APPLICATION FOR A PERMIT TO OPERATE A CLASS V LANDFILL

Prepared for:

INTERMOUNTAIN REGIONAL LANDFILL

Fairfield, Utah

Submitted February 2011

Prepared by:

HDR Engineering, Inc.
3949 South 700 East, Suite 500
Salt Lake City, Utah 84107

Project No. 125184

Intermountain Regional Landfill

Class V Landfill Permit Application

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Part 1: General Information

***Part I* General Information** APPLICANT: PLEASE COMPLETE ALL SECTIONS.				
***I.* Landfill Type**	☐ Class I ☒ Class V	***II.* Application Type**	☒ New Application ☐ Renewal Application	☐ Facility Expansion ☐ Modification

For Renewal Applications, Facility Expansion Applications and Modifications Enter Current Permit Number ______

***III.* Facility Name and Location**					
Legal Name of Facility INTERMOUNTAIN REGIONAL LANDFILL					
Site Address (street or directions to site) 800 SOUTH ALLEN RACH ROAD (18150 WEST)				County UTAH	
City FAIRFIELD TOWN			Zip Code 84013	Telephone	
Township 7 S	Range 2 W	Section(s) 16	Quarter/Quarter Section NW	Quarter Section SW	
Main Gate Latitude degrees minutes seconds			Longitude degrees minutes seconds		
***IV.* Facility Owner(s) Information**					
Legal Name of Facility Owner ROC FUND LANDFILL HOLDINGS, LLC					
Address (mailing) 1240 EAST 2100 SOUTH, SUITE 300					
City SALT LAKE CITY	State UT		Zip Code 84106	Telephone 801-931-5970	
***V.* Facility Operator(s) Information**					
Legal Name of Facility Operator ROC FUND LANDFILL HOLDINGS, LLC					
Address (mailing) 1240 EAST 2100 SOUTH, SUITE 300					
City SALT LAKE CITY	State UT		Zip Code 84106	Telephone 801-931-5970	
***VI.* Property Owner(s) Information**					
Legal Name of Property Owner ROC FUND LANDFILL HOLDINGS, LLC					
Address (mailing) 1240 EAST 2100 SOUTH, SUITE 300					
City SALT LAKE CITY	State UT		Zip Code 84106	Telephone 801-931-5970	
***VII.* Contact Information**					
Owner Contact Jonathan Slager			Title		
Address (mailing) 1240 East 2100 South, Suite 300					
City Salt Lake City	State UT		Zip Code 84106	Telephone 801-931-5970	
Email Address JSlager@pacific-group.com			Alternative Telephone (cell or other)		
Operator Contact ROB RICHARDS			Title GENERAL MANAGER		
Address (mailing) 10336 NORTH 6960 WEST					
City HIGHLAND	State UT		Zip Code 84003	Telephone 801-403-7651	
Email Address ROBR890@GMAIL.COM			Alternative Telephone (cell or other)		
Property Owner Contact			Title		
Address (mailing) *SAME AS ABOVE*					
City	State		Zip Code	Telephone	

Part I General Information (Continued)

VIII. **Waste Types** (check all that apply)			*IX.* **Facility Area**	
☒ All non-hazardous solid waste (see R315-315-7(3) for PCB special requirements) **OR** the following specific waste types:			Facility Area	330 acres
Waste Type	Combined Disposal Unit	Monofill Unit	Disposal Area	300 acres
☐ Municipal Waste	☐	☐	Design Capacity	
☐ Construction & Demolition	☐	☐	Years	50 approx.
☐ Industrial	☐	☐	Cubic Yards	27,000,000
☐ Incinerator Ash	☐	☐	Tons	17,000,000
☐ Animals	☐	☐		
☐ Asbestos	☐	☐		
☐ PCB's (R315-315-7(3) only)	☐	☐		
☐ Other ______________	☐	☐		

X. Fee and Application Documents

Indicate Documents Attached To This Application ☒ Application Fee: Amount $

				Class V Special Requirements
☒ Facility Map or Maps	☒ Facility Legal Description	☒ Plan of Operation	☒ Waste Description	☒ Documents required by UCA 19-6-108(9) and (10)
☐ Ground Water Report	☒ Closure Design	☒ Cost Estimates	☒ Financial Assurance	

I HEREBY CERTIFY THAT THIS INFORMATION AND ALL ATTACHED PAGES ARE CORRECT AND COMPLETE.

Signature of Authorized Owner Representative ______________________ ______________________ Name typed or printed	Title	Date
	Address	
Signature of Authorized Land Owner Representative (if applicable) ______________________ ______________________ Name typed or printed	Title	Date
	Address	
Signature of Authorized Operator Representative (if applicable) ______________________ ______________________ Name typed or printed	Title	Date
	Address	

Email Address	ROBR890@GMAIL.COM	Alternative Telephone (cell or other)	801-403-7651

Part 2: General Report

2.1 Facility Description

2.1.1 General

The Intermountain Regional Landfill (Landfill) is a proposed landfill near the town of Fairfield, Utah. See Figure 1 in Part 5. Once permitted and constructed, the landfill will consist of a single municipal landfill that will be constructed in phases. The major subunits of the landfill are called *cells*, and each cell will be developed in two or more *phases*. Other landfill facilities will include a stormwater/leachate evaporation pond, a scale house, and administrative offices. The perimeter of the active work area will be fenced using a 6-foot-high fence with an 18-inch angled top.

ROC Fund Landfill Holdings, a Utah limited liability company, will operate the Landfill once permits are secured and waste acceptance is authorized by the Division of Solid and Hazardous Waste (DSHW). ROC also owns the Landfill property.

The Intermountain Regional Landfill site is located in Cedar Valley, a large terminal basin typical of the Basin and Range physiographic province. Cedar Valley is generally cool and dry. Average annual precipitation is about 12 inches. Average high temperatures are 64 degrees Fahrenheit, and average low temperatures are 30 degrees Fahrenheit. Land use in Cedar Valley and in the vicinity of the Intermountain Regional Landfill site is agricultural, including livestock grazing and feed crop production. The site is currently undeveloped. A landfill for construction and demolition debris is located to the northwest.

2.1.2 Legal Description

The legal description of the Intermountain Regional Landfill site is:

The West half of Section 16, Township 7 South, Range 2 West, Salt Lake Base and Meridian. (Parcel ID 59:124:0001)

As mentioned above, The ROC fund currently owns the property. The proof of ownership is attached as Appendix B.

2.1.3 Area Served

ROC is securing a waste disposal contract with Town of Fairfield. Over the course of operations, ROC may seek other contracts with other local governments in the State of Utah.

2.1.4 Local Jurisdiction

The Town of Fairfield will oversee compliance with local ordinances and any operational considerations and restrictions that will be outlined in an operating agreement for the Landfill. The Utah County Health Department also has jurisdiction. The contact information for the Health Department is:

Utah County Health Department
Joseph Miner, MD, MSPH
Executive Director
151 S. University Avenue
Provo, UT 84601

2.1.5 Adjacent Property Owners

Table 1 provides a list of property owners within 100 feet of the landfill property boundary.

Table 1. Surrounding Property Owners

Name	Address	City and State	Zip
Corp. of the Presiding Bishopric	50 E. North Temple	SLC, UT	84150
Utah Trust Lands Administration	675 E 500 S	SLC, UT	84102
Myrna B. Carter	13218 S 6200 W	Herriman, UT	84096
Claude J. & Evelyn M. Curley	1409 Bryan Ave.	SLC, UT	84096
Norbert A. & Lorna A. Martinez	1142 Randers Ln.	Draper, UT	84020
John J. & Julie Kolar	642 Glorietta Blvd	Lafayette, CA	94549
Brent O. Ault	510 N 1100 E	American Fork, UT	84003
Richard S. Fullmer	2150 Willow Brook	Sandy, UT	84092
Larry D. & Sheena L. Mitchell	8721 Oakwood Park	Sandy, UT	84094
Melinda Word	P.O. Box 301	American Fork, UT	84003
Don Kaufer	P.O. Box 301	American Fork, UT	84003
Howard H. & Oliver R. Holmes, c/o Bonnie Kaufer	P.O. Box 301	American Fork, UT	84003

A Notice of Intent to apply for a landfill permit was submitted to the surrounding property owners on August 19, 2010. A copy of the Notice of Intent is included in Appendix B.

2.1.6 Waste Type

The waste disposed at the landfill will be solid non-hazardous residential and commercial solid wastes, including yard wastes, but the landfill generally will not accept construction and demolition (C&D) debris. Non-acceptable materials include liquid waste, burning materials, radioactive waste, and hazardous waste. Fairfield Town identified additional categories of wastes that will not be accepted at the landfill.

- ‘Hazardous waste’ as defined in 40 C.F.R. part 261, as such part may be amended and expanded from time to time, and in Utah Code Ann. Section 19-6-102(9) and the regulations promulgated there under as they may be amended and expanded from time to time;
- Any material that is now or hereafter defined by applicable Federal, State or Local Laws, regulation, or ordinance as radioactive, toxic, hazardous or extremely hazardous waste, excluding household hazardous waste and small quantity generator hazardous waste;
- Vehicle tires in excess of the amount of such tires permitted to be disposed of by applicable Federal, State or Local law, regulation, or ordinance;
- Lead acid batteries;
- Soils contaminated with hazardous, radioactive, or toxic wastes, or hazardous or toxic substances as such terms are defined by applicable Federal or State law or regulations;
- Asbestos, including the asbestiform varieties of serpentite (chrysolite), riebeckite (crocidolite), cummingtonite-grunerite, anthophylite and actinolite-termolite;
- Any material which contains asbestos (“ACM”), including asbestos waste from control devices, contaminated clothing, asbestos-waste material, materials used to enclose the work area during asbestos project, or bags or containers that previously contained asbestos;
- Dead animal carcasses;
- Any soils from coal mine sites, power plants, rail yards, and other industrial development sites and projects which may be removed as part of any voluntary or governmentally mandated environmental remediation plan or program;
- Infectious waste, medical waste, or sharps; and

- Any material whatsoever that the Permits or any Federal, State, or Local law, regulation, or ordinance may prohibit the disposal of at the Landfill now or in the future; provided, however, that any such future prohibition shall not operate retroactively such that any material previously determined to be Acceptable Waste and disposed of at the Landfill shall be a breach of this CUP [Conditional Use Permit] by virtue of such previous disposal.

The anticipated volume of waste to be disposed of at the Intermountain Regional Landfill will average about 2,600 tons annually (8 tons per day, based on about 310 operating days per year) during the initial operation.

2.1.7 Landfill Development

The overall site plan consists of one large landfill divided into six units, or cells. These cells are each about 650 feet wide (north to south) and about 2,500 feet long (east to west), or about 37 acres each. Each cell will be developed in 8- to 20-acre phases. The first lined landfill phase will be an 8-acre Cell 1 Phase 1, which will be constructed in the northwest corner of the landfill. Cell 1 will be developed by excavating to an average depth of about 30 feet. The liner grading for Cell 1 will direct leachate generally south and east to leachate collection pipes, which will convey the collected leachate east to a retention pond. An interim leachate retention pond will be constructed along the eastern edge of Cell 1 Phase 1. See Sheet 3 of 13 in Part 5. The total volume of Cell 1 Phase 1 will be about 334,000 cubic yards.

A permanent leachate retention pond will be constructed during subsequent phases of Cell 1 development. This permanent pond will collect and store pumped leachate from the entire landfill. Because the exact size of the next phase has not been determined, the timing for the construction of the permanent leachate pond is undefined. If Cell 2 Phase 2 extends to the eastern limits of Cell 1, the permanent pond will be constructed concurrently with the Phase 2 liner system. If Cell 1 is constructed in three or more phases, the leachate collection piping will be extended and interim leachate retention ponds moved to the eastern limits of Cell 1 Phase 2. Under this scenario, the permanent pond will be constructed with the cell phase that reaches the eastern limits of the excavation.

Cell 1 will be fully developed once the landfill liner system is extended to the eastern limits of the planned Cell 1 excavation. The total volume provided by Cell 1 will be about 2,700,000 cubic yards. Table 2 outlines the approximate volume provided assuming Cell 1 is constructed in three phases.

Table 2. Approximate Phase Volumes

Landfill Phase	Cumulative Volume (CY)
Cell 1 Phase 1	334,000
Cell 1 Phase 2	1,973,000
Cell 1 Phase 3	2,700,000
Cell 2	5,000,000

Cell 1 Phase 1 will be constructed after permits are secured and authorization to receive waste is received from DSHW. The initial liner construction is anticipated in 2011. Cell 1 Phase 1 will be constructed by placing waste in lifts that are about 10 feet deep. Each lift will cover the entire area of Cell 1 Phase 1. See Appendix A, Section 5, for more details on the procedures that will be used to construct the landfill.

Cell 2 development will start on the south side of the Cell 1 along the eastern edge of the excavation. Cell 2 will be graded to use the leachate collection piping installed for Cell 1. Cell 2 will be developed by extending the landfill liner east to west. Cells 3, 4, 5, and 6 will be developed in a similar manner. The landfill will be graded so that leachate generated in Cells 3 and 4 will be collected in common leachate piping installed for Cell 3. Similarly, Cells 5 and 6 will use a common leachate collection system.

2.2 Location Standards

2.2.1 Historical Survey Requirement

A Class III Cultural Resources Survey was performed at the Intermountain Regional Landfill site in April 2010. The results of the survey showed that the site meets the historical survey requirements listed in Utah Administrative Code (UAC) R315-302-1. The completed survey is found is Appendix C, Class III Cultural Resources Survey.

2.2.2 Land Use Compatibility

Maps showing the existing land use and topography within 1,000 feet of the site are presented in Figures 1 and 2 in Part 5 of this report. No residences, parks, monuments, recreation areas, or wilderness areas are within 1,000 feet of the site.

The Utah Division of Wildlife Resources (UDWR) maintains a list of the endangered species for all counties in Utah (UDWR 2010). There are three endangered species listed for Utah County; however, none of these species has been recorded in or within a few miles of the Goshen Pass quadrangle according to GIS data provided by UDWR (UNHP 2009). In addition, the site is not located in an ecologically or scientifically significant area.

On January 8, 2010, the site was investigated by an HDR biologist to determine if the site contained any evidence of biological significance, such as burrowing owl activity or nesting, kit fox dens, or unusual and sensitive desert plant communities. The site investigation found no significant biological or ecological resources. The site was a typical Utah Great Basin shrub community that has been affected by overgrazing, off-road vehicle (ORV) use, and other human activities. Affected shrub lands such as this site are common throughout Utah and are not unusual or significant biological or ecological areas.

There is one airport within 5 miles of the Intermountain Regional Landfill site: West Desert Airpark, which is 1.5 miles (8,000 feet) north-northwest of the site and provides services for piston-type aircraft only.

