	622 37
28	1044 42	624 61
29	1054 13	627 03
30	1063 78	629 62
31	1073 39	632 39
32	1082 95	635 33
33	1092 46	638 44
34	1101 90	641 72
35	1111 29	645 17
36	1120 61	648 79
37	1129 86	652 58
38	1139 05	656 54
39	1148 16	660 65
40	1157 20	664 94
41	1166 16	669 38
42	1175 03	673 99
43	1183 83	678 75
44	1192 53	683 67
45	1201 15	688 75
46	1209 67	693 98
47	1218 09	699 37
48	1226 42	704 90
49	1234 65	710 59
50	1242 77	716 42
51	1250 79	722 40
52	1255 24	725 85

Circle Center At X = 915 1 Y = 1164 1 and Radius 554 8

*** 0 947 ***

Failure Surface Specified By 54 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	766 67	624 17
2	776 62	623 23
3	786 59	622 40
4	796 56	621 69
5	806 55	621 09
6	816 53	620 61
7	826 53	620 24
8	836 52	619 99
9	846 52	619 85

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10	856 52	619 83
11	866 52	619 92
12	876 52	620 13
13	886 52	620 45
14	896 51	620 89
15	906 49	621 44
16	916 47	622 11
17	926 44	622 89
18	936 40	623 78
19	946 35	624 79
20	956 28	625 91
21	966 21	627 15
22	976 12	628 50
23	986 01	629 97
24	995 88	631 55
25	1005 74	633 24
26	1015 57	635 04
27	1025 39	636 96
28	1035 18	638 99
29	1044 95	641 13
30	1054 69	643 39
31	1064 41	645 75
32	1074 09	648 23
33	1083 75	650 82
34	1093 38	653 52
35	1102 98	656 33
36	1112 54	659 25
37	1122 07	662 28
38	1131 57	665 41
39	1141 03	668 66
40	1150 45	672 02
41	1159 83	675 48
42	1169 17	679 05
43	1178 47	682 73
44	1187 72	686 52
45	1196 94	690 41
46	1206 10	694 40
47	1215 22	698 50
48	1224 30	702 71
49	1233 32	707 02
50	1242 29	711 43
51	1251 21	715 95
52	1260 08	720 57
53	1268 90	725 29
54	1271 57	726 75

Cırcle Center At X = 853 5 , Y = 1490 5 and Radıus, 870 7

*** 0 947 ***

Faılure Surface Specıfıed By 46 Coordınate Poınts

Poınt No	X-Surf (ft)	Y-Surf (ft)
1	797 92	631 98
2	807 83	630 69
3	817 77	629 55
4	827 72	628 57
5	837 69	627 74
6	847 66	627 08
7	857 65	626 57
8	867 65	626 22
9	877 64	626 03
10	887 64	626 00
11	897 64	626 12
12	907 64	626 41
13	917 63	626 85
14	927 61	627 44
15	937 58	628 20
16	947 54	629 11
17	957 48	630 19
18	967 41	631 41

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19	977 31	632 80
20	987 19	634 34
21	997 05	636 04
22	1006 87	637 89
23	1016 67	639 90
24	1026 43	542 06
25	1036 16	544 38
26	1045 85	646 84
27	1055 50	649 47
28	1065 11	652 24
29	1074 67	655 17
30	1084 19	658 25
31	1093 65	661 47
32	1103 06	664 85
33	1112 42	668 37
34	1121 72	672 05
35	1130 97	675 86
36	1140 15	679 83
37	1149 26	683 94
38	1158 31	688 19
39	1167 30	692 58
40	1176 21	697 12
41	1185 05	701 80
42	1193 81	706 61
43	1202 50	711 57
44	1211 11	716 66
45	1219 63	721 88
46	1223 06	724 06

Circle Center At X = 884 8 Y = 1258 5 and Radius 632 5

*** 0 951 ***

Failure Surface Specified By 56 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	756 25	621 56
2	766 23	620 99
3	776 22	620 50
4	786 22	620 12
5	796 21	619 83
6	806 21	619 63
7	816 21	619 54
8	826 21	619 53
9	836 21	619 63
10	846 21	619 82
11	856 20	620 10
12	866 19	620 48
13	876 18	620 96
14	886 17	621 53
15	896 14	622 20
16	906 12	622 96
17	916 08	623 82
18	926 03	624 78
19	935 98	625 83
20	945 91	626 98
21	955 83	628 22
22	965 74	629 55
23	975 64	630 99
24	985 52	632 51
25	995 39	634 13
26	1005 24	635 85
27	1015 08	637 66
28	1024 90	639 56
29	1034 69	641 56
30	1044 47	643 65
31	1054 23	645 84
32	1063 97	648 12
33	1073 66	650 49
34	1083 37	652 95
35	1093 04	655 51

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36	1102 68	658 16
37	1112 30	660 91
38	1121 89	663 74
39	1131 45	666 67
40	1140 98	669 69
41	1150 49	672 80
42	1159 96	676 00
43	1169 41	679 29
44	1178 82	682 67
45	1188 19	686 15
46	1197 54	689 71
47	1206 85	693 36
48	1216 12	697 10
49	1225 36	700 93
50	1234 56	704 85
51	1243 72	708 85
52	1252 85	712 95
53	1261 93	717 13
54	1270 97	721 39
55	1279 98	725 75
56	1283 32	727 41

Circle Center At X = 821 5 Y = 1662 1 and Radius 1042 6

*** 0 953 ***

Failure Surface Specified By 57 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	756 25	621 56
2	766 23	620 93
3	776 22	620 39
4	786 21	619 95
5	796 20	619 60
6	806 20	619 34
7	816 20	619 18
8	826 20	619 11
9	836 20	619 14
10	846 19	619 26
11	856 19	619 47
12	866 19	619 77
13	876 18	620 17
14	886 17	620 67
15	896 15	621 25
16	906 13	621 93
17	916 10	622 71
18	926 06	623 57
19	936 01	624 53
20	945 96	625 59
21	955 89	626 73
22	965 81	627 97
23	975 73	629 31
24	985 62	630 73
25	995 51	632 25
26	1005 38	633 86
27	1015 23	635 56
28	1025 07	637 36
29	1034 89	639 25
30	1044 69	641 23
31	1054 47	643 30
32	1064 24	645 46
33	1073 98	647 71
34	1083 70	650 06
35	1093 40	652 50
36	1103 08	655 02
37	1112 73	657 64
38	1122 35	660 35
39	1131 95	663 15
40	1141 53	666 03
41	1151 07	669 01
42	1160 59	672 08

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43	1170 08	675 23
44	1179 54	678 48
45	1188 97	681 81
46	1198 36	685 23
47	1207 73	688 74
48	1217 06	692 34
49	1226 36	696 02
50	1235 62	699 79
51	1244 84	703 65
52	1254 03	707 60
53	1263 19	711 63
54	1272 30	715 74
55	1281 37	719 94
56	1290 41	724 23
57	1298 71	728 26

Circle Center At X = 828 6   Y = 1686 3 and Radius 1067 2

*** 0 954 ***

Failure Surface Specified By 48 Coordinate Points

Point No	X-Surf (ft)	Y-Surf (ft)
1	797 92	631 98
2	807 85	630 85
3	817 80	629 86
4	827 77	629 01
5	837 74	628 30
6	847 73	627 74
7	857 72	627 31
8	867 71	627 02
9	877 71	626 87
10	887 71	626 86
11	897 71	626 99
12	907 71	627 27
13	917 70	627 68
14	927 68	628 23
15	937 66	628 92
16	947 63	629 76
17	957 58	630 73
18	967 52	631 84
19	977 44	633 09
20	987 34	634 48
21	997 22	636 01
22	1007 08	637 68
23	1016 92	639 49
24	1026 73	641 43
25	1036 51	643 51
26	1046 26	645 73
27	1055 98	648 08
28	1065 66	650 58
29	1075 31	653 20
30	1084 92	655 96
31	1094 49	658 86
32	1104 02	661 89
33	1113 51	665 05
34	1122 95	668 35
35	1132 35	671 78
36	1141 69	675 34
37	1150 98	679 03
38	1160 22	682 85
39	1169 41	686 80
40	1178 54	690 88
41	1187 61	695 09
42	1196 63	699 42
43	1205 58	703 88
44	1214 46	708 47
45	1223 29	713 17
46	1232 04	718 01
47	1240 73	722 96
48	1244 62	725 26

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Circle Center At X = 883 3 Y = 1339 4 and Radius 712 5
*** 0 956 ***

ATTACHMENT 3· SETTLEMENT CALCULATIONS

HDR ONE COMPANY *Many Solutions*	Project	Intermountain Regional Landfill	Computed	GMS	Date March 2010
	Subject	Leachate Collection	Checked	PHP	Date 4 14 10
	Task	LCRS Settlement	Page	1 of 2	
	Job #	Dept 00143	No	125184	

3 1 Task

A Determine the settlement along the leachate piping alignments

a Venfy that positive drainage towards the sumps is maintained after placement of the waste

b Venfy maximum strains along the leachate do not exceed the maximum allowed

3 2 References

A Earthtec Testing & Engineenng, P C (2006) Geotechnical Study Intermountain Regional Landfill

B Das, B , (1990) Pnnciples of Foundation Engineenng, 2nd Ed

C HDR (2010) Determination of the MHA and Design EQ Calculations, 1 0

D HDR (2010) Slope Stability Calculations and determination of soil design values, 2 3 C

E Koerner, R M (2005) Designing With Geosynthetics, 5th Ed

3 3 Analysis

A Determine the consolidation values of the compressible zone soil based on Reference A

B Determine the thickness of the compressible zone, Hc

C Determine the initial pressure at the center of the compressible zone, P1

D Determine the pressure at the center of the compressible zone after excavation, P2

E Determine the final pressure at the center of the compressible zone, after waste placement, P3

F Calculation of Settlement

$$Sc = \left(\left(\frac{Cs * Hc}{1 + e0}\right) Log\ \frac{Pc}{P0}\right) + \left(\left(\frac{Cc * Hc}{1 + e0}\right) Log\ \left(\frac{P0 + \Delta P}{Pc}\right)\right)$$

Where
Sc = Total consolidation settlement
Cs = Swell Index
Cc = Compression Index
P0 = Pressure after excavation (pnor to filling with waste), P2
e0 = initial void ratio after excavation
Pc = Preconsolidation pressure, Ref A and attached = 2 4 KSF
He = Thickness of compressive soil = 100 FT
ΔP = Change in pressure, P3 – P2 KSF

Since, P0 > Pc (P2 > Pc), Disregard the settlement on the swell index part of the curve

HDR | ONE COMPANY *Many Solutions*℠

Project	Intermountain Regional Landfill	Computed	GMS	Date March 2010
Subject	Leachate Collection	Checked	*PMP*	Date *4 26 10*
Task	LCRS Settlement	Page	2 of 2	
Job #	Dept 00143	No	125184	

i) Settlement

Pt #	Depth to Center (FT)	Initial Pressure, P1 (KSF)	Thickness of Excavation (FT)	Pressure after Excavation P2 (KSF)	Thickness of Waste (FT)	Final Pressure, P3 (KSF)	Total Change in Pressure, ΔP (KSF)	Settlement (IN)	Settlement (FT)
1	70 0	8 47	20 0	6 05	42 0	8 57	2 52	18 7	1 6
2	72 0	8 71	22 0	6 05	72 0	10 37	4 32	21 5	1 8
3	75 0	9 08	25 0	6 05	100 0	12 05	6 00	23 7	2 0
4	82 0	9 92	32 0	6 05	134 0	14 09	8 04	26 0	2 2
5	90 0	10 89	40 0	6 05	73 0	10 43	4 38	21 6	1 8
6	95 0	11 50	45 0	6 05	46 0	8 81	2 76	19 1	1 6

Soil M Density = 121 0 (PCF)
Waste Density = 60 0 (PCF)

Cr = Cc = 0 048 Ref A and see attached
Hc = 100 0 FT (assumed)
e0 = 0 704 Ref A and see attached
Pc = 2 4 KSF

ii) Slope and Strain Check along Leachate lines See also attached sketch

Pt #	Distance (FT)	Initial Slope	Initial Dif In Elev (FT)	Initial Length (FT)	Settlement at Left Point (FT)	Settlement at Right Point (FT)	Final Dif In Elev (FT)	Final Slope	Verify Final Slope '+'=OK '-'=NG	Final Length (FT)	Strain
1 2	120 0	1 50%	1 8	120 0	1 60	1 83	2 03	1 69%	OK	120 0	0 003%
2-3	440 0	1 50%	6 6	440 0	1 83	2 00	6 77	1 54%	OK	440 1	0 001%
3 4	550 0	1 50%	8 3	550 1	2 00	2 17	8 42	1 53%	OK	550 1	0 000%
4 5	550 0	1 50%	8 3	550 1	2 17	1 83	7 91	1 44%	OK	550 1	-0 001%
5-6	500 0	1 50%	7 5	500 1	1 83	1 58	7 25	1 45%	OK	500 1	-0 001%

3 4 Conclusions

A All segments of the leachate collection alignment remain positive towards the sump

B Strains are less than 1 percent which is much less than maximum of 17% Reference D, pg 442

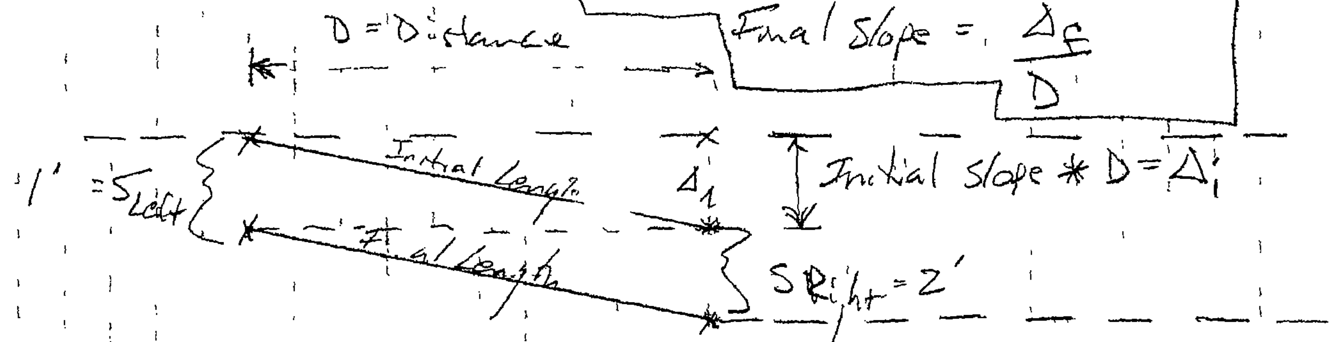
ATTACHMENT 3A: SETTLEMENT AND CONSOLIDATION CALCULATIONS

Calculations Approach

Initial slope $\frac{\Delta_i}{D}$

$\Delta_f \Rightarrow \Delta_i + S_R - S_L$

Final slope = $\frac{\Delta_f}{D}$



$$\text{Initial length} = \sqrt{D^2 + \left[(\text{Initial slope}) * D\right]^2}$$

Final length =

Δ_1 = Initial Dfi = D * (Initial slope) = Δ_1

$\Delta_f = \Delta_1 + (S_R - S_L)$

Point #	Depth to Center	P_1 Initial Pressure P_1 (ksf)*	Thickness of Excavation	$P_2 = P_0$ Pressure after Excav (ksf)	T of Waste	P_3 (ksf) Pressure Final**	ΔP
1	70'	8.47	20'	6.05	42'	8.57	2.52
2	72'	8.71	22'	6.05	72'	10.37	4.32
3	75'	9.08	25'	6.06	100'	12.06	6.00
4	82'	9.92	32'	6.05	134'	14.09	8.04
5	90'	10.89	40'	6.05	73'	10.43	4.38
6	95'	11.50	45'	6.06	46'	8.82	2.76

#	S'	S"
1	1.56'	19"
2	1.79'	22"
3	1.98'	24"
4	2.17'	26"
5	1.80'	22"
6	1.59'	19"

$P_1 = (\text{Depth to Center}) * (\text{Moist unit wt of soil})$

$P_2 = P_1 - [(\text{Thickness of Ex})(\text{Moist unit wt of soil})$

$P_3 = P_2 + [(\text{Thickness of Waste Fill})(\text{Moist unit wt. of Waste})]$

Consolidation settlement

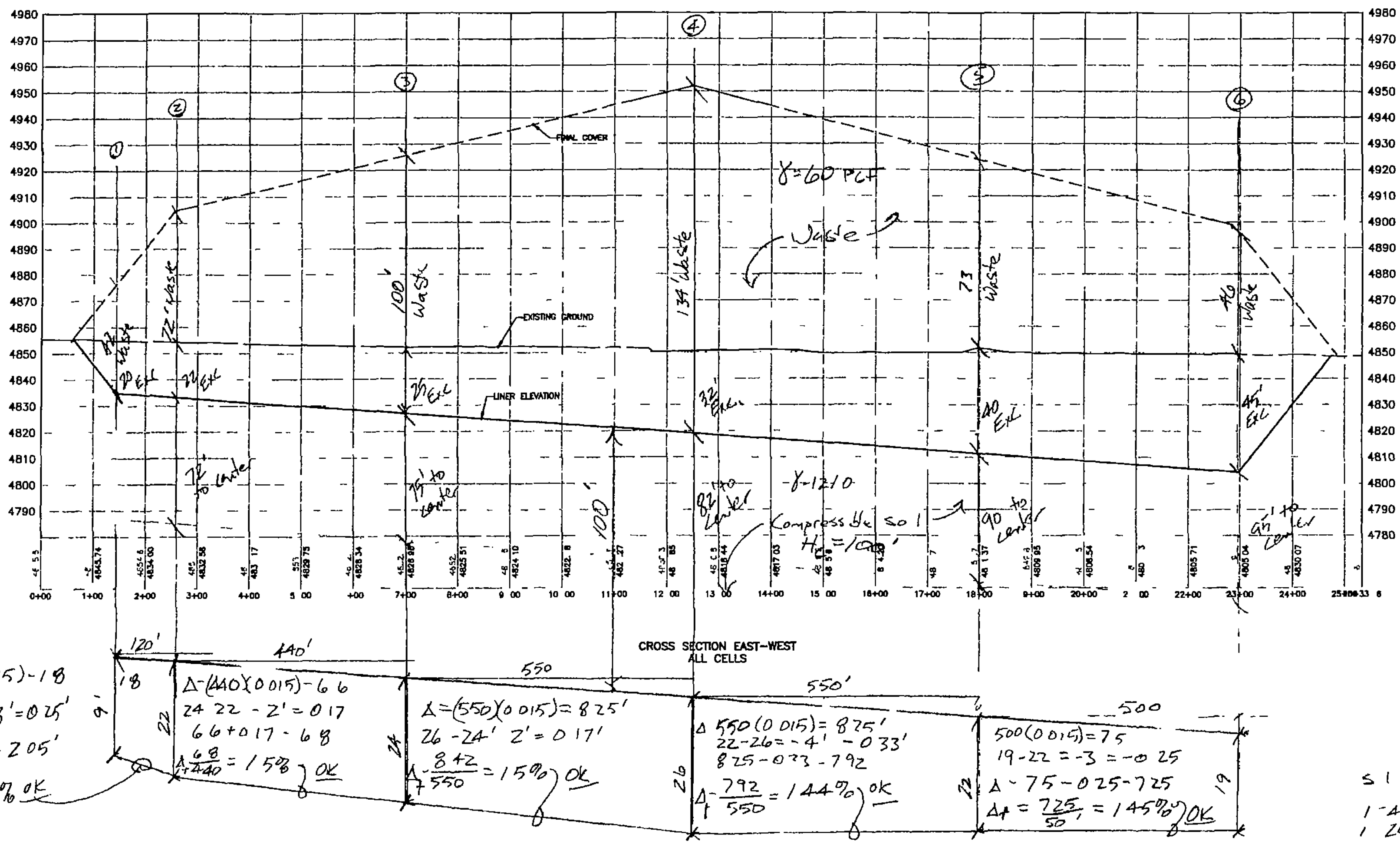
$$S_c = \underbrace{\cancel{\frac{C_s H_c}{1+e_0} \log \frac{P_c}{P_0}}}_{0} + \frac{C_c H_c}{1+e_0} \log \frac{P_0 + \Delta P}{P_c} \quad \text{Das}$$

$P_0 > P_c$

$P_c = 2.4$ ksf
$P_0 = P_2$
$\Delta P = P_3 - P_2$
$C_c = C_r = 0.048$
$H_c = 100'$

$e_0 = 0.704$

* Moist Density = 121.0 PCF (soil)
** Moist Density = 60 PCF (Waste Saturated)

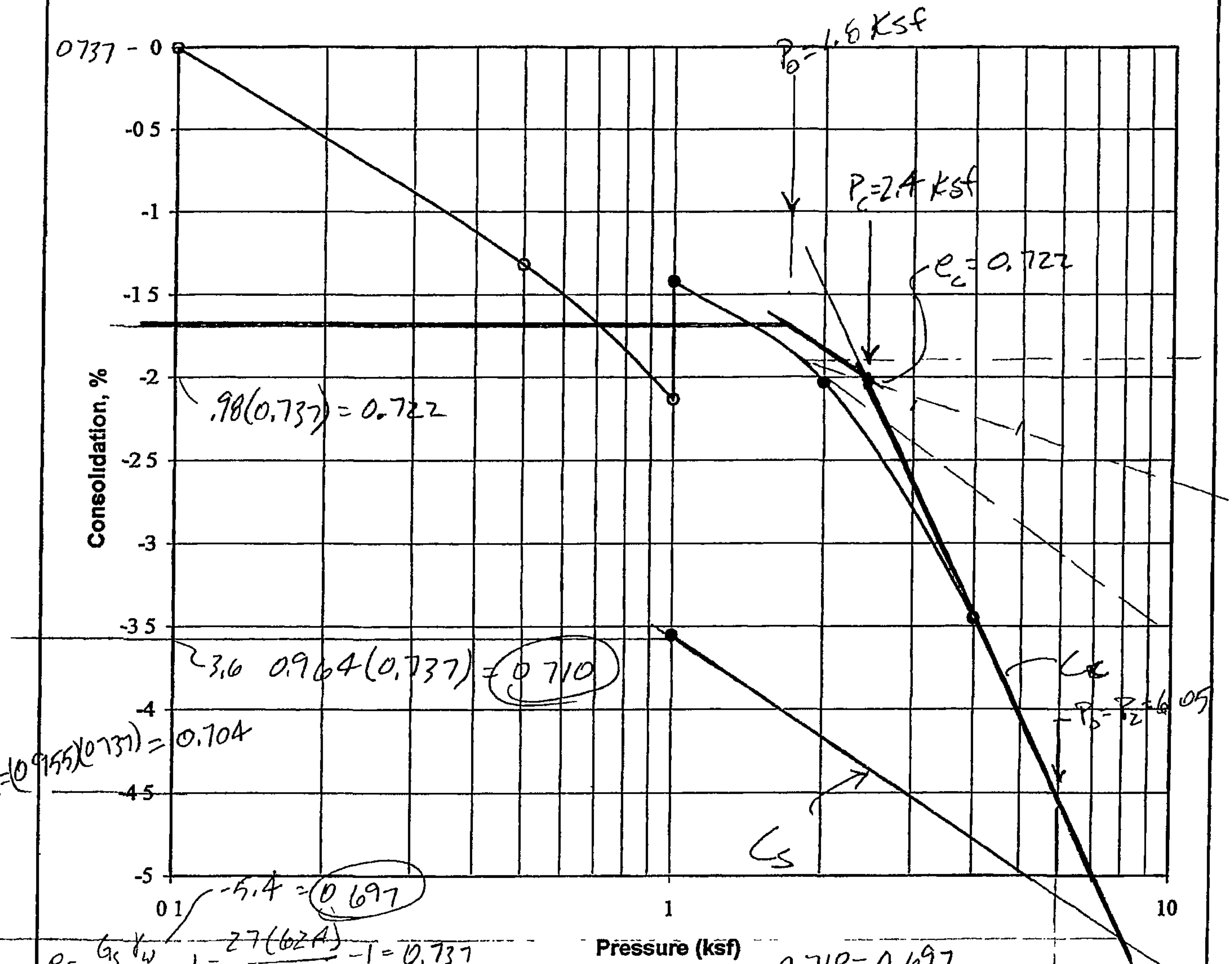


Δ - 120(0.015) - 1.8
22' - 19 = 3' = 0.25'
1.8 + 0.25 = 2.05'
Δ_t 2.05/120' - 1.7% OK

S 1 = 20"
1 - 40 V
1 200 H
Sheet 7 of 12

C:\PWwork\ g\PHX0d0164095\01C007.dwg Plot, 3/15/2010 9:02:10 AM gshafer

CONSOLIDATION - SWELL TEST



$$e_i = \frac{G_s \gamma_w}{\gamma_d} - 1 = \frac{2.7(62.4)}{97} - 1 = 0.737$$

$$C_s = \frac{0.710 - 0.697}{\log 8} = 0.014$$

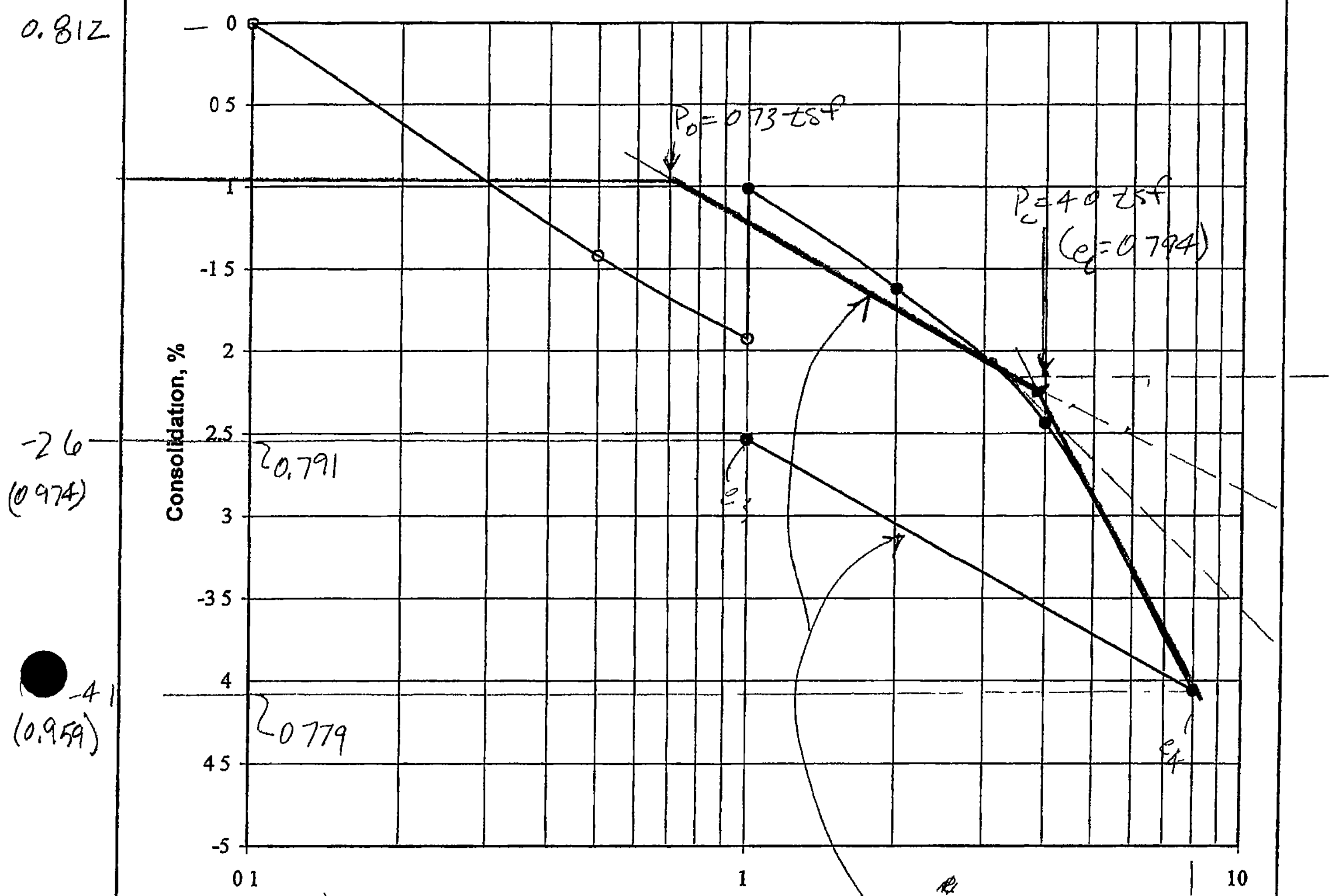
Project	Intermountain Regional Landfill
Location	TH-1
Sample Depth	15
Description	Block
Soil Type	FAT CLAY (CH)
Dry Density, pcf	97
Natural Moisture, %	21
Liquid Limit	77
Plasticity Index	51
Water Added at	1 ksf
Percent Swell	0 7

$$P_o = \frac{15.5(1.21)(97)}{1000 \text{ psf}} \left| \frac{1 \text{ tsf}}{} \right. = 1.8 \text{ tsf}$$

$$C_c = \frac{0.722 - 0.697}{\log \frac{8}{2.4}} = 0.048$$

PROJECT NO 062496	Earthtec Testing and Engineering, P.C.	**FIGURE NO** 30

CONSOLIDATION - SWELL TEST



$e_o = \frac{2.7(62.4)}{93} - 1 = 0.812$

$C_s = \frac{e_3 - e_4}{\log \frac{P_4}{P_3}} = \frac{0.791 - 0.779}{\log\left(\frac{8}{1}\right)} = 0.013$

8 ksf

$C_r = \frac{(0.794 - 0.779)}{\log\left(\frac{8}{4}\right)} = 0.05$

Project	Intermountain Regional Landfill
Location	TP-14
Sample Depth	6
Description	Block
Soil Type	FTA CLAY (CH)
Dry Density, pcf	93
Natural Moisture, %	20
Liquid Limit	71
Plasticity Index	47
Water Added at	1 ksf
Percent Swell	0.9

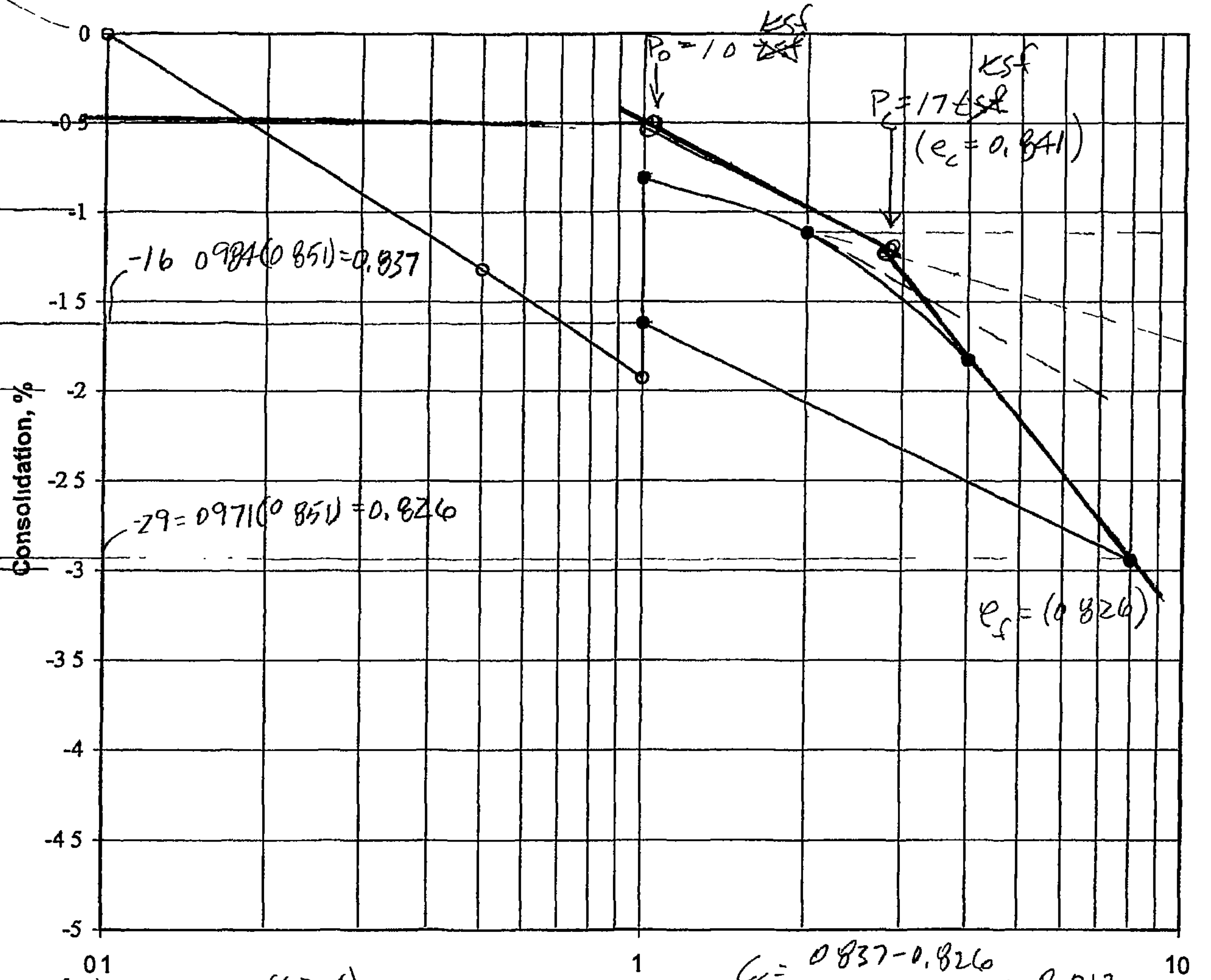
$P_o = \frac{(6.5)(120)(93.0)}{1000 \text{ psf}} \Big| \frac{1 \text{ tsf}}{} = 0.73$ tsf

$OCR = \frac{4.0 \text{ tsf}}{0.73 \text{ tsf}} = 5.5$

$LL = 71$ $\quad 0.0463\left(\frac{71}{100}\right)2.7 = 0.09$

PROJECT NO 062496	Earthtec Testing and Engineering, P.C.	**FIGURE NO** 28

CONSOLIDATION - SWELL TEST



$e_0 = \frac{G_s \gamma_w}{\gamma_d} - 1 = \frac{2.7(62.4)}{91} - 1 = 0.85$

$C_s = \frac{0.837 - 0.826}{\log 8} = 0.012$

(100 ft)(60 pcf) waste

$\frac{(50')(110)}{1000 \text{ ksf}} = 5.5$ ksf

$\frac{50(110)}{1000 \text{ LBS}} = 1$ Kip

Project	Intermountain Regional Landfill
Location	TP-10
Sample Depth	8½
Description	Block
Soil Type	FAT CLAY (CH)
Dry Density, pcf	91
Natural Moisture, %	26
Liquid Limit	70
Plasticity Index	50
Water Added at	1 ksf
Percent Swell	1.1

$P_o = \frac{(9 \text{ Ft})(91)(1.26)}{1000} \left| \frac{1 \text{ Kips}}{\#} \right.$

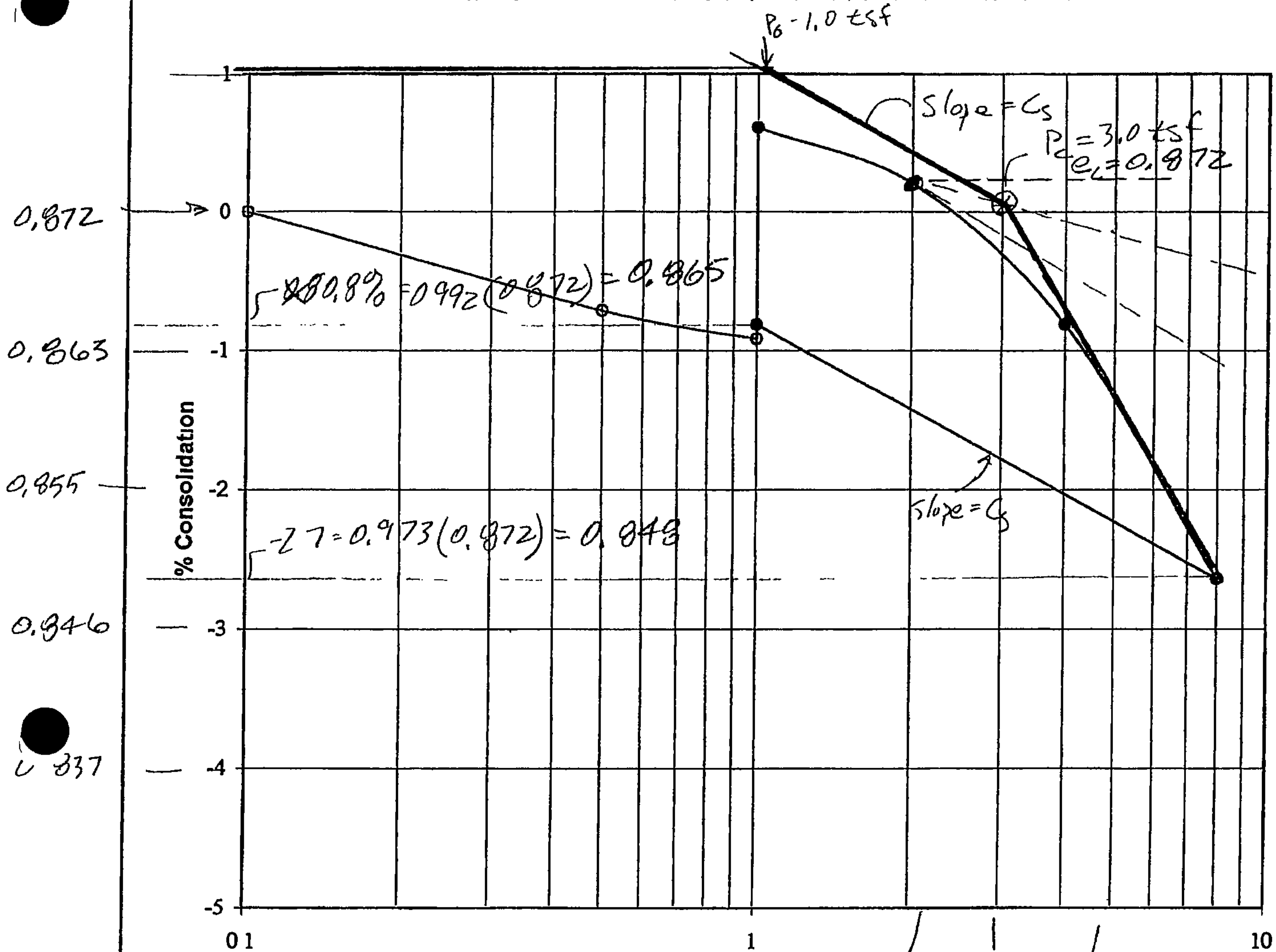
$= 1.03$ tsf

$C_c = \frac{0.841 - 0.826}{\log\left(\frac{8}{1.7}\right)} = 0.022$

$OCR = \frac{1.7 \text{ tsf}}{1.0 \text{ tsf}} = 1.7$

PROJECT NO 062496	Earthtec Testing and Engineering, P.C.	FIGURE NO 27

CONSOLIDATION - SWELL TEST



$e_c = \frac{2.7(62.4)}{90} - 1 = 0.872$

$C_s = \frac{0.865 - 0.848}{\log 8} = 0.019$

$C_c = \frac{0.872 - 0.848}{\log(8/3.0)} = 0.056$

Project	Intermountain Regional Landfill
Location	TP-7
Sample Depth	9
Description	Block
Soil Type	FAT CLAY (CH)
Dry Density, pcf	90
Natural Moisture, %	23
Liquid Limit	70
Plasticity Index	37
Water Added at	1 ksf
Percent Swell	1.5

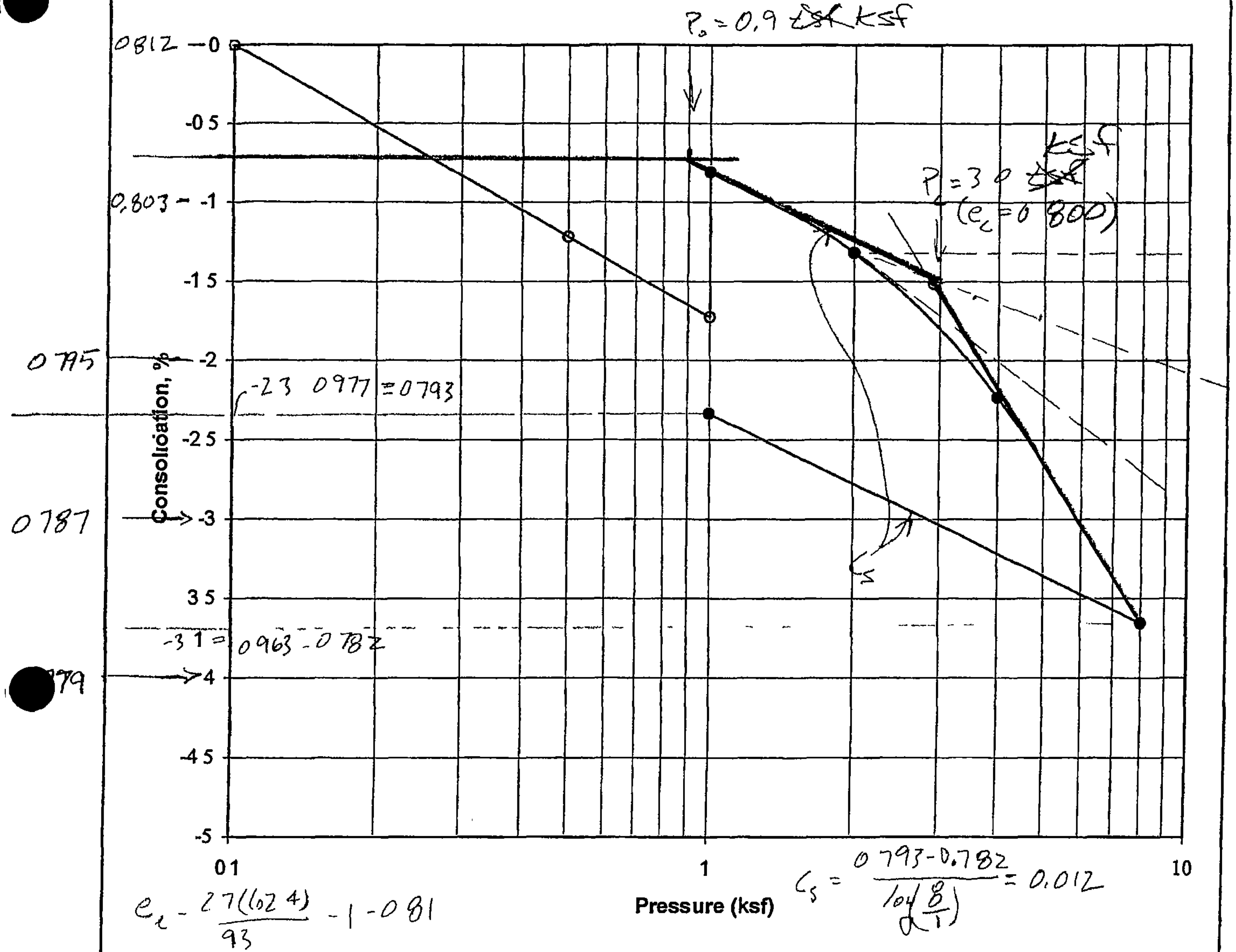
$P_o = \frac{9.25'(1.23)(90.0 \text{ pcf})}{1000}$

$= 1.02$ tsf

$OCR = \frac{P_c}{P_o} = \frac{3.0 \text{ tsf}}{1.0 \text{ tsf}} = 3.0$

PROJECT NO 062496	Earthtec Testing and Engineering, P.C.	FIGURE NO 26

CONSOLIDATION - SWELL TEST



Project	Intermountain Regional Landfill
Location	TP-15
Sample Depth	7½
Description	Block
Soil Type	FTA CLAY (CH)
Dry Density, pcf	93
Natural Moisture, %	19
Liquid Limit	61
Plasticity Index	37
Water Added at	1 ksf
Percent Swell	0 9

30(1

$P_o - \frac{(8)(93)(1.19)}{1000} \text{ ksf}$ / 1 ~~tsf~~ k

$P_o = 0.9$ ~~tsf~~ ksf

$C_c = \frac{0.800 - 0.782}{\log \frac{8}{3}} = 0.042$

$OCR = \frac{3.0 \text{ tsf}}{0.9 \text{ tsf}} = 3.3$

PROJECT NO 062496	Earthtec Testing and Engineering, P.C.	FIGURE NO 29

APPENDIX D

Differential Settlement Update

Purpose: To recalculate the settlement along the leachate piping alignments to verify positive drainage towards the sumps is maintained and to ensure maximum strains on the HDPE liner along the leachate lines do not exceed the maximum allowable.

Method: The methodology outlined in the following publications were followed, consistent with the analysis completed by HDR for the original design:

Das, B., 2011. Principles of Foundation Engineering, 7th Edition.
Koerner, R M, 1990. Designing with Geosynthetics, 2nd Edition.

The following previous studies were also used as the basis for the analysis:

HDR, 2010. Slope Stability and Settlement Evaluation for Intermountain Regional Landfill, Fairfield, Utah.

Earthtec Testing & Engineering, PC, 2006. Geotechnical Study Intermountain Regional Landfill, Fairfield, Utah.

Required: In order to calculate the differential settlement, the following settlement equation will be used:

$$Sc = \left(\frac{C_s H_c}{1+e_0} Log \frac{\sigma_c}{\sigma_0}\right) + \left(\frac{C_c H_c}{1+e_0} Log \frac{\sigma_0 + \triangle\sigma}{\sigma_c}\right)$$

Where

H_c = Thickness of the compressible zone, 100 ft
S_c = Total consolidation settlement
C_s = Swelling index, 0
C_c = Compression index, 0.048
σ_o = Pressure after excavation (prior to filling with waste), KSF
e_o = Initial void ration after excavation, 0.704 according to Earthtec study
σ_c = Preconsolidation pressure, 2.4 KSF according to Earthtec study
$\Delta\sigma$ = Average increase in effective pressure on the clay layer after filling with waste, KSF

With Soil M density of 121 PCF and waste density of 60 PCF

Calculations:

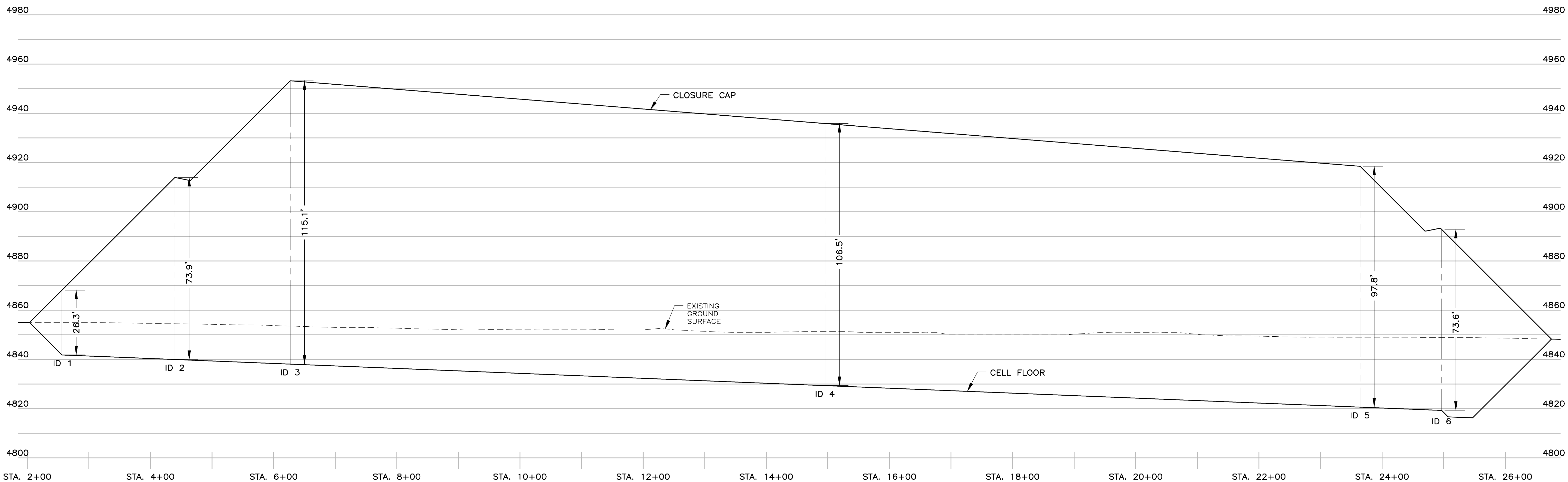
Differential Settlement along main leachate line in Cell 2 (see attached drawing):

ID	Depth to Center (ft)	Initial Pressure, σ_c (KSF)	Thickness of Excavation (ft)	Pressure After Excavation, σ_o (KSF)	Thickness of Waste (ft)	Final Pressure (KSF)	Total Change in Pressure, $\Delta\sigma$ (KSF)	Settlement, S_c (ft)
2+54.2	63.2	7.64	13.2	6.05	26.3	2.31	-3.74	-0.046
4+37.5	64.5	7.81	14.5	6.05	73.9	5.17	-0.88	0.938
6+24.8	65.5	7.92	15.5	6.05	115.1	7.64	1.59	1.416
14+93.3	72.0	8.71	22.0	6.05	106.5	7.12	1.07	1.330
23+61.7	78.4	9.48	28.4	6.05	97.8	6.60	0.55	1.238
24+44.6	82.6	9.99	32.6	6.05	64.0	4.57	-1.48	0.788

Check for positive slope on leachate line and liner strain:

ID	Initial Length (ft)	Initial Difference Elevation (ft)	Settlement at 1st Point (ft)	Settlement at 2nd Point (ft)	Final Dif in Elevation (ft)	Final Slope Post Settlement (ft/ft)	Post Settlement Length (ft)	Liner Strain (%)
1-2	183.29	1.8437	-0.046	0.938	2.828	0.01543	183.3053	0.0068%
2-3	187.37	1.8847	0.938	1.416	2.363	0.01261	187.3727	0.0029%
3-4	868.46	8.7357	1.416	1.330	8.650	0.00996	868.4607	-0.0001%
4-5	868.53	8.7364	1.330	1.238	8.644	0.00995	868.5263	-0.0001%
5-6	132.38	1.3322	1.238	0.933	1.027	0.00776	132.4427	0.0492%

The results of the updated differential settlement analysis confirm that the leachate and floor slopes will remain positive post-settlement. Likewise, liner strain will remain far below 1% which is well within the maximum 17% used as the criteria in the 2010 calculations.



FILE NAME: PROJECTS\373 – INTERMOUNTAIN REGIONAL LANDFILL\02.100 – LF REDESIGN\ENG\CALCULATIONS\APPENDIX D – HAL SETTLEMENT UPDATE\SETTLEMENT CALCULATION DIMENSIONS.DWG
FILE DATE: 10.26.2016 08:45:09 (CAH)

HANSEN ALLEN & LUCE INC ENGINEERS

2016 PERMIT MODIFICATIONS
UPDATE TO DIFFERENTIAL SETTLEMENT CALCULATIONS

INTERMOUNTAIN regional landfill

FIGURE 1

373-02-100

10/07

APPENDIX E

Leachate Collection and Removal System

HELP Model

Leachate Collection System Geonet/Leachate Pipe/Sump Sizing

Leachate Withdrawal Pipe and Leachate Collection Pipe Integrity

Geotextile Sizing for Geocomposite Selection

The HELP Model was used to determine leachate quantities for the leachate collection system as well as other useful information. The required input to the model was determined as listed below:

- The evaporation and solar radiation values that were used in the model were generated from default data corresponding to the Salt Lake area as designated in the HELP Model program.
- Precipitation and average temperature data input for Fairfield, Utah were taken from the Western Regional Climate Center database, found at www.wrcc.dri.edu.
- The evaporative zone depth was assumed to be 16 inches for the waste layer and 24 inches for the clay soils used as protective cover over the geosynthetic materials. These numbers were derived based on specific soils information and suggested values from the HELP Model Users Guide.
- The maximum leaf area index was assumed to be zero based on the arid desert conditions that exist in the Fairfield area.
- The Curve number for the protective cover soils was based on both NRCS soils data and geotechnical studies performed by both EARTHTEC Testing and Engineering and Applied Geotechnical Engineering Consultants, Inc. (AGEC). Using methods described in TR-55, it was determined that the majority of the soils that are intended to be used as protective cover over the geosynthetics materials are classified under the hydrologic classification of somewhere between C and D and that the cover type is Desert Shrub with poor coverage.
- The drainage net was applied as the default in the HELP model and then specific parameters altered to match typical geocomposite values
  - Thickness 0.25 inches
  - Hydraulic Conductivity 23.6 cm/sec

The model was set up according to the preliminary designs for the layer system. From the HELP Model manual, Table 4 entitled “Default Soil, Waste, and Geosynthetic Characteristics” was used to determine which layer classification to use. The model used 5-7 layers that are summarized below:

Layer	**Thickness (in.)**	**Porosity (Vol/Vol)**	**Hydraulic Conductivity (cm/sec)**
Soil Cover	0-24	0.479	2.5E-5
High Density Polyethylene - HDPE Liner	0-0.06	0	2.0E-13
Municipal Waste	0-1,452	0.671	1.0E-3
Protective Soil Cover	24	0.479	2.5E-5
Drainage Net – Geocomposite	0.25	0.85	23.6
HDPE Liner	0.06	0	2.0E-13
GCL	0.25	0.75	3.0E-9

The Help Model was run for different waste heights in order to determine the prevailing condition to apply to the leachate collection system. This was determined to be at about the 10 ft range where from 10 to 121 ft (full waste height) the predicted peak daily value is relatively stable. Once the full waste height was reached, the model was run with and without the closure cap.

The results are summarized in the following table:

Model Run – Waste Height	Peak Daily Collected at Geonet (in.)	Annual Average Collected at Geonet (in.)	Annual Average Runoff (in.)
No waste	0.204	0.134	0.845
10 ft	0.161	0.571	0.120
50 ft	0.157	0.571	0.120
100 ft	0.160	0.571	0.120
121 ft	0.158	0.571	0.120
Closure	0.001	0.0128	1.885

Back to:

State Map | Western U.S. map | Home Page

NOTE:
To print data frame (right side), click on right frame before printing.

1981 - 2010

- Daily Temp. & Precip.
- Daily Tabular data (~23 KB)
- Monthly Tabular data (~1 KB)
- NCDC 1981-2010 Normals (~3 KB)

1971 - 2000

- Daily Temp. & Precip.
- Daily Tabular data (~23 KB)
- Monthly Tabular data (~1 KB)
- NCDC 1971-2000 Normals (~3 KB)

1961 - 1990

- Daily Temp. & Precip.
- Daily Tabular data (~23 KB)
- Monthly Tabular data (~1 KB)
- NCDC 1961-1990 Normals (~3 KB)

Period of Record

- Station Metadata

FAIRFIELD, UTAH (422696)

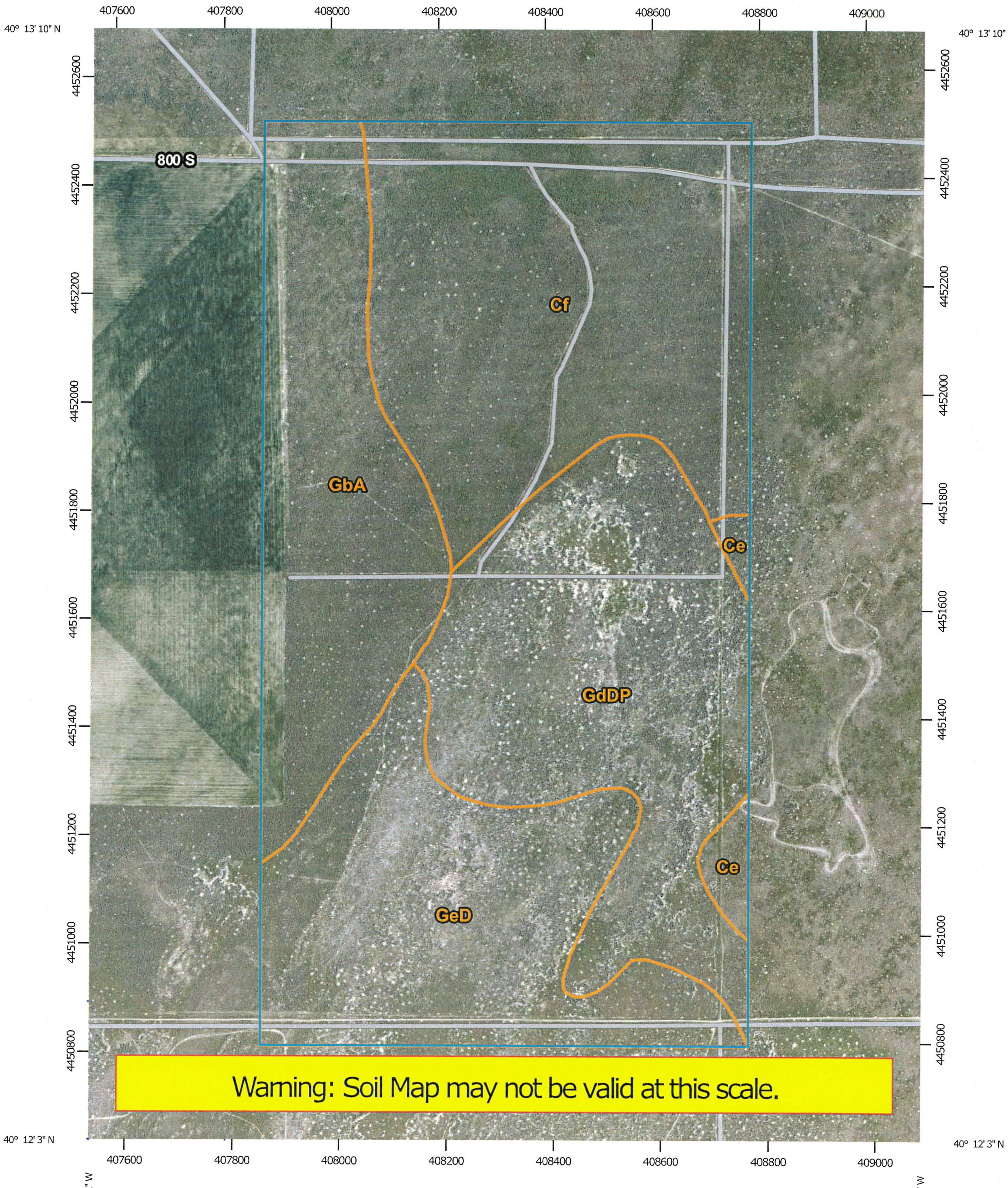
1981-2010 Monthly Climate Summary

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Max. Temperature (F)	38.0	43.9	54.2	62.7	71.8	81.7	89.0	87.4	78.7	65.6	49.7	39.6
Average Min. Temperature (F)	12.2	17.1	24.8	30.2	37.4	44.1	50.6	49.7	40.3	29.4	20.8	13.9
Average Total Precipitation (in.)	1.07	1.05	1.15	1.20	1.31	0.78	0.90	0.96	1.02	1.18	1.04	1.06

Unofficial values based on averages/sums of smoothed daily data. Information is computed from available daily data during the 1981-2010 period. Smoothing, missing data and observation-time changes may cause these 1981-2010 values to differ from official NCDC values. This table is presented for use at locations that don't have official NCDC data. No adjustments are made for missing data or time of observation. Check NCDC normals table for official data.

Western Regional Climate Center, wrcc@dri.edu

Soil Map—Fairfield-Nephi Area, Utah
(Intermountain Regional Landfill)



Map Scale: 1:10,000 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 450 900 1800 2700

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Fairfield-Nephi Area, Utah
Survey Area Data: Version 9, Sep 23, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 2, 2011—Aug 29, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Fairfield-Nephi Area, Utah (UT608)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
Ce	Cheebe fine sandy loam	5.4	1.4%
Cf	Cheebe silty clay loam	117.5	30.5%
GbA	Genola silt loam, 0 to 1 percent slopes	76.1	19.8%
GdDP	Goldrun loamy fine sand, hummocky, 0 to 10 percent slopes	100.9	26.2%
GeD	Goldrun-Cheebe complex, 0 to 10 percent slopes	85.3	22.1%
Totals for Area of Interest		**385.2**	**100.0%**

Engineering Properties

This table gives the engineering classifications and the range of engineering properties for the layers of each soil in the survey area.

Hydrologic soil group is a group of soils having similar runoff potential under similar storm and cover conditions. The criteria for determining Hydrologic soil group is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba). Listing HSGs by soil map unit component and not by soil series is a new concept for the engineers. Past engineering references contained lists of HSGs by soil series. Soil series are continually being defined and redefined, and the list of soil series names changes so frequently as to make the task of maintaining a single national list virtually impossible. Therefore, the criteria is now used to calculate the HSG using the component soil properties and no such national series lists will be maintained. All such references are obsolete and their use should be discontinued. Soil properties that influence runoff potential are those that influence the minimum rate of infiltration for a bare soil after prolonged wetting and when not frozen. These properties are depth to a seasonal high water table, saturated hydraulic conductivity after prolonged wetting, and depth to a layer with a very slow water transmission rate. Changes in soil properties caused by land management or climate changes also cause the hydrologic soil group to change. The influence of ground cover is treated independently. There are four hydrologic soil groups, A, B, C, and D, and three dual groups, A/D, B/D, and C/D. In the dual groups, the first letter is for drained areas and the second letter is for undrained areas.

The four hydrologic soil groups are described in the following paragraphs:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly."