West Desert Airpark, LLC
614 North 18150 West
Fairfield, UT 84013

The distance from the Intermountain Regional Landfill site to West Desert Airpark (8,000 feet) meets the required minimum distance from an airport runway listed in UAC R315-302-1. This minimum distance is 10,000 feet from any airport runway end used by turbojet aircraft, or 5,000 feet from any airport runway end used by piston-type aircraft only.

2.2.3 Geology

No known faults, special landslide areas, or subsidence areas were identified on the Intermountain Regional Landfill site. Maps showing the geology and seismic activity of the area surrounding the site are found in Part 5 of this report. The geologic maps in Part 5 include:

- Figure 3 – Geologic Features. This map includes geologic faults and locations of recent earthquakes.

- Figure 4 – Seismicity. This map includes earthquake data from State of Utah Map MF-1856.

The Intermountain Regional Landfill site is located in a seismic impact zone as defined by the State of Utah Administrative Code (Utah Department of Environmental Quality 2009). Refer to Part 3, Technical and Engineering Report, and Appendix F, Slope Stability and Settlement Analysis, for more information on the characteristics of the site and the design considerations used for engineered features of the landfill.

2.2.4 Surface Water

Based on data obtained from the Western Regional Climate Center for the Fairfield, Utah, Station, the average annual total precipitation at the Intermountain Regional Landfill site is about 12 inches (NOAA 2009). Surface water is largely generated from mountain snowmelt and conveyed via intermittent streams to the valley. However, most of the stream channels dissipate as they reach the valley floor. The 24-hour precipitation depths for 25-year and 100-year events are 1.74 inches and 2.10 inches, respectively (NOAA 2009).

No defined streams traverse the site. The only stream within 1 mile of the site that is identified on U.S. Geological Survey (USGS) topographic mapping for the area—in the Goshen 7.5-minute Quadrangle—originates about 1 mile east of the site and travels in a generally northern direction toward the sinks southeast of Fairfield. In addition, there are no special flood hazard areas defined by the Federal Emergency Management Agency (FERM) within or in the vicinity of the site; therefore no base (1% annual chance or 100-year) flood elevations have been established (FEMA 2002). Surface water hydrology is further discussed in Section 3.2.3, Surface Water.

2.2.5 Wetlands

HDR reviewed National Wetland Inventory (NWI) maps produced by the U.S. Fish and Wildlife Service, aerial photographs from 2007, and Natural Resources Conservation Service soils maps. None of these sources indicated that wetlands are present at the Intermountain Regional Landfill site. A subsequent field visit on January 8, 2010 by a wetland scientist certified by the U.S. Army Corps of Engineers found that the site was dominated by upland vegetation typical of the Great Basin, including big sagebrush, rabbit brush, cheat grass, tumble mustard, and Russian thistle and that no wetland vegetation was evident.

2.2.6 Groundwater

Cedar Valley consists of a basin-fill aquifer and bedrock aquifers. The basin-fill aquifer extends across Cedar Valley and is up to 1,900 feet thick in the center of the valley, with a clay layer of up to 240 feet thick confining the aquifer. Figure 5 shows the Intermountain Regional Landfill site and the groundwater level contours for the area. The groundwater is found 55 to 110 feet below the existing ground elevation of the site. Groundwater conditions are discussed further in Section 3.2.4, Groundwater, and Section 3.4.2.4, Groundwater.

2.3 Plan of Operations

The Plan of Operations for the Intermountain Regional Landfill is included as Appendix A, Plan of Operations. The Plan includes onsite waste screening and handling procedures, alternate waste handling procedures, procedures for excluding prohibited wastes, procedures for minimizing liquids, inspection and monitoring schedules, contingency and corrective action plans, fugitive dust and litter control methods, the training and safety plan for site operation, and procedures for controlling disease vectors.

2.4 Closure Plan

2.4.1 General

The Intermountain Regional Landfill will be constructed with several landfill cells. The landfill will be closed over time as each cell reaches maximum capacity. Soil from newly excavated landfill cells will be stockpiled onsite and used for cover materials as cells are closed. Final closure of each cell will begin once the landfill reaches the maximum permitted height and within 30 days of the last receipt of waste. Final closure will be completed within 180 days after closure activities begin.

2.4.2 Site Capacity

The Intermountain Regional Landfill will consist of several cells constructed in phases. Cell 1, which will be constructed beginning sometime in 2011, is designed to contain about 2,700,000 million cubic yards when it reaches capacity. The total volume of the landfill is about 27,000,000 CY. Assuming a waste density of 1,500 lb/CY and 15% of the volume taken by soil for daily and intermediate cover, the total capacity is about 17,000,000 tons of waste.

2.4.3 Grading

Grading plans, including final grades, can be seen on conceptual engineering plans (Sheets 1 to 13) provided in Part 5. In general, the final cover will be graded so that the top slopes at least 2% to provide positive drainage, and the side slopes will not be greater than 4 to 1 (horizontal to vertical).

2.4.4 Final Cover Placement

Final cover will be placed on Cell 1 once the landfill operations are able to reach the maximum waste fill height and within 30 days of the last receipt of waste. It is anticipated that the Cell 1 Phase 2 liner will need to be constructed before waste fill heights can reach the maximum over Cell 1 Phase 1. The closure and post-closure care plan will be updated annually to account for changing conditions of the landfill. The status of closure and post-closure care funding will be reported to the Utah Department of Environmental Quality (UDEQ) with the landfill's annual reports.

A standard-design final cover will be designed, as prescribed by UAC R315-303-3. The standard design for a final cover consists of a minimum of 2 feet of compacted clay under a 60-mil HDPE (high-density polyethylene) synthetic layer. A minimum of 6 inches of topsoil will be placed on the synthetic layer to support vegetation.

2.5 Post-Closure Care Plan

Post-closure care for the Intermountain Regional Landfill will consist of long-term maintenance of the closure cap and ongoing sampling of the groundwater monitoring wells (and gas-monitoring stations when installed) to ensure that the landfill cell has been closed in accordance with regulations. The post-closure care period will be 30 years unless unexpected environmental contamination or continued subsidence occurs, or a shorter period if it can be proven that the landfill is stable and no longer presents a threat to human health or the environment.

The costs for post-closure care for Cell 1 Phase 1 are identified in Section 2.6.1, Closure Cost Estimate.

2.5.1 Monitoring and Maintenance

Semiannual groundwater monitoring and quarterly landfill gas monitoring will occur throughout the post-closure period. This frequency will be increased if data indicate that contamination might have occurred. The post-closure monitoring frequency will revert to the original schedule if the more-frequent monitoring demonstrates that contamination, if present, is not attributable to the landfill.

Leachate generated in the landfill will be collected and treated by a dual-lined evaporation pond. The pond will contain stormwater and process water runoff at the facility. The leachate collection and treatment system will be inspected as part of the routine quarterly monitoring. Since the Intermountain Regional Landfill has no planned discharge of surface water, no surface water monitoring will be required during the post-closure period.

Table 3 provides a schedule for conducting inspections and maintenance and for recording these routine activities. The Landfill Foreman will be responsible for conducting the inspections, scheduling maintenance, and recording these activities on the forms provided in Appendix I, Leachate Pond Calculations. Some of these activities listed below will be carried out as part of the ongoing operations during the active life of the site. These activities will be expanded to include the entire site at final landfill closure and will continue throughout the post-closure monitoring period.

Table 3. Frequency of Inspection and Maintenance of Facilities during Post-Closure Care

Landfill Facility	Inspection or Maintenance	Frequency
Landfill cell	Cell perimeter fence integrity	Quarterly
Stormwater/leachate pond	Perimeter fence integrity Exposed liner system integrity	Quarterly
Other appurtenances	Entrance gate integrity Perimeter fence integrity Monitoring station integrity Berm integrity Run-on and run-off control system integrity	Quarterly

A written summary of the activities performed during each inspection will be maintained. Fairfield will retain the right of entry to the closed landfill, maintain all rights-of-way, and conduct maintenance and/or remediation activities as needed. The landfill will be inspected on a quarterly basis for the following conditions:

- Integrity of the final cover (including erosion, subsidence, seeps, and settlement)
- Loss of vegetative cover
- Visible debris, litter, and waste
- Condition of access roads, gates, and fences
- Integrity of onsite structures
- Integrity of the groundwater monitoring system
- Integrity of the landfill gas monitoring system (when constructed)
- Integrity of drainage features
- Integrity of the leachate collection system

The final cover will be inspected for erosion or other maintenance problems. Any problems detected during routine site inspections will be corrected as soon as practicable. All eroded areas will be re-covered with suitable soil to establish erosion-control and infiltration layers and to provide positive drainage that will maintain the integrity of the final cover. All bare areas in the final cover will be revegetated as necessary.

Period inspections will determine whether the final cover system needs to be repaired due to differential settlement or subsidence by evaluating whether the final cover in the affected area has been impaired. Any areas where the integrity of the final cover has been compromised will be repaired as necessary.

Eroded areas in drainage ditches will be repaired and re-graded. Sediment buildup will be removed from areas where flow is restricted. Temporary stormwater control structures will be constructed and maintained as needed.

The leachate collection system will be maintained and operated as needed to minimize leachate head on the liner. The Landfill may seek the approval of the UDEQ to stop extracting and storing leachate if it can demonstrate that leachate generation has diminished and no longer poses a threat to human health and the environment.

2.6 Closure Cost Estimate and Financial Assurance

2.6.1 Closure Cost Estimate

The total cost for closure and post-closure for Cell 1 Phase 1 is $1,700,000. A cost breakdown is included in Appendix D, Cost Breakdown for Closure/Post-Closure. The closure cost estimate includes costs for engineering design, contractor procurement, permitting, and final cover construction. Post Closure care includes post closure plan preparation and 30 years of site inspections, record keeping, environmental monitoring, data analysis, and reporting.

2.6.2 Proposed Financial Assurance Mechanism

Fairfield will secure a Surety Bond as the financial assurance mechanism for the Landfill. The Surety Bond will be secured concurrently with landfill construction and will be submitted to DSHW along with construction certification documents and a request to authorize waste acceptance.

2.7 References

[NOAA] National Oceanic and Atmospheric Administration. 2009. *Atlas 14 Precipitation-Frequency Atlas of the United States National Oceanic and Atmospheric Administration, Volume 1*. Available online at http://hdsc.nws.noaa.gov/hdsc/pfds/sa/ut_pfds.html.

[UAC] Utah Administrative Code. 2009. Rule 315, Utah Solid Waste Permitting and Management Rules. Available online at http://www.hazardouswaste.utah.gov/Rules/SolidWasteRules.htm.

[UDWR] Utah Division of Wildlife Resources. 2010. *Counties List of Utah's Federally Listed Threatened, Endangered, and Candidate Species*. Available online at http://dwrcdc.nr.utah.gov/ucdc/ViewReports/te_cnty.pdf and http://dwrcdc.nr.utah.gov/ucdc/DownloadGIS/disclaim.htm.

[UNHP] Utah Natural Heritage Program. 2009. E-mail from Sarah Lindsey, Utah Natural Heritage Program, Division of Wildlife Resources. December 15.

Part 3: Technical and Engineering Report

3.1 Maps

Referenced location Figures and Plan Sheets showing the development of the Landfill and associated details are included in Part 5, Figures.

3.2 Geohydrology

3.2.1 General

The Intermountain Regional Landfill site is located in the Town of Fairfield in western Utah County, Utah. The site is in the central part of Cedar Valley, which is bounded on the west by the Thorpe Hills and Topliff Hill, on the east by the Lake Mountains and Mosida Hills, on the south by the East Tintic Mountains, on the north by the Traverse Mountains, and on the northwest by the Oquirrh Mountains.

The geology and hydrogeology of Cedar Valley have been described by Feltis (1967), Hurlow (2004), and Jordan and Sabbah (2007). A site-specific geotechnical study was completed by Earthtec Testing & Engineering, PC in 2006 (Appendix E). These sources were used in the evaluations of geology and hydrology presented in the following sections.

3.2.2 Geology

The Intermountain Regional Landfill site is located in Cedar Valley, which is underlain by up to 2,000 feet of basin-fill sediment and about 1,000 feet of basin-fill sediment at the landfill site (Hurlow 2004). The surface materials at the site consist of homogeneous deposits consisting of clay and silt as reported from the onsite geotechnical investigation by Earthtec. Boring logs and test pit observations from the site are included in the geotechnical investigation in Appendix E, Site Geotechnical Study by Earthtec.

There are geologic faults within 5 miles of the Intermountain Regional Landfill site as shown on Figure 3. The nearest mapped fault is about 2.9 miles west of the site in the Thorpe Hills area. The nearest mapped fault on the basin floor is about 5 miles northeast of the site.

Two sources were consulted to determine historic seismic activity. Figure 3 shows data taken from the Utah Automated Geographic Reference

Center (AGRC) and shows earthquakes from the 1960s to the 1990s with magnitudes ranging from 0.00 to 2.99. Figure 4 is part of the USGS Miscellaneous Field Studies Map MF-1856 and includes seismic activity from the late 1800s through about 1990. Figure 3 shows that three earthquakes, ranging in magnitude from less than 1.00 to as much as 2.99, have occurred within 5 miles of the site within the last 50 years. Figure 4 does not show any seismic activity within 5 miles of the site.

In 2008, the Utah Geological Survey (UGS) prepared a Landslide Special Study Area Map for the Wasatch Front and Nearby Areas. No mapped areas showing susceptibility to landslides are near the Intermountain Regional Landfill site. In addition, no subsidence areas have been mapped near the site. However, no maps showing subsidence have been prepared for Utah County. To the best recollection of representatives from UGS and the Utah County Community Development Department, no subsidence has been reported for the area.

Utah County provides an online hazards map that shows known fault lines, fault rupture zones, slope hazard areas, and liquefaction potential. According to the hazards map, the Intermountain Regional Landfill site is not in a slope hazards area. The site is very flat and does not have any steep slopes that would create slope stability problems. The hazards map also shows that the site is in an area of low liquefaction potential. The fault data on the hazards map are similar to the Utah AGRC data presented above.

The probabilistic maximum (peak) horizontal acceleration for an earthquake with a return period of 2% in 50 years (10% in 250 years) near the site is 0.25g. This was determined from USGS National Seismic Hazard Mapping Project Probabilistic Seismic Hazards Assessment, Custom Mapping and Analysis Tools, Interactive Deaggregation Tool. 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. The complete Slope Stability and Settlement Analysis is included as Appendix F, Slope Stability and Settlement Analysis.

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. 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 also determined by Earthtec (Appendix E) in accordance with the International Building Code (IBC) using a Site Class D classification. These values are appropriate to evaluate structural components that are not currently planned for the Intermountain Regional Landfill.

3.2.3 Surface Water

Although the Oquirrh Mountains to the northwest receive on average over 40 inches of precipitation each year, mainly in the form of snow, the Cedar Valley floor receives considerably less (Hurlow 2004). Based on data obtained from the Western Regional Climate Center for the Fairfield, Utah, Station, the average annual total precipitation is about 12 inches (NOAA 2009). Surface water is largely generated from mountain snowmelt and conveyed via intermittent streams to the valley. However, most of the stream channels dissipate as they reach the valley floor. Precipitation in the valley is received primarily as winter snowfall and late-summer thunderstorms (Hurlow 2004). The 24-hour precipitation depths for 25-year and 100-year events are 1.74 inches and 2.10 inches, respectively (NOAA 2009).

No defined streams traverse the site. The only stream within 1 mile of the site that is identified on USGS topographic mapping for the area—in the Goshen 7.5-minute Quadrangle—originates about 1 mile east of the site and travels in a generally northern direction toward the sinks southeast of Fairfield. Topographic mapping and other geospatial data were obtained from the Utah AGRC; stream data confirm the information provided on the Goshen Quadrangle map (Utah AGRC 2009). Topographic data including 2-foot contours for the site were obtained from Olympus Aerial Surveys, Inc. Except for minor roadside swales, no defined drainage features are evident on or around the Intermountain Regional Landfill site. The roadside swales are most notable along east-west roads near the northern and southern site boundaries. Little to no relief is shown near the other unpaved roads within the site. The general slope of the site is from west to east with an elevation difference of 6 to 8 feet across the width of the site.

There are no special flood hazard areas defined by the Federal Emergency Management Agency within or in the vicinity of the site; therefore no base (1% annual chance or 100-year) flood elevations have been established (FEMA 2002).

3.2.4 Groundwater

Cedar Valley consists of a basin-fill aquifer and bedrock aquifers. The basin-fill aquifer extends across Cedar Valley and is up to 1,900 feet thick in the center of the valley. A clay layer up to 240 feet thick confines the aquifer (Jordan 2007). The bedrock aquifers are at the base of the mountain ranges that surround Cedar Valley.

Groundwater level contours show that groundwater is at an elevation of about 4,740 to 4,795 feet near the Intermountain Regional Landfill site, which is 55 to 110 feet below the existing ground elevation of 4,850 feet. The clay layer that confines the aquifer is up to 200 feet thick in the area of the proposed landfill site (Jordan 2007). Figure 5 shows the location of the Intermountain Regional Landfill and approximate groundwater levels. In addition, the geotechnical exploration performed by Earthtec in September 2006 included 20 shallow test pits and two test holes. No groundwater was encountered during the geotechnical exploration; test holes 1 and 2 were drilled to depths of about 31 feet and 41 feet, respectively.

According to the groundwater contours presented by Jordan (2007), groundwater in the vicinity of the Intermountain Regional Landfill site travels in a south-southeasterly direction. Using the results of aquifer tests performed by UGS and others, Jordan estimated the hydraulic conductivity in the basin-fill aquifer to range from 0.003 to 49 feet per day, with an average of 8 feet per day and a median value of 2.5 feet per day.

In April 2010, Lucy Jordan with UGS provided data from a short-duration aquifer test that was performed at a well on the Michael Burch residence in Fairfield about 3.25 miles north of the Intermountain Regional Landfill site. The well is in the principal basin-fill aquifer, which is the primary aquifer below the Intermountain Regional Landfill site. The test consisted of a 7-hour drawdown with a 5-hour recovery. The calculated hydraulic conductivity is about 2 feet per day (Jordan 2010).

3.2.5 Water Rights

Spatial and tabular water rights data were obtained from the Utah Division of Water Rights (2009), and all points of diversion within 2,000 feet of the Intermountain Regional Landfill boundary were identified. There are no wells or other points of diversion (PODs) within the landfill boundary. Five PODs are within 2,000 feet. However, the status of each point is noted as “terminated,” and the water rights might have been consolidated into another POD. For all but one POD, the water right application is either withdrawn or permanently lapsed. One POD is about 1,000 feet east and downgradient of the landfill boundary, and the other four are at a single location about 1,400 feet south of the southwest corner of the landfill boundary. The source at each POD is one or more underground water well. Figure 6 in Part 5 of this report is a map showing the location of the five PODs. Data on each POD are included in Appendix K, Water Rights Data.

3.3 Background Groundwater Quality

Because there are no surface water drainages near the Intermountain Regional Landfill site, general surface water quality was not quantified for this permit application.

In the northern parts of Cedar Valley, concentrations of total dissolved solids (TDS) in groundwater are typically less than 1,000 mg/L (micrograms per liter), nitrate concentrations are less than 10 mg/L (except for one privately owned well), and no other chemical constituents exceed the U.S. Environmental Protection Agency's (EPA) standards for drinking water. Groundwater along the northeastern boundary of Cedar Valley has TDS concentrations ranging from about 400 to 1,200 mg/L and is enriched in sodium and chloride relative to the northwestern part of the valley. The groundwater chemistry is different in the northeastern part of the valley because the groundwater mixes with water that is ascending along the Lake Mountains fault on the eastern boundary of Cedar Valley.

Groundwater in southeastern Cedar Valley (the area that includes the Intermountain Regional Landfill) has moderate to high salinity and sodium, has TDS concentrations ranging from about 1,700 to 2,000 mg/L, and is enriched in sodium and sulfate relative to groundwater in the northeastern part of the valley. The likely cause of the degraded groundwater quality is chemical reactions between the groundwater and clay-rich, sulfide-bearing sediment of Lake Bonneville, the Tertiary Salt Lake Formation, and/or Oligocene tuff as groundwater moves from northwest to southeast (Hurlow 2004).

More site-specific background water quality for the Intermountain Regional Landfill site will be established after monitoring wells are installed. See Appendix G, Groundwater Monitoring Plan, for the Groundwater Monitoring Plan for the Intermountain Regional Landfill.

3.4 Engineering Report

3.4.1 Performance Standards

The Intermountain Regional Landfill will be a lined landfill with a leachate collection system to convey leachate to a lined leachate evaporation pond. See Section 3.4.3.2, Leachate Management, of this report for more information. In addition, a Groundwater Monitoring Plan will be followed to test for groundwater contamination; this plan includes steps for determining the need for remediation if groundwater becomes contaminated. The Groundwater Monitoring Plan is included in Appendix G, Groundwater Monitoring Plan.

All surface water that comes into contact with waste will be considered leachate and will be conveyed to a lined leachate evaporation pond, which will be designed to hold the volume of the 25-year, 24-hour storm as required by UAC R-315-7-19. It is not anticipated that leachate will be discharged off-site. See Section 3.4.3.2, Leachate Management, of this report for more information.

The landfill will likely be subject to a stormwater discharge permit under the Utah Pollutant Discharge Elimination System (UPDES) Multi-Sector General Permit (MSGP) for stormwater discharges associated with industrial activity.

3.4.2 Location Standards

UDEQ has adopted specific location restrictions that include the criteria specified in the federal Subtitle D regulations. The Utah location restrictions for municipal solid waste landfills are outlined below. Subtitle D criteria are indicated with an asterisk (*).

1. Land Use Compatibility [R315-302-1(2)(a)]
   a. Parks and protected areas
   b. Ecologically and scientifically significant areas
   c. Prime farmland
   d. Dwellings and structures*
   e. Airport runways*
   f. Archaeological sites
   g. Land use planning or zoning
2. Geology [R315-302-1(2)(b)] and Fault Areas*
   a. Seismic impact zones*
   b. Unstable areas*

3. Surface Water [R315-302-1(2)(c)]
    a. Floodplains*
    b. Wetlands*
4. Groundwater [R315-302-1(2)(e)]
    a. Groundwater/landfill separation
    b. Sole-source aquifer
    c. Groundwater quality
    d. Source protection areas

The following sections present the State of Utah location restrictions and discuss the Intermountain Regional Landfill's compliance with those requirements.

3.4.2.1 Land Use Compatibility

The Utah Solid Waste Permitting and Management Rules state that no municipal solid waste landfill shall be located within the following restriction zones:

- One thousand feet of a national, state, or county park, monument, or recreation area; designated wilderness or wilderness study area; or wild and scenic river area.
- Ecologically and scientifically significant natural areas, including wildlife management areas and habitat for listed or proposed endangered species as designated pursuant to the Endangered Species Act of 1982.
- Farmland classified as prime, unique, or of statewide importance by the U.S. Department of Agriculture Soil Conservation Service [now the Natural Resources Conservation Service] under the Prime Farmland Protection Act.
- One-quarter mile of existing permanent dwellings, residential areas, and other incompatible structures such as schools, churches, and historic structures or properties listed or eligible to be listed in the State or National Register of Historic Places.
- Ten thousand feet of any airport runway end used by turbojet aircraft, or 5,000 feet of any airport runway end used by only piston-type aircraft.
- Areas with respect to archeological sites that would violate [UAC] R9-8-404.

- An area that is at variance with any locally adopted land use plan or zoning requirement unless otherwise provided by local law or ordinance.

The Intermountain Regional Landfill site is not within any of these restriction zones. Part 5 of this document contains figures and maps of the Intermountain Regional Landfill site and nearby facilities, residences, and land features. The land use directly adjacent to the landfill site is agricultural. The nearest residence is more than 2 miles west of the site boundary, and the nearest town, Fairview, is about 3 miles north of the site. The nearest airport runway is about 8,000 feet from the site and is used by only piston-type aircraft. No parks, ecologically significant areas, prime farmland, or archeological sites (see also Appendix C) are known to exist near the site. The Intermountain Regional Landfill site is surrounded on the north and west by land zoned mining and grazing (MEG1) and on the south and east by land zoned agricultural (A1). The landfill is consistent with these zoned land uses.

3.4.2.2 Geology

The Utah Solid Waste Permitting and Management Rules, listed below, state that no municipal solid waste landfill shall be located in a subsidence area, in a dam failure flood area, over an underground mine or salt bed, or on or adjacent to geologic features that could compromise the structural integrity of the facility.

- Fault Areas. A new facility or a lateral expansion of an existing facility shall not be located within 200 feet of a Holocene fault.
- Unstable Areas. Unstable areas require demonstration that the site has been engineered to ensure that the integrity of the structural components of the facility will not be damaged by the unstable conditions.
- Seismic Impact Zones. A new facility of a lateral expansion of an existing facility shall not be located in seismic impact zones unless all containment structures are designed to resist the maximum anticipated horizontal acceleration for the site.

There are no known Holocene faults within 200 feet of the site, and the site is not within a known unstable area as defined in the regulations. However, as described in Section 3.2.2, the probabilistic maximum (peak) horizontal acceleration was determined to be 0.25g, which was determined at bedrock, and the value adjusted based on site-specific soils to 0.28g. These values exceed 0.1g, which is the minimum per UDEQ and EPA to qualify as a seismic impact zone. The Slope Stability and Settlement Analysis, which is included as Appendix F, evaluated slope stabilities, settlement, and liner system stain and found that adequate safety factors are maintained during design seismic events.

3.4.2.3 Surface Water

The Utah Solid Waste Permitting and Management Rules state that no municipal solid waste landfill shall be located within a public water system watershed, a floodplain, or a wetlands area without specific approval of the Executive Secretary. The Intermountain Regional Landfill site is not within a public water system watershed or 100-year floodplain. USGS topographic maps and a site survey (2-foot contours) were evaluated for surface drainage, and no defined surface drainage features traverse the site. In addition, the site does not contain vegetation or hydrologic features that are characteristic of wetland areas.

3.4.2.4 Groundwater

The Utah Solid Waste Permitting and Management Rules state that no municipal solid waste landfill shall be located within the following restriction zones:

- Within 5 feet of the historical high groundwater elevation.
- Within 100 feet of an aquifer that could contains TDS concentrations less than 1,000 mg/L (or 50 feet for TDS between 1,000 and 3,000 mg/L) unless the landfill is constructed with a composite liner system.
- Over an aquifer designated as a sole-source aquifer or groundwater classified as 1B (irreplaceable groundwater).
- In a drinking water source protection area.

Landfill cells will not be constructed within 5 feet of the historical high groundwater elevation. The geotechnical exploration performed at the site in September 2006 included 20 shallow test pits and two test holes. No groundwater was encountered during the geotechnical exploration; test holes drilled to depths of about 31 to 41 feet. Figure 5 shows the Intermountain Regional Landfill site and the groundwater level contours for the area. The groundwater is found 55 to 110 feet below the existing ground elevation of the site. The maximum depth of the proposed landfill liner system below existing ground surface is planned to be in the range of 35 to 40 feet, placing the bottom of the liner at least 17 feet from the historical high groundwater elevation, and well outside the 5 foot proximity requirement.

The TDS in groundwater in the southeastern part of Cedar Valley, near the Intermountain Regional Landfill, is expected to be over 1,000 mg/L (Hurlow 2004). The Intermountain Regional Landfill will be constructed with a composite liner and leachate collection system consisting of a geosynthetic clay liner (GCL) and an HDPE geomembrane. See Section 3.4.3 below for a detailed description of the landfill's composite liner.

The Intermountain Regional Landfill site is not within a sole-source aquifer and is not over groundwater with a 1B classification.

3.4.3 Engineering Design

3.4.3.1 Cell Design

The Intermountain Regional Landfill will consist of six cells. Cell 1 Phase 1 will consist of an 8-acre geosynthetic-clay-and-HDPE-lined area. The soil from the excavation of Cell 1 will be placed in the soil stockpile area north of the cell. Excavation side slopes will be constructed on a 4:1 (H:V) slope. Generally, the bottom slope will be 1.4% west to east and 1.4% north to south.

The liner system for Cell 1 will consist of the following components (from bottom to top):

- A non-woven, needle-punched polypropylene geotextile (optional). The excavation will determine the maximum size and gradation of materials that remain on the surface of the excavation. The need for an extra layer of cushioning geotextile will be determined to provide puncture resistance for the overlying GCL and geomembrane.
- A bentonite-impregnated geotextile, or GCL. The GCL will provide a barrier to leachate and landfill gas migration.
- A 60-mil HDPE textured flexible membrane liner.
- A non-woven needle-punched polypropylene geotextile. The upper geotextile will provide puncture resistance for the HDPE liner. The thickness of the geotextile will be evaluated based on the soil properties of the material selected for the protective cover soil. It in anticipated that a 12- to 16-ounce geotextile will be use.

- A 2-foot-thick protective cover layer. This sand or non-carbonate gravel soil layer will protect the geotextile, HDPE, and GCL as the first lift of solid waste is placed. It will also provide a pathway for leachate above the HDPE to move toward the leachate collection and removal system.

During the final design, a Construction Quality Assurance (CQA) Plan will be developed. This CQA Plan will describe the responsibilities of the installation contractor for conducting a construction quality-control program during installation. The CQA Plan will require that all seams will be tested for continuity. In addition, periodic samples will be removed from the rolls and subjected to tensile testing at a third-party laboratory. Construction observation personnel will be on-site at all times when HDPE, GCL, and geotextile are installed and when the 2-foot-thick protective layer is placed. These personnel will provide a CQA review of the construction and installation of the liner system.