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2005) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2004).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Percentage of rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

References:

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Report—Engineering Properties

Absence of an entry indicates that the data were not estimated. The asterisk '*' denotes the representative texture; other possible textures follow the dash. The criteria for determining the hydrologic soil group for individual soil components is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba). Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Engineering Properties–Fairfield-Nephi Area, Utah

Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
Ce—Cheebe fine sandy loam														
Cheebe	80	C	0-8	Fine sandy loam	SM, SC-SM, ML, CL-ML	A-4	0- 0- 0	0- 0- 0	100-100-100	100-100-100	70-78-85	40-48-55	20-23-25	NP-3 -5
			8-15	Silty clay	CH	A-7	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-98-100	90-93-95	50-55-60	25-30-35
			15-20	Silty clay	CH	A-7	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-98-100	90-93-95	50-55-60	25-30-35
			20-31	Silty clay	CH	A-7	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-98-100	90-93-95	50-55-60	25-30-35
			31-44	Silty clay	CH	A-7	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-98-100	90-93-95	50-55-60	25-30-35
			44-55	Silty clay loam	CL	A-7	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-98-100	85-90-95	40-45-50	20-23-25
			55-65	Clay	CH	A-7	0- 0- 0	0- 0- 0	100-100-100	100-100-100	90-95-100	80-88-95	50-55-60	25-30-35

Engineering Properties–Fairfield-Nephi Area, Utah														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
Cf—Cheebe silty clay loam														
Cheebe	80	C	0-2	Silty clay loam	CL	A-6, A-7	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-98-100	85-90-95	35-40-45	15-20-25
			2-4	Silty clay loam	CL	A-6, A-7	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-98-100	85-90-95	35-40-45	15-20-25
			4-8	Silty clay loam	CL	A-6, A-7	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-98-100	85-90-95	35-40-45	15-20-25
			8-15	Silty clay	CH	A-7-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-98-100	90-93-95	50-55-60	25-30-35
			15-20	Silty clay	CH	A-7-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-98-100	90-93-95	50-55-60	25-30-35
			20-31	Silty clay	CH	A-7-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-98-100	90-93-95	50-55-60	25-30-35
			31-44	Silty clay	CH	A-7-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-98-100	90-93-95	50-55-60	25-30-35
			44-55	Silty clay loam	CL	A-7-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-98-100	85-90-95	40-45-50	20-23-25
			55-65	Clay	CH	A-7-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	90-95-100	80-88-95	50-55-60	25-30-35

Engineering Properties–Fairfield-Nephi Area, Utah

Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
GbA—Genola silt loam, 0 to 1 percent slopes														
Genola	80	C	0-1	Silt loam	CL-ML	A-4	0- 0- 0	0- 0- 0	100-100-100	100-100-100	85-93-100	75-83-90	20-25-30	5-8 -10
			1-6	Silt loam	CL-ML	A-4	0- 0- 0	0- 0- 0	100-100-100	100-100-100	85-93-100	75-83-90	20-25-30	5-8 -10
			6-15	Silt loam	CL-ML	A-4	0- 0- 0	0- 0- 0	100-100-100	100-100-100	85-93-100	75-83-90	20-25-30	5-8 -10
			15-29	Silt loam	CL-ML	A-4	0- 0- 0	0- 0- 0	100-100-100	100-100-100	85-93-100	75-83-90	20-25-30	5-8 -10
			29-42	Silt loam	CL-ML	A-4	0- 0- 0	0- 0- 0	100-100-100	100-100-100	85-93-100	75-83-90	20-25-30	5-8 -10
			42-60	Silt loam	CL-ML	A-4	0- 0- 0	0- 0- 0	100-100-100	100-100-100	85-93-100	75-83-90	20-25-30	5-8 -10
GdDP—Goldrun loamy fine sand, hummocky, 0 to 10 percent slopes														
Goldrun	85	A	0-2	Loamy fine sand	SM	A-2	0- 0- 0	0- 0- 0	100-100-100	100-100-100	75-83-90	15-25-35	10-15-20	NP-3 -5
			2-11	Loamy fine sand	SM	A-2	0- 0- 0	0- 0- 0	100-100-100	100-100-100	75-83-90	15-25-35	10-15-20	NP-3 -5
			11-26	Fine sand	SM	A-2	0- 0- 0	0- 0- 0	100-100-100	100-100-100	75-83-90	15-25-35	10-15-20	NP-3 -5
			26-48	Fine sand	SM	A-2	0- 0- 0	0- 0- 0	100-100-100	100-100-100	75-83-90	10-15-20	10-15-20	NP-3 -5
			48-60	Loamy fine sand	SM	A-2	0- 0- 0	0- 0- 0	100-100-100	100-100-100	75-83-90	15-25-35	10-15-20	NP-3 -5

Engineering Properties–Fairfield-Nephi Area, Utah

Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
GeD—Goldrun-Cheebe complex, 0 to 10 percent slopes														
Goldrun	50	A	0-2	Loamy fine sand	SM	A-2	0- 0- 0	0- 0- 0	100-100-100	100-100-100	75-83-90	15-25-35	10-15-20	NP-3 -5
			2-11	Loamy fine sand	SM	A-2	0- 0- 0	0- 0- 0	100-100-100	100-100-100	75-83-90	15-25-35	10-15-20	NP-3 -5
			11-26	Fine sand	SM	A-2	0- 0- 0	0- 0- 0	100-100-100	100-100-100	75-83-90	15-25-35	10-15-20	NP-3 -5
			26-48	Fine sand	SM	A-2	0- 0- 0	0- 0- 0	100-100-100	100-100-100	75-83-90	10-15-20	10-15-20	NP-3 -5
			48-60	Loamy fine sand	SM	A-2	0- 0- 0	0- 0- 0	100-100-100	100-100-100	75-83-90	15-25-35	10-15-20	NP-3 -5
Cheebe	30	C	0-2	Silty clay loam	CL	A-6, A-7	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-98-100	85-90-95	35-40-45	15-20-25
			2-4	Silty clay loam	CL	A-6, A-7	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-98-100	85-90-95	35-40-45	15-20-25
			4-8	Silty clay loam	CL	A-6, A-7	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-98-100	85-90-95	35-40-45	15-20-25
			8-15	Silty clay	CH	A-7-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-98-100	90-93-95	50-55-60	25-30-35
			15-20	Silty clay	CH	A-7-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-98-100	90-93-95	50-55-60	25-30-35
			20-31	Silty clay	CH	A-7-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-98-100	90-93-95	50-55-60	25-30-35
			31-44	Silty clay	CH	A-7-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-98-100	90-93-95	50-55-60	25-30-35
			44-55	Silty clay loam	CL	A-7-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	95-98-100	85-90-95	40-45-50	20-23-25
			55-65	Clay	CH	A-7-6	0- 0- 0	0- 0- 0	100-100-100	100-100-100	90-95-100	80-88-95	50-55-60	25-30-35

Data Source Information

Soil Survey Area: Fairfield-Nephi Area, Utah
Survey Area Data: Version 9, Sep 23, 2015

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**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                 DEVELOPED BY ENVIRONMENTAL LABORATORY                    **
**                   USAE WATERWAYS EXPERIMENT STATION                      **
**              FOR USEPA RISK REDUCTION ENGINEERING LABORATORY             **
**                                                                          **
**                                                                          **
******************************************************************************
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PRECIPITATION DATA FILE:     C:\HELP3\IRLHELP\DATA4.D4
TEMPERATURE DATA FILE:       C:\HELP3\IRLHELP\DATA7.D7
SOLAR RADIATION DATA FILE:   C:\HELP3\IRLHELP\DATA13.D13
EVAPOTRANSPIRATION DATA:     C:\HELP3\IRLHELP\DATA1124.D11
SOIL AND DESIGN DATA FILE:   C:\HELP3\IRLHELP\0_418.D10
OUTPUT DATA FILE:            C:\HELP3\IRLHELP\0_418.OUT


TIME:  13:15      DATE:   9/28/2016


******************************************************************************

     TITLE:  IRL_2016_Redesign

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
            COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                   LAYER  1
                                   --------

                       TYPE 1 - VERTICAL PERCOLATION LAYER
```

```
               MATERIAL TEXTURE NUMBER  14
THICKNESS                    =     24.00   INCHES
POROSITY                     =      0.4790 VOL/VOL
FIELD CAPACITY               =      0.3710 VOL/VOL
WILTING POINT                =      0.2510 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.3399 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.249999994000E-04 CM/SEC


                         LAYER  2
                         --------

             TYPE 2 - LATERAL DRAINAGE LAYER
               MATERIAL TEXTURE NUMBER   0
THICKNESS                    =      0.25   INCHES
POROSITY                     =      0.8500 VOL/VOL
FIELD CAPACITY               =      0.0100 VOL/VOL
WILTING POINT                =      0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0100 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =   23.6000004000     CM/SEC
SLOPE                        =      2.00   PERCENT
DRAINAGE LENGTH              =    418.0    FEET


                         LAYER  3
                         --------

             TYPE 4 - FLEXIBLE MEMBRANE LINER
               MATERIAL TEXTURE NUMBER  35
THICKNESS                    =      0.06   INCHES
POROSITY                     =      0.0000 VOL/VOL
FIELD CAPACITY               =      0.0000 VOL/VOL
WILTING POINT                =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY          =      1.00   HOLES/ACRE
FML INSTALLATION DEFECTS     =      4.00   HOLES/ACRE
FML PLACEMENT QUALITY        =  3 - GOOD


                         LAYER  4
                         --------
```

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 17

THICKNESS	=	0.25	INCHES
POROSITY	=	0.7500	VOL/VOL
FIELD CAPACITY	=	0.7470	VOL/VOL
WILTING POINT	=	0.4000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.7500	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.300000003000E-08	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM A USER-SPECIFIED CURVE NUMBER OF 86.0, A SURFACE SLOPE OF 2.% AND A SLOPE LENGTH OF 418. FEET.

SCS RUNOFF CURVE NUMBER	=	85.90	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	82.000	ACRES
EVAPORATIVE ZONE DEPTH	=	24.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	8.158	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	11.496	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	6.024	INCHES
INITIAL SNOW WATER	=	0.125	INCHES
INITIAL WATER IN LAYER MATERIALS	=	8.348	INCHES
TOTAL INITIAL WATER	=	8.473	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
SALT LAKE CITY UTAH

STATION LATITUDE	=	40.76	DEGREES
MAXIMUM LEAF AREA INDEX	=	0.00	
START OF GROWING SEASON (JULIAN DATE)	=	117	
END OF GROWING SEASON (JULIAN DATE)	=	289	
EVAPORATIVE ZONE DEPTH	=	24.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	8.80	MPH

AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 67.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 48.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 39.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 65.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR SALT LAKE CITY UTAH

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.07	1.05	1.15	1.20	1.31	0.78
0.90	0.96	1.02	1.18	1.04	1.06

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR SALT LAKE CITY UTAH

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
25.10	30.50	39.50	46.50	54.60	62.90
69.80	68.60	59.50	47.50	35.30	26.80

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR SALT LAKE CITY UTAH
AND STATION LATITUDE = 40.76 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 30

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						

```
-------------
  TOTALS                    0.92    0.95    1.33    1.11    1.11    0.83
                            0.84    0.89    0.96    1.09    1.12    1.13

  STD. DEVIATIONS           0.47    0.43    0.53    0.48    0.59    0.60
                            0.58    0.83    0.69    0.85    0.62    0.46

RUNOFF
------
  TOTALS                    0.115   0.279   0.240   0.001   0.001   0.003
                            0.049   0.029   0.004   0.030   0.009   0.086

  STD. DEVIATIONS           0.155   0.322   0.217   0.005   0.002   0.013
                            0.152   0.081   0.020   0.094   0.050   0.153

EVAPOTRANSPIRATION
------------------
  TOTALS                    0.556   0.562   1.647   1.418   1.192   0.900
                            0.883   0.839   0.974   0.916   0.777   0.640

  STD. DEVIATIONS           0.173   0.190   0.591   0.672   0.624   0.627
                            0.594   0.786   0.739   0.647   0.283   0.189

LATERAL DRAINAGE COLLECTED FROM LAYER  2
----------------------------------------
  TOTALS                    0.0000  0.0000  0.0914  0.0031  0.0015  0.0018
                            0.0005  0.0005  0.0004  0.0003  0.0130  0.0216

  STD. DEVIATIONS           0.0000  0.0001  0.2482  0.0057  0.0042  0.0032
                            0.0008  0.0009  0.0005  0.0004  0.0688  0.1175

PERCOLATION/LEAKAGE THROUGH LAYER  4
------------------------------------
  TOTALS                    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
                            0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

  STD. DEVIATIONS           0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
                            0.0000  0.0000  0.0000  0.0000  0.0000  0.0000


-------------------------------------------------------------------------------
               AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)
-------------------------------------------------------------------------------


DAILY AVERAGE HEAD ON TOP OF LAYER  3
-------------------------------------
  AVERAGES                  0.0000  0.0000  0.0005  0.0000  0.0000  0.0000
```

```
                              0.0000   0.0000   0.0000   0.0000   0.0001   0.0001

    STD. DEVIATIONS           0.0000   0.0000   0.0013   0.0000   0.0000   0.0000
                              0.0000   0.0000   0.0000   0.0000   0.0004   0.0006

*******************************************************************************


*******************************************************************************

    AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS    1 THROUGH   30
-------------------------------------------------------------------------------
                                    INCHES              CU. FEET       PERCENT
                               -------------------   -------------   ---------
 PRECIPITATION                  12.28   (   2.129)    3655066.5      100.00

 RUNOFF                          0.845  (  0.5193)     251519.31      6.881

 EVAPOTRANSPIRATION             11.305  (  1.8950)    3364966.25     92.063

 LATERAL DRAINAGE COLLECTED      0.13415 (  0.30584)     39931.727   1.09250
   FROM LAYER  2

 PERCOLATION/LEAKAGE THROUGH     0.00000 (  0.00000)         0.047    0.00000
   LAYER  4

 AVERAGE HEAD ON TOP             0.000 (    0.000)
   OF LAYER  3

 CHANGE IN WATER STORAGE        -0.005  (  1.1961)      -1351.17     -0.037

*******************************************************************************


*******************************************************************************

              PEAK DAILY VALUES FOR YEARS    1 THROUGH   30
  ------------------------------------------------------------------------
                                                (INCHES)      (CU. FT.)
                                               ----------   -------------
    PRECIPITATION                                 1.67       497092.187

    RUNOFF                                        0.716      213208.8590

    DRAINAGE COLLECTED FROM LAYER  2              0.20360     60602.12500
```

PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000000	0.00466
AVERAGE HEAD ON TOP OF LAYER 3	0.032	
MAXIMUM HEAD ON TOP OF LAYER 3	0.063	
LOCATION OF MAXIMUM HEAD IN LAYER 2 (DISTANCE FROM DRAIN)	4.0 FEET	
SNOW WATER	2.36	703569.5620
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.4414	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.2640	

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

****

****

FINAL WATER STORAGE AT END OF YEAR 30

LAYER	(INCHES)	(VOL/VOL)
1	8.1190	0.3383
2	0.0025	0.0100
3	0.0000	0.0000
4	0.1875	0.7500
SNOW WATER	0.027	

****
****

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**             HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                   **
**              DEVELOPED BY ENVIRONMENTAL LABORATORY                       **
**                USAE WATERWAYS EXPERIMENT STATION                         **
**            FOR USEPA RISK REDUCTION ENGINEERING LABORATORY               **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:    C:\HELP3\IRLHELP\DATA4.D4
TEMPERATURE DATA FILE:      C:\HELP3\IRLHELP\DATA7.D7
SOLAR RADIATION DATA FILE:  C:\HELP3\IRLHELP\DATA13.D13
EVAPOTRANSPIRATION DATA:    C:\HELP3\IRLHELP\DATA11.D11
SOIL AND DESIGN DATA FILE:  C:\HELP3\IRLHELP\10_418.D10
OUTPUT DATA FILE:           C:\HELP3\IRLHELP\10_418.OUT


TIME:  13:26     DATE:   9/28/2016


******************************************************************************

     TITLE:  IRL_2016_Redesign

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
            COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                  LAYER  1
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
```

MATERIAL TEXTURE NUMBER 18

```
THICKNESS                      =    120.00   INCHES
POROSITY                       =      0.6710 VOL/VOL
FIELD CAPACITY                 =      0.2920 VOL/VOL
WILTING POINT                  =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT     =      0.2811 VOL/VOL
EFFECTIVE SAT. HYD. COND.      =  0.100000005000E-02 CM/SEC
```

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 14

```
THICKNESS                      =     24.00   INCHES
POROSITY                       =      0.4790 VOL/VOL
FIELD CAPACITY                 =      0.3710 VOL/VOL
WILTING POINT                  =      0.2510 VOL/VOL
INITIAL SOIL WATER CONTENT     =      0.3710 VOL/VOL
EFFECTIVE SAT. HYD. COND.      =  0.249999994000E-04 CM/SEC
```

LAYER 3

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

```
THICKNESS                      =      0.25   INCHES
POROSITY                       =      0.8500 VOL/VOL
FIELD CAPACITY                 =      0.0100 VOL/VOL
WILTING POINT                  =      0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT     =      0.0100 VOL/VOL
EFFECTIVE SAT. HYD. COND.      =   23.6000004000     CM/SEC
SLOPE                          =      2.00   PERCENT
DRAINAGE LENGTH                =    418.0    FEET
```

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 35

```
   THICKNESS                      =      0.06   INCHES
   POROSITY                       =      0.0000 VOL/VOL
   FIELD CAPACITY                 =      0.0000 VOL/VOL
   WILTING POINT                  =      0.0000 VOL/VOL
   INITIAL SOIL WATER CONTENT     =      0.0000 VOL/VOL
   EFFECTIVE SAT. HYD. COND.      =  0.199999996000E-12 CM/SEC
   FML PINHOLE DENSITY            =      1.00   HOLES/ACRE
   FML INSTALLATION DEFECTS       =      4.00   HOLES/ACRE
   FML PLACEMENT QUALITY          =  3 - GOOD
```

```
                            LAYER  5
                            --------

                  TYPE 3 - BARRIER SOIL LINER
                  MATERIAL TEXTURE NUMBER  17
   THICKNESS                      =      0.25   INCHES
   POROSITY                       =      0.7500 VOL/VOL
   FIELD CAPACITY                 =      0.7470 VOL/VOL
   WILTING POINT                  =      0.4000 VOL/VOL
   INITIAL SOIL WATER CONTENT     =      0.7500 VOL/VOL
   EFFECTIVE SAT. HYD. COND.      =  0.300000003000E-08 CM/SEC
```

```
              GENERAL DESIGN AND EVAPORATIVE ZONE DATA
              ----------------------------------------

 NOTE:  SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
          SOIL DATA BASE USING SOIL TEXTURE #18 WITH BARE
          GROUND CONDITIONS, A SURFACE SLOPE OF  2.% AND
          A SLOPE LENGTH OF  418. FEET.

 SCS RUNOFF CURVE NUMBER                =     79.50
 FRACTION OF AREA ALLOWING RUNOFF       =    100.0    PERCENT
 AREA PROJECTED ON HORIZONTAL PLANE     =     82.000  ACRES
 EVAPORATIVE ZONE DEPTH                 =     16.0    INCHES
 INITIAL WATER IN EVAPORATIVE ZONE      =      3.365  INCHES
 UPPER LIMIT OF EVAPORATIVE STORAGE     =     10.736  INCHES
 LOWER LIMIT OF EVAPORATIVE STORAGE     =      1.232  INCHES
 INITIAL SNOW WATER                     =      0.125  INCHES
 INITIAL WATER IN LAYER MATERIALS       =     42.827  INCHES
 TOTAL INITIAL WATER                    =     42.951  INCHES
 TOTAL SUBSURFACE INFLOW                =      0.00   INCHES/YEAR
```

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
SALT LAKE CITY UTAH

STATION LATITUDE	=	40.76 DEGREES
MAXIMUM LEAF AREA INDEX	=	0.00
START OF GROWING SEASON (JULIAN DATE)	=	117
END OF GROWING SEASON (JULIAN DATE)	=	289
EVAPORATIVE ZONE DEPTH	=	16.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	8.80 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	67.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	48.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	39.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	65.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR SALT LAKE CITY UTAH

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.07	1.05	1.15	1.20	1.31	0.78
0.90	0.96	1.02	1.18	1.04	1.06

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR SALT LAKE CITY UTAH

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
25.10	30.50	39.50	46.50	54.60	62.90
69.80	68.60	59.50	47.50	35.30	26.80

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR SALT LAKE CITY UTAH
AND STATION LATITUDE = 40.76 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 30

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.92	0.95	1.33	1.11	1.11	0.83
	0.84	0.89	0.96	1.09	1.12	1.13
STD. DEVIATIONS	0.47	0.43	0.53	0.48	0.59	0.60
	0.58	0.83	0.69	0.85	0.62	0.46
RUNOFF						
TOTALS	0.014	0.045	0.045	0.000	0.000	0.000
	0.000	0.000	0.000	0.001	0.000	0.015
STD. DEVIATIONS	0.038	0.095	0.054	0.000	0.000	0.000
	0.003	0.000	0.000	0.004	0.000	0.056
EVAPOTRANSPIRATION						
TOTALS	0.556	0.570	1.784	1.499	1.214	0.907
	0.870	0.884	0.939	0.945	0.770	0.647
STD. DEVIATIONS	0.173	0.198	0.597	0.724	0.643	0.614
	0.615	0.843	0.750	0.671	0.283	0.210
LATERAL DRAINAGE COLLECTED FROM LAYER 3						
TOTALS	0.0214	0.0036	0.0403	0.2721	0.1360	0.0133
	0.0097	0.0030	0.0019	0.0041	0.0153	0.0505
STD. DEVIATIONS	0.1014	0.0136	0.0888	0.4075	0.1350	0.0257
	0.0191	0.0040	0.0023	0.0086	0.0597	0.2501

PERCOLATION/LEAKAGE THROUGH LAYER 5

```
 ------------------------------------
  TOTALS                   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                           0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

  STD. DEVIATIONS          0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                           0.0000   0.0000   0.0000   0.0000   0.0000   0.0000


-------------------------------------------------------------------------------
              AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)
-------------------------------------------------------------------------------


 DAILY AVERAGE HEAD ON TOP OF LAYER  4
 -------------------------------------
  AVERAGES                 0.0001   0.0000   0.0002   0.0014   0.0007   0.0001
                           0.0000   0.0000   0.0000   0.0000   0.0001   0.0003

  STD. DEVIATIONS          0.0005   0.0001   0.0004   0.0021   0.0007   0.0001
                           0.0001   0.0000   0.0000   0.0000   0.0003   0.0013

*******************************************************************************


*******************************************************************************

    AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS    1 THROUGH   30
-------------------------------------------------------------------------------
                                     INCHES            CU. FEET      PERCENT
                               -------------------   -------------  ---------
 PRECIPITATION                  12.28    (   2.129)   3655066.5     100.00

 RUNOFF                          0.120   (  0.1169)     35677.98      0.976

 EVAPOTRANSPIRATION             11.584   (  1.9139)   3448107.25     94.338

 LATERAL DRAINAGE COLLECTED      0.57137 (  0.71037)   170074.672    4.65312
   FROM LAYER  3

 PERCOLATION/LEAKAGE THROUGH     0.00000 (  0.00000)        0.153    0.00000
   LAYER  5

 AVERAGE HEAD ON TOP             0.000 (    0.000)
   OF LAYER  4

 CHANGE IN WATER STORAGE         0.004   (  1.1797)      1205.93      0.033
```

****

****

PEAK DAILY VALUES FOR YEARS 1 THROUGH 30

	(INCHES)	(CU. FT.)
PRECIPITATION	1.67	497092.187
RUNOFF	0.303	90270.1797
DRAINAGE COLLECTED FROM LAYER 3	0.16075	47849.55470
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000000	0.00418
AVERAGE HEAD ON TOP OF LAYER 4	0.025	
MAXIMUM HEAD ON TOP OF LAYER 4	0.049	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	9.4 FEET	
SNOW WATER	2.36	703569.5620

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.4024
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0921

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

****

****

FINAL WATER STORAGE AT END OF YEAR 30

LAYER	(INCHES)	(VOL/VOL)
1	33.9517	0.2829
2	8.9040	0.3710
3	0.0025	0.0100
4	0.0000	0.0000
5	0.1875	0.7500
SNOW WATER	0.027	

****
****

```
****************************************************************************
****************************************************************************
**                                                                        **
**                                                                        **
**          HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                 **
**             HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                 **
**              DEVELOPED BY ENVIRONMENTAL LABORATORY                     **
**                USAE WATERWAYS EXPERIMENT STATION                       **
**          FOR USEPA RISK REDUCTION ENGINEERING LABORATORY               **
**                                                                        **
**                                                                        **
****************************************************************************
****************************************************************************
```

```
PRECIPITATION DATA FILE:    C:\HELP3\IRLHELP\DATA4.D4
TEMPERATURE DATA FILE:      C:\HELP3\IRLHELP\DATA7.D7
SOLAR RADIATION DATA FILE:  C:\HELP3\IRLHELP\DATA13.D13
EVAPOTRANSPIRATION DATA:    C:\HELP3\IRLHELP\DATA11.D11
SOIL AND DESIGN DATA FILE:  C:\HELP3\IRLHELP\50_418.D10
OUTPUT DATA FILE:           C:\HELP3\IRLHELP\50_418.OUT
```

TIME: 14:43   DATE: 9/28/2016

****

TITLE: IRL_2016_Redesign

****

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 18

```
THICKNESS                  =    600.00   INCHES
POROSITY                   =      0.6710 VOL/VOL
FIELD CAPACITY             =      0.2920 VOL/VOL
WILTING POINT              =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT =      0.2898 VOL/VOL
EFFECTIVE SAT. HYD. COND.  =  0.100000005000E-02 CM/SEC
```

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 14

```
THICKNESS                  =     24.00   INCHES
POROSITY                   =      0.4790 VOL/VOL
FIELD CAPACITY             =      0.3710 VOL/VOL
WILTING POINT              =      0.2510 VOL/VOL
INITIAL SOIL WATER CONTENT =      0.3710 VOL/VOL
EFFECTIVE SAT. HYD. COND.  =  0.249999994000E-04 CM/SEC
```

LAYER 3

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

```
THICKNESS                  =      0.25   INCHES
POROSITY                   =      0.8500 VOL/VOL
FIELD CAPACITY             =      0.0100 VOL/VOL
WILTING POINT              =      0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT =      0.0100 VOL/VOL
EFFECTIVE SAT. HYD. COND.  =   23.6000004000     CM/SEC
SLOPE                      =      2.00   PERCENT
DRAINAGE LENGTH            =    418.0    FEET
```

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 35

```
THICKNESS                    =      0.06   INCHES
POROSITY                     =      0.0000 VOL/VOL
FIELD CAPACITY               =      0.0000 VOL/VOL
WILTING POINT                =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY          =      1.00   HOLES/ACRE
FML INSTALLATION DEFECTS     =      4.00   HOLES/ACRE
FML PLACEMENT QUALITY        =  3 - GOOD
```

```
                         LAYER  5
                         --------

               TYPE 3 - BARRIER SOIL LINER
               MATERIAL TEXTURE NUMBER  17
THICKNESS                    =      0.25   INCHES
POROSITY                     =      0.7500 VOL/VOL
FIELD CAPACITY               =      0.7470 VOL/VOL
WILTING POINT                =      0.4000 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.7500 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.300000003000E-08 CM/SEC
```

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          GENERAL DESIGN AND EVAPORATIVE ZONE DATA
          ----------------------------------------

NOTE:  SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
         SOIL DATA BASE USING SOIL TEXTURE #18 WITH BARE
         GROUND CONDITIONS, A SURFACE SLOPE OF  2.% AND
         A SLOPE LENGTH OF  418. FEET.

SCS RUNOFF CURVE NUMBER             =     79.50
FRACTION OF AREA ALLOWING RUNOFF    =    100.0    PERCENT
AREA PROJECTED ON HORIZONTAL PLANE  =     82.000  ACRES
EVAPORATIVE ZONE DEPTH              =     16.0    INCHES
INITIAL WATER IN EVAPORATIVE ZONE   =      3.365  INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE  =     10.736  INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE  =      1.232  INCHES
INITIAL SNOW WATER                  =      0.125  INCHES
INITIAL WATER IN LAYER MATERIALS    =    182.987  INCHES
TOTAL INITIAL WATER                 =    183.111  INCHES
TOTAL SUBSURFACE INFLOW             =      0.00   INCHES/YEAR
```

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
SALT LAKE CITY UTAH

STATION LATITUDE	=	40.76 DEGREES
MAXIMUM LEAF AREA INDEX	=	0.00
START OF GROWING SEASON (JULIAN DATE)	=	117
END OF GROWING SEASON (JULIAN DATE)	=	289
EVAPORATIVE ZONE DEPTH	=	16.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	8.80 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	67.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	48.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	39.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	65.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR SALT LAKE CITY UTAH

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.07	1.05	1.15	1.20	1.31	0.78
0.90	0.96	1.02	1.18	1.04	1.06

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR SALT LAKE CITY UTAH

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
25.10	30.50	39.50	46.50	54.60	62.90
69.80	68.60	59.50	47.50	35.30	26.80

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR SALT LAKE CITY UTAH
AND STATION LATITUDE = 40.76 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 30

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.92	0.95	1.33	1.11	1.11	0.83
	0.84	0.89	0.96	1.09	1.12	1.13
STD. DEVIATIONS	0.47	0.43	0.53	0.48	0.59	0.60
	0.58	0.83	0.69	0.85	0.62	0.46
RUNOFF						
TOTALS	0.014	0.045	0.045	0.000	0.000	0.000
	0.000	0.000	0.000	0.001	0.000	0.015
STD. DEVIATIONS	0.038	0.095	0.054	0.000	0.000	0.000
	0.003	0.000	0.000	0.004	0.000	0.056
EVAPOTRANSPIRATION						
TOTALS	0.556	0.570	1.784	1.499	1.214	0.907
	0.870	0.884	0.939	0.945	0.770	0.647
STD. DEVIATIONS	0.173	0.198	0.597	0.724	0.643	0.614
	0.615	0.843	0.750	0.671	0.283	0.210
LATERAL DRAINAGE COLLECTED FROM LAYER 3						
TOTALS	0.0228	0.0040	0.0206	0.2846	0.1430	0.0135
	0.0097	0.0030	0.0019	0.0041	0.0141	0.0498
STD. DEVIATIONS	0.1087	0.0149	0.0264	0.4402	0.1422	0.0264
	0.0191	0.0040	0.0023	0.0086	0.0538	0.2464

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	0.0001	0.0000	0.0001	0.0015	0.0007	0.0001
	0.0000	0.0000	0.0000	0.0000	0.0001	0.0003
STD. DEVIATIONS	0.0005	0.0001	0.0001	0.0023	0.0007	0.0001
	0.0001	0.0000	0.0000	0.0000	0.0003	0.0012

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30

	INCHES	CU. FEET	PERCENT
PRECIPITATION	12.28 (2.129)	3655066.5	100.00
RUNOFF	0.120 (0.1169)	35677.98	0.976
EVAPOTRANSPIRATION	11.584 (1.9139)	3448107.25	94.338
LATERAL DRAINAGE COLLECTED FROM LAYER 3	0.57137 (0.71065)	170074.672	4.65312
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.00000 (0.00000)	0.152	0.00000
AVERAGE HEAD ON TOP OF LAYER 4	0.000 (0.000)		
CHANGE IN WATER STORAGE	0.004 (1.1864)	1205.93	0.033

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 30

	(INCHES)	(CU. FT.)
PRECIPITATION	1.67	497092.187
RUNOFF	0.303	90270.1797
DRAINAGE COLLECTED FROM LAYER 3	0.15661	46617.22660
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000000	0.00413
AVERAGE HEAD ON TOP OF LAYER 4	0.024	
MAXIMUM HEAD ON TOP OF LAYER 4	0.048	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	3.8 FEET	
SNOW WATER	2.36	703569.5620

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.4024

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.0921

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 30

LAYER	(INCHES)	(VOL/VOL)
1	174.1117	0.2902
2	8.9040	0.3710
3	0.0025	0.0100
4	0.0000	0.0000
5	0.1875	0.7500
SNOW WATER	0.027	

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**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                 DEVELOPED BY ENVIRONMENTAL LABORATORY                    **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**              FOR USEPA RISK REDUCTION ENGINEERING LABORATORY             **
**                                                                          **
**                                                                          **
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PRECIPITATION DATA FILE:     C:\HELP3\IRLHELP\DATA4.D4
TEMPERATURE DATA FILE:       C:\HELP3\IRLHELP\DATA7.D7
SOLAR RADIATION DATA FILE:   C:\HELP3\IRLHELP\DATA13.D13
EVAPOTRANSPIRATION DATA:     C:\HELP3\IRLHELP\DATA11.D11
SOIL AND DESIGN DATA FILE:   C:\HELP3\IRLHELP\100_418.D10
OUTPUT DATA FILE:            C:\HELP3\IRLHELP\100_418.OUT


TIME:  15:44     DATE:   9/28/2016


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     TITLE:  IRL_2016_Redesign

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                    LAYER  1
                                    --------

                        TYPE 1 - VERTICAL PERCOLATION LAYER
```

MATERIAL TEXTURE NUMBER 18

THICKNESS	=	1200.00 INCHES
POROSITY	=	0.6710 VOL/VOL
FIELD CAPACITY	=	0.2920 VOL/VOL
WILTING POINT	=	0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2909 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02 CM/SEC

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 14

THICKNESS	=	24.00 INCHES
POROSITY	=	0.4790 VOL/VOL
FIELD CAPACITY	=	0.3710 VOL/VOL
WILTING POINT	=	0.2510 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.3710 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.249999994000E-04 CM/SEC

LAYER 3

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.25 INCHES
POROSITY	=	0.8500 VOL/VOL
FIELD CAPACITY	=	0.0100 VOL/VOL
WILTING POINT	=	0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0100 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	23.6000004000 CM/SEC
SLOPE	=	2.00 PERCENT
DRAINAGE LENGTH	=	418.0 FEET

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06 INCHES
POROSITY	=	0.0000 VOL/VOL
FIELD CAPACITY	=	0.0000 VOL/VOL
WILTING POINT	=	0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY	=	1.00 HOLES/ACRE
FML INSTALLATION DEFECTS	=	4.00 HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD

LAYER 5

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 17

THICKNESS	=	0.25 INCHES
POROSITY	=	0.7500 VOL/VOL
FIELD CAPACITY	=	0.7470 VOL/VOL
WILTING POINT	=	0.4000 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.7500 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.300000003000E-08 CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #18 WITH BARE GROUND CONDITIONS, A SURFACE SLOPE OF 2.% AND A SLOPE LENGTH OF 418. FEET.