3.4.3.2 Leachate Management

Leachate, including stormwater falling in the active landfill cell that comes into contact with solid waste or daily cover, will be transmitted through the 2-foot-thick protective cover soil layer to a leachate collection pipe installed along the southern boundary of Cell 1 (see Sheets 3 and 4 of 13 in Part 5). Cell 1 Phase 1 will include a temporary leachate pond that will be constructed along the eastern edge of Phase 1.

With the construction of Cell 1 Phase 2 or 3 (or other cell Phase division), a permanent leachate pond will be constructed at the northeast corner of the site. The leachate collection pipe from Cell 1 Phase 1 will be extended to the sump of Cell 1 Phases 2 and 3. The leachate collection pipe will consist of an 8-inch-diameter perforated HDPE pipe encased in a granular fill wrapped with a geotextile. The pipe trench will be about 2 feet deep to match the thickness of the protective cover. Leachate will be managed by this system during filling and after closure.

EPA's Hydrologic Evaluation of Landfill Performance (HELP) model, Version 3.07, was applied to several operational and closure scenarios to evaluate infiltration into Cell 1 and subsequent generation of leachate. See Appendix H, Leachate Generation Calculations. Soil, waste, and geosynthetic characteristics were modeled with the default soil properties. The initial moisture content of the waste was adjusted to reflect the drier waste conditions at other Utah landfills. Information from Wasatch Integrated Waste Management District (formerly known as Davis County

Solid Waste Management and Energy Recovery Special Service District) indicates waste moisture contents by weight of about 11%. Site specific climatic conditions were included in the model. The HELP model results show that no leachate would be generated.

The following scenarios were considered representative of the life cycle for Cell 1:

- Ten feet of waste and a 6-inch daily cover, simulating initial filling.
- One hundred feet of waste and 12 inches of intermediate cover for 20 years, simulating the anticipated life of Cell 1.

The model produced the same result for each scenario, which indicates that no leachate would be generated. Based on this result, no hydraulic head will occur on the liner.

Because the HELP model shows that no leachate would be generated in these scenarios, the temporary leachate pond at the north end of the Cell 1 Phase 1 and the permanent leachate pond at the northeast corner of the site was sized to hold the 25-year, 24-hour precipitation event (as required by UAC R-315-7-19) for the largest cell development phase, which is Cell 1.

After Cell 1 is fully constructed, the perforated leachate collection pipe will enter a gravel-filled sump in the southeast corner of Cell 1. The pipe (solid wall) will continue up the side slope and terminate at the top of excavation as a clean-out. An 18-inch-diameter HDPE pipe will be installed in the sump and will also continue up the side slope. The bottom of the pipe will be perforated so that leachate can enter. A submersible pump capable of pumping at least 50 gallons per minute will be lowered down the 18-inch pipe to pump leachate out of the cell into another pipe, where it will be conveyed in a dual-lined leachate drain line from Cell 1 to the permanent evaporation pond.

The leachate evaporation pond will be double-lined. The pond will consist of the following layers (from bottom to top):

- An optional 16-ounce non-woven, needle-punched polypropylene geotextile
- A geosynthetic clay liner (GCL)
- Liner 1, a 60-mil HDPE geomembrane
- Liner 2, a 60-mil HDPE geomembrane

- A cushioning geotextile—a non-woven needle-punched polypropylene geotextile
- A layer of soil or other material to provide ballast for the pond liner system

3.4.3.3 Surface Water Controls

The Intermountain Regional Landfill site vicinity generally drains from west to east. As discussed in Section 3.2.3, Surface Water, no defined streams traverse the site. Construction of Cell 1 will not alter the existing stormwater conditions.

Stormwater originating on-site will be managed as non-contact or contact stormwater depending on its source. Non-contact stormwater is water that falls on unimproved parts of the site or on improved parts of the site that have no contact with solid waste (for example, the entrance roads and soil stockpile areas) or on Cell 1 once final cover has been placed. Run-on control structures will divert this water away from the active landfill cell. Run-off control structures will divert water falling on the active landfill cell into the leachate collection system. Ultimately, contact stormwater will be stored and evaporated in the evaporation pond. Neither leachate nor contact stormwater will be discharged from the site in surface waters. If the evaporation pond reaches capacity, water will be pumped from the pond onto waste in the active working area to accelerate evaporation.

Analyses have been conducted for run-on and run-off control systems around Cell 1. These analyses were conducted for a 25-year storm event and the associated time of concentration that produced peak flow. The analyses, presented in Appendix J, Run-on/Runoff Calculations, indicate that a triangular ditch with 4 to 1 side slopes and nominally 1.5 foot deep, provides adequate flow capacity. This ditch geometry will be constructed concurrent with Cell 1 construction.

A perimeter ditch around the west and north property boundaries is required to collect and convey stormwater run-on. Run-on results from stormwater runoff from the property on the west side of the Landfill. This 419-acre area contributes approximately 140 cubic feet per second of stormwater runoff. A ditch with a bottom width of 10 feet, with 4 to 1 (horizontal to vertical) side slopes, and a nominal depth of about 3 feet will be constructed to manger stormwater runoff. Stormwater run-on will be conveyed north and west along the northern portions of the landfill and will be returned to overland flow at the northeast corner of the landfill.

3.4.3.4 Closure and Post-Closure

The final closure of Cell 1 will occur in about 2018. The landfill cap will consist of the standard design final cover as prescribed by UAC R315-303-3. The standard design for final cover consists of a minimum of 2 feet of compacted clay under a 60-mil HDPE synthetic layer. A minimum of 6 inches of topsoil will be placed on the synthetic layer to support vegetation. A seed mix similar to that shown in Table 4 will be used to establish vegetation.

Table 4. Seed Mix for Intermountain Regional Landfill

Type of Grass	Percent of Mix
Sand drop seed	0.50%
Alkali sacaton	1.50%
Blue grama	3.50%
Blue bunch wheat grass	17.50%
Indian rice grass	17.50%
Sandberg blue grass	3.00%
Sheep fescue	4.00%
Slender wheat grass	16.25%
Stream bank wheat grass	16.25%
Western wheat grass	20.00%
	100.00%

Proposed final contours for Cell 1 can be seen on Sheet 7 of 13 in Part 5. The side slopes of the landfill will be constructed at a 4:1 (H:V) slope with the top being about 5%.

Post-closure care is expected to consist of the following tasks:

- Quarterly inspections of the cap to determine whether significant erosion or differential settlement has occurred.
- Quarterly inspections of the stormwater/leachate evaporation pond.
- Quarterly monitoring of landfill gases at the extraction wells, if gas generation requires that these are installed.
- Quarterly inspection of groundwater well integrity.
- Semi-annual monitoring and sampling of groundwater wells.

These activities will take place on Cell 1 after it has received final cover and will be expanded to all closed areas at the appropriate time. Closure and post-closure is discussed in more detail in Section 2.5, Post-Closure Care Plan, and Section 2.6, Closure Cost Estimate and Financial Assurance, of this application.

3.5 References

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Part 4: Class V Landfill Information

For Class V permit applications, the Utah Solid Waste and Hazardous Waste Act requires that additional information is provided in permit applications. This Part is provided pursuant to Subsections 19-6-108(9) and 19-6-108(10) of the Utah Solid Waste and Hazardous Waste Act.

4.1 Municipal Solid Waste Market

The potential market for the Intermountain Regional Landfill (IRL) would be future waste generated in communities in Salt Lake and Utah Counties. Municipal solid waste generated from this area is managed by four entities, two in Salt Lake County and two in Utah County.

- The Salt Lake Valley Solid Waste Management Facility (SLVSWMF) is a public Class I landfill jointly owned by Salt Lake City and Salt Lake County. This landfill receives waste from northern Salt Lake County communities. The larger communities in this area are Salt Lake City, South Salt Lake (location of a transfer station), and West Valley City.
- Trans-Jordan Cities is a special service district that manages the Class I Trans-Jordan Landfill. Its member cities are located in the southern portion of Salt Lake County and include the growing communities of Sandy, South Jordan, West Jordan, and Draper.
- Municipal solid waste generated in the southern portion of Utah County is managed by the South Utah Valley Solid Waste District (SUVSWD). The SUVSWD manages the Springville Transfer station and hauls waste to its Class I Bayview Landfill located near Elberta, Utah.
- Municipal solid waste generated in the northern portion of Utah County is managed by the North Pointe Solid Waste Special Service District (North Pointe). The larger communities served by North Pointe are Lehi, American Fork, Orem, and the growing communities of Saratoga Springs and Eagle Mountain. Cedar Fort and Fairfield are also served by North Pointe. North Pointe operates a transfer station and hauls waste to privately operated landfills.

The SLVSWMF has about 45 years of permitted disposal capacity remaining, which will secure solid waste disposal for its owners well into the future. Similarly SUVSWD's Bayview Landfill has well over 50 years of permitted capacity based on current waste volumes. Therefore, the following sections focus on the benefits of the IRL assuming the landfill uses the most probable waste market: waste from northern Utah County and southern Salt Lake County.

4.1.1 Population Projections

The IRL could provide service to growing municipalities throughout Utah and Salt Lake Counties. These counties have annual population growth rates of 2.3% and 1.1%, respectively.[1] Table 5 summarizes the 2009 population estimates[2] and 2030 projections. The projections reported in Table 5 are based on county-wide growth rates. Note that the majority of growth is occurring in northern Utah County and southern Salt Lake County. Therefore, the projected populations listed below might be understated. Nevertheless, the estimated 1,000,128 people living in this area in 2030 represent a 41% increase over the 2009 population.

Table 5. Population Estimates and Projections

Potential Service Area	Estimated Population, 2009	Projected Population, 2030
Northern Utah County	295,303	476,054
Southern Salt Lake County	416,503	524,074
Total	**711,806**	**1,000,128**

4.1.2 Waste Generation Estimates

The sources of solid waste deposited at the IRL could be any municipalities or private waste haulers throughout northern Utah. The anticipated growth in the region will require a long-term solid waste disposal capacity. Future waste volumes were estimated by examining current per-capita waste generation rates and applying them to future population projections. Per-capita waste generation was determined by

[1] Source is the Governor's Office of Planning and Budget: http://www.governor.utah.gov/dea/UPEC/2009%20Utah%20Population%20Estimates%20by%20County.pdf

[2] Source is US Census Bureau: http://www.census.gov/popest/cities/tables/SUB-EST2009-04-49.xls

taking reported waste volumes received at Utah landfills in 2009[3] and dividing by the estimated population using those landfills. Per-capita waste generation ranges from 2.8 to 3.7 pounds per person per day. This range can be attributed to the diversion programs, the level of industrial development, and the current levels of residential and commercial development within various landfills' waste sheds. Table 6 provides an estimate of 2030 waste volumes, a portion of which could use the IRL.

Table 6. Waste Generation Estimates

Year	Tons per Year at 2.7 lb/person/day	Tons per Year at 3.7 lb/person/day
2009	469,379[a]	469,379[a]
2030	636,262	675,983
Increase (tons per year)	**166,883**	**206,604**
Increase 2009 to 2030	**36%**	**44%**

[a] 2009 is actual reported disposal.

As reported in Table 6, in 2030 a large portion of about 650,000 total tons per year (or about 2,000 tons per day) could use the IRL.

4.1.3 Review of Class I Disposal Facilities

There are currently three large, public, Class I municipal landfills that operate in Salt Lake and Utah Counties.

Salt Lake Valley Solid Waste Management Facility (SLVSWMF). The SLVSWMF is a Class I landfill jointly owned by Salt Lake City and Salt Lake County. The general location of the offices and gatehouse is 1400 South 6030 West in Salt Lake City, Salt Lake County, Utah. The operational area consists of 550 acres; 450 acres are designated in the permit for landfill operations and 100 acres are for a buffer area. SLVSWMF updated the landfill master plan in 2008[4]. Based on the assumed master plan design and the projected waste within the SLVSWMF waste district, the landfill will provide disposal capacity through 2053, or for about 42 years.

[3] Source is Utah Department of Environmental Quality Division of Solid and Hazardous waste: http://www.hazardouswaste.utah.gov/Solid_Waste_Section/SolidWasteSection.htm#DisposalFacilities

[4] Source is *Resource Recovery Technology Review for Waste Reduction in Salt Lake County*, HDR Engineering, February 2008.

Trans-Jordan Landfill. The Trans-Jordan Landfill (TJL) is a Class I landfill that began operation in 1958. The TJL facilities are located at 10873 South 7200 West in South Jordan, Salt Lake County, Utah. The landfill acreage is about 100 acres. According to the Landfill Permit Renewal Application (Trans-Jordan Cities 2005), the landfill has disposal capacity for about 20 more years, or until 2030.

Bayview Landfill. The SUVSWD was organized in 1989 and operates the Bayview Landfill. The landfill lies on over 600 acres located about 6 miles north of Elberta, Utah County, Utah, which is near the southwest shore of Utah Lake's Goshen Bay. The landfill's active cell, which is over 50 acre, will provide disposal capacity for SUVSWD's member cities until about 2032. The landfill also has additional land available and, given the projected growth in waste volume, the expected useful life is well over 50 years (SUVSWD 2008).

4.1.4 Review of Commercial Disposal Facilities

There are currently three other large, privately operated (Class V), commercial solid waste facilities in the region that are permitted to dispose of solid waste generated in Utah.

ECDC Environmental Landfill. The ECDC is a Class V landfill located within the boundaries of East Carbon, Carbon County, Utah. The site encompasses about 2,400 acres and is permitted for the disposal of non-hazardous municipal waste. The Utah Division of Solid and Hazardous Waste (DSHW) reports that about 18,029 tons of municipal waste were delivered to ECDC in 2009. In addition, DSHW reports that 161,943 tons of industrial wastes were deposited at ECDC. In the past, ECDC received municipal waste from the Wasatch Front. Waste would be processed through a transfer station where it would be loaded into rail containers and hauled to ECDC. Because disposal costs were subject to rail rates that were negotiated between ECDC and the Union Pacific Railroad, many of ECDC's public customers along the Wasatch Front abandoned the rail transfer hauling operations in favor of more standard, over-the-road operations.

Wasatch Regional Solid Waste Landfill. Wasatch Regional is located in Tooele County roughly 6 miles north of Interstate 15 and north/northwest of Grantsville, Utah. Wasatch Regional sits on about 1,969 acres. According to the Class V Permit Application, the total capacity is reported to be at least 90 years to as much as 449 years depending on the daily waste acceptance rate (Psomas 2004). DSHW reports that, in 2009, 603,661 tons of municipal solid waste were deposited in the landfill. The sources for this waste are not known.

Tekoi Balefill. The Tekoi Balefill is a landfill on leased tribal-trust lands of the Skull Valley Band of Goshute Indians. A balefill is a type of landfill in which municipal solid waste is mechanically baled (like a hay bale) at a transfer station before being placed on a truck and hauled over the road to be unloaded at the landfill. The lease between Skull Valley Band prohibits unbaled waste from being deposited in the landfill. Because the site is regulated by the Bureau of Indian Affairs and the U.S. Environmental Protection Agency (EPA), the total volume of waste going to Tekoi is was not available in DSHW records. A portion of the waste volume comes from the greater Salt Lake County area via privately operated transfer stations.