SCS RUNOFF CURVE NUMBER	=	79.50	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	82.000	ACRES
EVAPORATIVE ZONE DEPTH	=	16.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	3.365	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	10.736	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	1.232	INCHES
INITIAL SNOW WATER	=	0.125	INCHES
INITIAL WATER IN LAYER MATERIALS	=	358.187	INCHES
TOTAL INITIAL WATER	=	358.311	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
SALT LAKE CITY UTAH

STATION LATITUDE	=	40.76 DEGREES
MAXIMUM LEAF AREA INDEX	=	0.00
START OF GROWING SEASON (JULIAN DATE)	=	117
END OF GROWING SEASON (JULIAN DATE)	=	289
EVAPORATIVE ZONE DEPTH	=	16.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	8.80 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	67.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	48.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	39.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	65.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR SALT LAKE CITY UTAH

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.07	1.05	1.15	1.20	1.31	0.78
0.90	0.96	1.02	1.18	1.04	1.06

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR SALT LAKE CITY UTAH

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
25.10	30.50	39.50	46.50	54.60	62.90
69.80	68.60	59.50	47.50	35.30	26.80

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR SALT LAKE CITY UTAH
AND STATION LATITUDE = 40.76 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 30

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.92	0.95	1.33	1.11	1.11	0.83
	0.84	0.89	0.96	1.09	1.12	1.13
STD. DEVIATIONS	0.47	0.43	0.53	0.48	0.59	0.60
	0.58	0.83	0.69	0.85	0.62	0.46
RUNOFF						
TOTALS	0.014	0.045	0.045	0.000	0.000	0.000
	0.000	0.000	0.000	0.001	0.000	0.015
STD. DEVIATIONS	0.038	0.095	0.054	0.000	0.000	0.000
	0.003	0.000	0.000	0.004	0.000	0.056
EVAPOTRANSPIRATION						
TOTALS	0.556	0.570	1.784	1.499	1.214	0.907
	0.870	0.884	0.939	0.945	0.770	0.647
STD. DEVIATIONS	0.173	0.198	0.597	0.724	0.643	0.614
	0.615	0.843	0.750	0.671	0.283	0.210
LATERAL DRAINAGE COLLECTED FROM LAYER 3						
TOTALS	0.0229	0.0041	0.0196	0.2849	0.1438	0.0136
	0.0097	0.0030	0.0019	0.0041	0.0140	0.0497
STD. DEVIATIONS	0.1094	0.0151	0.0254	0.4410	0.1431	0.0264
	0.0191	0.0040	0.0023	0.0086	0.0533	0.2460

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	0.0001	0.0000	0.0001	0.0015	0.0007	0.0001
	0.0000	0.0000	0.0000	0.0000	0.0001	0.0003
STD. DEVIATIONS	0.0006	0.0001	0.0001	0.0023	0.0007	0.0001
	0.0001	0.0000	0.0000	0.0000	0.0003	0.0012

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30

	INCHES	CU. FEET	PERCENT
PRECIPITATION	12.28 (2.129)	3655066.5	100.00
RUNOFF	0.120 (0.1169)	35677.98	0.976
EVAPOTRANSPIRATION	11.584 (1.9139)	3448107.25	94.338
LATERAL DRAINAGE COLLECTED FROM LAYER 3	0.57137 (0.71069)	170074.672	4.65312
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.00000 (0.00000)	0.152	0.00000
AVERAGE HEAD ON TOP OF LAYER 4	0.000 (0.000)		
CHANGE IN WATER STORAGE	0.004 (1.1870)	1205.78	0.033

****

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 30

	(INCHES)	(CU. FT.)
PRECIPITATION	1.67	497092.187
RUNOFF	0.303	90270.1797
DRAINAGE COLLECTED FROM LAYER 3	0.15956	47495.00390
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000000	0.00417
AVERAGE HEAD ON TOP OF LAYER 4	0.025	
MAXIMUM HEAD ON TOP OF LAYER 4	0.051	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	2.36	703569.5620

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.4024

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.0921

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 30

LAYER	(INCHES)	(VOL/VOL)
1	349.3116	0.2911
2	8.9040	0.3710
3	0.0025	0.0100
4	0.0000	0.0000
5	0.1875	0.7500
SNOW WATER	0.027	

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**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                 DEVELOPED BY ENVIRONMENTAL LABORATORY                    **
**                   USAE WATERWAYS EXPERIMENT STATION                      **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:    C:\HELP3\IRLHELP\DATA4.D4
TEMPERATURE DATA FILE:      C:\HELP3\IRLHELP\DATA7.D7
SOLAR RADIATION DATA FILE:  C:\HELP3\IRLHELP\DATA13.D13
EVAPOTRANSPIRATION DATA:    C:\HELP3\IRLHELP\DATA11.D11
SOIL AND DESIGN DATA FILE:  C:\HELP3\IRLHELP\121_418.D10
OUTPUT DATA FILE:           C:\HELP3\IRLHELP\121_418.OUT


TIME:  16:21     DATE:   9/28/2016


******************************************************************************

     TITLE:  IRL_2016_Redesign

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
            COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                    LAYER  1
                                    --------

                       TYPE 1 - VERTICAL PERCOLATION LAYER
```

```
              MATERIAL TEXTURE NUMBER  18
THICKNESS                    =   1452.00   INCHES
POROSITY                     =      0.6710 VOL/VOL
FIELD CAPACITY               =      0.2920 VOL/VOL
WILTING POINT                =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.2911 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.100000005000E-02 CM/SEC


                       LAYER  2
                       --------

         TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  14
THICKNESS                    =     24.00   INCHES
POROSITY                     =      0.4790 VOL/VOL
FIELD CAPACITY               =      0.3710 VOL/VOL
WILTING POINT                =      0.2510 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.3710 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.249999994000E-04 CM/SEC


                       LAYER  3
                       --------

           TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =      0.25   INCHES
POROSITY                     =      0.8500 VOL/VOL
FIELD CAPACITY               =      0.0100 VOL/VOL
WILTING POINT                =      0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0100 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =   23.6000004000     CM/SEC
SLOPE                        =      2.00   PERCENT
DRAINAGE LENGTH              =    418.0    FEET


                       LAYER  4
                       --------

           TYPE 4 - FLEXIBLE MEMBRANE LINER
              MATERIAL TEXTURE NUMBER  35
```

```
THICKNESS                      =      0.06   INCHES
POROSITY                       =      0.0000 VOL/VOL
FIELD CAPACITY                 =      0.0000 VOL/VOL
WILTING POINT                  =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT     =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.      =  0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY            =      1.00   HOLES/ACRE
FML INSTALLATION DEFECTS       =      4.00   HOLES/ACRE
FML PLACEMENT QUALITY          =  3 - GOOD


                        LAYER  5
                        --------

             TYPE 3 - BARRIER SOIL LINER
             MATERIAL TEXTURE NUMBER  17
THICKNESS                      =      0.25   INCHES
POROSITY                       =      0.7500 VOL/VOL
FIELD CAPACITY                 =      0.7470 VOL/VOL
WILTING POINT                  =      0.4000 VOL/VOL
INITIAL SOIL WATER CONTENT     =      0.7500 VOL/VOL
EFFECTIVE SAT. HYD. COND.      =  0.300000003000E-08 CM/SEC


          GENERAL DESIGN AND EVAPORATIVE ZONE DATA
          ----------------------------------------

NOTE:  SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
         SOIL DATA BASE USING SOIL TEXTURE #18 WITH BARE
         GROUND CONDITIONS, A SURFACE SLOPE OF  2.% AND
         A SLOPE LENGTH OF  418. FEET.

SCS RUNOFF CURVE NUMBER              =     79.50
FRACTION OF AREA ALLOWING RUNOFF     =    100.0    PERCENT
AREA PROJECTED ON HORIZONTAL PLANE   =     82.000  ACRES
EVAPORATIVE ZONE DEPTH               =     16.0    INCHES
INITIAL WATER IN EVAPORATIVE ZONE    =      3.365  INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE   =     10.736  INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE   =      1.232  INCHES
INITIAL SNOW WATER                   =      0.125  INCHES
INITIAL WATER IN LAYER MATERIALS     =    431.771  INCHES
TOTAL INITIAL WATER                  =    431.895  INCHES
TOTAL SUBSURFACE INFLOW              =      0.00   INCHES/YEAR
```

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
SALT LAKE CITY UTAH

STATION LATITUDE	=	40.76 DEGREES
MAXIMUM LEAF AREA INDEX	=	0.00
START OF GROWING SEASON (JULIAN DATE)	=	117
END OF GROWING SEASON (JULIAN DATE)	=	289
EVAPORATIVE ZONE DEPTH	=	16.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	8.80 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	67.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	48.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	39.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	65.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR SALT LAKE CITY UTAH

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.07	1.05	1.15	1.20	1.31	0.78
0.90	0.96	1.02	1.18	1.04	1.06

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR SALT LAKE CITY UTAH

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
25.10	30.50	39.50	46.50	54.60	62.90
69.80	68.60	59.50	47.50	35.30	26.80

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR SALT LAKE CITY UTAH
AND STATION LATITUDE = 40.76 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 30

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.92	0.95	1.33	1.11	1.11	0.83
	0.84	0.89	0.96	1.09	1.12	1.13
STD. DEVIATIONS	0.47	0.43	0.53	0.48	0.59	0.60
	0.58	0.83	0.69	0.85	0.62	0.46
RUNOFF						
TOTALS	0.014	0.045	0.045	0.000	0.000	0.000
	0.000	0.000	0.000	0.001	0.000	0.015
STD. DEVIATIONS	0.038	0.095	0.054	0.000	0.000	0.000
	0.003	0.000	0.000	0.004	0.000	0.056
EVAPOTRANSPIRATION						
TOTALS	0.556	0.570	1.784	1.499	1.214	0.907
	0.870	0.884	0.939	0.945	0.770	0.647
STD. DEVIATIONS	0.173	0.198	0.597	0.724	0.643	0.614
	0.615	0.843	0.750	0.671	0.283	0.210
LATERAL DRAINAGE COLLECTED FROM LAYER 3						
TOTALS	0.0229	0.0041	0.0194	0.2849	0.1440	0.0136
	0.0097	0.0030	0.0019	0.0041	0.0140	0.0497
STD. DEVIATIONS	0.1095	0.0151	0.0253	0.4411	0.1432	0.0265
	0.0191	0.0040	0.0023	0.0086	0.0533	0.2459

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	0.0001	0.0000	0.0001	0.0015	0.0007	0.0001
	0.0000	0.0000	0.0000	0.0000	0.0001	0.0003
STD. DEVIATIONS	0.0006	0.0001	0.0001	0.0023	0.0007	0.0001
	0.0001	0.0000	0.0000	0.0000	0.0003	0.0012

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30

	INCHES		CU. FEET	PERCENT
PRECIPITATION	12.28	(2.129)	3655066.5	100.00
RUNOFF	0.120	(0.1169)	35677.98	0.976
EVAPOTRANSPIRATION	11.584	(1.9139)	3448107.25	94.338
LATERAL DRAINAGE COLLECTED FROM LAYER 3	0.57137	(0.71070)	170074.672	4.65312
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.00000	(0.00000)	0.152	0.00000
AVERAGE HEAD ON TOP OF LAYER 4	0.000	(0.000)		
CHANGE IN WATER STORAGE	0.004	(1.1871)	1205.78	0.033

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 30

	(INCHES)	(CU. FT.)
PRECIPITATION	1.67	497092.187
RUNOFF	0.303	90270.1797
DRAINAGE COLLECTED FROM LAYER 3	0.15763	46919.11720
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000000	0.00414
AVERAGE HEAD ON TOP OF LAYER 4	0.025	
MAXIMUM HEAD ON TOP OF LAYER 4	0.048	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	7.1 FEET	
SNOW WATER	2.36	703569.5620

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.4024

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.0921

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 30

LAYER	(INCHES)	(VOL/VOL)
1	422.8956	0.2913
2	8.9040	0.3710
3	0.0025	0.0100
4	0.0000	0.0000
5	0.1875	0.7500
SNOW WATER	0.027	

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1. Determine the required geocomposite transmissivity to provide sufficient capacity to conduct the leachate to the leachate collection pipes.

    a. Bearing pressure over the geocomposite.

    The Normal Bearing Pressure (P'):

126' Depth above Liner			
Soil Cover (2 ft @ 120 pcf)	=	240 psf	
Closure Material (3 ft @ 120 pcf)	=	360 psf	
Waste (121 ft @ 60 pcf)	=	7,260 psf	
	=	7,860 psf	(use 7,900 psf)
N TOTAL	=	54.9 psi	

    b. Required geocomposite capacity

    The geocomposite will be required to conduct the greatest amount of water at the low side of the planar slopes just prior to discharging leachate into the leachate collection pipes. The boundary conditions for the composite (from top to bottom) are:

    - Closure and Waste Loading (as calculated above)
    - 2' protective soil cover comprised of a silty clay soil
    - Geocomposite
    - 60-mil HDPE geomembrane liner

    The geocomposite capacity is dependent on the length of the flow path of the leachate before it enters into the pipe drainage system. The maximum length of the flow path was determined based on a reasonable transmissivity of available geocomposite products. The maximum flow path allowable was calculated to be about 612 feet and the placement of leachate drainage pipe system was designed accordingly for each cell.

    Due to the differences between Cells 1, 2 and 3 separate calculations for the geocomposite capacity are included.

    The longest one-foot wide flow path along the resultant slope of the wider planar surfaces within the geocomposite for Cells 1, 2 and 3 is approximately 426 ft, 418 ft, and 460 ft respectively.

    The HELP Model was used to predict leachate rates from the geocomposite. Several runs were computed at varying waste heights above the geomembrane to determine a governing peak rate. The predicted peak daily leachate rate conveyed through the geocomposite was predicted to be about 0.161 in/day for all of the cells.

The resulting peak daily flow from the longest flow path in each of the cells is:

Cell 1
$q_{leachate}$ = (426 ft)(0.161 in/day)(1 ft/ 12 in)
$q_{leachate}$ = 5.72 ft^3/ft-day

Cells 2
$q_{leachate}$ = (418 ft)(0.161 in/day)(1 ft/ 12 in)
$q_{leachate}$ = 5.61 ft^3/ft-day

Cell 3
$q_{leachate}$ = (460 ft)(0.161 in/day)(1 ft/ 12 in)
$q_{leachate}$ = 6.17 ft^3/ft-day

The minimum slope for the planar surfaces for the geocomposite is 2.0% for all cells. A steeper slope will provide a more conservative design.

The required transmissivity for the geocomposite is given by $q_{req'd}$ and is related to the leachate rate $q_{leachate}$ by applying necessary safety factors. The combination of all the necessary safety factors is a resulting safety factor (SF_{RES}). Therefore,

$$q_{req'd} = q_{leachate} \times SF_{RES}$$

"Designing with Geosynthetics" by Robert Koerner provides recommended safety factors in the design of geonets as follows:

SF_{IN} = Safety factor for intrusion of adjacent geosynthetic materials into the geonet (1.5)
SF_{CR} = Safety factor for creep deformation of the geonet (1.5)
SF_{BC} = Safety factor for biological (2.0)
SF_{cc} = Safety factor for chemical clogging (1.5)

Because geocomposite testing includes the intrusion of the adjacent geosynthetic materials SF_{IN} is not required.

Combining all of the remaining safety factors presented yields a resulting safety factor of:

SF_{RES} =1.5 x 2.0 x 1.5 = 4.5

Using the information presented above, the required geocomposite transmissivity (Θ_{req}) in m^2/sec for each of the cells is:

Cell 1
(5.72)(4.5) = (Θ_{req} m^2/sec)(10.7639 ft^2/m^2)(86400 sec/day)(0.02)

Θ_{req} = 1.38 x 10^{-3} m^2/sec

Cell 2
$(5.61)(4.5) = (\Theta_{req}\ m^2/sec)(10.7639\ ft^2/m^2)(86400\ sec/day)(0.02)$

$\Theta_{req} = 1.36 \times 10^{-3}\ m^2/sec$

Cell 3
$(6.17)(4.5) = (\Theta_{req}\ m^2/sec)(10.7639\ ft^2/m^2)(86400\ sec/day)(0.02)$

$\Theta_{req} = 1.49 \times 10^{-3}\ m^2/sec$

The geocomposite shall be selected to provide the required hydraulic transmissivity at the loading and boundary conditions provided.

2. Determine the required diameters for the leachate collection pipe system.

a. Max pipe capacity:

Assume 6-inch, 8-inch, and 10-inch diameter corrugated polyethylene pipe on a 1.01% slope after projected potential differential settlement. It was assumed for the purposes of this design that flow at 80% depth represents pipe capacity.

Manning's n = 0.016 ("ADS Specifier Manual - Civil Engineer", Advanced Drainage Systems, Inc.)

$$Q = \frac{1.49}{n} AR^{2/3} S^{1/2}$$

Pipe Capacity (80% flow depth assumed as full capacity)

Pipe Diameter	Pipe Area	Hydraulic Radius	Flow Capacity	
(in.)	(ft^2)	(ft)	(cfs)	(gpm)
6	0.17	0.15	0.45	201
8	0.30	0.20	0.96	433
10	0.47	0.25	1.75	785

b. Pipe Sizing:

Figure 1 shows the pipe number for each of the Leachate pipes designed for the system. Predicted flows (Q) within the leachate collection pipes were calculated based on HELP model predicted peak daily leachate rates, 0.161 in/day on the cell floor and 0.124 in/day on slopes (4H:1V), applied over the contributing areas to each pipe. The leachate collection pipe system including pipe numbers are identified in Figure 1. The resultant pipe diameter requirements for each cell are shown in tables below:

Cell 1 Pipe Diameter Requirements

Pipe	Contributing Areas Floor	Contributing Areas Slope	Contributing Q from Upstream Piping	Q		Pipe Diameter
	(ft^2)	(ft^2)	(cfs)	(cfs)	(gpm)	(in.)
1	232,023	41,002	-	0.04	18	6
2	317,526	74,465	-	0.06	26	6
3	169,310	40,043	-	0.03	14	6
4	249,951	69,86	-	0.04	18	6
5	5,845	0	0.04	0.04	18	6
6	18,637	1,025	0.17	0.17	78	8*
7	643,567	3,074	-	0.10	45	6
8	32,382	14,442	0.27	0.28	126	8*
9	1,082,673	28,728	-	0.17	77	6
10	72,763	28,702	-	0.01	7	6
11	0	111,103	0.01	0.03	13	6

*8 in pipes are used where the modified design of the landfill extended previously installed 8 in pipes from the original design.

Cell 2 Pipe Diameter Requirements

Pipe	Contributing Areas Floor	Contributing Areas Slope	Contributing Q from Upstream Piping	Q		Pipe Diameter
	(ft^2)	(ft^2)	(cfs)	(cfs)	(gpm)	(in.)
1	793,909	5,192	-	0.12	55	6
2	77,669	70,363	0.12	0.14	64	6
3	722,346	34,034	-	0.12	52	6
4	67,725	79,972	0.12	0.14	61	6
5	1,555,074	28,366	-	0.24	109	6

Cell 3 Pipe Diameter Requirements

Pipe	Contributing Areas Floor	Contributing Areas Slope	Contributing Q from Upstream Piping	Q		Pipe Diameter
	(ft^2)	(ft^2)	(cfs)	(cfs)	(gpm)	(in.)
1	840,013	84,870	-	0.14	63	6
2	81,983	97,094	0.14	0.16	74	6
3	789973	5,362	-	0.12	55	6
4	81857	73,979	0.12	0.14	65	6
5	1,560,073	29,801	-	0.24	110	6

3. Determine the required storage capacity for sump design
    a. The Help model predicts an annual average of lateral drainage collected from the geocomposite to be 0.57 in/year.

    b. The storage volume (V) required within each cell was based on three assumptions:

        i. The conservative assumption that an entire cell is left open (no final closure applied).
        ii. A collection time of 1 week
        iii. A pore space of 0.32% within the gravel being used to fill the leachate pond.

    And is calculated for each cell below:

    Cell 1
    Area = 3,183,564 ft^2

    V = (3,183,564 ft^2)(0.57 in/yr)(1 yr/52 weeks)(1 ft/12 in)/(0.32) = 9,088 ft^3

    Cell 2
    Area = 3,434,604 ft^2

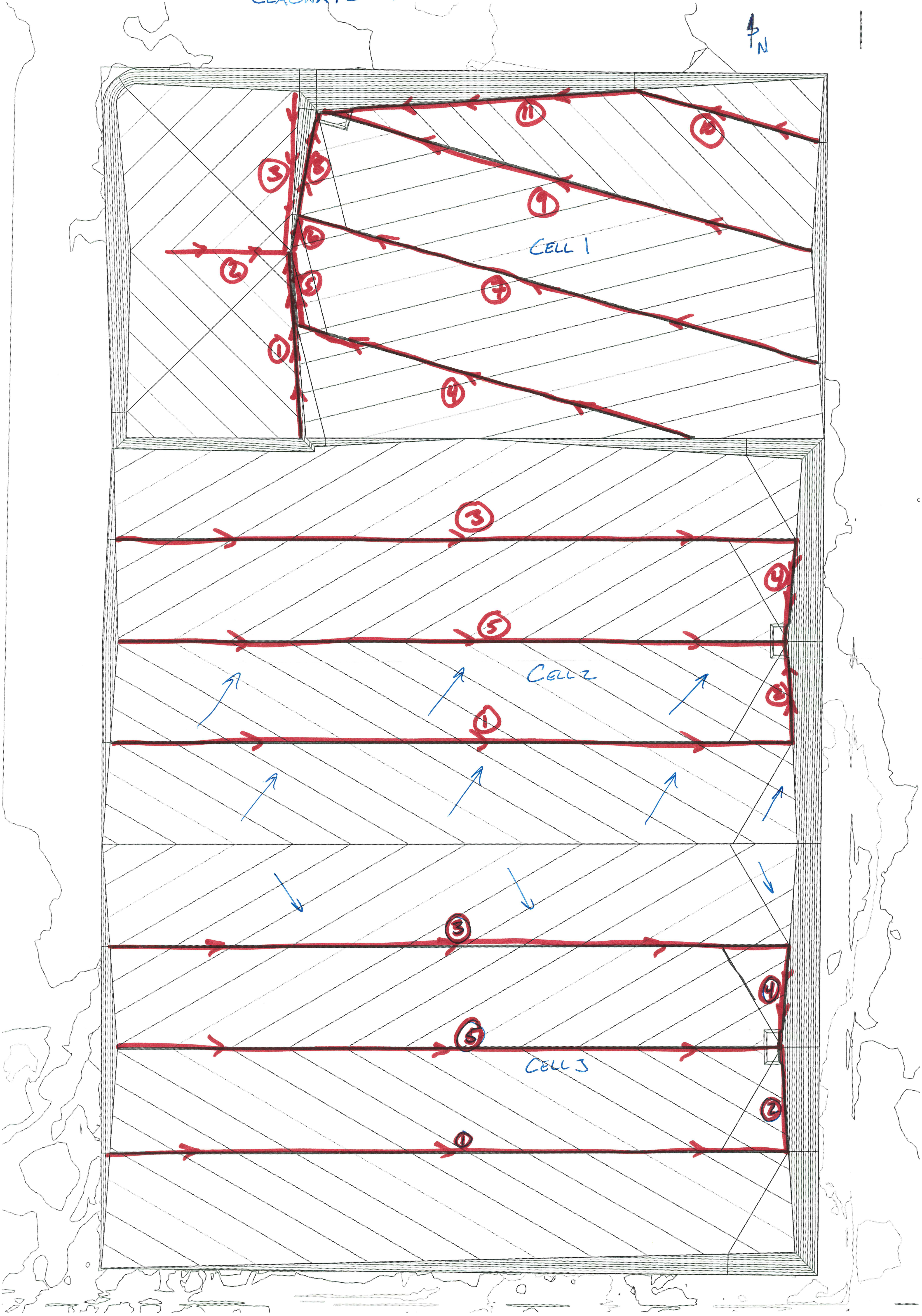
    V = (3,434,604 ft^2)(0.57 in/yr)(1 yr/52 weeks)(1 ft/12 in)/(0.32) = 9,804 ft^3

    Cell 3
    Area = 3,642,949 ft^2

    V = (3,642,949 ft^2)(0.57 in/yr)(1 yr/52 weeks)(1 ft/12 in)/(0.32) = 10,399 ft^3

    c. The sumps were designed to fully contain the leachate volume described above at a depth of about 2.5 ft at the deepest point. The design also accommodates between 0.4 and 0.5 ft of freeboard.

LEACHATE PIPE DESIGNATION



I. Evaluate the long-term strength of the Polyethylene pipe against failure or significant loss of cross-sectional area.

Reference Manuals: "Plastics Pipe Institute Handbook of Polyethylene Pipe", by Plastics Pipe Institute.

Design Criteria:

Pipe Diameter = 8 inches
Maximum Design Height of Overburden = 126 feet (See attached drawing)
This is the height of the closure material above the inlet of the pipe.

Note: This project uses both 6-inch and 8-inch pipes. Calculations are provided for 8-inch pipe because it will fail at a lower stress than 6-inch pipe.

Unit weight of overburden (126 ft of total height):

Soil cover (2 ft @ 120 pcf)	=	240 lbs
Closure Material (3 ft @ 120 pcf)	=	360 lbs
Waste (126-2-3=121 ft @ 60 pcf)	=	7,260 lbs
Total	=	7,860 lbs

A. Soil Pressure by components

$$P_T = P_S + P_L$$

where: P_T = Total load pressure
P_S = Static or dead load pressure
P_L = Live load pressure

From above, P_s = 7,860 psf = 54.6 psi

Using Boussinesq's Equation from the manual reference above, the live load pressure can be estimated as follows:

$$P_L = \frac{3W_L H^3}{2\pi * R^5}$$

W_L = wheel load (lb)
H = vertical depth of crown
R = distance from the point load application to the crown

However, the tire load becomes insignificant with the 126 feet of total overburden and the static load governs the design.

B. <u>Evaluate Wall Crushing</u>

The compressive thrust on the pipe walls is given below:

$$S = \frac{P_{RD} D_O}{288A}$$

S = Compressive stress (psi)
A = Wall thickness = 0.639 in
D_O = Outside diameter of pipe (in)
P_{RD} = Radial directed earth pressure (psf)

$$P_{RD} = (VAF)wH$$

Where

w = Unit weight of soil, pcf = 62.4 pcf (average)
H = Depth of cover = 126 ft
VAF = Vertical Arching Factor

$$VAF = 0.88 - \frac{0.71(S_A - 1)}{S_A + 2.5}$$

With

$$S_A = \frac{1.43 M_s r_{CENT}}{EA}$$

Where

M_s = One-dimensional modulus of soil = 1000 psi (pg 228 of manual)
r_{CENT} = radius to centroidal axis of pipe = 7.590 in
E = Apparent modulus of elasticity of pipe material = 28,000 psi

Then

$$S_A = \frac{(1.43)(1000psi)(7.950in)}{(28000psi)(0.639in)} = 0.63540$$

$$VAF = 0.88 - \frac{0.71(0.6354 - 1)}{(0.6354 + 2.5)} = 0.9626$$

$$PRD = (0.9626)(62.4pcf)(126ft) = 7568\,psf$$

And

$$S = \frac{(7568psf)(8.548in)}{(288)(0.639in)} = 351.5\,psi$$

The maximum long-term compressive design stress value for PE 3408 pipe is 1000 psi (page 102 of engineering manual). Thus, this pipe meets the design criterion for wall crushing.

C. <u>Evaluate Wall Buckling</u>

Wall buckling resistance of pipe is increased when it is buried. The soil and pipe work together to resist buckling. The PPI Handbook recommends using the Moore-Selig Equation to calculate critical buckling pressure of deep buried pipes (more than 50 ft below the soil surface).

$$P_{CR} = \frac{(1.32)}{D_M}(EI)^{\frac{1}{3}}(E_S^*)^{\frac{2}{3}}$$

P_{CR}	=	Critical buckling stress (psi)
D_M	=	Mean Pipe Diameter = 7.909 in
E	=	Pipe modulus of elasticity = 28,000 psi for 50 years at 73°F (Table B.1.1 Page 99 of engineering manual)
I	=	Pipe wall moment of Inertia = $\frac{t^3}{12}$
t	=	Pipe wall thickness = 0.639 in (PE 3408 pipe, 130 psi)
E_S^*	=	$\frac{E_S}{1-\mu}$
E_S	=	Secant modulus of soil, psi
μ	=	Poisson's Ratio of Soil

Taking E_S = 2083 psi and μ = 0.40 (*Foundation Design,* D.P. Coduto, 1994),

$$E_S^* = \frac{2083}{1-0.40} = 3{,}472 \text{ psi}$$

$$I = \frac{t^3}{12} = \frac{0.639in^3}{12} = 0.0217\frac{in^4}{in}$$

$$P_{CR} = \frac{1.32}{7.909in}\left(\left(28000\frac{lb}{in^2}\right)\left(0.0217\frac{in^4}{in}\right)\right)^{\frac{1}{3}}\left(3{,}472\frac{lb}{in^2}\right)^{\frac{2}{3}} = 324.4\,psi$$

With an overburden stress of 50 psi, an 8-inch PE 3408, 130 psi-rated pipe will have sufficient buckling resistance.

D. <u>Evaluate Ring Deflection</u>

Ring deflections are calculated using the Watkins-Gaube method. First, the rigidity factor and soil strain are determined.

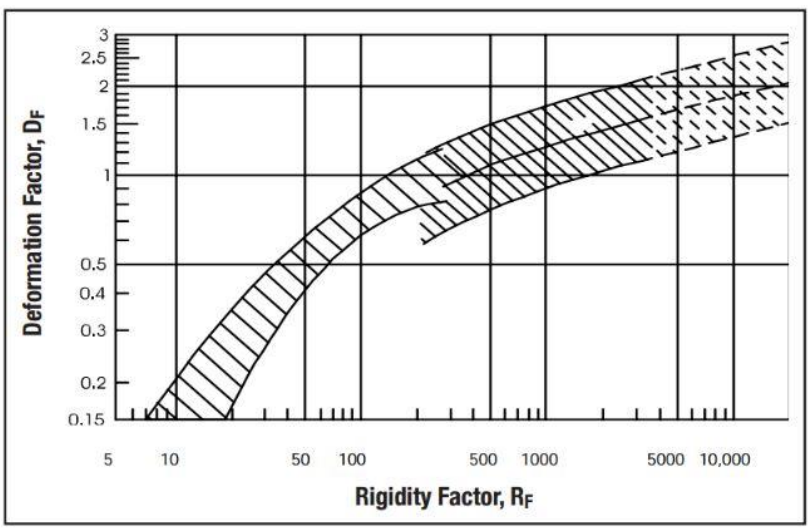
$$R_F = \frac{12E_S(DR-1)^3}{E} = \frac{(12)(2083psi)(13.38-1)^3}{28{,}000psi} = 1{,}693.8$$

Where

R_F = Rigidity Factor
E_s = Secant Modulus of Soil = 2083 psi
DR = Dimension Ratio = D_o/t = 8.548/0.639 = 13.38
E = Modulus of elasticity of pipe material = 28,000 psi

$$\varepsilon_S = \frac{wH}{144E_S} = \frac{(62.6pcf)(115ft)}{(144)(2083psi)} = 0.0240$$

Using the Watkins-Gaube Graph (below) and the rigidity factor, the deformation factor D_F was determined to be 1.40.



Finally, ring deflection can be calculated.

$$\frac{\Delta X}{D_m}(100) = D_F\varepsilon_S = (1.40)(2.40\%) = 3.36\%$$

The PLEXCO design manual references a study by Jansen that states strains of 8% should perform well for at least 50 years. ISCO Industries also lists its polyethylene pipe as having an elongation at yield of 8% (page 62 of the design manual).

The structural envelope around both the 6-inch and the 8-inch diameter corrugated polyethylene pipes should provide the structural support necessary to maintain the integrity of the pipes.

Reference Manuals:

Corrugated Polyethylene Pipe Design Manual & Installation Guide. (n.d.). Retrieved October 3, 2016, from Plastics Pipe Institute: http://plasticpipe.org/drainage/cppa-design-guide.html

Modulus of Soil Reaction, E'. (1997, April). Retrieved October 3, 2016, from Rinker Materials: http://www.rinkerpipe.com/TechnicalInfo/files/InfoBriefs/IB4003ModulusSoilReactionE.pdf

Plexco/Spirolite Engineering Manual 2. System Design", by Chevron Chemical Co., April 1996

I. Objective: Evaluate the long-term strength of the 24-inch DR17 HDPE pipe against failure or significant loss of cross-sectional area.

Design Criteria:

Pipe Diameter = 24 inches
Maximum Design Height of Overburden = 76 feet

Unit weight of overburden (76 ft of total height):

Soil cover (2 ft @ 120 pcf)	=	240 psf
Closure Material (3 ft @ 120 pcf)	=	360 psf
Waste (76-2-3=71 ft @ 60 pcf)	=	4,260 psf
Total	=	4,860 psf

A. Soil Loads

In the case of maximum overburden height, the soil and waste will have an average unit weight of 64 pcf. Vehicle loads will be insignificant at this depth. The weight of the soil column above the pipe is given by the following equation:

$$W_C = \frac{H\gamma_S OD}{144} = \frac{76\,ft * 64\,pcf * 24\,in}{144} = 810.7\ lb/inch$$

W_C	=	Weight of soil column above pipe, lb/inch of pipe
H	=	Burial depth to the top of pipe = 76 ft
γ_S	=	Average soil density = 64 pcf
OD	=	Outside diameter of pipe = 24 in

Vehicle live loads can have significant effects on shallow buried pipes. Thus, calculations must also be performed for the minimum case of 3 ft of cover and vehicle loads. For this case, the average soil unit weight is 100 pcf and

$$W_C = \frac{3\,ft * 100\,pcf * 24\,in}{144} = 50.0\,lb/inch$$

The live load transferred to the pipe from a vehicle is given by the equation

$$W_L = OD * P_L = 24\,in * 26.39 = 633\,lb/inch$$

W_L = Live load, lb/linear inch of pipe
OD = Outside diameter of pipe
P_L = Live load factor = 26.39

The live load factor was based on a soil cover depth of 3 ft for Cooper E-80. This represents the most extreme case. Since the loads for the extreme live load case are smaller than the case of maximum overburden, further calculations will be based on the deadload case of 76 ft of overburden when the landfill is at maximum capacity.

B. Evaluate Wall Crushing

The compression stress on the pipe walls is given below:

$S = P_L D_o / 288t$

S = Compressive stress (psi)
P_L = vertical load applied to pipe (psf)
t = wall thickness (in)
D_o = outside diameter of pipe (in)

The maximum long-term stress value given by Plexco and other publications is 1600 psi, and with a safety factor of 2 this is reduced to 800 psi.

D_o/t = 288(800psi)/4,860 psf = 47.4

Therefore, an SDR of 47 or lower should be strong enough to avoid crushing failure so the selection of 17 is sufficient.

C. Evaluate Deflection

Ring deflections are calculated using the Modified Iowa Equation. Vertical deflection should be less than 7.5% of the inside diameter.

$$\Delta y = \frac{K(D_L W_C + W_L)}{0.149PS + 0.061E'}$$

Where

Δy	=	Deflection, in
K	=	Bedding constant = 0.1
D_L	=	Deflection lag factor = 1.0
W_C	=	Soil column load on pipe, lb/linear inch of pipe
W_L	=	Live load, lb/linear inch of pipe (negligible)
OD	=	Outside diameter of pipe = 24 in
PS	=	Pipe stiffness = 34 pii
E'	=	Modulus of soil reaction = 2000 psi

Notice: A modulus of soil reaction of 2000 psi is necessary for adequate pipe performance, and will only be obtained if the most granular soil on site is used. Calculations are performed assuming that this granular soil is used and compacted to greater than 95% standard Proctor density.

If these parameters are met,

$$\Delta y = \frac{0.1(1.0*969.4\ lb/in)}{0.149*34\ pii + 0.061*2000\ psi} = 0.763\ in$$

And

$$\%\ Deflection = \frac{0.763\ in}{24\ in} = 3.17\%$$

This level of deflection is well below the minimum of 7.5%.

D. Evaluate Buckling

The critical buckling pressure is given below:

$$P_{CR} = \frac{0.772}{SF}\left[\left(\frac{E'PS}{1-v^2}\right)\right]^{\left(\frac{1}{2}\right)}$$

P_{CR}	=	Critical buckling pressure, psi
E'	=	Modulus of soil reaction

PS	=	Pipe stiffness = 34 pii (Reference Manual Table 5-1)
v	=	Poisson ratio = 0.4 for polyethylene
SF	=	Safety Factor = 2.0

With a modulus of soil reaction of 2000 psi, the critical buckling pressure is:

$$P_{cr} = \frac{0.772}{2.0}\left[\frac{2000*34}{1-0.40^2}\right] = 109.8\,psi$$

The actual buckling pressure is as follows (if pipe is above water table):

$$P_V = \frac{R_W H \gamma_s}{144} + \frac{W_L}{OD}$$

P_V	=	Actual buckling pressure, psi
R_W	=	Water buoyancy factor
H	=	Burial depth to top of pipe, ft
γ_s	=	Soil density, pcf
W_L	=	Live load (insignificant)
	=	OD * P_L =
OD	=	Outside diameter of pipe, in

The water buoyancy factor is 1 for pipes above the water table. Using a burial depth of 76 ft, an average soil density of 64 pcf, the actual buckling pressure is:

$$P_v = \frac{(1.0)(76ft)(64pcf)}{144} = 33.8\,psi$$

Since the actual buckling pressure is less than the critical buckling pressure, the pipe has sufficient strength to avoid buckling.

D. <u>Evaluate Bending</u>

Bending stress should not exceed the long-term tensile strength of polyethylene (900 psi). Bending strain should not exceed 5%.

$$\sigma_b = \frac{(2)(D_f)(E)(\Delta y)(y_O)(SF)}{D_M^2}$$

σ_b	=	Bending stress, psi
D_F	=	Shape factor