4.2 Public Benefits

The community of Fairfield supports the IRL within its jurisdiction because it provides a convenient waste disposal option for its residents. The following sections present the other public benefits of the IRL. The public benefits are those associated with environmental protection and the ability to provide a convenient, low-cost disposal alternative for northern Utah communities that will use the IRL.

Both categories of benefits are associated with the location of the IRL. As described in Parts 2 and 3 of this permit application, the proposed IRL meets all environmental siting criteria in Utah solid waste regulations, which are in place to prevent major environmental conflicts between landfills and sensitive environmental resources. Parts 2 and 3 also describe the IRL's commitment to environmental monitoring, which includes having controls in place for early detection.

The other advantage is that the location of the IRL is central to the growing communities in northern Utah County and southern Salt Lake County. The relatively short haul distance to the IRL provides transfer hauling cost and environmental benefits to communities that would be served by the IRL. Section 4.2.2 below compares hauling distances and presents the estimated fuel consumption and greenhouse gas (GHG) emissions for hauling waste to the alternative landfills listed above.

The IRL is committed to be a leader in developing recycling programs for northern Utah County. The IRL management team has previously developed recycling centers in Salt Lake City and will bring that experience to the community. The majority of waste delivered to the IRL would be processed through a transfer station. Transfer station operations will provide a central point where waste can be inspected and recyclable materials removed from the waste stream. The IRL would be the operational anchor and would provide enough revenue that volatility in the recyclables market would not be the sole driver in decisions to sort and recycle certain materials. The IRL also provides a convenient location to dispose of residual materials.

4.2.1 Need for Additional Capacity

The population growth estimates discussed in Section 4.1.1 indicate that additional waste disposal capacity will be needed for the rapidly growing communities in southern Salt Lake County and northern Utah County. Municipalities in northern Utah County already haul waste to privately owned landfills for disposal outside of the county's boundaries. Trans-Jordan communities will run short of disposal capacity at the Trans-Jordan Landfill within 20 years. Given the rate of population growth and the value of property in the communities served by Trans-Jordan, it is unlikely that the TJC could secure additional, adequately large land-disposal capacity within it district boundaries by the time additional disposal capacity is needed. This trend to large, remote landfills operated under multi-jurisdictional partnerships or by private enterprises is expected to continue along the Wasatch Front as the population continues to expand.

Permitting an additional commercial landfill would provide future disposal capacity for northern Utah communities and would provide more competition among commercial facilities to keep disposal rates reasonable.

4.2.2 Summary Environmental Benefits

All permitted facilities are presumed to adequately protect the environment. The proposed facilities at the IRL represent the standard of modern landfill design and operation. Advanced materials and equipment will be used to further reduce the potential for adverse environmental consequences as result of landfill operation. No extraordinary engineered features are required at the IRL.

In addition to meeting all siting criteria and other solid waste design requirements, the location of the proposed IRL has two main environmental benefits. The first advantage of the IRL's location is a thick underlying clay soil layer. In addition to a constructed flexible membrane and geocomposite liner system, the low permeability of the clay soils under the IRL will help further protect groundwater resources.

The second major environmental benefit of the IRL's location is the short haul distance from the location of waste generation. The IRL is substantially closer to the largest northern Utah communities than any other commercial landfill. Shorter haul distances will help control costs in an era of fuel cost uncertainly and would result in far less GHG emissions. In addition to a shorter haul distance, the haul route to the IRL (south out of the Salt Lake Valley) is advantageous to all Salt Lake, Utah, and Tooele County communities because it would reduce additional diesel emissions in air quality non-attainment areas.

For the IRL and other permitted facilities, Table 7 lists the facility name, facility location, and approximate distance to the facility from two waste-generation centroids. The distance presented is an approximate *one-way* haul distance.

Table 7. Existing Commercial Solid Waste Management Facilities

Facility Name	Facility Location	Distance to Facility from Northern Utah County (miles, one-way)[a]	Distance to Facility from Southern Salt Lake County (miles, one-way)[b]
Intermountain Regional Landfill	Fairfield, Utah	30	37
Wasatch Regional Landfill	Tooele County, Utah	99	80
Tekoi Balefill	Tooele County, Utah[c]	95	85
ECDC Environmental Landfill	East Carbon, Utah	120	130

[a] Distance measured from an approximate waste centroid near Lehi, Utah.
[b] Distance measured from an approximate waste centroid near Sandy, Utah.
[c] Located in the Goshute Nation's Skull Valley Indian Reservation.

As shown in Table 7, the IRL would have the shortest haul distance from the two largest waste generation areas. The Wasatch Regional Landfill requires a 198-mile *round-trip* haul from northern Utah County, where the majority of growth in the County is anticipated to occur. In contrast, the IRL would require only a 60-mile round-trip haul form northern Utah County. Shorter haul distances benefit the community in several ways including less vehicle traffic, which results in reduced highway maintenance, reduced air quality impact, and fewer GHG emissions.

Table 8 below presents the round-trip haul distance, estimated waste tonnages, and predicted GHG emissions over the planning horizon (2010 to 2030) for hauling waste from northern Utah County to the IRL versus the other area landfills. GHG emissions are expressed as metric tons of carbon-dioxide equivalents per year (MTCO2e/yr). A carbon-dioxide equivalent is a metric used to compare the global warming potential of various GHG.

Table 8. Comparison of Emissions from Hauling Northern Utah County Waste to Area Landfills

	Waste to IRL	Waste to Wasatch	Waste to Tekoi	Waste to ECDC
2009 Waste Tonnage				
Haul distance, round trip (miles)	60	198	190	240
Tonnage transferred to landfill (tons/yr)	187,866	187,866	187,866	187,866
Total fuel use estimate (gallons/yr)[a]	64,411	212,557	203,969	257,645
Total GHG equivalents estimate (MTCO2e/yr)[b]	654	2,157	2,070	2,614
2030 Estimated Waste Tonnage				
Haul distance, round trip (miles)	60	198	190	240
Tonnage transferred to landfill (tons/yr)	302,856	302,856	302,856	302,857
Total fuel use estimate (gallons/yr)[a]	103,836	342,660	328,815	415,347
Total GHG equivalents estimate (MTCO2e/yr)[b]	1,054	3,477	3,336	4,215

[a] Estimates assume transfer truck hauling in vehicles with a 25-ton payload capacity and 7 mile-per-gallon fuel economy.

[b] Assumes a diesel fuel GHG emission factor of 22.37 pounds of carbon dioxide equivalents per gallon. From EPA's Solid Waste Management and Greenhouse Gases, *A Life-Cycle Assessment of Emissions and Sinks*, 3rd Edition, September 2006, Exhibit 2-1.

The IRL provides an opportunity save about 148,000 gallons of fuel and eliminate about 1,500 metric tons of carbon-dioxide equivalents annually from the northern Utah County solid waste disposal system (assuming the 2009 waste tonnage). At $3 per gallon, the fuel savings equals $440,000 annually. The reduced fuel consumption and GHG emissions savings is equivalent to eliminating about 353 passenger cars[5] or 773 tons of coal.[6] By 2030, with increased trips needed due to the anticipated population and waste growth, the fuel savings would be about 230,000 gallons ($690,000 annually). The reduced emissions would be about 2,400 metric tons of carbon-dioxide equivalents, which is the same as the emissions from 569 passenger cars or 1,249 tons of coal.

Exhibit 1 below provides a graphical representation of the *cumulative* GHG emissions for the landfill facilities presented in Table 8 and Table 9.

[5] Assuming 12,000 miles per year per vehicle, 25 miles per gallon, and a GHG emissions factor of 19.56 pounds of carbon-dioxide equivalent per gallon of gasoline.

[6] Assuming 4,286 pounds of carbon-dioxide equivalent per ton of coal.

This cumulative emissions chart sums GHG emitted each year over a 20-year planning horizon and does not account for any improvements in fuel efficiency for waste transfer vehicles.

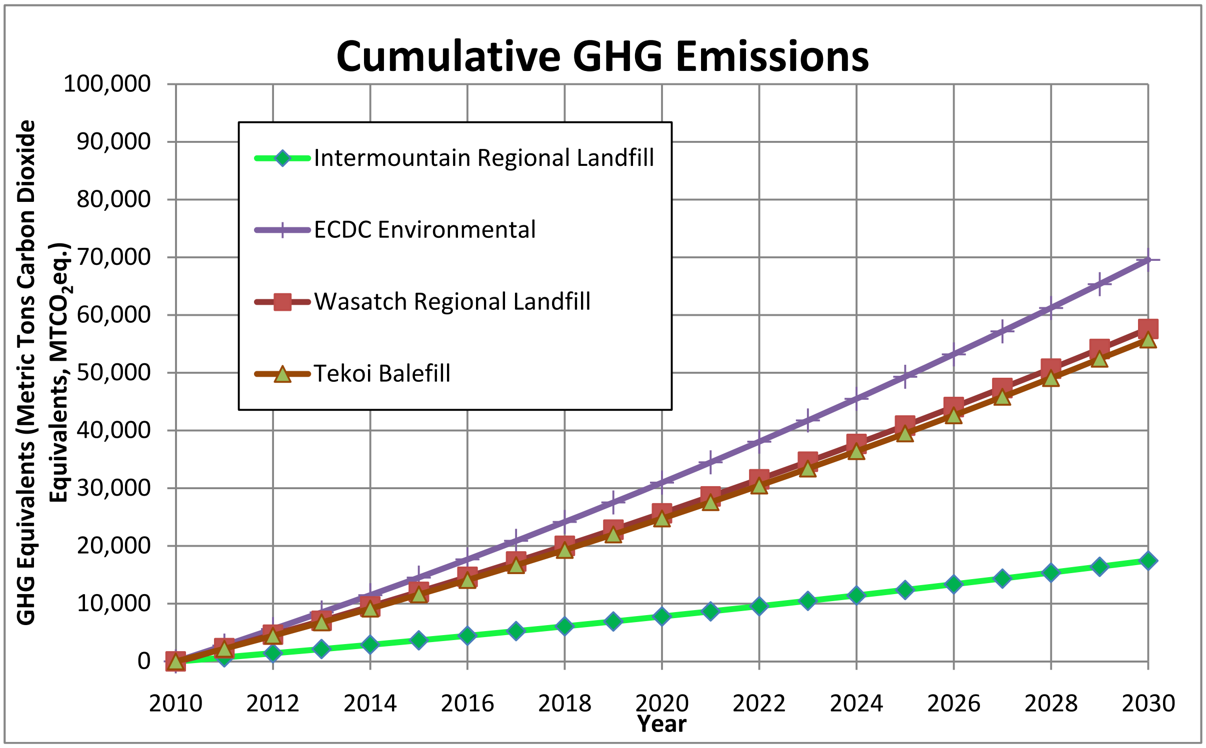


Exhibit 1. Cumulative GHG Emissions Comparison from Northern Utah County Waste Hauling

The difference in haul distances from northern Utah County to either Wasatch Regional Landfill or Tekoi Landfill versus the IRL results in a net reduction in total GHG emissions of about 39,000 metric tons (carbon-dioxide equivalents) over a 20-year period. This is equivalent to taking roughly 9,100 cars off the road or not burning 20,000 tons of coal over that period.

Another potential waste source available to the IRL is waste from southern Salt Lake County, which is currently served by the Trans-Jordan Landfill. The Trans-Jordan Landfill serves one of the fastest-growing areas along the Wasatch Front and is expected to reach capacity by 2030. Table 9 below lists the predicted annual GHG emissions from hauling southern Sat Lake County waste to the IRL in 2025 versus the GHG emissions from hauling waste to other, more-remote commercial landfills. The year 2025 was selected for analysis to account for the unknown population and waste growth rate assumptions used in the landfill life calculation for Trans-Jordan Landfill.

Table 9. Comparison of Emissions from Hauling Southern Salt Lake County Waste to Area Landfills

	Waste to IRL	Waste to Wasatch	Waste to Tekoi	Waste to ECDC
2025 Estimated Waste Tonnage				
Haul distance, round trip (miles)	74	160	170	260
Tonnage transferred to landfill (tons/yr)	315,000	315,000	315,000	315,000
Total fuel use estimate (gallons/yr) [a]	133,200	288,000	306,000	468,000
Total GHG equivalents estimate (MTCO2e/yr) [b]	1,352	2,922	3,105	4,749

[a] Estimates assume transfer truck hauling in vehicles with a 25-ton payload capacity and 7 mile-per-gallon fuel economy.

[b] Assumes a diesel fuel GHG emission factor of 22.37 pounds of carbon dioxide equivalents per gallon. From EPA's Solid Waste Management and Greenhouse Gases, *A Life-Cycle Assessment of Emissions and Sinks*, 3rd Edition, September 2006, Exhibit 2-1.

The IRL provides an opportunity save about 164,000 gallons of fuel and eliminate about 1,600 metric tons of carbon-dioxide equivalents annually from the southern Salt Lake County solid waste disposal system (assuming the 2025 waste tonnage). At $3 per gallon, the fuel savings equals $492,000 in 2025. This GHG emissions savings is equivalent to eliminating about 376 passenger cars or 823 tons of coal in 2025.

By 2030, the total amount of waste that could be hauled from the IRL's potential waste shed (northern Utah County and southern Sat Lake County) is about 656,000 tons (approximate 2030 waste generation; see Table 6 above). The total fuel savings of hauling waste to the IRL compared to Wasatch or Tekoi would be about 356,000 gallons ($1,068,000 annually). In 2030, the GHG emissions savings would be about 3,600 metric tons of carbon-dioxide equivalents, which is equivalent to eliminating about 849 passenger cars or 1,859 tons of coal.

Exhibit 2 below provides a graphical representation of the cumulative GHG emissions for hauling waste to the landfill facilities over a 20-year planning horizon. Exhibit 2 adds the GHG emissions of hauling waste from southern Salt Lake County in 2025 to the cumulative emissions presented in Exhibit 1. The total cumulative emission reduction (IRL compared to Wasatch or Tekoi) would be about 50,000 metric tons of carbon-dioxide equivalents, which is the same as the emissions from 11,700 passenger cars or 25,700 tons of coal.