E	=	Long-term modulus of elasticity of polyethylene, 22,000 psi
Δy	=	Deflection, in
y_O	=	Distance from centroid of pipe wall to outside surface
	=	1.7 in

OD	=	Outside diameter of pipe = 24 in
ID	=	Inside diameter of pipe = 21.007 in
SF	=	Safety factor = 1.5
D_M	=	Mean pipe diameter, in = 25.3 in

The shape factor for this pipe depends on the backfill material used. The most conservative case in table 5-2 of the manual gives a shape factor of 5.6. Using this value,

$$\sigma_b = \frac{(2)(5.6)(22{,}000psi)(0.763in)(1.7in)(1.5)}{25.3^2 in^2} = 749\ psi$$

This is below the long-term tensile strength of polyethylene, which is 900 psi.

Bending strain must not exceed 5%. Bending strain is given by the equation

$$\varepsilon_B = \frac{2*D_f*\Delta y*y_O*SF}{D_M^2} = \frac{2*5.6*0.763in*1.7in*1.5}{25.3^2} = 0.034$$

Bending strain is sufficiently low.

1. Geotextile filter fabric is to be placed on top of the drainage net to serve as a filter for the overlying materials. Check design criteria on pages 38 – 45 of "Geotextile Design and Construction Guidelines" by the U.S. Department of Transportation to determine the soil retention and permeability criteria that must be met.

   Native Soil Properties will be used to design the filter fabric. Other materials may be used as a cover soil, however due to the high fines content of the native materials they will lead to a more conservative design. Permeability is the exception in that a higher permeability of the cover soil is more conservative. Therefore the conductivity will be based on the highest cover soil conductivity that might be encountered.

   A. Soil Retention

      A sieve analysis of the native soil was performed by Applied Geotechnical Engineering Consultants[1]. The results of this analysis are presented in Table 1 and in Figure 1. From Figure 1 the following soil parameters were estimated.

$D_{10} < 0.0013$
$D_{60} = 0.011$

Cu = D10/D60 < 0.091

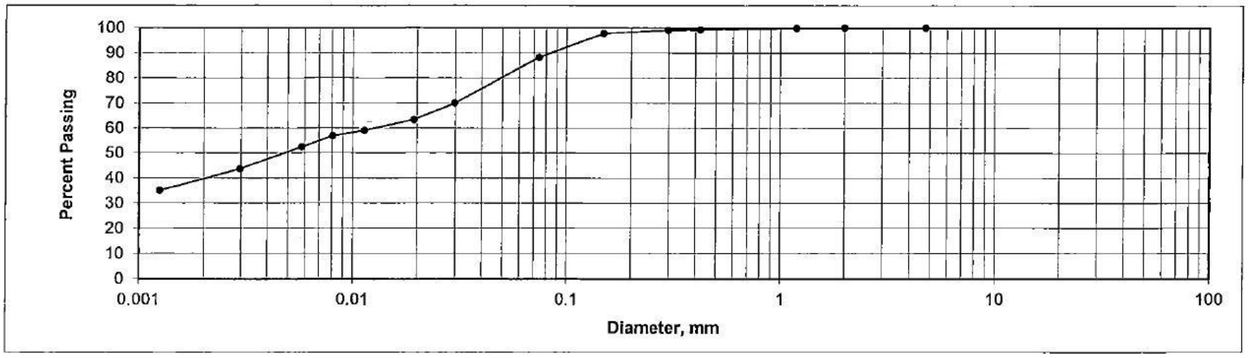
$D_{85} = .065$ mm

Table 1

Sieve #	Size (mm)	% Finer
3/4"	20	100
3/8"	9.525	100
4	4.75	100
10	2	100
16	1.19	100
40	0.42	99
50	0.297	99
100	0.149	97
200	0.074	86

[1]AGEC Lab results

Figure 1: Gradation Curve of Soil at Landfill Site



Criteria from page 39 of design manual for ≥ 50% passing the #200 sieve:

AOS No. (Fabric) ≤ 0.3 mm

$O_{95} \leq 1.8 * D_{85\ (soil)}$

$O_{95} \leq 1.8 * 0.065$ mm

$O_{95} \leq 0.12$ mm

Geotextiles with O_{95} this small are not commonly available.

Thererfore, using AASHTO M 288 Standard Specifications for Geotextiles, the recommended maximum O_{95} = 0.22 mm for materials with more than 50% passing the no. 200 sieve.

B. Permeability Criteria

$k_{v\ (fabric)} \geq 10 * k_{v\ (soil)}$
$k_{v\ (fabric)} \geq 10 * (1.35*10^{-3}$ cm/sec)
$k_{v\ (fabric)} \geq 1.35*10^{-2}$ cm/sec

C. Clogging Resistance Criterion

$$\boldsymbol{O_{95_{geotextile}} \geq 3\, D_{15_{soil}} \geq 3 * 0.001 = 0.003\, mm}$$ **- OK**

An 8-oz/yd^3 nonwoven geotextile on a GSE 250 geocomposite or equivalent will meet the AASHTO M 288 Standard Specification and the USDOT Criteria.

2. Check the tensile strength requirement. Since the geotextile fabric is part of the geocomposite, the fabric must have sufficient strength to bridge the ridges of the geonet without failure. According to Robert M. Koerner (1990) in "Designing with Geosynthetics" (published by Prentice-Hall, Inc.) the required fabric burst strength to bridge the gap is:

$$T_{req'd} = p'd_v$$

where

$T_{req'd}$	=	the required fabric strength
p'	=	the stress at the fabric's surface, which in the worst case would equal the overburden stress at closure
d_v	=	the maximum void diameter, or in this case the gap distance between ridges of the geonet = 0.4 inches

The Normal Bearing Pressure (P):

The existing soils to be used for the daily soil cover and protective soil cover have a dry density of 97 pcf (average value of those reported by Earthtec in their original geological study performed in 2006 for Intermountain Regional Landfill and AGEC in a study performed in 2014). The average saturated density of 124 pcf was determined from the dry density based on a soils characteristics chart found in Foundation Engineering, by Peck R.B., W.E. Hanson, and T.H. Thornburn (1974).

115' Depth above Liner		
110' of waste at 60 pcf	=	6,600 psf
2' Soil Protective Cover at 124 pcf	=	248 psf
3' Final Protective Cover at 124 pcf	=	372 psf
	=	7,220 psf
TOTAL	=	50.1 psi

Thus, $T_{req'd} = (50.1)(0.4) = 20.0$ psi

The geotextile will be designed using the design-by-function concept recommended by EPA for the design of hazardous waste facilities. According to EPA seminar publication Requirements for Hazardous Waste Landfill Design, Construction, and Closure (1989, pg. 56), "whatever parameter of a specific material one is evaluating, a required value for the material must be found using a design model and an allowable value for the material must be determined by a test method. The allowable value divided by the required value yields the design ratio, or the resulting factor of safety." Thus in evaluating the tensile strength requirement for the filter fabric, an allowable tensile strength is divided by the required tensile strength to determine the factor of safety for the design, or:

Factor of Safety (FS) = $T_{allow}/T_{req'd}$

where

T_{allow} = the allowable tensile strength as obtained from laboratory testing, and

$T_{req'd}$ = the required tensile strength as obtained from design of the actual system

Koerner (1990) in "Designing with Geosynthetics" suggests that additional factors of safety be applied to the tensile strength value found by test method to account for installation damage, creep and for biological and chemical degradation. In accordance with the procedures recommended by Koerner (1990), a factor of safety of 1.2 will be applied to the tensile strength found by test method for installation damage, an additional factor of safety of 1.2 will be applied to the tensile strength value for creep, and an additional factor of safety of 1.5 will be applied to test tensile strength for potential biological and chemical degradation. This value becomes the allowable value to be used in the equation above. This is in addition to the factor of safety to be used in the design-by-function concept discussed above. Thus,

$$\boldsymbol{T_{allow}} = \frac{\boldsymbol{T_{given}}}{(\mathbf{1.2 * 1.2 * 1.5})} = \frac{\boldsymbol{T_{given}}}{\mathbf{2.16}} \frac{\boldsymbol{lbs}}{\boldsymbol{in^2}}$$

Assuming a design-by-function FS of 2, then

$2 = T_{allow}/T_{req'd}$
$T_{given}/2.16 = 2 * T_{req'd}$
$T_{given} = 2 * 2.16 * T_{req'd}$
$T_{given} = 2 * 2.16 * 20.0$ psi
$T_{given} = 86.4$ lbs

APPENDIX F

Hydrology

Onsite Run-off

Offsite Run-on

Downspouts

Purpose: To determine the runoff from the closure cap of the Wasatch Regional Facility.

Method: The SCS curve number method was used in a HEC-HMS hydrology model.

Required: In order to calculate the runoff the following steps and information are required:

- A delineation of the tributary area.
- A representative Soil Conservation Service (SCS) curve number (CN) for the tributary area.
- Lag time.
- Storm Distribution.
- 100 year-24 hour precipitation.

Delineation: The delineation of the subbasins, shown in Figure 1, was based on the preliminary cell closure cap design. Each basin would drain into a channel which would convey the runoff to a down spout that would take the water off of the cell.

Curve Numbers: Curve numbers were determined based on the hydrologic soil type, Type C, found in the area because native soils are going to be used for cover. The cover type was assumed to be similar to a dirt road. The cover conditions were combined with the hydrologic soil type to produce a curve number based on Table 2-2a of Technical Release 55. A curve number of 87 was applied to each subbasin.

Precipitation: A 25 year - 24 hour event was used for the design storm. The rainfall amount was taken from the “Point Precipitation Frequency Estimates from NOAA Atlas 14. The value for a 25 year - 24 hour event was 1.74 inches.

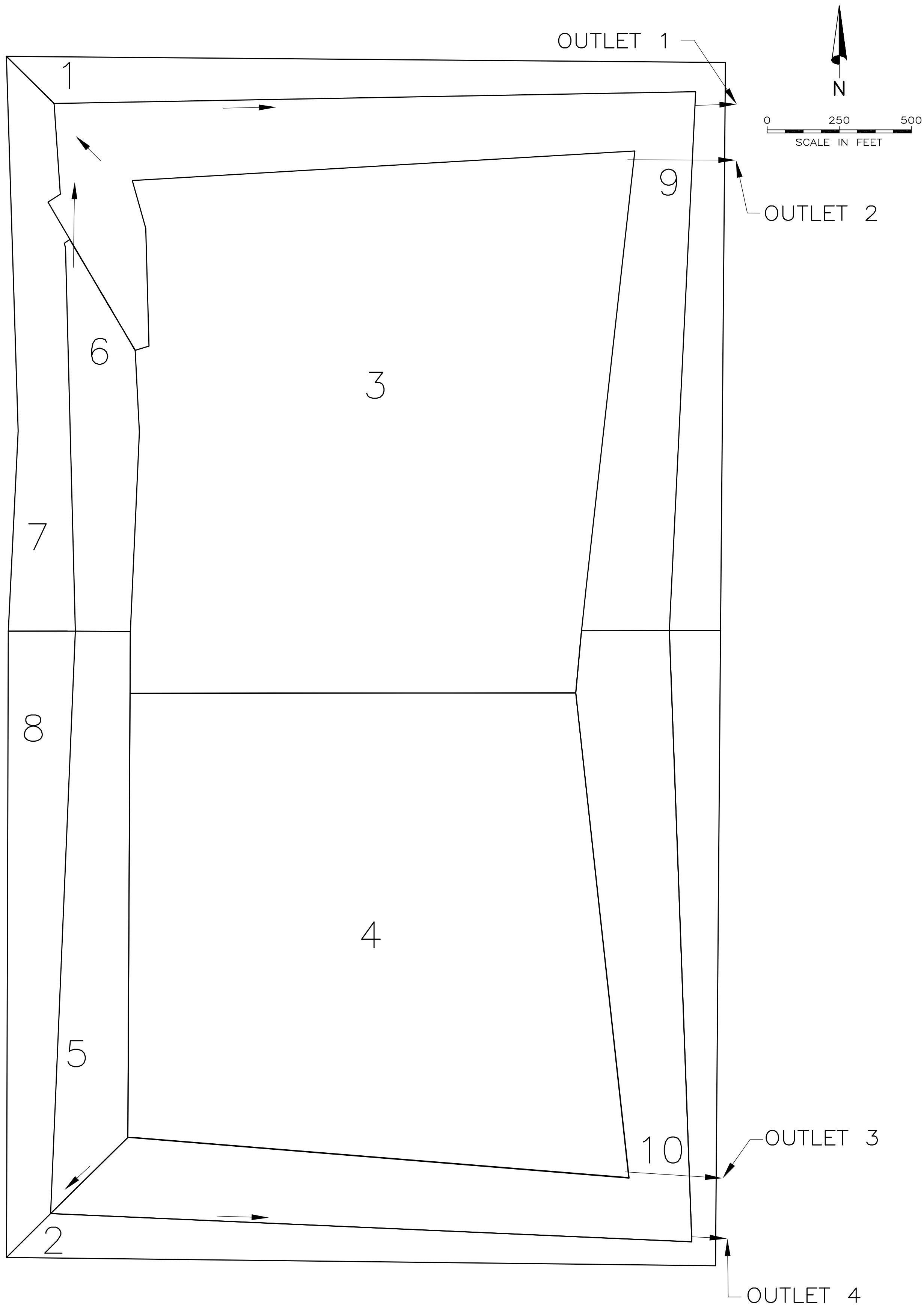
Storm Distribution: The distribution used for the 24-hour event was the SCS Type II.

Lag Time: Lag time (T_L) for each subbasin was calculated by using the time of concentration (T_c) and the equation $T_L = 0.6T_c$. T_c was calculated using Worksheet 3 in TR-55. A lag time of 5 minutes was used in the HEC-HMS model in the event that the calculated lag time was less than 5 minutes.

Results: Results are summarized in the table below.

Table 1: Peak Discharge for each Downspout

Outlet	Peak Discharge (cfs)	Contributing Subbasins	Description
1	23	6, 9	Northeast Corner (Bench)
2	28.5	3	Northeast Corner (Top)
3	26.3	4	Southeast Corner (Top)
4	25.3	5, 10	Southeast Corner (Bench)

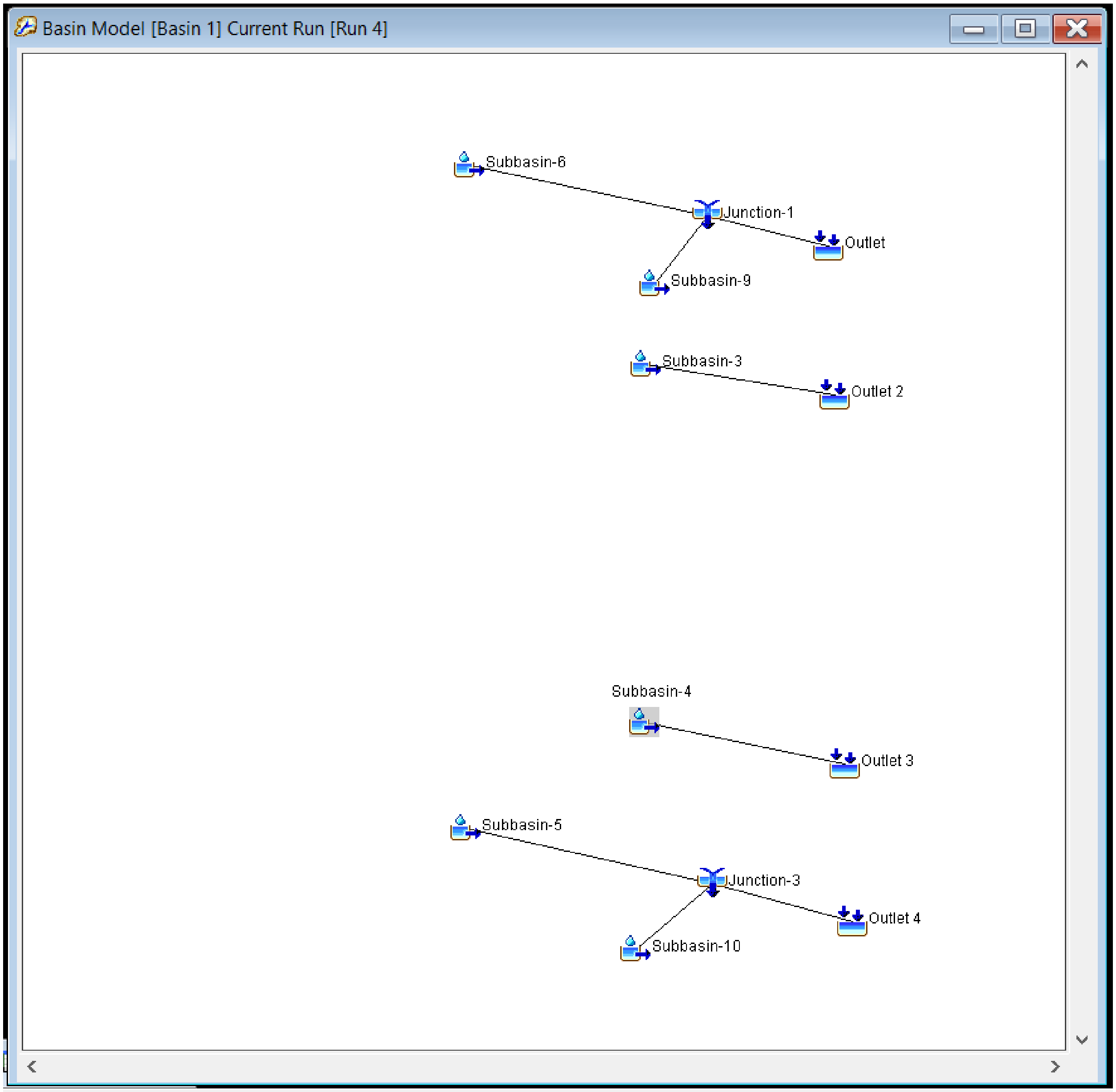


HANSEN ALLEN & LUCE INC
ENGINEERS

RUNOFF SUBBASINS

FIGURE 1

Figure 2: HEC-HMS Model



Subbasin and outlet names correspond with labels on Figure 1.

Figure 3: Model Summary Output

Global Summary Results for Run "Run 4"

Project: On_Site_Runoff_Update_RJG   Simulation Run: Run 4

Start of Run: 01Jan2000, 00:00   Basin Model: Basin 1
End of Run: 02Jan2000, 00:30   Meteorologic Model: Met 1
Compute Time: 24Oct2016, 16:27:30   Control Specifications: Control 1

Show Elements: All Elements   Volume Units: IN / AC-FT   Sorting: Hydrologic

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Subbasin-3	0.1059200	28.5	01Jan2000, 12:15	0.71
Outlet 2	0.1059200	28.5	01Jan2000, 12:15	0.71
Subbasin-4	0.0946223	26.3	01Jan2000, 12:15	0.71
Outlet 3	0.0946223	26.3	01Jan2000, 12:15	0.71
Subbasin-10	0.0370772	17.9	01Jan2000, 12:00	0.71
Subbasin-5	0.0152945	7.4	01Jan2000, 12:00	0.71
Junction-3	0.0523717	25.3	01Jan2000, 12:00	0.71
Outlet 4	0.0523717	25.3	01Jan2000, 12:00	0.71
Subbasin-9	0.0381039	18.4	01Jan2000, 12:00	0.71
Subbasin-6	0.0094428	4.6	01Jan2000, 12:00	0.71
Junction-1	0.0475467	23.0	01Jan2000, 12:00	0.71
Outlet	0.0475467	23.0	01Jan2000, 12:00	0.71

Intermountain Regional Landfill
Lag Time Calculations
Computed: RJG
10/24/2016

Sheet flow

Subbasin Name	Manning N	Flow Length (ft)	Design rainfall (in)	High Elevation	Low Elevation	Slope (ft/ft)	Tt (hr)
1	0.011	100	1.1	4872.0	4848.0	0.24	0.013
2	0.011	100	1.1	4870.0	4851.0	0.19	0.014
3	0.011	300	1.1	4952.0	4946.0	0.02	0.083
4	0.011	300	1.1	4952.0	4946.0	0.02	0.083
5	0.011	162	1.1	4952.0	4897.0	0.34	0.016
6	0.011	162	1.1	4952.0	4897.0	0.34	0.016
7	0.011	168	1.1	4896.0	4856.0	0.24	0.019
8	0.011	168	1.1	4896.0	4856.0	0.24	0.019
9	0.011	230	1.1	4949.0	4881.0	0.30	0.023
10	0.011	283	1.1	4949.0	4881.0	0.24	0.029

Equation Used:

$$T_t = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5} s^{0.4}} \qquad \text{[eq. 3-3]}$$

where:

T_t = travel time (hr),
n = Manning's roughness coefficient (table 3-1)
L = flow length (ft)
P_2 = 2-year, 24-hour rainfall (in)
s = slope of hydraulic grade line (land slope, ft/ft)

Shallow Concentrated Flow Velocity taken from Fig 3-1 in TR-55

Subbasin Name	Manning N	Flow Length (ft)	High Elevation*	Low Elevation*	Slope (ft/ft)	Velocity (ft/sec)	Tt (hr)
1	0.011	0	N/A	N/A	N/A	0	0
2	0.011	0	N/A	N/A	N/A	0	0
3	0.011	1,444	4952.0	4946.0	0.004	1.1	0.365
4	0.011	1,444	4952.0	4946.0	0.004	1.1	0.365
5	0.011	0	N/A	N/A	N/A	0	0
6	0.011	0	N/A	N/A	N/A	0	0
7	0.011	0	N/A	N/A	N/A	0	0
8	0.011	0	N/A	N/A	N/A	0	0
9	0.011	0	N/A	N/A	N/A	0	0
10	0.011	0	N/A	N/A	N/A	0	0

* Indicates a subbasin with no anticipated shallow concentrated flow (e.g. distance from any point to channe flow is less than 300 ft)

Equation used:

$$T_t = \frac{L}{3600V} \qquad \text{[eq. 3-1]}$$

where:

T_t = travel time (hr)
L = flow length (ft)
V = average velocity (ft/s)
3600 = conversion factor from seconds to hours.

Channel Flow

Subbasin Name	Manning N	Flow Length (ft)	High Elevation	Low Elevation	Slope (ft/ft)	Hydraulic Radius	Velocity (ft/s)	Tt (hr)
1	0.02	1,970	4848.0	4847.0	0.00	2	2.66	0.205
2	0.02	2,196	4848.0	4846.5	0.00	2	3.09	0.197
3	0.02	1,863	4922.4	4918.7	0.002	0.5	2.10	0.247
4	0.02	1,666	4922.4	4919.1	0.002	0.5	2.10	0.220
5	0.02	1,984	4905.0	4885.0	0.01	2	11.87	0.046
6	0.02	695	4905.0	4887.0	0.03	2	19.03	0.010
7	0.02	1,987	4856.0	4855.0	0.00	2	2.65	0.208
8	0.02	2,166	4856.0	4855.0	0.00	2	2.54	0.237
9	0.02	2,495	4883.0	4863.0	0.01	2	10.59	0.065
10	0.02	1,868	4883.0	4860.0	0.01	2	13.12	0.040

Equation used:

$$V = \frac{1.49 r^{\frac{2}{3}} s^{\frac{1}{2}}}{n} \qquad \text{[eq. 3-4]}$$

where:

V = average velocity (ft/s)
r = hydraulic radius (ft) and is equal to a/p_w
a = cross sectional flow area (ft^2)
p_w = wetted perimeter (ft)
s = slope of the hydraulic grade line (channel slope, ft/ft)
n = Manning's roughness coefficient for open channel flow.

Results:

Subbasin Name	Tc (hr)	Tl (hr)	Lag Time (min)
1	0.218	0.131	7.85
2	0.211	0.127	7.61
3	0.694	0.416	24.98
4	0.668	0.401	24.04
5	0.063	0.038	2.26
6	0.026	0.016	0.95
7	0.227	0.136	8.18
8	0.256	0.154	9.22
9	0.088	0.053	3.17
10	0.069	0.041	2.47

NOAA Atlas 14, Volume 1, Version 5
Location name: Fairfield, Utah, USA*
Latitude: 40.2156°, Longitude: -112.08°
Elevation: 4852.8 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.114 (0.097-0.135)	0.144 (0.124-0.172)	0.201 (0.172-0.241)	0.252 (0.212-0.303)	0.329 (0.272-0.397)	0.400 (0.323-0.486)	0.481 (0.379-0.586)	0.576 (0.440-0.710)	0.724 (0.529-0.906)	0.855 (0.602-1.08)
10-min	0.173 (0.147-0.206)	0.219 (0.189-0.262)	0.306 (0.261-0.366)	0.383 (0.322-0.461)	0.501 (0.413-0.604)	0.609 (0.492-0.739)	0.733 (0.577-0.892)	0.877 (0.669-1.08)	1.10 (0.805-1.38)	1.30 (0.916-1.65)
15-min	0.214 (0.182-0.255)	0.272 (0.235-0.325)	0.380 (0.324-0.454)	0.475 (0.399-0.572)	0.621 (0.513-0.749)	0.755 (0.610-0.916)	0.908 (0.715-1.11)	1.09 (0.830-1.34)	1.37 (0.998-1.71)	1.61 (1.14-2.04)
30-min	0.288 (0.246-0.343)	0.366 (0.316-0.437)	0.511 (0.436-0.612)	0.640 (0.537-0.770)	0.836 (0.691-1.01)	1.02 (0.821-1.23)	1.22 (0.964-1.49)	1.46 (1.12-1.80)	1.84 (1.34-2.30)	2.17 (1.53-2.75)
60-min	0.357 (0.304-0.425)	0.453 (0.391-0.541)	0.633 (0.540-0.758)	0.792 (0.665-0.953)	1.03 (0.855-1.25)	1.26 (1.02-1.53)	1.51 (1.19-1.84)	1.81 (1.38-2.23)	2.28 (1.66-2.85)	2.69 (1.89-3.40)
2-hr	0.438 (0.389-0.506)	0.551 (0.488-0.643)	0.724 (0.636-0.842)	0.887 (0.770-1.03)	1.14 (0.967-1.32)	1.36 (1.14-1.60)	1.63 (1.32-1.92)	1.93 (1.52-2.31)	2.41 (1.81-2.92)	2.83 (2.05-3.51)
3-hr	0.488 (0.439-0.556)	0.609 (0.545-0.692)	0.785 (0.696-0.890)	0.935 (0.824-1.06)	1.18 (1.02-1.34)	1.39 (1.18-1.62)	1.65 (1.37-1.94)	1.95 (1.58-2.34)	2.42 (1.89-2.95)	2.84 (2.13-3.54)
6-hr	0.620 (0.569-0.688)	0.766 (0.700-0.848)	0.941 (0.853-1.04)	1.09 (0.991-1.22)	1.31 (1.17-1.47)	1.50 (1.32-1.68)	1.74 (1.50-1.97)	2.03 (1.72-2.36)	2.50 (2.06-2.98)	2.90 (2.34-3.58)
12-hr	0.761 (0.699-0.837)	0.935 (0.859-1.03)	1.13 (1.04-1.25)	1.30 (1.19-1.43)	1.53 (1.38-1.69)	1.70 (1.52-1.89)	1.89 (1.67-2.12)	2.16 (1.88-2.44)	2.58 (2.20-3.01)	2.94 (2.45-3.61)
24-hr	0.901 (0.833-0.979)	1.11 (1.02-1.20)	1.33 (1.22-1.44)	1.51 (1.38-1.63)	1.74 (1.60-1.89)	1.92 (1.75-2.08)	2.10 (1.91-2.28)	2.29 (2.07-2.48)	2.61 (2.27-3.04)	2.97 (2.48-3.65)
2-day	1.01 (0.929-1.10)	1.23 (1.14-1.34)	1.48 (1.36-1.60)	1.68 (1.55-1.82)	1.95 (1.79-2.11)	2.16 (1.98-2.33)	2.37 (2.17-2.57)	2.59 (2.35-2.81)	2.88 (2.59-3.13)	3.10 (2.77-3.69)
3-day	1.10 (1.01-1.20)	1.35 (1.24-1.47)	1.62 (1.49-1.77)	1.84 (1.70-2.01)	2.16 (1.98-2.35)	2.40 (2.19-2.61)	2.65 (2.41-2.89)	2.91 (2.63-3.18)	3.25 (2.91-3.56)	3.52 (3.13-4.03)
4-day	1.20 (1.09-1.31)	1.46 (1.34-1.60)	1.76 (1.62-1.93)	2.01 (1.84-2.21)	2.37 (2.16-2.59)	2.64 (2.40-2.89)	2.93 (2.65-3.21)	3.23 (2.90-3.54)	3.63 (3.23-4.00)	3.95 (3.49-4.37)
7-day	1.40 (1.28-1.53)	1.72 (1.58-1.88)	2.06 (1.89-2.25)	2.35 (2.15-2.56)	2.73 (2.49-2.97)	3.03 (2.76-3.29)	3.33 (3.02-3.62)	3.63 (3.28-3.95)	4.03 (3.61-4.40)	4.33 (3.86-4.75)
10-day	1.58 (1.45-1.72)	1.94 (1.78-2.10)	2.31 (2.13-2.51)	2.62 (2.41-2.84)	3.02 (2.77-3.27)	3.33 (3.04-3.60)	3.63 (3.31-3.94)	3.93 (3.58-4.27)	4.32 (3.90-4.70)	4.60 (4.14-5.03)
20-day	2.06 (1.90-2.24)	2.53 (2.33-2.75)	3.00 (2.77-3.26)	3.37 (3.12-3.66)	3.85 (3.55-4.17)	4.19 (3.86-4.54)	4.52 (4.16-4.91)	4.84 (4.44-5.27)	5.24 (4.78-5.71)	5.52 (5.03-6.04)
30-day	2.43 (2.24-2.63)	2.98 (2.75-3.22)	3.54 (3.27-3.83)	3.99 (3.68-4.30)	4.58 (4.21-4.94)	5.01 (4.60-5.41)	5.44 (4.98-5.88)	5.86 (5.34-6.34)	6.39 (5.80-6.94)	6.77 (6.12-7.37)
45-day	3.03 (2.81-3.27)	3.70 (3.44-4.00)	4.37 (4.05-4.70)	4.88 (4.53-5.25)	5.54 (5.14-5.96)	6.01 (5.57-6.47)	6.46 (5.98-6.95)	6.88 (6.36-7.41)	7.39 (6.81-7.96)	7.74 (7.12-8.36)
60-day	3.55 (3.31-3.80)	4.35 (4.05-4.66)	5.12 (4.76-5.47)	5.71 (5.30-6.09)	6.44 (5.99-6.87)	6.97 (6.47-7.43)	7.47 (6.92-7.96)	7.93 (7.33-8.47)	8.49 (7.82-9.07)	8.86 (8.15-9.49)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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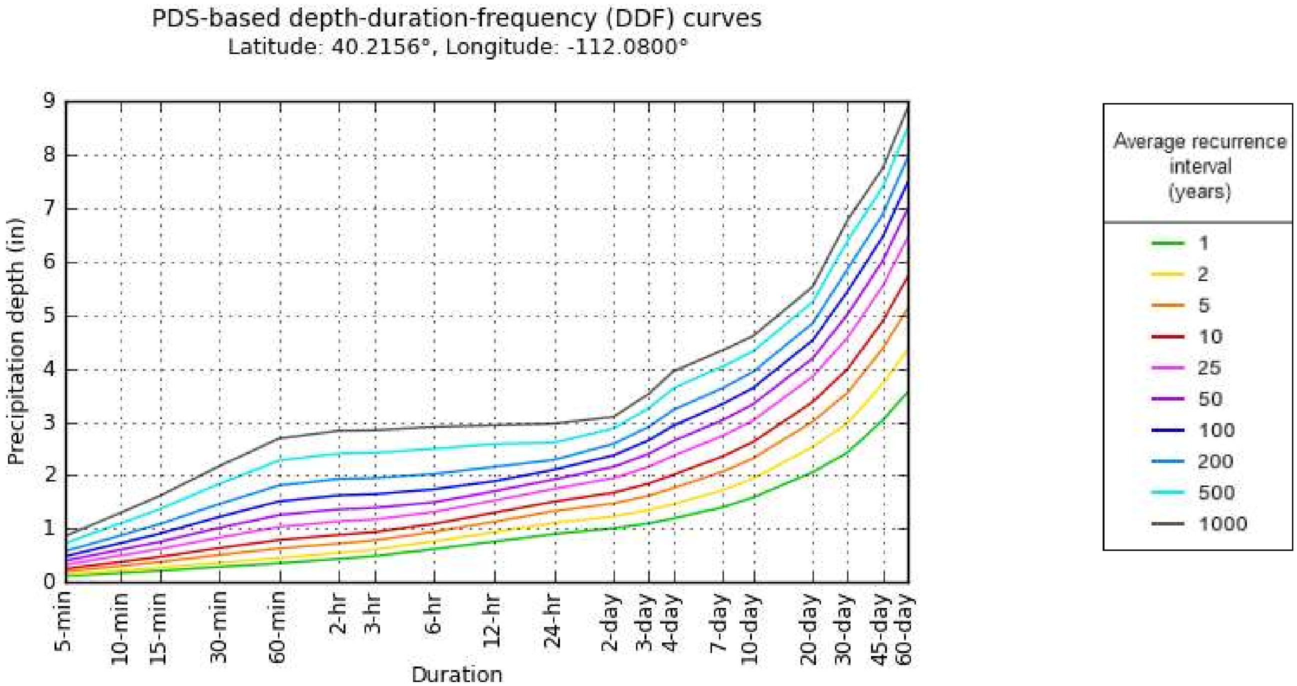
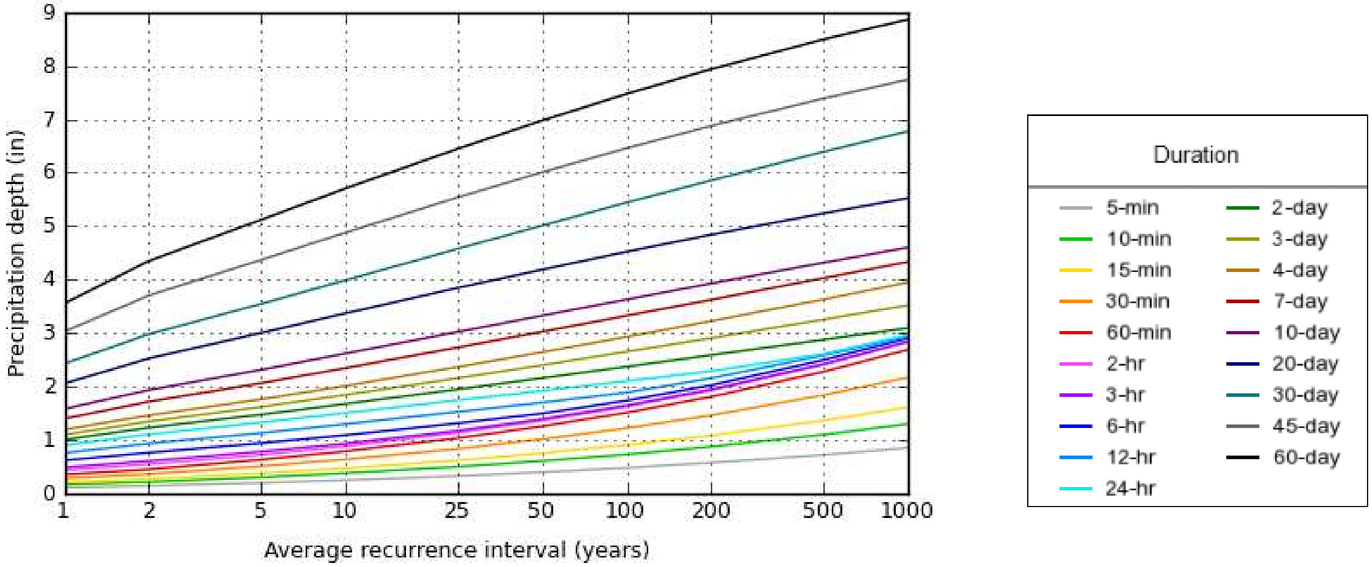
PF graphical





NOAA Atlas 14, Volume 1, Version 5 Created (GMT): Mon Oct 24 23:03:23 2016

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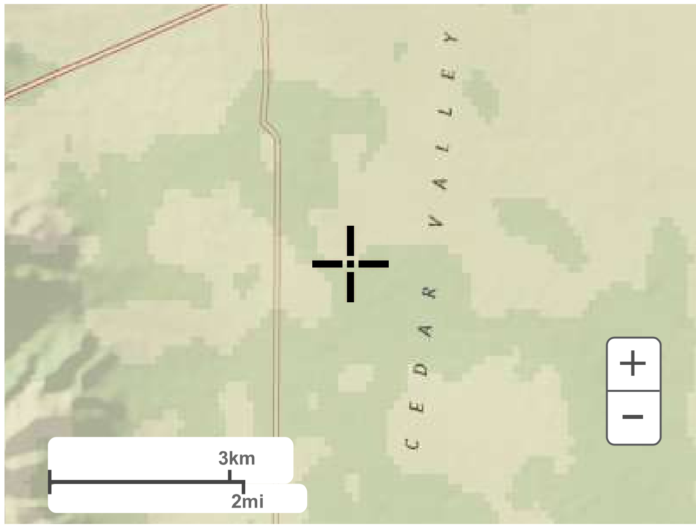
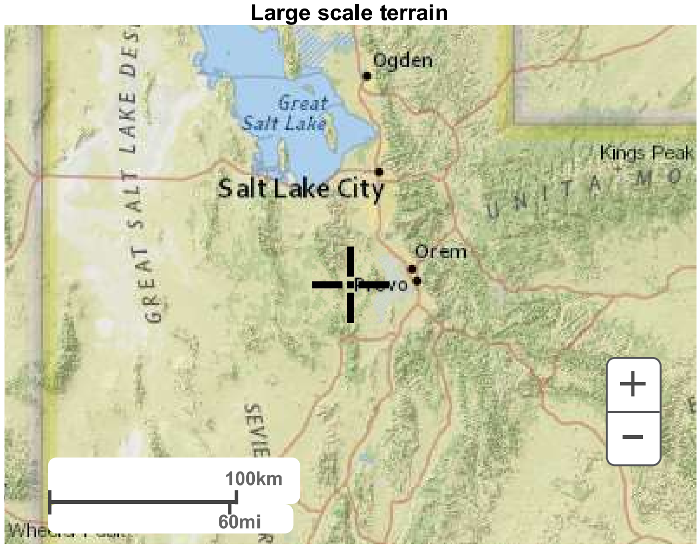
Maps & aerials

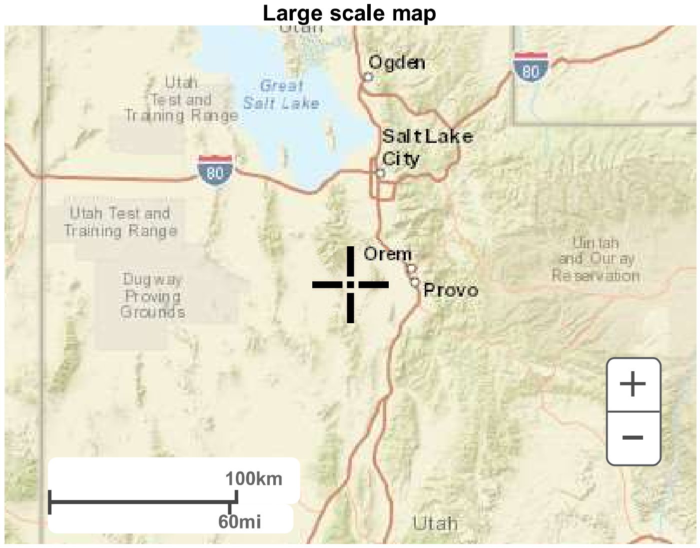
Small scale terrain



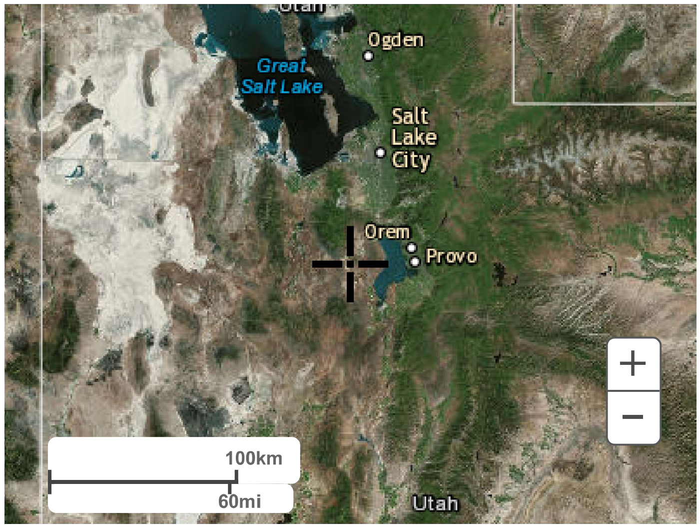
Large scale terrain



Large scale map



Large scale aerial



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1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

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Purpose: To determine the design flows to use for the run-on control diversions around the facility.

Method: The Soil Conservation Service (SCS) curve number method was used with the HEC-HMS hydrology model. The HEC-HMS model was set up using information from ArcGIS.

Required: In order to calculate the runoff the following steps and information are required:

- A delineation of the tributary area
- A weighted or representative curve number for the tributary area
- Lag time
- Storm Distribution
- 25 year-24 hour precipitation

Delineation: The delineation of the subbasin, shown in Figure 1, was based on the contours provided from USGS topographic maps. One basin was delineated for the entire site.

Curve Numbers: Curve numbers were determined based on the hydrologic soil type and soil cover contained in information given in the NRCS study "Fairfield-Nephi Area, Utah." The cover conditions were combined with the hydrologic soil type to produce a curve number based on Table 2-2d of Technical Release 55. Because the subbasin contained several different soil types and covers, a weighted curve number was applied to the entire subbasin based on area. The calculations of the weighted curve numbers are attached.

Precipitation: A 25 year - 24 hour event was used for the design storm according to the EPA regulation in 258.26(a)(1) of Title 40 Chapter 1. The rainfall amount was taken from the "Point Precipitation Frequency Estimates from NOAA Atlas 14". One precipitation value was used for the subbasin due to similar values of rainfall throughout the entire subbasin.

Storm Distribution: The distribution used for the 24-hour event was the SCS Type II.

Lag Time: The lag times were calculated by using the Time of Concentration and the equation $T_L = 0.6Tc$. Tc was calculated using Worksheet 3 in TR-55. A calculation sheet for the subbasin is attached.

Areal Reduction: An areal reduction factor was applied based on the Salt Lake City Hydrology Manual. According to the manual, a 24-hour event has an areal reduction factor of:

$$ARF = 0.01(100 - 2*Area^{0.46})$$

Area = Total Tributary Area, 6.69 mi^2

ARF = 0.95

Results: The results of the HEC-HMS model predicts a runoff of 61 cfs. Run-on protection should therefore have a capacity for the predicted flow rate.

Project: Intermountain Regional Landfill 2016 Redesign
Feature: Run-on Hydrology Weighted Curve Number Calculation
Computed: CAS
Date: May 2016
Checked: GLJ

Map Unit Symbol	**Acres in AO**	**Percent**	**Soil Clas**	**Curve Number**	**% CN**
Acf	1577.9	36.9%	D	80	29.4969
Ce	1.1	0.0%	C	-	0
Cf	105.1	2.5%	C	63	1.54721
GaBP	50.9	1.2%	C	63	0.74932
GbA	455.4	10.6%	C	63	6.7041
GbA	151.8	3.5%	C	71	2.51847
GbB	148.425	3.5%	C	63	2.18502
GbB	49.475	1.2%	C	71	0.82083
GdDp	92.7	2.2%	A	63	1.36467
GeD	150.2	3.5%	A	63	2.21115
HdC	642.3	15.0%	A	63	9.45552
LaC	278.6	6.5%	B	51	3.32015
LaC	278.6	6.5%	B	58	3.77586
MfA	0.6	0.0%	A	-	0
MfB	0.9	0.0%	A	-	0
SfC	221.625	5.2%	D	70	3.62513
SfC	73.875	1.7%	D	78	1.34648
Total	**4279.5**	**100%**			**69.1208**

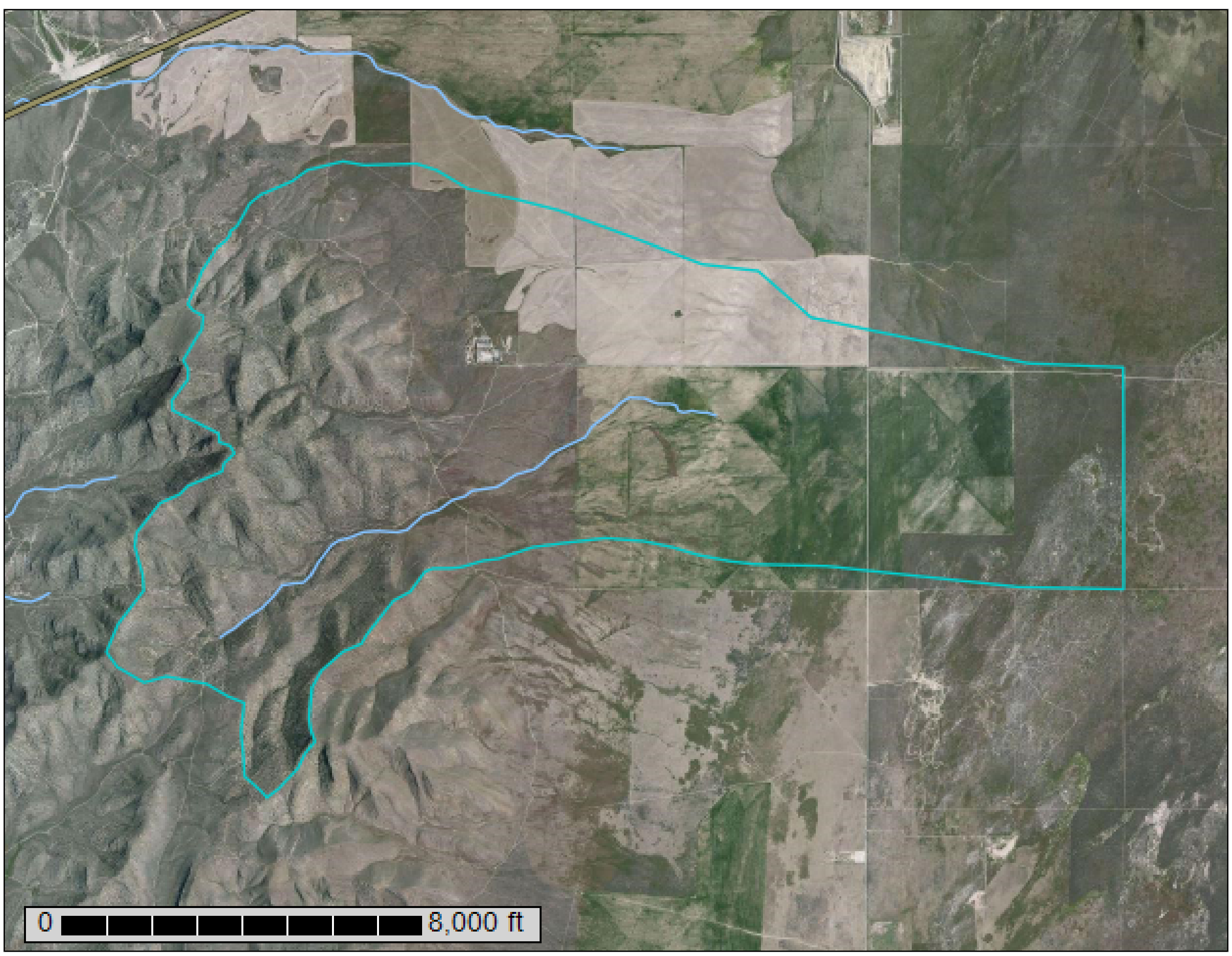
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Fairfield-Nephi Area, Utah; and Tooele Area, Utah - Tooele County and Parts of Box Elder, Davis and Juab Counties



May 5, 2016

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

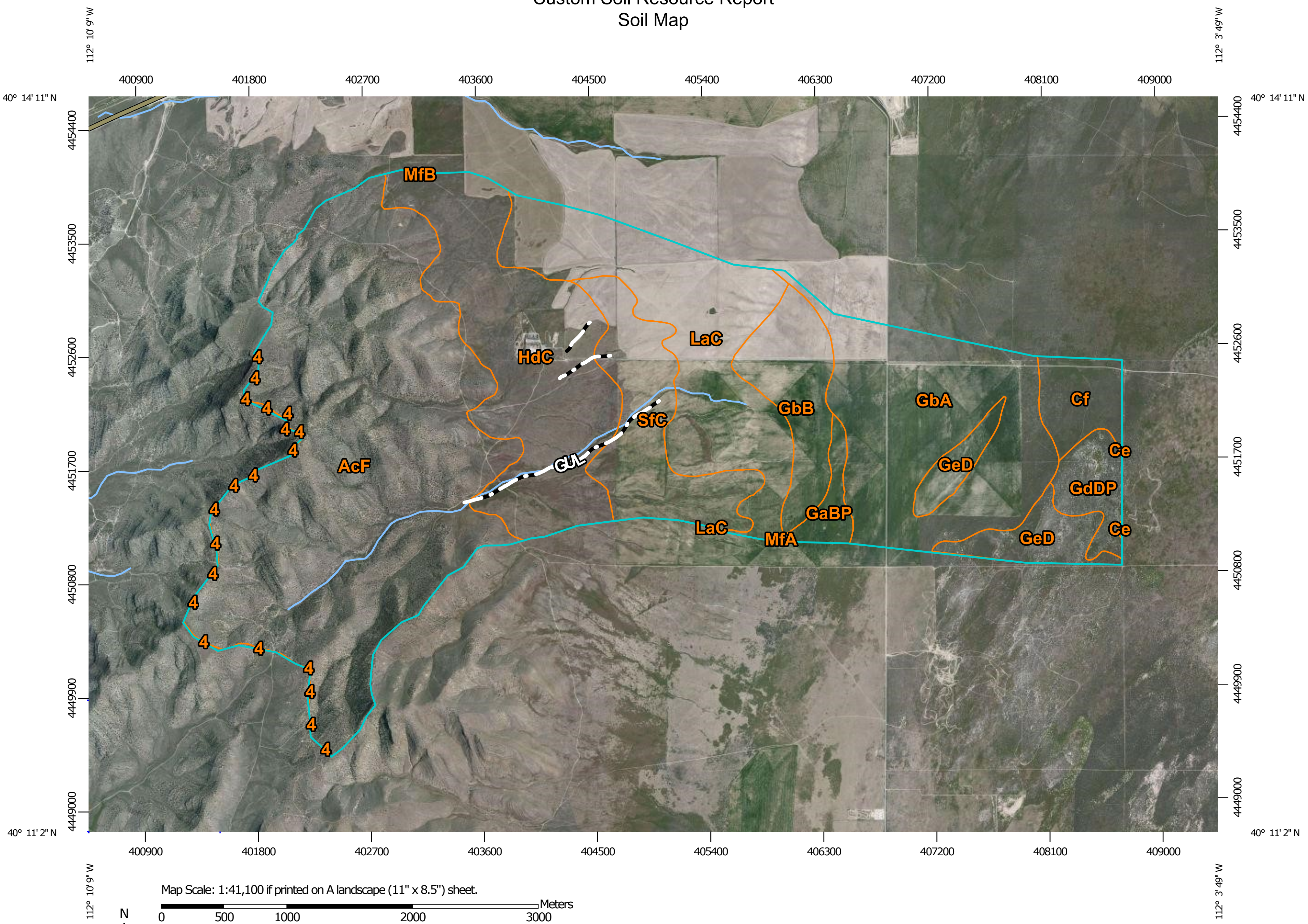
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:41,100 if printed on A landscape (11" x 8.5") sheet.

Meters: 0 500 1000 2000 3000

Feet: 0 1500 3000 6000 9000

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Fairfield-Nephi Area, Utah
Survey Area Data: Version 9, Sep 23, 2015

Soil Survey Area: Tooele Area, Utah - Tooele County and Parts of Box Elder, Davis and Juab Counties
Survey Area Data: Version 9, Sep 23, 2015

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 2, 2011—Aug 29, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Fairfield-Nephi Area, Utah (UT608)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
AcF	Amtoft-Rock outcrop complex, 30 to 70 percent slopes	1,577.9	36.8%
Ce	Cheebe fine sandy loam	1.1	0.0%
Cf	Cheebe silty clay loam	105.1	2.5%
GaBP	Genola fine sandy loam, hummocky, 1 to 2 percent slopes	50.9	1.2%
GbA	Genola silt loam, 0 to 1 percent slopes	607.2	14.2%
GbB	Genola silt loam, 1 to 2 percent slopes	197.9	4.6%
GdDP	Goldrun loamy fine sand, hummocky, 0 to 10 percent slopes	92.7	2.2%
GeD	Goldrun-Cheebe complex, 0 to 10 percent slopes	150.2	3.5%
HdC	Hiko Peak stony sandy loam, 4 to 8 percent slopes	642.3	15.0%
LaC	Linoyer very fine sandy loam, 2 to 5 percent slopes	557.2	13.0%
MfA	Medburn fine sandy loam, 0 to 2 percent slopes	0.6	0.0%
MfB	Medburn fine sandy loam, 2 to 4 percent slopes	0.9	0.0%