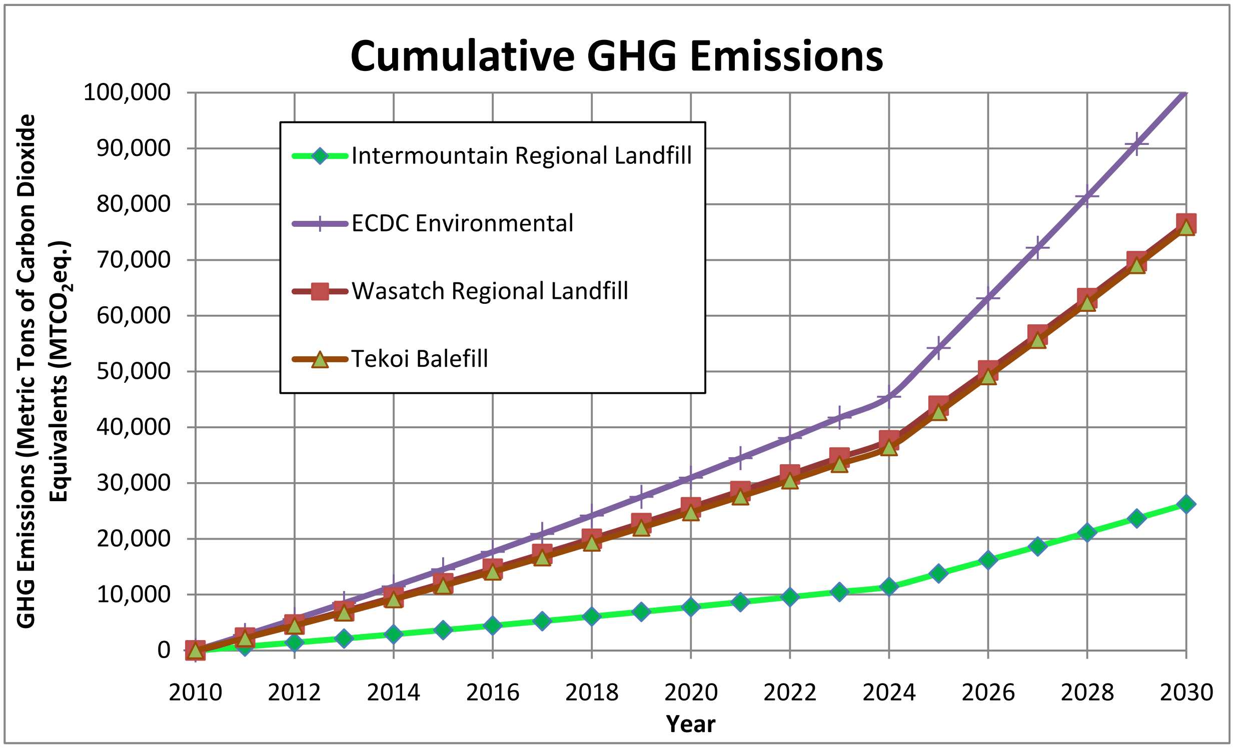


Exhibit 2. Cumulative GHG Emissions Comparison for Waste Hauling within the IRL Waste Shed

The IRL, once permitted, would accept waste from the rapidly growing communities in northern Utah County and southern Salt Lake County. The IRL would provide a disposal site requiring shorter haul distances, resulting in less truck traffic on public highways and fewer GHG emissions than the currently permitted commercial landfills. Exhibit 2 above illustrates that hauling waste to the IRL would result in about one-third of the cumulative GHG emissions over the next 20 years. In addition to reducing GHG output, the shorter haul distances would result in fewer diesel soot emissions per ton of waste disposed and would keep more diesel soot out of the air quality non-attainment air sheds of Salt Lake and Tooele Counties.

The IRL is located such that other long-term environmental benefits, including landfill gas-to-energy, could be use by future industrial development. Landfill gas-to-energy (LFGTE) systems are increasingly seen as a solution to GHG and flammable gas emissions from landfills and serve the dual purpose of reducing GHG emmsions and providing an alternative fuel supply. The environmental benefits of an LFGTE are wide ranging and include providing a fuel source with a lower carbon footprint than traditional fuels. A fuel source from LFGTE at the IRL could also encourage economic development in the Cedar Valley, further benefiting the community.

4.3 Compliance History of Landfill Operator

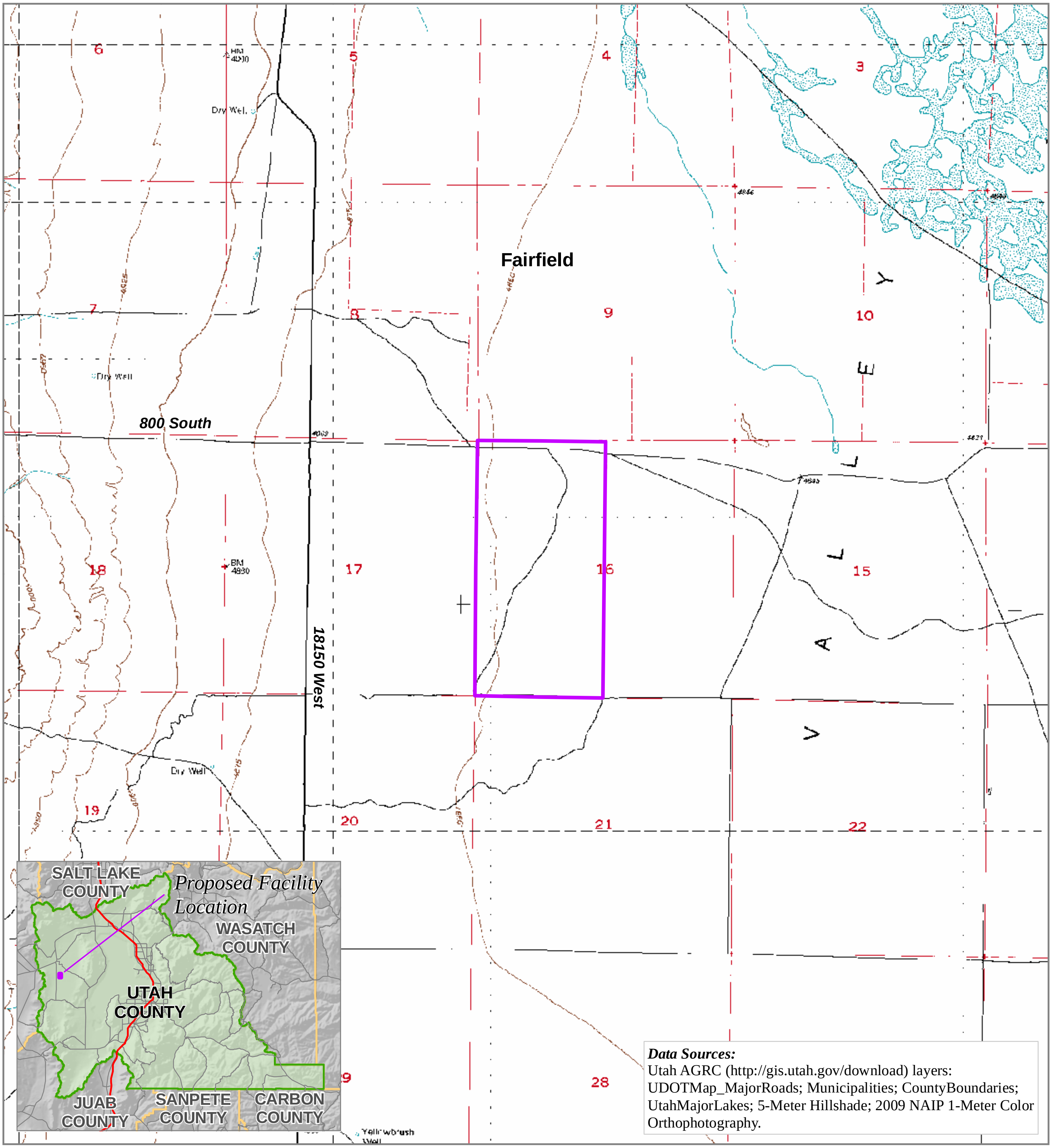
The IRL management team has a breadth of experience in the solid waste industry in Utah, including the management of hauling operations; the development and operation of two large recycling/transfer stations; and the permitting, design, construction, and operation of a modern 500-acre municipal solid waste landfill.

The General Manager of the IRL, Rob Richards, oversaw the operations of a 500-acre municipal solid waste landfill that was under the jurisdiction of the federal EPA and that had no violations. As part of his duties, Rob has become proficient and knowledgeable in current landfill design standards and operating practices. Some of his areas of experience include efficient landfill operations, site design, regulatory compliance, landfill economics, waste acceptance and screening procedures, groundwater sampling and statistical analysis, landfill gas management, and the management of daily landfill operations and record keeping. Rob has also developed a comprehensive safety program and contingency plan that meets all compliance and regulatory standards.

Part 5: Figures

List of Figures

List of Plan Sheets



Legend

Intermountain Regional Landfill Facility Boundary

N

0.5 0.25 0 0.5 1

Miles

USGS 7.5-Minute Topographic Quad:
Goshen Pass

Intermountain Regional Landfill

Figure One

USGS Topographic Map and Site Vicinity

Permit Application

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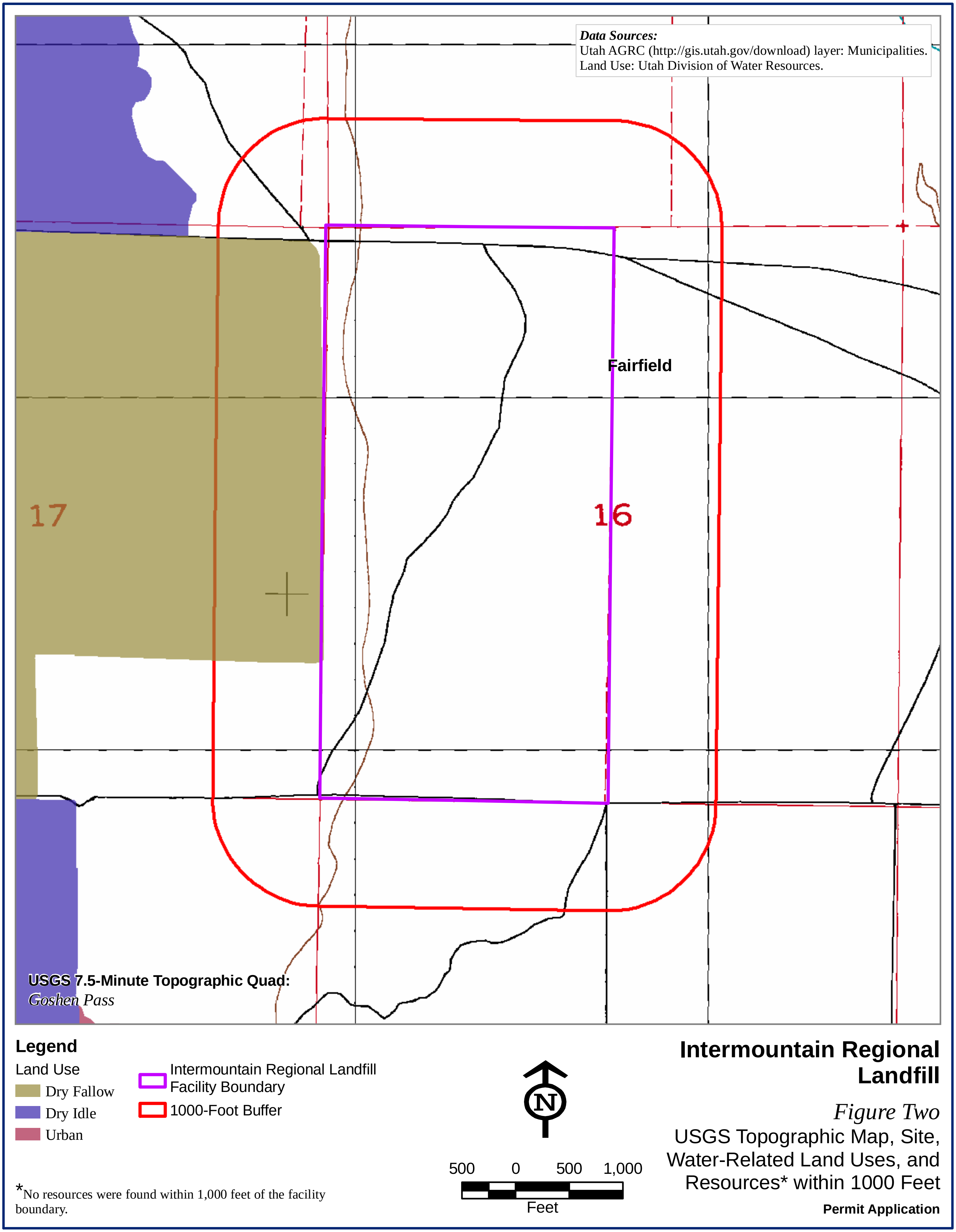

*No resources were found within 1,000 feet of the facility boundary.

Intermountain Regional Landfill

Figure Two

USGS Topographic Map, Site, Water-Related Land Uses, and Resources* within 1000 Feet

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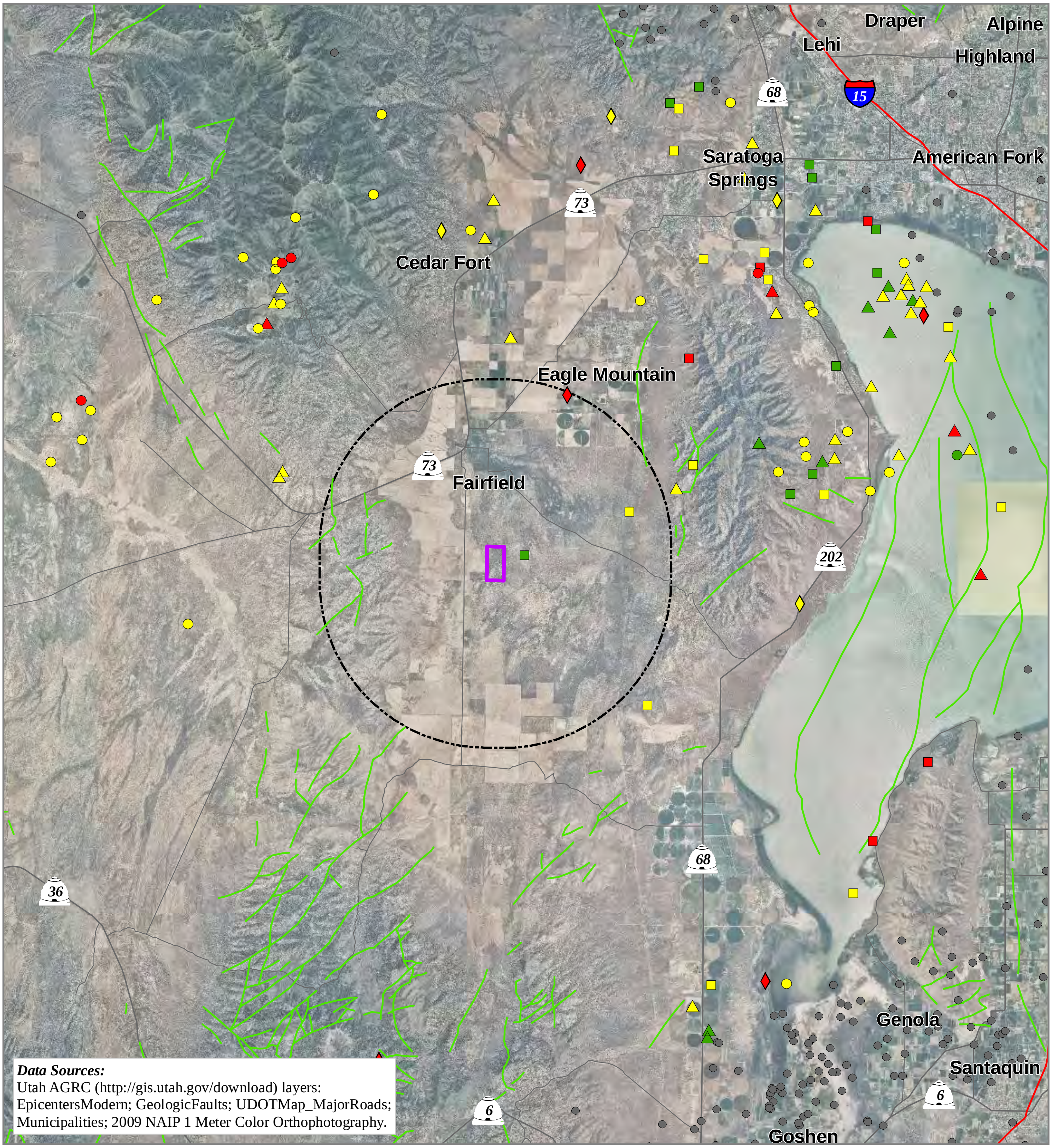

Data Sources:
Utah AGRC (http://gis.utah.gov/download) layers: EpicentersModern; GeologicFaults; UDOTMap_MajorRoads; Municipalities; 2009 NAIP 1 Meter Color Orthophotography.