SfC	Shabliss very fine sandy loam, 2 to 5 percent slopes	295.5	6.9%
Subtotals for Soil Survey Area		**4,279.4**	**99.9%**
Totals for Area of Interest		**4,285.8**	**100.0%**

Tooele Area, Utah - Tooele County and Parts of Box Elder, Davis and Juab Counties (UT611)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
4	Amtoft-Rock outcrop complex, 30 to 70 percent slopes	6.4	0.1%
Subtotals for Soil Survey Area		**6.4**	**0.1%**
Totals for Area of Interest		**4,285.8**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Fairfield-Nephi Area, Utah

AcF—Amtoft-Rock outcrop complex, 30 to 70 percent slopes

Map Unit Setting

National map unit symbol: j60t
Elevation: 4,900 to 6,200 feet
Mean annual precipitation: 8 to 14 inches
Mean annual air temperature: 45 to 51 degrees F
Frost-free period: 100 to 140 days
Farmland classification: Not prime farmland

Map Unit Composition

Amtoft and similar soils: 55 percent
Rock outcrop: 25 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Amtoft

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve, crest, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Colluvium derived from sedimentary rock and/or residuum weathered from sedimentary rock

Typical profile

A11 - 0 to 3 inches: stony loam
A12 - 3 to 5 inches: gravelly loam
C1ca - 5 to 14 inches: very cobbly loam
C2ca - 14 to 19 inches: very gravelly fine sandy loam
R - 19 to 23 inches: unweathered bedrock

Properties and qualities

Slope: 30 to 70 percent
Percent of area covered with surface fragments: 13.0 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 80 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water storage in profile: Very low (about 2.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: Semidesert Shallow Loam (Black Sagebrush) (R028AY236UT)

Description of Rock Outcrop

Setting

Landform: Ridges, escarpments
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear

Minor Components

Saxby

Percent of map unit: 10 percent

Amtoft

Percent of map unit: 5 percent

Hiko peak

Percent of map unit: 5 percent

Ce—Cheebe fine sandy loam

Map Unit Setting

National map unit symbol: j61v
Elevation: 4,800 to 4,850 feet
Mean annual precipitation: 8 to 12 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 100 to 140 days
Farmland classification: Not prime farmland

Map Unit Composition

Cheebe and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cheebe

Setting

Landform: Lake terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Lake sediment derived from limestone, sandstone & shale

Typical profile

A11 - 0 to 8 inches: fine sandy loam
B1 - 8 to 15 inches: silty clay
B21t - 15 to 20 inches: silty clay
B22t - 20 to 31 inches: silty clay
B3ca - 31 to 44 inches: silty clay

C1ca - 44 to 55 inches: silty clay loam
C2 - 55 to 65 inches: clay

Properties and qualities
Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 55 percent
Gypsum, maximum in profile: 2 percent
Salinity, maximum in profile: Moderately saline to strongly saline (8.0 to 16.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 40.0
Available water storage in profile: Moderate (about 8.0 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: Semidesert Loam (Wyoming Big Sagebrush) (R028AY220UT)

Minor Components

Harding
Percent of map unit: 5 percent

Goldrun
Percent of map unit: 5 percent

Woodrow
Percent of map unit: 5 percent

Cheebe
Percent of map unit: 5 percent

Cf—Cheebe silty clay loam

Map Unit Setting
National map unit symbol: j61w
Elevation: 4,800 to 4,850 feet
Mean annual precipitation: 8 to 12 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 100 to 140 days
Farmland classification: Farmland of statewide importance

Map Unit Composition
Cheebe and similar soils: 80 percent
Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cheebe

Setting

Landform: Lake terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Lake sediment derived from limestone, sandstone & shale

Typical profile

A11 - 0 to 2 inches: silty clay loam
A12 - 2 to 4 inches: silty clay loam
A13 - 4 to 8 inches: silty clay loam
B1 - 8 to 15 inches: silty clay
B21t - 15 to 20 inches: silty clay
B22t - 20 to 31 inches: silty clay
B3ca - 31 to 44 inches: silty clay
C1ca - 44 to 55 inches: silty clay loam
C2 - 55 to 65 inches: clay

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 55 percent
Gypsum, maximum in profile: 2 percent
Salinity, maximum in profile: Moderately saline to strongly saline (8.0 to 16.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 40.0
Available water storage in profile: Moderate (about 8.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: Alkali Flat (Black Greasewood) (R028AY004UT)

Minor Components

Goldrun

Percent of map unit: 5 percent

Woodrow

Percent of map unit: 5 percent

Cheebe

Percent of map unit: 5 percent

Harding

Percent of map unit: 5 percent

GaBP—Genola fine sandy loam, hummocky, 1 to 2 percent slopes

Map Unit Setting

National map unit symbol: j62p
Elevation: 4,500 to 5,700 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 100 to 140 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Genola and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Genola

Setting

Landform: Flood plains, alluvial fans
Landform position (three-dimensional): Talf, dip
Down-slope shape: Linear, concave
Across-slope shape: Concave, convex
Parent material: Alluvium derived from limestone and sandstone and/or alluvium derived from igneous rock

Typical profile

A11 - 0 to 1 inches: fine sandy loam
A12 - 1 to 6 inches: fine sandy loam
C1 - 6 to 15 inches: silt loam
C2 - 15 to 29 inches: silt loam
C3 - 29 to 42 inches: silt loam
C4 - 42 to 60 inches: silt loam

Properties and qualities

Slope: 1 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C

Ecological site: Semidesert Loam (Wyoming Big Sagebrush) (R028AY220UT)

Minor Components

Genola
Percent of map unit: 10 percent

Linoyer
Percent of map unit: 10 percent

Medburn
Percent of map unit: 5 percent

GbA—Genola silt loam, 0 to 1 percent slopes

Map Unit Setting
National map unit symbol: j62q
Elevation: 4,500 to 5,700 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 100 to 140 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition
Genola and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Genola

Setting
Landform: Flood plains, alluvial fans
Landform position (three-dimensional): Dip, talf
Down-slope shape: Linear, concave
Across-slope shape: Concave, convex
Parent material: Alluvium derived from limestone and sandstone and/or alluvium derived from igneous rock

Typical profile
A11 - 0 to 1 inches: silt loam
A12 - 1 to 6 inches: silt loam
C1 - 6 to 15 inches: silt loam
C2 - 15 to 29 inches: silt loam
C3 - 29 to 42 inches: silt loam
C4 - 42 to 60 inches: silt loam

Properties and qualities
Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 10.2 inches)

Interpretive groups
Land capability classification (irrigated): 2c
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C
Ecological site: Semidesert Loam (Wyoming Big Sagebrush) (R028AY220UT)

Minor Components

Linoyer
Percent of map unit: 10 percent

Medburn
Percent of map unit: 5 percent

Genola
Percent of map unit: 5 percent

GbB—Genola silt loam, 1 to 2 percent slopes

Map Unit Setting
National map unit symbol: j62r
Elevation: 4,500 to 5,700 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 100 to 140 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition
Genola and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Genola

Setting
Landform: Flood plains, alluvial fans
Landform position (three-dimensional): Talf, dip
Down-slope shape: Linear, concave
Across-slope shape: Concave, convex
Parent material: Alluvium derived from igneous rock and/or alluvium derived from limestone and sandstone

Typical profile
A11 - 0 to 1 inches: silt loam
A12 - 1 to 6 inches: silt loam

C1 - 6 to 15 inches: silt loam
C2 - 15 to 29 inches: silt loam
C3 - 29 to 42 inches: silt loam
C4 - 42 to 60 inches: silt loam

Properties and qualities

Slope: 1 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 10.2 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C
Ecological site: Semidesert Loam (Wyoming Big Sagebrush) (R028AY220UT)

Minor Components

Linoyer

Percent of map unit: 10 percent

Medburn

Percent of map unit: 5 percent

Genola

Percent of map unit: 5 percent

Genola

Percent of map unit: 5 percent

GdDP—Goldrun loamy fine sand, hummocky, 0 to 10 percent slopes

Map Unit Setting

National map unit symbol: j62x
Elevation: 4,500 to 5,500 feet
Mean annual precipitation: 8 to 12 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 100 to 140 days
Farmland classification: Not prime farmland

Map Unit Composition

Goldrun and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Goldrun

Setting

Landform: Lake terraces, alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear, concave
Across-slope shape: Linear, convex
Parent material: Sand & alluvium derived from sandstone & igneous rocks

Typical profile

A11 - 0 to 2 inches: loamy fine sand
C1 - 2 to 11 inches: loamy fine sand
C2 - 11 to 26 inches: fine sand
C3 - 26 to 48 inches: fine sand
C4 - 48 to 60 inches: loamy fine sand

Properties and qualities

Slope: 0 to 10 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: Semidesert Sand (Four-Wing Saltbush) (R028AF222UT)

Minor Components

Linoyer

Percent of map unit: 10 percent

Medburn

Percent of map unit: 5 percent

GeD—Goldrun-Cheebe complex, 0 to 10 percent slopes

Map Unit Setting

National map unit symbol: j62y
Elevation: 4,500 to 5,500 feet
Mean annual precipitation: 8 to 12 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 100 to 140 days

Farmland classification: Not prime farmland

Map Unit Composition

Goldrun and similar soils: 50 percent
Cheebe and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Goldrun

Setting

Landform: Lake terraces, alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear, concave
Across-slope shape: Linear, convex
Parent material: Sand & alluvium derived from sandstone & igneous rocks

Typical profile

A1 - 0 to 2 inches: loamy fine sand
C1 - 2 to 11 inches: loamy fine sand
C2 - 11 to 26 inches: fine sand
C3 - 26 to 48 inches: fine sand
C4 - 48 to 60 inches: loamy fine sand

Properties and qualities

Slope: 0 to 10 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: Semidesert Sand (Four-Wing Saltbush) (R028AF222UT)

Description of Cheebe

Setting

Landform: Lake terraces, alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear, concave
Across-slope shape: Linear, convex
Parent material: Lacustrine deposits derived from limestone, sandstone, and shale

Typical profile

A11 - 0 to 2 inches: silty clay loam
A12 - 2 to 4 inches: silty clay loam
A13 - 4 to 8 inches: silty clay loam
B1 - 8 to 15 inches: silty clay

B21t - 15 to 20 inches: silty clay
B22t - 20 to 31 inches: silty clay
B3ca - 31 to 44 inches: silty clay
C1ca - 44 to 55 inches: silty clay loam
C2 - 55 to 65 inches: clay

Properties and qualities
Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 55 percent
Gypsum, maximum in profile: 2 percent
Salinity, maximum in profile: Moderately saline to strongly saline (8.0 to 16.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 40.0
Available water storage in profile: Moderate (about 8.3 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: Alkali Flat (Black Greasewood) (R028AY004UT)

Minor Components

Linoyer
Percent of map unit: 10 percent

Genola
Percent of map unit: 5 percent

Medburn
Percent of map unit: 5 percent

HdC—Hiko Peak stony sandy loam, 4 to 8 percent slopes

Map Unit Setting
National map unit symbol: j635
Elevation: 4,800 to 5,800 feet
Mean annual precipitation: 8 to 12 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 100 to 140 days
Farmland classification: Not prime farmland

Map Unit Composition

Hiko peak and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hiko Peak

Setting

Landform: Alluvial fans
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Alluvium derived from limestone and sandstone and/or alluvium derived from quartzite

Typical profile

A11 - 0 to 3 inches: stony sandy loam
A12 - 3 to 7 inches: stony sandy loam
B2 - 7 to 19 inches: gravelly sandy loam
C1ca - 19 to 28 inches: very gravelly sandy loam
C2ca - 28 to 37 inches: very gravelly sandy loam
C3ca - 37 to 44 inches: very gravelly sandy loam
C4 - 44 to 60 inches: extremely gravelly sandy loam

Properties and qualities

Slope: 4 to 8 percent
Percent of area covered with surface fragments: 11.0 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: Semidesert Gravelly Loam (Wyoming Big Sagebrush) North (R028AY215UT)

Minor Components

Hiko peak

Percent of map unit: 5 percent

Spager

Percent of map unit: 5 percent

Medburn

Percent of map unit: 5 percent

Sanpete

Percent of map unit: 5 percent

LaC—Linoyer very fine sandy loam, 2 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2smc4
Elevation: 4,490 to 5,740 feet
Mean annual precipitation: 8 to 12 inches
Mean annual air temperature: 45 to 51 degrees F
Frost-free period: 100 to 140 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Linoyer and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Linoyer

Setting

Landform: Lake plains, lake terraces, alluvial fans
Landform position (three-dimensional): Tread, rise
Down-slope shape: Linear, concave
Across-slope shape: Linear, convex
Parent material: Alluvium and/or lacustrine deposits

Typical profile

A1 - 0 to 9 inches: very fine sandy loam
A2 - 9 to 15 inches: very fine sandy loam
C1 - 15 to 48 inches: very fine sandy loam
C2 - 48 to 60 inches: very fine sandy loam

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 5.0
Available water storage in profile: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: Semidesert Sandy Loam (Wyoming Big Sagebrush) (R028AY226UT)

MfA—Medburn fine sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: j647
Elevation: 4,500 to 5,300 feet
Mean annual precipitation: 10 to 12 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 100 to 140 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Medburn and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Medburn

Setting

Landform: Alluvial fans
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Alluvium derived from sandstone and/or alluvium derived from igneous rock

Typical profile

A11 - 0 to 4 inches: fine sandy loam
A12 - 4 to 8 inches: fine sandy loam
C1 - 8 to 15 inches: fine sandy loam
C2 - 15 to 24 inches: fine sandy loam
C3 - 24 to 32 inches: fine sandy loam
C4 - 32 to 41 inches: gravelly sandy loam
C5 - 41 to 60 inches: fine sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Ecological site: Semidesert Sandy Loam (Wyoming Big Sagebrush) (R028AY226UT)

Minor Components

Hiko peak

Percent of map unit: 5 percent

Linoyer

Percent of map unit: 5 percent

Medburn

Percent of map unit: 5 percent

MfB—Medburn fine sandy loam, 2 to 4 percent slopes

Map Unit Setting

National map unit symbol: j648
Elevation: 4,500 to 5,300 feet
Mean annual precipitation: 10 to 12 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 100 to 140 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Medburn and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Medburn

Setting

Landform: Alluvial fans
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Alluvium derived from sandstone and/or alluvium derived from igneous rock

Typical profile

A11 - 0 to 4 inches: fine sandy loam
A12 - 4 to 8 inches: fine sandy loam
C1 - 8 to 15 inches: fine sandy loam
C2 - 15 to 24 inches: fine sandy loam
C3 - 24 to 32 inches: fine sandy loam
C4 - 32 to 41 inches: gravelly sandy loam
C5 - 41 to 60 inches: fine sandy loam

Properties and qualities

Slope: 2 to 4 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None

Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 6.4 inches)

Interpretive groups
Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Ecological site: Semidesert Sandy Loam (Wyoming Big Sagebrush) (R028AY226UT)

Minor Components

Hiko peak
Percent of map unit: 5 percent

Linoyer
Percent of map unit: 5 percent

Medburn
Percent of map unit: 5 percent

SfC—Shabliss very fine sandy loam, 2 to 5 percent slopes

Map Unit Setting
National map unit symbol: j665
Elevation: 4,700 to 6,000 feet
Mean annual precipitation: 8 to 14 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 100 to 140 days
Farmland classification: Not prime farmland

Map Unit Composition
Shabliss and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Shabliss

Setting
Landform: Lake terraces, alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear, concave
Across-slope shape: Linear, convex
Parent material: Alluvium and lake sediment derived dominantly from sedimentary and igneous rocks

Typical profile
A1 - 0 to 4 inches: very fine sandy loam
B1 - 4 to 9 inches: very fine sandy loam
B2 - 9 to 15 inches: very fine sandy loam

C1sica - 15 to 26 inches: cemented
C2sica - 26 to 40 inches: cemented
C3ca - 40 to 60 inches: loam

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: 10 to 20 inches to duripan
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 60 percent
Salinity, maximum in profile: Slightly saline to moderately saline (4.0 to 8.0 mmhos/cm)
Available water storage in profile: Very low (about 2.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: Semidesert Shallow Hardpan (Black Sagebrush) (R028AY230UT)

Minor Components

Shabliss

Percent of map unit: 5 percent

Medburn

Percent of map unit: 4 percent

Truesdale

Percent of map unit: 3 percent

Spager

Percent of map unit: 3 percent

Tooele Area, Utah - Tooele County and Parts of Box Elder, Davis and Juab Counties

4—Amtoft-Rock outcrop complex, 30 to 70 percent slopes

Map Unit Setting

National map unit symbol: j5q2
Elevation: 5,500 to 7,000 feet
Mean annual precipitation: 10 to 12 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 100 to 140 days
Farmland classification: Not prime farmland

Map Unit Composition

Amtoft and similar soils: 65 percent
Rock outcrop: 15 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Amtoft

Setting

Landform: Mountainsides, hillsides
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Colluvium derived from limestone and/or residuum weathered from limestone

Typical profile

A,Bw - 0 to 9 inches: very cobbly loam
Bk - 9 to 16 inches: extremely cobbly loam
R - 16 to 26 inches: bedrock

Properties and qualities

Slope: 30 to 70 percent
Percent of area covered with surface fragments: 2.0 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 80 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water storage in profile: Very low (about 1.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: Semidesert Shallow Loam (Utah Juniper-Bluebunch Wheatgrass) (R028AY238UT)

Description of Rock Outcrop

Setting

Landform: Hillsides, mountainsides
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Convex
Across-slope shape: Convex

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s

Minor Components

Lundy

Percent of map unit: 4 percent

Lodar

Percent of map unit: 4 percent

Cliffdown

Percent of map unit: 3 percent

Spager

Percent of map unit: 3 percent

Hiko peak

Percent of map unit: 3 percent

Checkett

Percent of map unit: 3 percent

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NOAA Atlas 14, Volume 1, Version 5
Location name: Cedar Valley, Utah, US*
Latitude: 40.2165°, Longitude: -112.1232°
Elevation: 5057 ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.115 (0.098-0.137)	0.147 (0.127-0.175)	0.205 (0.175-0.244)	0.256 (0.215-0.307)	0.334 (0.276-0.403)	0.406 (0.328-0.492)	0.488 (0.385-0.594)	0.584 (0.446-0.720)	0.734 (0.536-0.919)	0.867 (0.610-1.10)
10-min	0.175 (0.150-0.209)	0.224 (0.193-0.267)	0.312 (0.266-0.372)	0.389 (0.328-0.468)	0.508 (0.420-0.613)	0.618 (0.499-0.749)	0.743 (0.586-0.904)	0.889 (0.679-1.10)	1.12 (0.817-1.40)	1.32 (0.929-1.67)
15-min	0.217 (0.186-0.259)	0.277 (0.239-0.330)	0.387 (0.330-0.462)	0.483 (0.406-0.580)	0.630 (0.521-0.760)	0.766 (0.619-0.928)	0.921 (0.726-1.12)	1.10 (0.841-1.36)	1.39 (1.01-1.73)	1.64 (1.15-2.07)
30-min	0.293 (0.250-0.349)	0.373 (0.322-0.445)	0.521 (0.444-0.622)	0.650 (0.547-0.781)	0.849 (0.702-1.02)	1.03 (0.834-1.25)	1.24 (0.978-1.51)	1.48 (1.13-1.83)	1.86 (1.36-2.33)	2.20 (1.55-2.79)
60-min	0.363 (0.310-0.432)	0.462 (0.399-0.550)	0.645 (0.550-0.769)	0.804 (0.677-0.967)	1.05 (0.869-1.27)	1.28 (1.03-1.55)	1.53 (1.21-1.87)	1.84 (1.40-2.26)	2.31 (1.69-2.89)	2.73 (1.92-3.46)
2-hr	0.448 (0.397-0.516)	0.564 (0.498-0.655)	0.739 (0.650-0.858)	0.905 (0.787-1.05)	1.16 (0.988-1.35)	1.39 (1.16-1.63)	1.66 (1.35-1.96)	1.97 (1.55-2.35)	2.45 (1.84-2.98)	2.89 (2.09-3.57)
3-hr	0.501 (0.451-0.571)	0.625 (0.560-0.709)	0.804 (0.715-0.910)	0.958 (0.846-1.09)	1.20 (1.05-1.37)	1.42 (1.21-1.64)	1.69 (1.41-1.98)	1.99 (1.62-2.38)	2.47 (1.93-3.00)	2.90 (2.19-3.61)
6-hr	0.640 (0.588-0.710)	0.792 (0.723-0.875)	0.971 (0.880-1.08)	1.13 (1.02-1.25)	1.35 (1.21-1.51)	1.54 (1.36-1.72)	1.79 (1.55-2.02)	2.08 (1.77-2.40)	2.56 (2.12-3.04)	2.98 (2.41-3.64)
12-hr	0.791 (0.728-0.871)	0.973 (0.893-1.07)	1.18 (1.08-1.30)	1.35 (1.23-1.49)	1.59 (1.44-1.75)	1.77 (1.58-1.97)	1.97 (1.74-2.20)	2.24 (1.95-2.54)	2.68 (2.28-3.08)	3.05 (2.54-3.68)
24-hr	0.942 (0.870-1.02)	1.16 (1.07-1.26)	1.39 (1.28-1.50)	1.58 (1.45-1.71)	1.83 (1.68-1.98)	2.02 (1.84-2.19)	2.21 (2.01-2.40)	2.41 (2.18-2.61)	2.71 (2.39-3.11)	3.08 (2.55-3.72)
2-day	1.06 (0.975-1.15)	1.30 (1.19-1.41)	1.56 (1.44-1.70)	1.77 (1.63-1.93)	2.07 (1.90-2.24)	2.30 (2.10-2.49)	2.53 (2.31-2.75)	2.77 (2.50-3.01)	3.09 (2.77-3.37)	3.33 (2.96-3.75)
3-day	1.16 (1.06-1.27)	1.42 (1.30-1.56)	1.71 (1.57-1.88)	1.96 (1.80-2.14)	2.30 (2.10-2.51)	2.56 (2.33-2.80)	2.84 (2.57-3.10)	3.12 (2.81-3.42)	3.51 (3.12-3.85)	3.80 (3.36-4.25)
4-day	1.26 (1.15-1.39)	1.54 (1.42-1.70)	1.87 (1.71-2.06)	2.14 (1.96-2.35)	2.53 (2.30-2.77)	2.83 (2.56-3.11)	3.15 (2.84-3.46)	3.47 (3.11-3.82)	3.92 (3.48-4.33)	4.28 (3.76-4.75)
7-day	1.48 (1.36-1.63)	1.82 (1.67-2.00)	2.20 (2.02-2.42)	2.51 (2.30-2.75)	2.94 (2.68-3.21)	3.27 (2.97-3.57)	3.60 (3.26-3.94)	3.94 (3.55-4.32)	4.40 (3.93-4.84)	4.75 (4.21-5.25)
10-day	1.68 (1.54-1.83)	2.06 (1.90-2.25)	2.48 (2.27-2.69)	2.81 (2.58-3.06)	3.25 (2.98-3.54)	3.59 (3.28-3.90)	3.93 (3.58-4.28)	4.27 (3.87-4.66)	4.72 (4.24-5.16)	5.05 (4.51-5.54)