Legend

Earthquake*
Decade, Magnitude

- *1990s, 2.00 - 2.99*
- *1990s, 1.00 - 1.99*
- *1990s, 0.00 - 0.99*
- *1980s, 2.00 - 2.99*
- *1980s, 1.00 - 1.99*
- *1980s, 0.00 - 0.99*
- *1970s, 2.00 - 2.99*
- *1970s, 1.00 - 1.99*
- *1970s, 0.00 - 0.99*
- *1960s, 2.00 - 2.99*
- *1960s, 1.00 - 1.99*
- Earthquake Outside 15-Mile Radius of Facility Boundary
- Geologic Fault
- Facility Boundary
- Five-Mile Buffer

2.5 1.25 0 2.5 5
Miles

Intermountain Regional Landfill

Figure Three
Geologic Features

Permit Application

* Earthquakes displayed are within a 15-mile radius of the facility boundary.

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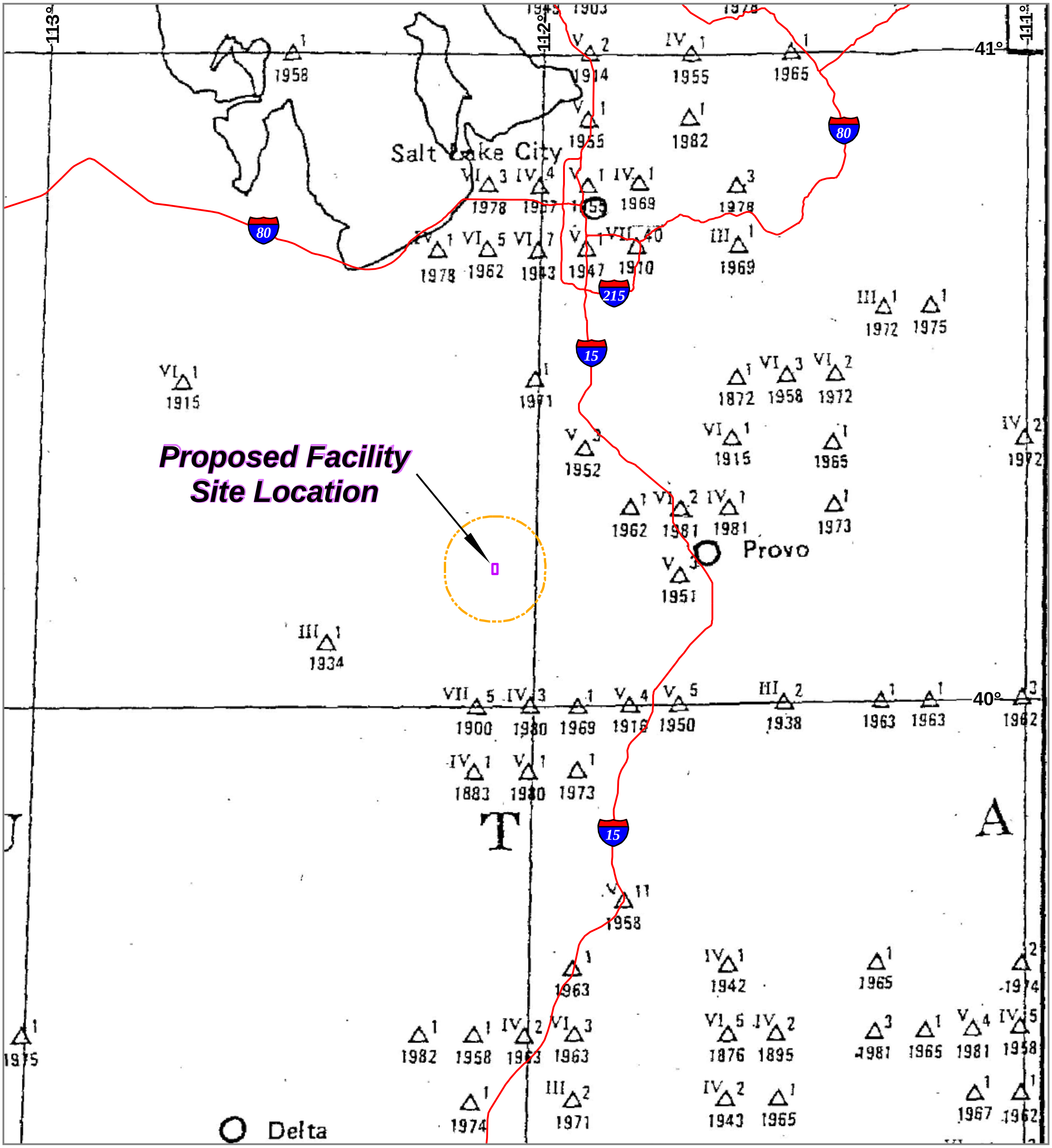

Legend

- Facility Boundary
- Five-Mile Buffer

Data Sources:
Scanned seismicity map of the State of Utah, Map MF-1856.
UDOTMap_MajorRoads layer from Utah AGRC (http://gis.utah.gov/download).

10 5 0 10 20

Miles

Intermountain Regional Landfill

Figure Four

Seismicity

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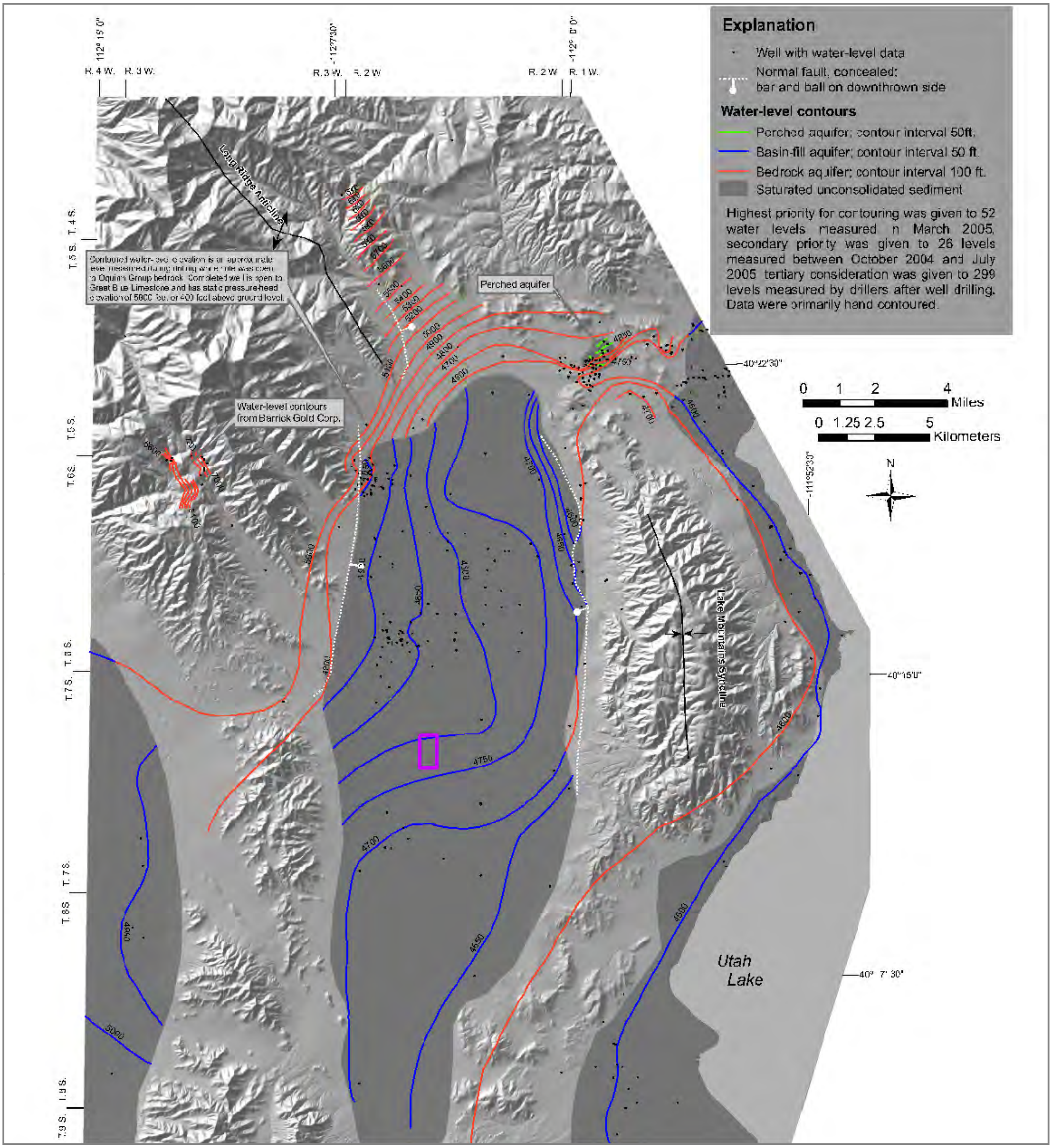


Legend

Intermountain Regional Landfill Proposed Location

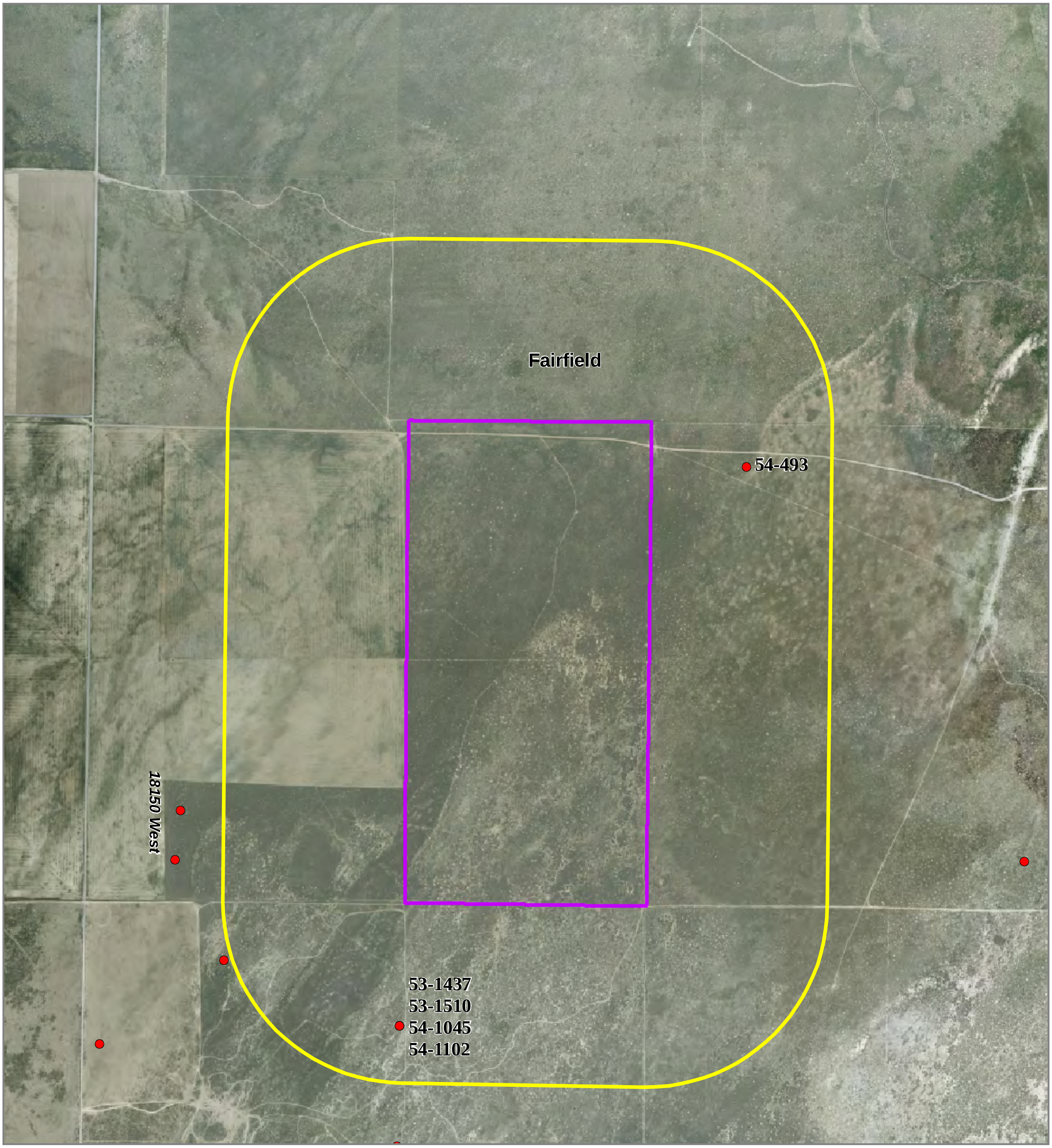
Intermountain Regional Landfill

Figure Five

Potentiometric Contours

Data Source:
Potentiometric Contours figure (Figure 3) from *Ground-Water Flow, Water-Level Trends, and the Connection Between Fairfield Spring and the Basin-Fill Aquifer in Cedar Valley, Utah County, North-Central Utah*, J. Lucy Jordan and Walid Sabbah, *2007 UGA Publication 36*, G.C. Willis, M.D. Hylland, D. L. Clar, T. C. Chidsey, Jr., editors.