20-day	2.20 (2.03-2.39)	2.71 (2.50-2.95)	3.23 (2.98-3.51)	3.63 (3.35-3.94)	4.15 (3.82-4.51)	4.53 (4.17-4.92)	4.91 (4.50-5.34)	5.27 (4.81-5.75)	5.73 (5.20-6.26)	6.06 (5.48-6.64)
30-day	2.61 (2.40-2.82)	3.20 (2.96-3.47)	3.83 (3.53-4.15)	4.32 (3.98-4.67)	4.97 (4.57-5.38)	5.46 (5.00-5.91)	5.94 (5.43-6.44)	6.41 (5.83-6.96)	7.03 (6.35-7.66)	7.47 (6.72-8.17)
45-day	3.26 (3.02-3.52)	4.00 (3.71-4.32)	4.73 (4.38-5.11)	5.30 (4.91-5.72)	6.03 (5.58-6.52)	6.57 (6.07-7.10)	7.09 (6.53-7.67)	7.58 (6.96-8.21)	8.20 (7.50-8.89)	8.64 (7.87-9.40)
60-day	3.84 (3.57-4.12)	4.71 (4.38-5.06)	5.57 (5.17-5.97)	6.22 (5.78-6.66)	7.05 (6.54-7.55)	7.65 (7.08-8.19)	8.22 (7.59-8.81)	8.76 (8.07-9.40)	9.43 (8.64-10.1)	9.89 (9.04-10.7)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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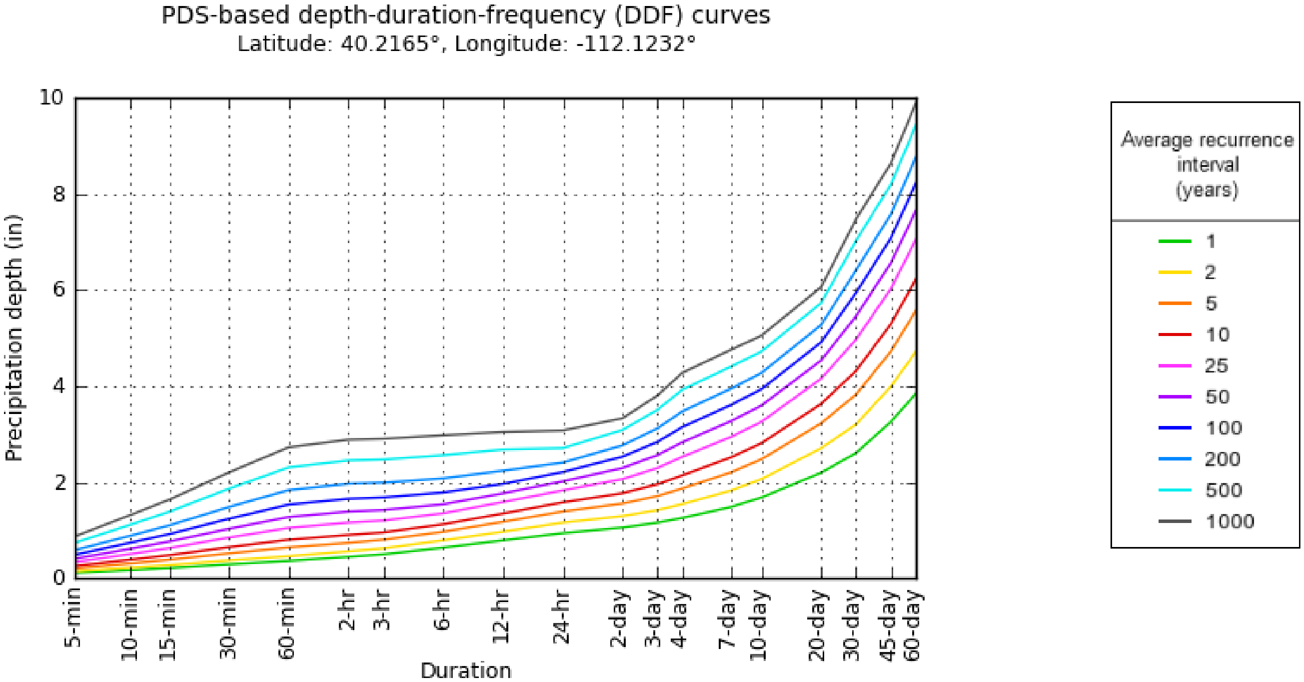
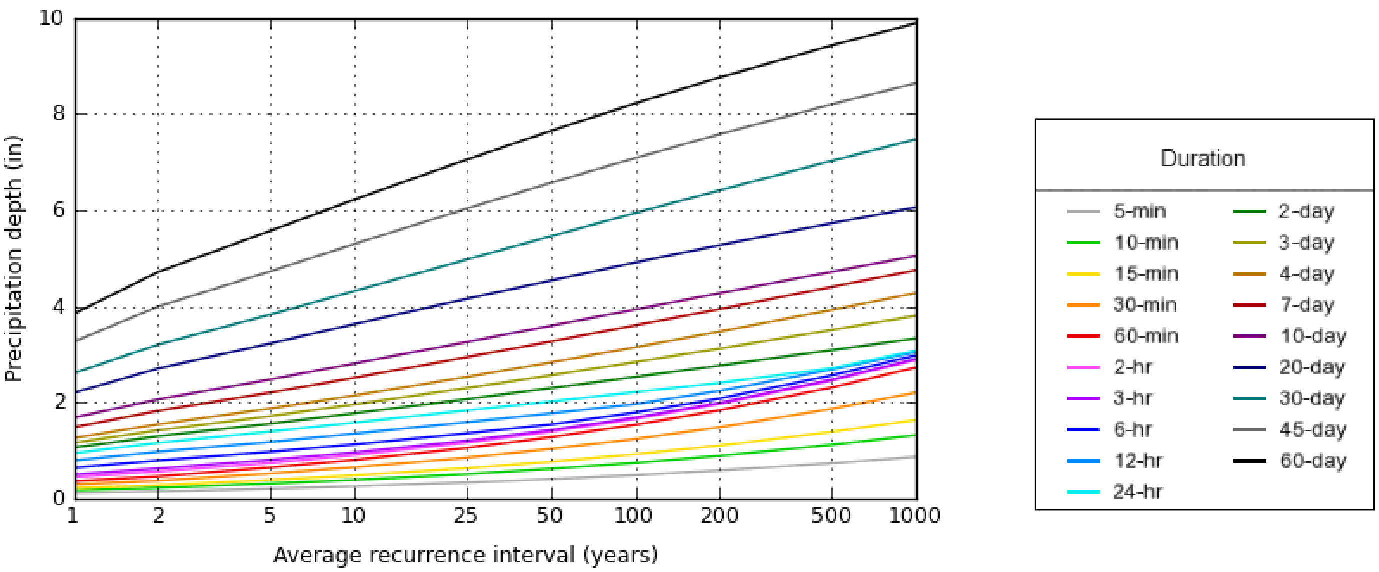
PF graphical





NOAA Atlas 14, Volume 1, Version 5 Created (GMT): Mon May 9 22:04:41 2016

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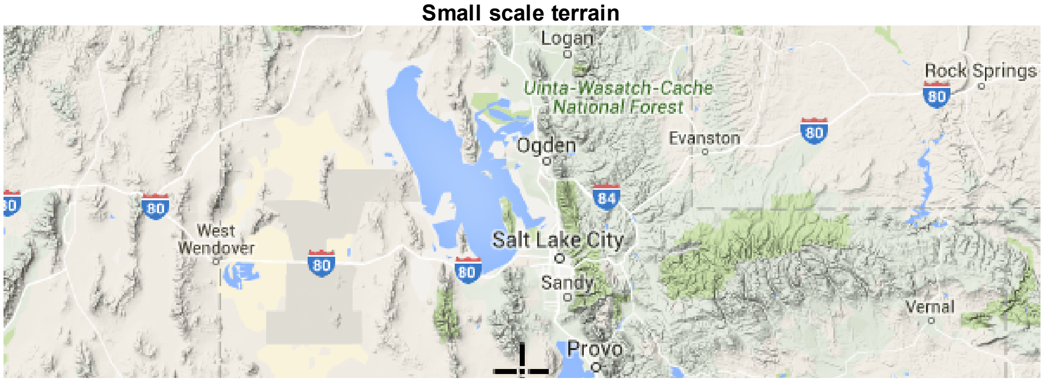
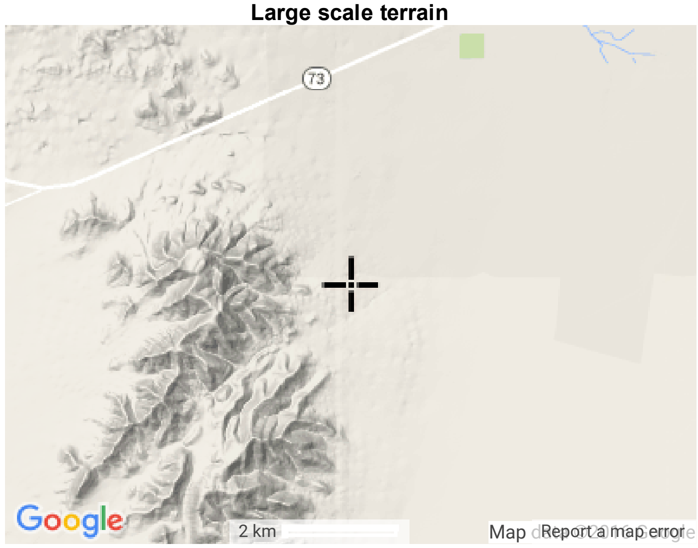
Maps & aerials

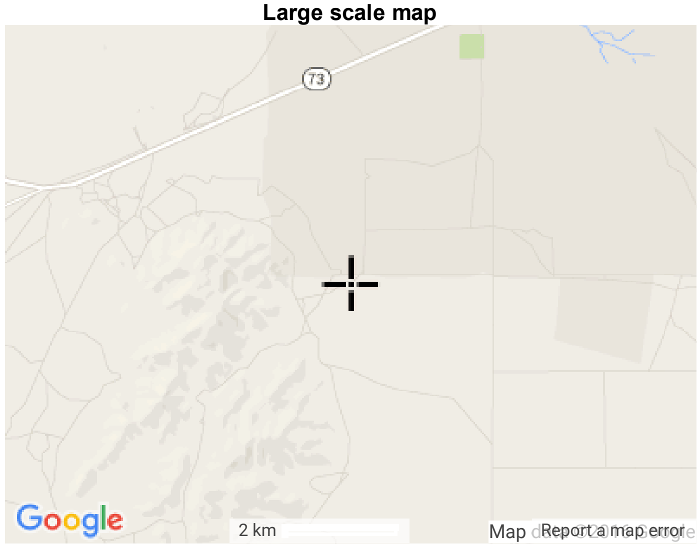
Small scale terrain



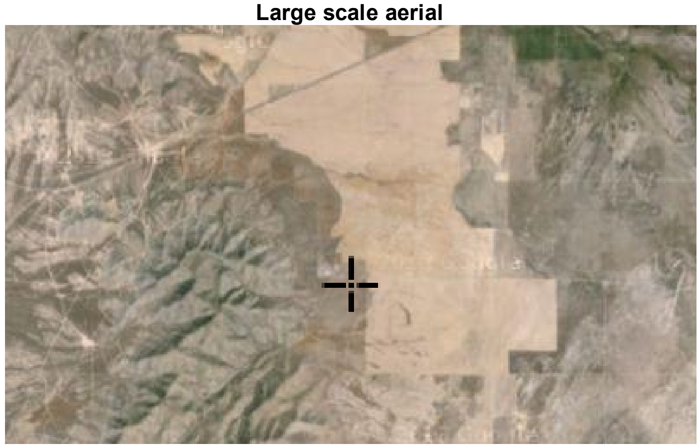
Large scale terrain



Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

Worksheet 3: Time of Concentration (T_c) or Travel Time (T_t)

Project:	IRL - Redesign	By:	RJG	Date:	7/15/2016
Location:	Run-on Hydrology	Checked:	GLJ	Date:	9/23/2016

Check One: ☑ Present ☐ Developed

Check One: ☑ Tc ☐ Tt Through subarea

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet Flow

	Segment ID			
1. Surface Description (table 3-1)	Range			
2. Manning's roughness coesfficent, n (table 3-1)	0.13			
3. Flow length, L (total L + 300 ft)	300			
4. Two-year 24-hour rainfall, P_2	1.16			
5. Land Slope, s	0.25			
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2{}^{0.5}s^{0.4}}$ Comput T_t hr	0.21	+		= 0.21

Shallow Concentrated Flow

	Segment ID			
7. Surface Description (paved or unpaved)	Unpaved			
8. Flow Length, L	960			
9. Watercouse slope, s	0.10			
10. Average Velocity, V (figure 3-1)	5			
11. $T_t = \frac{L}{3600V}$ Comput T_t hr	0.05	+		= 0.05

Channel Flow

Segment ID	Mtn Chan 1	Mtn Chan 2	Fields
12. Cross section falow area, a	2.5	2.5	50
13. Wetted Perimeter, p_w	6.24	6.24	101
14. Hydraulic radius, $r = \frac{a}{p_w}$ Compute r	0.40	0.40	0.495
15. Channel Slope, s	0.07	0.04	0.01
16. Manning's roughness coefficient, n	0.06	0.06	0.05
17. $V = \frac{1.49(r)^{0.8}(s)^{1/2}}{n}$ Compute V	3.49	2.52	1.86
18. Flow length, L	7000	7000	10000
19. $T_t = \frac{L}{3600V}$ Compute T_t	0.56 +	0.77 +	1.49
		=	2.82

20. Watershed or subarea T_c or T_t (add Tt in steps 6, 11, and 19) 3.08

Purpose: To design the downspout to convey runoff from the closure cap and bench.

Process: Reference: Reference: “ADS Specifier Manual - Civil Engineer”, Advanced Drainage Systems, Inc.)

Each hydrologic subbasin on the landfill closure cap was delineated, its area was measured, and then runoff calculations were performed in accordance with TR-55. See hydrology calculations discussed previously in the report. Maximum runoff from each downspout location is included in the summary table below.

Outlet	Peak Discharge (cfs)	Contributing Subbasins	Description
1	23	6, 9	Northeast Corner (Bench)
2	28.5	3	Northeast Corner (Top)
3	26.3	4	Southeast Corner (Top)
4	25.3	5, 10	Southeast Corner (Bench)

Downspouts

An 18-inch pipe was chosen to be used for each downspout to accommodate this flow.

Manning’s n = 0.020

$Q = (1.49/n)(A)(r)^{2/3}(S)^{1/2}$

A = cross-sectional area of pipe (ft^2)
r = hydraulic radius of pipe (ft)
S = slope of pipe (ft/ft)

$Q = (1.49/0.020)(pi(9/12ft)^2)((9/12)/2)^{2\backslash 3}(0.25)^{0.5}$

$Q = 34.1\ ft^3/sec$

An 18 inch pipe is capable of carrying the maximum projected flows.

Inlet pipes must have sufficient head above the pipe in order to obtain maximum flow. Due to the geometry of the landfill cap design, a maximum of 4 feet of head above the pipe inlet can be obtained. Using the orifice equation with a standard discharge coefficient of 0.61, Q = (Cd)*(A)*(sqrt(2*g*h))

Cd = Coefficient of discharge
A = Area of orifice
g = 32.2 ft/s^2
h = head above orifice

Q = (0.61)(pi$(9/12)^2$)(sqrt(2*32.2ft/s^2*4ft))

Q = 17.3 cfs

Results: Since this capacity is less than any of the maximum predicted peak flows, two 18" pipes are necessary for each of the four outlet areas denoted on figure 1. This will provide a capacity of 34.6 cfs, which is sufficient for any of the four downspouts.

APPENDIX G

Erosion Protection

1. Purpose and Procedure.

The purpose of these calculations is determine if erosion protection is needed and if so which measure to use and how to apply it. The closure cap will consist of a 4H:1V slope extending up from the top of the cell embankments. The embankments will consist of a 4H:1V slope from the top of the embankment down to the ground surface. Benches will be constructed in the slopes of the closure cap to intercept precipitation and snow melt runoff from the slopes as needed to control runoff and to minimize erosion.

The procedure used to determine the allowable slope lengths between the bench areas of the closure cap slopes is taken from the publication "Erosion and Sedimentation in Utah - A Guide for Control", Utah Water Research Laboratory, February 1984. This publication is specific to Utah. The figure presented on Sheet 2 presents a cross-section showing the configuration of the area contributing runoff to the slopes of the closure cap. The degree of erosion protection required is based on the steepness and length of the slopes. Erosion protection measures will be determined for the longest slope length and the erosion control measures determined for the longest slope will be conservatively applied to all slopes. According to a 1991 Seminar Publication from the EPA entitled “Design and Construction of RCRA/CERCLA Final Covers”, the minimum cirteria is a cover soil loss of less than 2 tons/acre/year. This same criteria will be applied to these calculations.

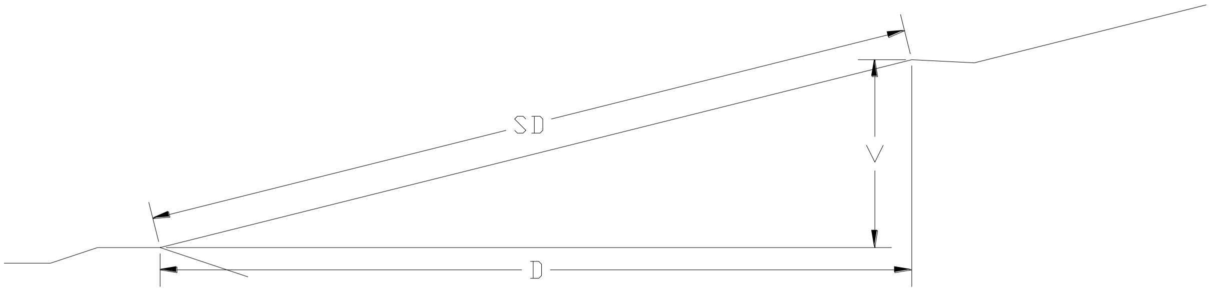
2. The procedure from the above publication uses the Universal Soil Loss Equation (in modified form to represent Utah's climatic and topographic conditions) to estimate the soil erosion potential of the surface soils assuming no application of erosion control measures. Erosion control measures to be implemented are based on the soil erosion potential calculated.

The universal soil loss equation used to calculate soil erosion potential is:

$$A = R * K * LS$$

where;

A	=	Computed amount of soil loss per unit area for the time interval represented by factor R, generally in tons per acre per year.
R	=	Rainfall (precipitation) factor.
K	=	Soil erodibility factor in tons per acre per year per unit of R.
LS	=	Topographic factor (length and steepness of slope).



D = Horizontal Distance
V = Vertical Distance
SD = Slope Distance

For 4H:1V Slopes

$$D = 4V$$
$$SD = \sqrt{D^2 + V^2}$$
$$SD = \sqrt{(4^2)(V^2) + V^2}$$
$$SD = \sqrt{17V^2}$$

Calculated erosion after applying erosion control measures is determined by applying and erosion control factor (VM) to the universal soil loss equation. The erosion control factor is dependant upon the type and extent to which the erosion control measure is used (ie. vegetative - type and density, mulches - type and thickness, chemical - type and application amount, mechanical - compactive effort, smoothness of surface, etc.).

a. The rainfall (precipitation) factor (*R*) is obtained from mean annual iso-erodent *R* value maps. The *R*-value for the facility as obtained from the Tooele area map is:

   R = 6

b. Soil erodibility factor (K) is determined using the figures on Sheet 6. The gradation of the materials is based on information from AGEC soil testing completed in 2016 (see attached). Samples were taken at the site and in depth hydrometer tests were performed. Information from these two samples were used to determine K.

Parameters obtained from the gradation envelopes of the two samples and parameters assumed for use with the nomographs to determine K are:

North Stockpile

- 53 % silt + very fine sand
- 7 % sand
- 0 % organic material assumed
- slow permeability assumed due to 40% Clay content.

South Stockpile

- 48 % silt + very fine sand
- 10 % sand
- 0 % organic material assumed
- slow permeability assumed due to 42% Clay content.

Applying the above parameters to the nomographs on Sheet 5 gives an average soil erodibility factor (K) equal to 0.265.

c. The topographic factor (LS) is determined assuming single slopes. The figure on Sheet 2 shows the configuration of the typical slope segment. The closure cap slope is designed at 4H:1V. The LS factor is determined by the following equation:

$$LS = \left(\frac{65.41s^2}{s^2 + 10{,}000} + \frac{4.56s}{\sqrt{s^2 + 10{,}000}} + 0.065\right)\left(\frac{l}{72.6}\right)^m$$

where;

LS	=	topographic factor for slope segment n.
l	=	length of slope segment n.
s	=	slope gradient of segment n in percent.
m	=	slope gradient factor, which is:
		0.2 for gradients of 0 to 1 percent
		0.3 for gradients of 1 to 3 percent
		0.4 for gradients of 3.5 to 4.5 percent
		0.5 for gradients greater than 5 percent

The following table provides LS factor values for varying lengths of the 4H:1V slopes and potential erosion rates (A) assuming bare soils (without erosion protection measures) where R = 6 and K = 0.265.

HORIZONTAL DISTANCE ALONG SLOPE (FT)	SLOPE LENGTH (FT)	LS FACTOR	A (tons/ac/yr)
50	51.539	4.228	6.72
100	103.078	5.980	9.51
150	154.617	7.324	11.64
200	206.155	8.457	13.45
250	257.694	9.455	15.03
300	309.233	10.358	16.47
350	360.772	11.187	17.79
400	412.311	11.960	19.02

A check on the top of the closed landfill was also performed over the full length of the landfill where the slope is set at 2.0%.

Horizontal Length = 1,710
l = 1,763 ft
LS = 0.47
A = 0.75 tons/ac/yr

While the top of the landfill on the 2% slope shows that it does not require additional erosion protection, the side slopes indicate that additional protection is required. The results also show that it would be unreasonable to create enough benching to alleviate erosion without additional protection.

In order to minimize erosion control protection required on the 4H:1V side slope of the final cover a berm was designed along the east side of the top (2% slope) of the landfill closure to capture the runoff.

d. Potential erosion rates applying a range of VM where R = 6, K = 0.265, and LS as tabulated above are presented in the table below:

Horizontal Distance Along Slope (ft)	Slope Length (ft)	A (2 yr storm) (tons/ac/yr)		
		VM =		
		0.1	0.133	0.15
50	51.54	0.67	0.89	1.01
100	103.08	0.95	1.26	1.43
150	154.62	1.16	1.55	1.75
200	206.16	1.34	1.79	2.02
250	257.69	1.50	2.00	2.26
300	309.23	1.65	2.19	2.47
350	360.77	1.78	2.37	2.67
400	412.31	1.90	2.53	2.85

Based on this table the landfill was designed with a single bench that will limit the maximum flow length (horizontal distance) along the 4H:1V slope to 250 ft. This will also require a grass ground cover (pulled from figure on Sheet 7) with coverage as defined below:

- between 29% (25% canopy of tall weeds) and 32% (0% canopy of tall weeds).

If it is determined that vegetation as described above will not subsist in the natural environment an equivalent alternative erosion protection measure may be applied.

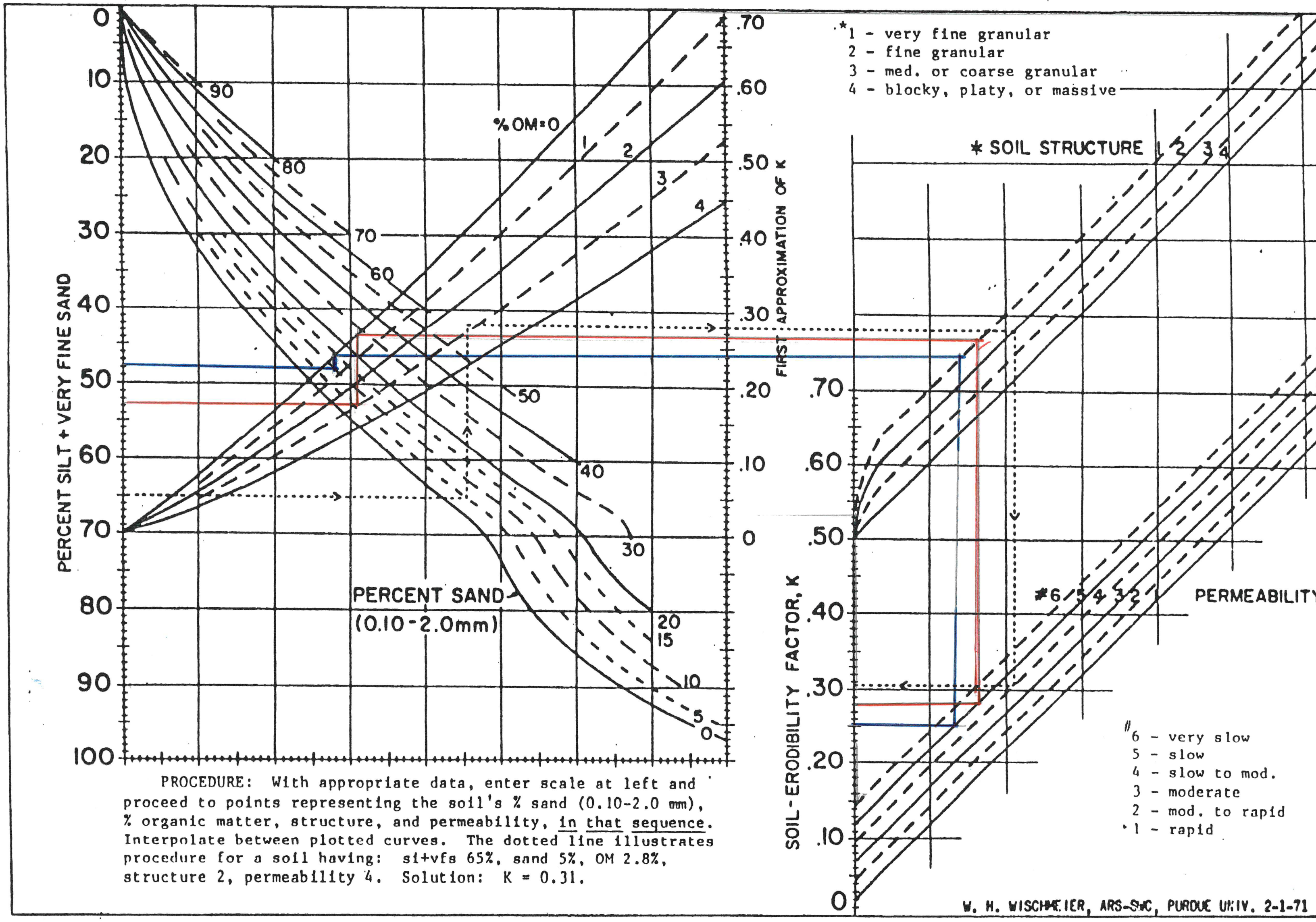


Figure 2-2. Nomograph for determining soil erodibility factor K.

- K=0.28 North Stockpile
- K=0.25 South Stockpile

Average
K=0.265

6%
8% organic Material
52% silt & fine sand

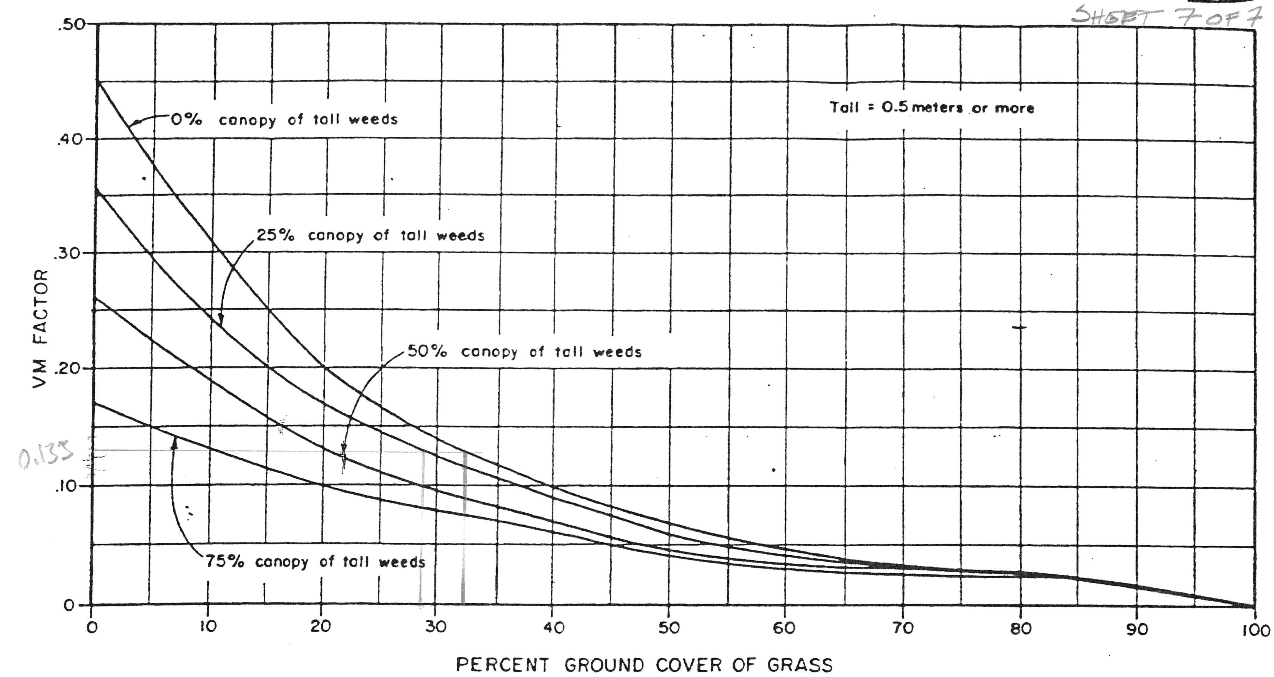


Figure 2-8. Relationship between grass density and VM factor.

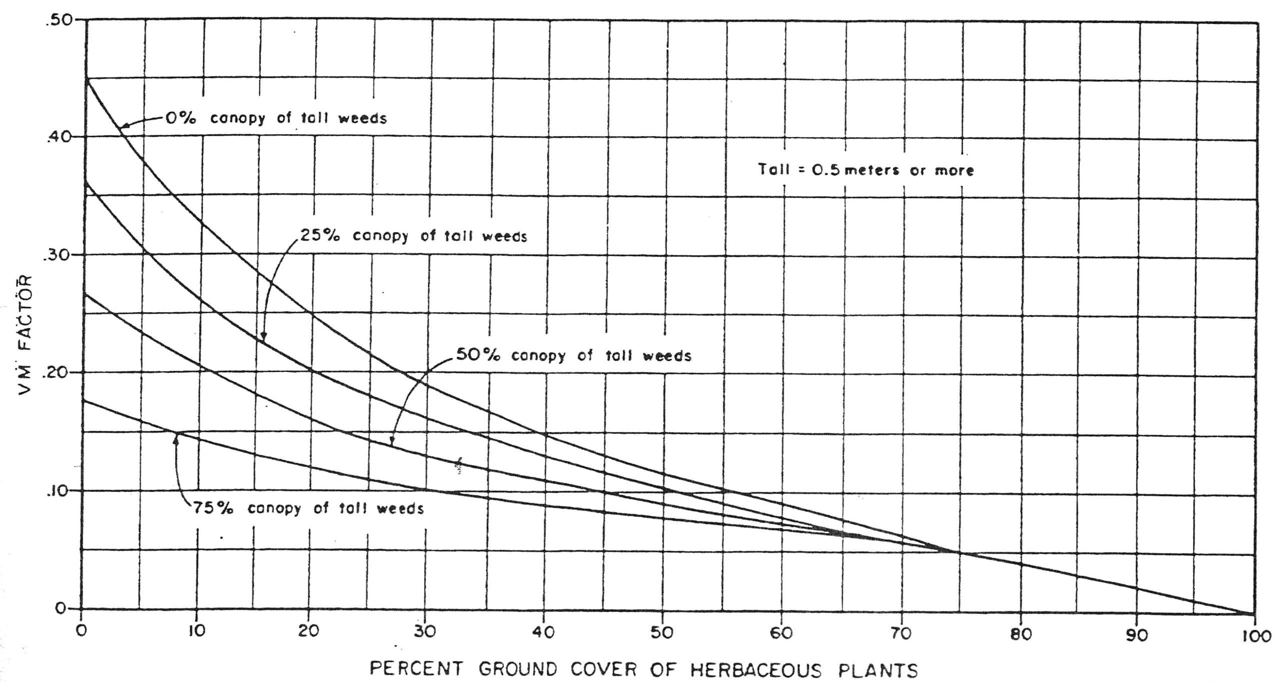
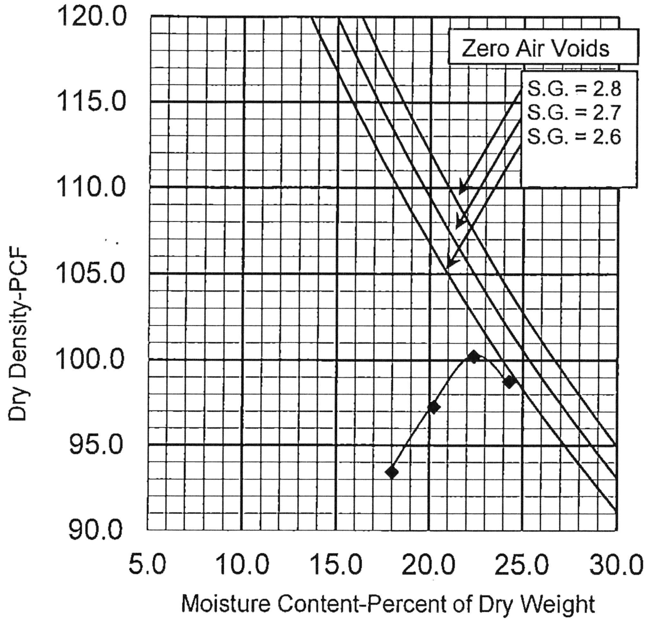


Figure 2-9. Relationship between forb density and VM factor.

APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, Inc.

Moisture - Density Relationship, Gradation, & Classification Results



SAMPLE IDENTIFICATION

Project Name: Intermountain Regional Landfill

Project No. 1150743
Sample No. 14190
Sample Location: South Stockpile

Date Sampled: 05/06/16
Sampled By: client

TESTING INFORMATION

Date Tested: 05/07/16
Tested By: RN
Reviewed By: KBB
Test Procedure: ASTM D1557 A
Specific Gravity: Assumed 2.6
Moisture Curing: 16+ hours

ATTERBERG DATA

Plasticity Determined by ASTM D 2488

PROCTOR RESULTS

Maximum Dry Density	100.3 pcf
Optimum Moisture	22.6%

Final Based On Microwave Oven Moisture Contents

VISUAL-MANUAL DESCRIPTION (ASTM D2488)

Lean Clay (CL)

GRADATION RESULTS

Sieve Designation	Sieve Opening Size (mm)	Percent Passing (%)	Project Specification (%)
5"	127	100	-
3"	76.2	100	-
1 1/2"	38.1	100	-
3/4"	19.1	100	-
3/8"	9.52	100	-
#4	4.76	100	-
#10	2	100	-
#16	1.19	100	-
#40	0.42	99	-
#50	0.297	99	-
#100	0.149	97	-
#200	0.074	86	-

GRAVEL	SAND	SILT & CLAY
0%	14%	86%

Applied Geotechnical Engineering Consultants, Inc.
SIEVE/HYDROMETER WORKSHEET

Project No. 1150743 Project Name Intermountain Regional Landfill Tested By JG Test Date 5/9/2016
Sample South Stockpile (14190)

Block A: Material Prior to Break On #10 Sieve	
Dish Name:	PNK
Air-Dry Material & Dish Wt:	331.73
Dish Wt:	163.2
Air-Dry Material Wt:	168.53

Block B: Post Wash, Oven-Dried Material Retained On #10 Sieve	
Dish Name:	MEN
Post-Wash Oven-Dried +#10 Material & Dish Wt:	177.3
Dish Wt:	177.19
Post-Wash, Oven-Dried +#10 Material Wt:	0.11

Block C: Post Wash, Oven Dried, Retained On #200 Sieve	
Dish Name:	YOLO
Post-Wash Oven-Dried +-#200 Material & Dish Wt	281.85
Dish Wt:	274.69
Post-Wash, Oven Dried +#200 Material Wt:	7.16

Block D:	
Cum Wt in Pan After Shake of +#10 Material:	0.07

Block E:	
Cum Wt in Pan After Shake of +#200 Material:	7.12

Plus #10

* Sample broken on No. 10 Sieve

Sieve Size	BLOCK H Cum. Wt. Retained	% Passing
5"	0.00	100
3"	0.00	100
1-1/2"	0.00	100
3/4"	0.00	100
3/8"	0.00	100
No. 4*	0.00	100
No. 10*	0.07	100

Total Air-Dry Sample Weight, Prior to Break Over #10 Sieve: 168.53

Sample Weights

	Air-Dry	Oven-Dry
Total Sample		168.39
Post-Wash, Oven-Dried, Retained #10		0.07
Passing #10*	168.46	168.32

* Sample broken on No. 10 Sieve

Minus #10 / Plus #200

Sieve Size	BLOCK I	% Passing
No. 16	0.06	100
No. 40	0.36	99
No. 50	0.57	99
No. 100	1.46	97
No. 200	6.66	86

Air-Dried Wt. of -#10 Soil** 51.13
Oven-Dried Wt. of -#10 Soil 47.15

**Soil Used for Hydrometer Test

BLOCK F: Moisture Content of -#10 Material	
Dish Name:	QBA
Dish and Air-Dried -#10 Soil Wt.:	27.17
Dish and Oven-Dried -#10 Soil Wt:	26.10
Dish Wt:	13.42
Moisture of Air-Dried -#10 Soil (%)	8.44%

* Sample broken on No. 10 Sieve

HYDROMETER

Cylinder #	3
Area	28.08

Specific Gravity	2.60
Meniscus Corr.	1

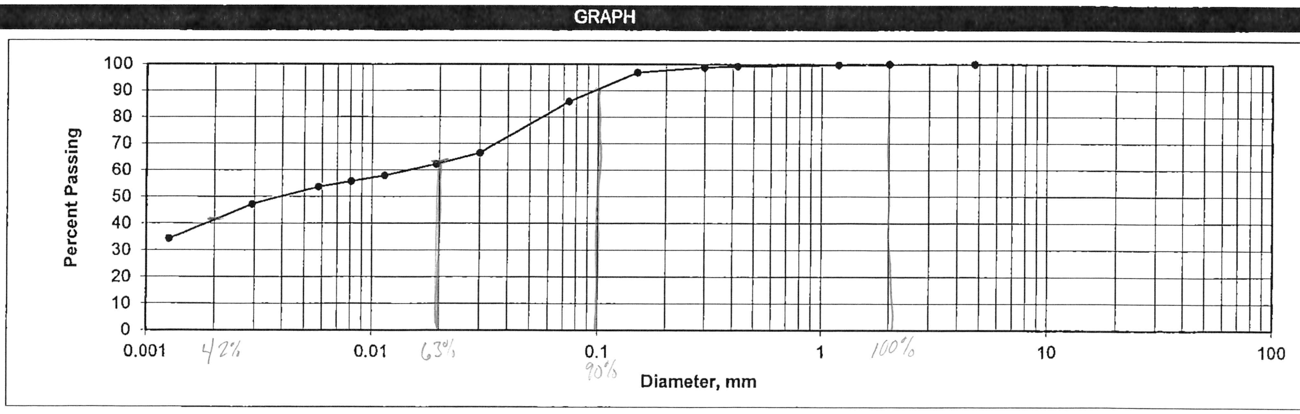
	BLOCK G
Air-Dried Wt of -#10 Soil**	51.13
Hydroscopic Corrected Wt of -#10 Soil	47.17

** Soil Used for Hydrometer Test

Time (minutes)	Hydrometer Reading*	Temperature °C	Standard Reading*	Corrected Reading	Percent Finer	Meniscus Corrected	L (cm) (from Table)	K (from Table)	Diameter (mm)
2	38	22.8	7	31	66	39	9.9	0.01353	0.030
5	36	22.8	7	29	62	37	10.2	0.01353	0.019
15	34	22.8	7	27	58	35	10.6	0.01353	0.011
30	33	22.8	7	26	56	34	10.7	0.01353	0.008
60	32	22.8	7	25	54	33	10.9	0.01353	0.006
250	29	21.7	7	22	47	30	11.4	0.01369	0.003
1440	23	21.8	7	16	34	24	12.4	0.01369	0.001

* All Readings made to TOP of meniscus

GRAPH



10% Sand
27% fine sand
21% silt
42% clay

$\}$ 48% silt & fine sand

Pinhole Dispersion Report

APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS

Identification and Classification of Dispersive Soils by the Pinhole Test (ASTM D4647-06)

Project Number: 1150743 Project Name: Intermountain Date: 5/16/2016

Sample Number: 14190 Tested by: JG

Sample Description: Lean Clay, Remolded to 95% Maximum Dry Density per ASTM D-1557

Average Flow Rate in Each Trial (mL/sec)

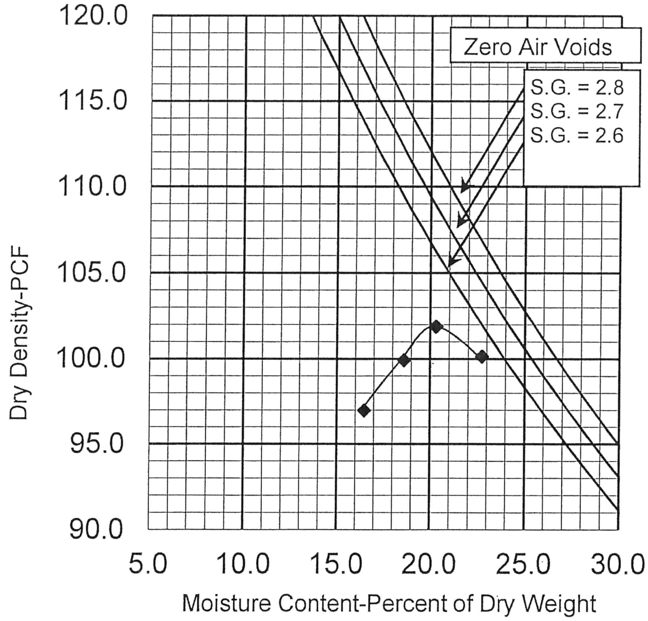
Avg Flow at 2" Head for 5min: 0.32 Avg Flow at 7" Head: 0.87 Avg Flow at 40" Head: 2.94

Avg Flow at 2" Head for 10min: - Avg Flow at 15" Head: 1.55

Head (in):	Time (sec):	Flow (mL):	Flow rate: (ml/sec)	Cloudiness of Effluent	Notes
2	Start	0		Effluent was clear from the top throughout the duration of the trial. Rate was slightly below the range of 0.4-0.8 mL/s. However, decision was made to raise to 7" head.	**Dispersion Classification:** Nondispersive, ND1 **Pinhole Size:** 1x wire diameter
	60	20.5	0.34		
	60	19.5	0.33		
	60	20	0.33		
	60	19	0.32		
	60	17.5	0.29		
7	Start	0		Effluent is still completely clear from the top and within the range of 0.8-1.4 mL/s. Head was raised to 15"	
	60	54	0.90		
	60	51.5	0.86		
	60	51.5	0.86		
	60	52	0.87		
	60	52.5	0.88		
15	Start	0		Effluent clear to clear from top throughout duration of trial. Average flow rate was within the range of 1.0-1.8 mL/s. Thus, head was raised to 40"	
	60	96	1.60		
	60	91.5	1.53		
	60	93.5	1.56		
	60	94	1.57		
	60	90.5	1.51		
40	Start	0		Effluent remained clear throughout duration of trial at 40" head. Test ended.	
	60	173	2.88		
	60	168	2.80		
	60	180	3.00		
	60	179	2.98		
	60	181	3.02		

APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, Inc.

Moisture - Density Relationship, Gradation, & Classification Results



SAMPLE IDENTIFICATION

Project Name:	Intermountain Regional Landfill
Project No.	1150743
Sample No.	14189
Sample Location:	North Stockpile
Date Sampled:	05/06/16
Sampled By:	client

PROCTOR RESULTS

Maximum Dry Density	101.9 pcf
Optimum Moisture	20.3%

Final Based On Microwave Oven Moisture Contents

VISUAL-MANUAL DESCRIPTION (ASTM D2488)

Lean Clay (CL)

TESTING INFORMATION

Date Tested:	05/07/16
Tested By:	RN
Reviewed By:	KBB
Test Procedure:	ASTM D1557 A
Specific Gravity:	Not Used
Moisture Curing:	16+ hours

ATTERBERG DATA

Plasticity Determined by ASTM D 2488

GRADATION RESULTS

Sieve Designation	Sieve Opening Size (mm)	Percent Passing (%)	Project Specification (%)
5"	127	100	-
3"	76.2	100	-
1 1/2"	38.1	100	-
3/4"	19.1	100	-
3/8"	9.52	100	-
#4	4.76	100	-
#10	2	100	-
#16	1.19	100	-
#40	0.42	99	-
#50	0.297	99	-
#100	0.149	98	-
#200	0.074	88	-

GRAVEL	SAND	SILT & CLAY
0%	12%	88%

Applied Geotechnical Engineering Consultants, Inc.

SIEVE/HYDROMETER WORKSHEET

Project No. 1150743 Project Name Intermountain Regional Landfill Tested By JG Test Date 5/9/2016

Sample North Stockpile (14189)

Block A: Material Prior to Break On #10 Sieve	
Dish Name:	NAP
Air-Dry Material & Dish Wt:	289.95
Dish Wt:	159.6
Air-Dry Material Wt:	130.35

Block B: Post Wash, Oven-Dried Material Retained On #10 Sieve	
Dish Name:	-
Post-Wash Oven-Dried +#10 Material & Dish Wt:	0
Dish Wt:	0
Post-Wash, Oven-Dried +#10 Material Wt:	0

Block C: Post Wash, Oven Dried, Retained On #200 Sieve	
Dish Name:	BUG
Post-Wash Oven-Dried +-#200 Material & Dish Wt	296.2
Dish Wt:	289.99
Post-Wash, Oven Dried +#200 Material Wt:	6.21

Block D:	
Cum Wt in Pan After Shake of +#10 Material:	0

Block E:	
Cum Wt in Pan After Shake of +#200 Material:	6.1

Plus #10

* Sample broken on No. 10 Sieve

Sieve Size	BLOCK H Cum. Wt. Retained	% Passing
5"	0.00	100
3"	0.00	100
1-1/2"	0.00	100
3/4"	0.00	100
3/8"	0.00	100
No. 4*	0.00	100
No. 10*	0.00	100

Total Air-Dry Sample Weight, Prior to Break Over #10 Sieve: 130.35

Sample Weights

	Air-Dry	Oven-Dry
Total Sample		130.24
Post-Wash, Oven-Dried, Retained #10		0.00
Passing #10*	130.35	130.24

* Sample broken on No. 10 Sieve

Minus #10 / Plus #200

Sieve Size	BLOCK I	% Passing
No. 16	0.04	100
No. 40	0.30	99
No. 50	0.46	99
No. 100	1.01	98
No. 200	5.43	88

Air-Dried Wt. of -#10 Soil** 50.15

Oven-Dried Wt. of -#10 Soil 46.30

**Soil Used for Hydrometer Test

BLOCK F: Moisture Content of -#10 Material	
Dish Name:	BAA
Dish and Air-Dried -#10 Soil Wt.:	25.27
Dish and Oven-Dried -#10 Soil Wt:	24.40
Dish Wt:	13.95
Moisture of Air-Dried -#10 Soil (%)	8.33%

* Sample broken on No. 10 Sieve

HYDROMETER

Cylinder #	2
Area	27.53

Specific Gravity	2.60
Meniscus Corr.	1

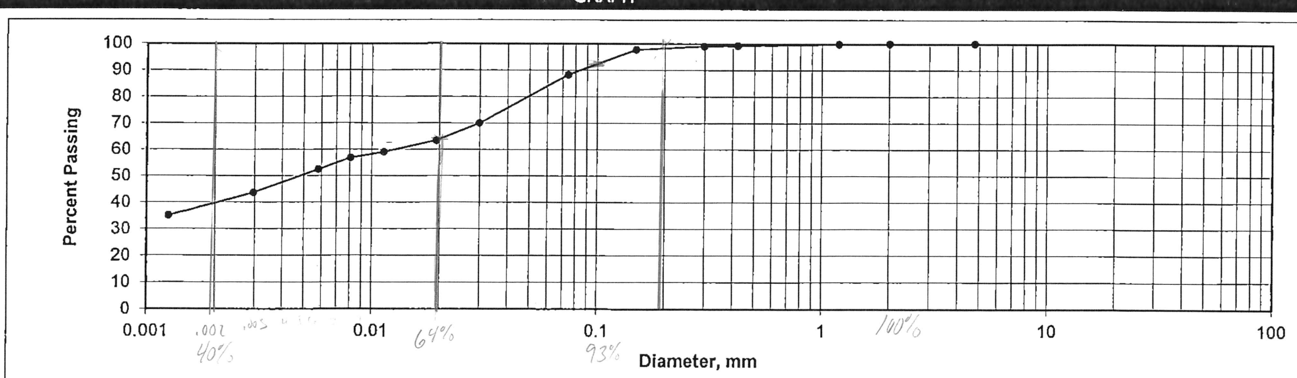
	BLOCK G
Air-Dried Wt of -#10 Soil**	50.15
Hydroscopic Corrected Wt of -#10 Soil	46.30

** Soil Used for Hydrometer Test

Time (minutes)	Hydrometer Reading*	Temperature °C	Standard Reading*	Corrected Reading	Percent Finer	Meniscus Corrected	L (cm) (from Table)	K (from Table)	Diameter (mm)
2	39	22.8	7	32	70	40	9.7	0.01353	0.030
5	36	22.8	7	29	63	37	10.2	0.01353	0.019
15	34	22.8	7	27	59	35	10.5	0.01353	0.011
30	33	22.8	7	26	57	34	10.7	0.01353	0.008
60	31	22.8	7	24	52	32	11.0	0.01353	0.006
250	27	21.7	7	20	44	28	11.7	0.01369	0.003
1440	23	22.8	7	16	35	24	12.3	0.01353	0.001

* All Readings made to TOP of meniscus

GRAPH



7% Sand
29% fine Sand
24% silt
40% Clay

53% Silt & fine Sand

Pinhole Dispersion Report

APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS

Identification and Classification of Dispersive Soils by the Pinhole Test (ASTM D4647-06)

Project Number 1150743 Project Name Intermountain Regional Landfill Date: 5/10/2016

Sample Number 14189 Tested by: JG/DJ

Sample Description Lean Clay, Remolded to 95% of Maximum Dry Density per ASTM D-1557

Average Flow Rate in Each Trial (mL/sec)

Avg Flow at 2" Head for 5min: 0.40 Avg Flow at 7" Head: 0.95 Avg Flow at 40" Head: 2.86

Avg Flow at 2" Head for 10min: - Avg Flow at 15" Head: 1.68

Head (in):	Time (sec):	Flow (mL):	Flow rate: (ml/sec)	Cloudiness of Effluent	Notes
2	Start	0			**Dispersion Classification:** Nondispersive, ND1
	60	21	0.35		
	60	26	0.43		
	60	25	0.42	Effluent was barely visible for the duration of the trial. Head was raised to 7"	**Pinhole Size:** 2x wire punch diameter
	60	23.5	0.39		
	60	24	0.40		
7	Start	0			
	60	57	0.95		
	60	56.5	0.94		
	60	58	0.97		
	60	56.5	0.94	Effluent was clear throughout duration. Head raised to 15"	
	60	57.5	0.96		
15	Start	0			
	60	92.5	1.54		
	60	100	1.67		
	30	53	1.77		
	30	50.5	1.68		
	30	51.5	1.72		
	30	51	1.70	Effluent was completely clear for majority of the trial. Head raised to 40"	
	30	50.5	1.68		
	30	50.5	1.68		
40	Start	0			
	60	166	2.77		
	60	173	2.88		
	60	175	2.92	Effluent was clear to barely visible for the duration of the trial. Test Concluded.	
	60	172	2.87		
	60	173	2.88		