Permit Application



Legend

- Water Right Point-of-Diversion
- Intermountain Regional Landfill Proposed Location
- 2000-Foot Buffer

Data Sources:
WRPOD.shp from State of Utah, Department of Natural Resources, Division of Water Rights, December 2009.
http://waterrights.utah.gov/gisinfo/wrcover.asp

750 0 750 1,500
Feet

Intermountain Regional Landfill

Figure Six
Water Right
Points-of-Diversion

Permit Application

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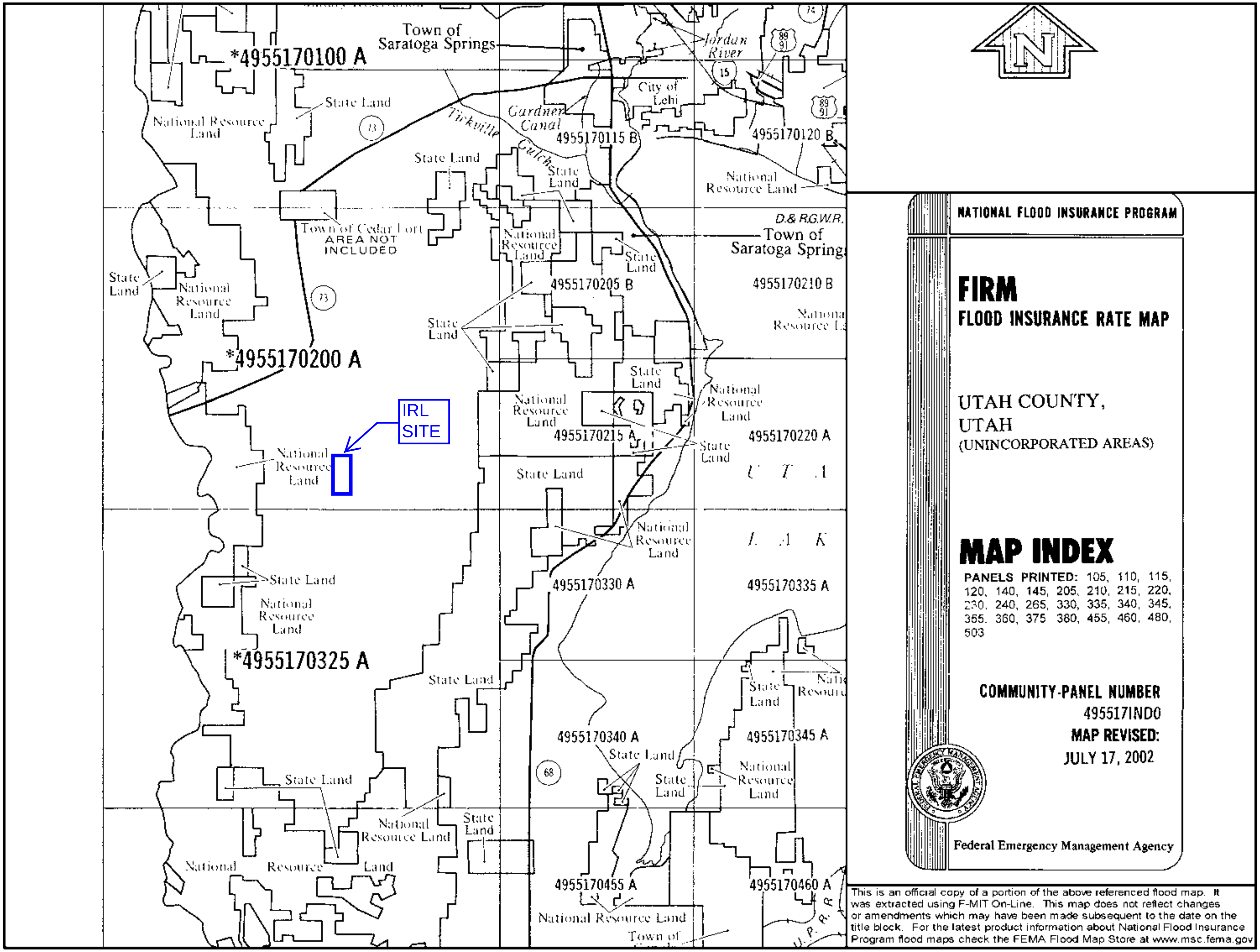
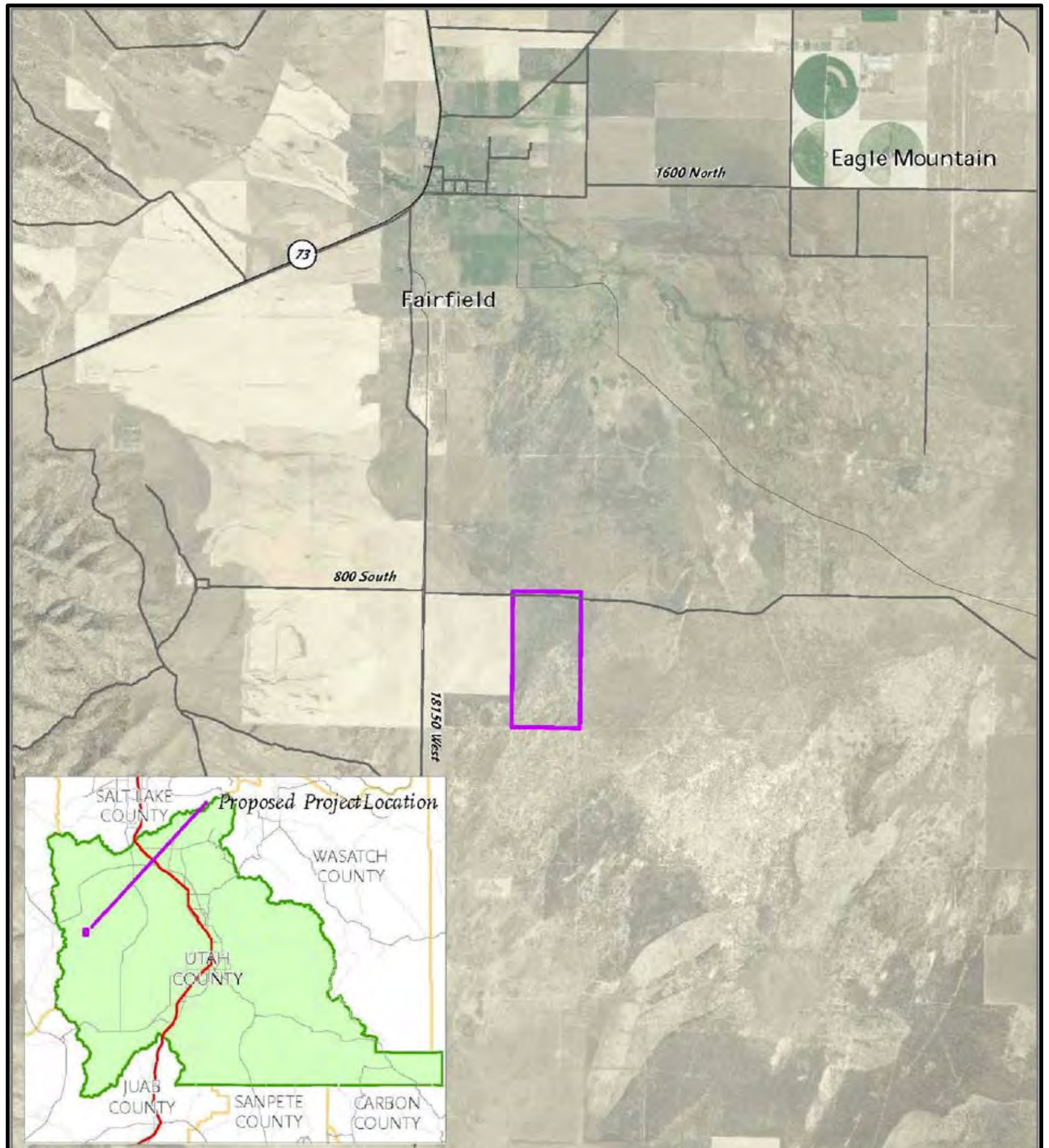
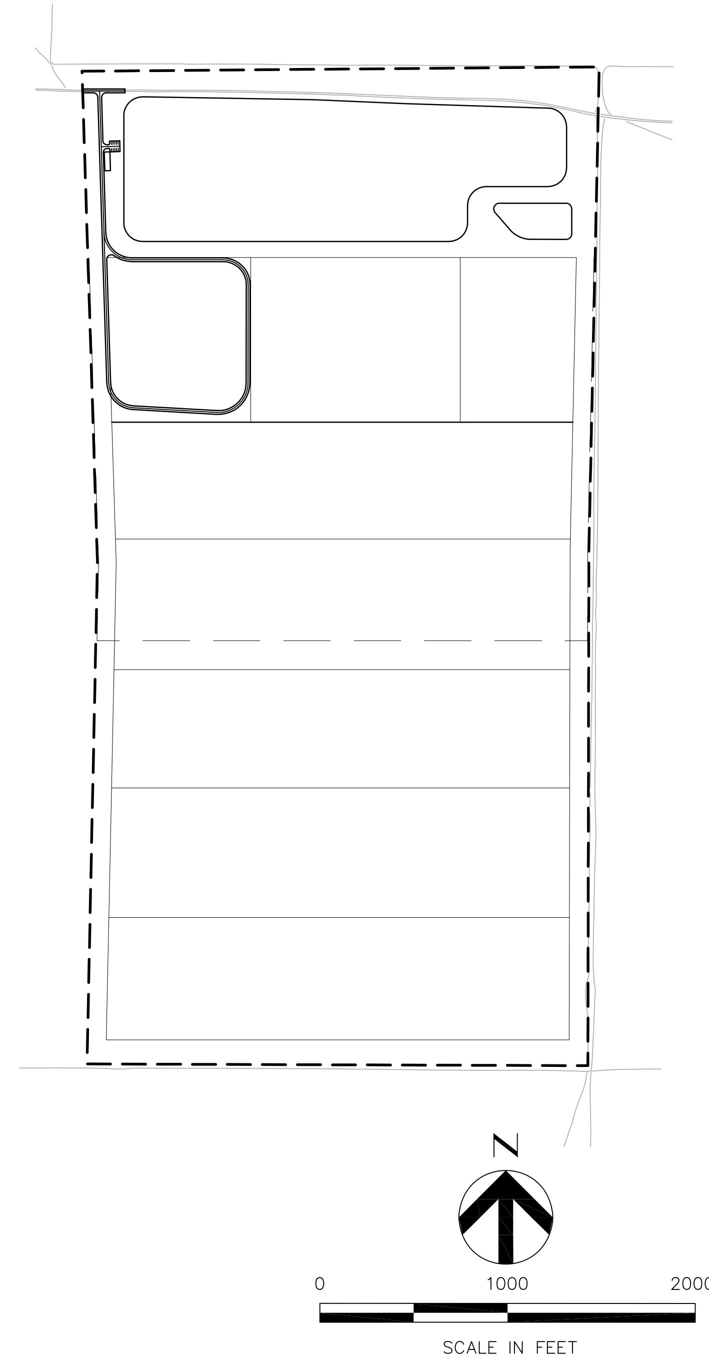


FIGURE 7
FEMA FIRM MAP





INTERMOUNTAIN REGIONAL LANDFILL

2010 PERMIT APPLICATION

AUGUST 13, 2010

INDEX OF DRAWINGS

HDR	PROJECT TITLE: INTERMOUNTAIN REGIONAL LANDFILL 2010 PERMIT APPLICATION	PROJECT NUMBER:	FILE NAME: 01C001.DWG
	SHEET TITLE: COVER	PROJECT MANAGER: T. WARNER	SCALE: 1"=1000'
		DATE: 08/13/10	SHEET NUMBER: 1 OF 13

GENERAL NOTES

1. COORDINATE SYSTEM IS BASED ON LOCAL SURVEY. THE BENCHMARK TO BE USED FOR CONSTRUCTION IS LOCATED AS SHOWN ON DRAWING NO. C3. EXISTING CONTOURS ARE BASED ON AERIAL SURVEY FLOWN NOVEMBER 18, 2009, BY OLYMPUS AERIALS INC, SALT LAKE CITY, UTAH. CURRENT GROUND ELEVATIONS MAY VARY FROM THOSE SHOWN.
2. THE CONTRACTOR SHALL VERIFY EXISTING CONTOURS PRIOR TO THE START OF EARTHWORK.
3. GROUNDWATER AT THE SITE MAY VARY DEPENDING ON STREAM FLOW, RAINFALL, AND SUBSURFACE CONDITIONS. THERE SHALL NOT BE ANY ADDITIONAL PAYMENT OR EXTENSION OF CONTRACT TIME FOR WORKING WITH SATURATED SOILS OR HANDLING GROUNDWATER SEEPAGE.
4. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO PROTECT THE EXISTING LANDFILL FEATURES DURING THE CONSTRUCTION PERIOD. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE INCURRED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PROTECT EXISTING LANDFILL FEATURES.
5. THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES HAVE NOT BEEN ESTABLISHED BY THE OWNER OR HIS REPRESENTATIVES. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UTILITIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING PROPER SAFE WORKING DISTANCE FROM ALL UTILITY EASEMENTS.
6. EXCAVATION BY "BLASTING" IS NOT PERMITTED ON THIS PROJECT.
7. FINISHED GROUND ELEVATIONS SHALL MATCH EXISTING GROUND ELEVATIONS EXCEPT AS SHOWN ON THE PLANS. EXCESS SOIL FROM EXCAVATION AND GRADING SHALL BE PLACED IN DESIGNATED STOCKPILE LOCATIONS AS APPROVED BY THE OWNER. TRANSPORT OF SOIL TO FILL AREAS SHALL BE CONDUCTED BY THE CONTRACTOR AT NO ADDITIONAL EXPENSE TO THE OWNER.
8. GEOTECHNICAL INVESTIGATION REPORTS FOR THE SITE ARE AVAILABLE FOR REVIEW UPON THE REQUEST OF HDR ENGINEERING. THE CONTRACTOR MAY PERFORM ADDITIONAL GEOTECHNICAL INVESTIGATIONS AS HE DEEMS NECESSARY FOR CONSTRUCTION ACTIVITIES. HOWEVER, THERE SHALL BE NO ADDITIONAL PAYMENT TO THE CONTRACTOR FOR ADDITIONAL GEOTECHNICAL INVESTIGATIONS.
9. THE CONTRACTOR SHALL CONSTRUCT, AND UPON COMPLETION OF THE PROJECT, REMOVE TEMPORARY CONSTRUCTION ACCESS ROADS. SUCH ROADS SHALL BE LOCATED AS APPROVED BY THE OWNER. DRAINAGE PATTERNS AT THE SITE SHALL NOT BE ALTERED BY ROAD CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONSTRUCTION AND MAINTENANCE OF TEMPORARY DRAINAGE STRUCTURES, INCLUDING CULVERTS, AT NO ADDITIONAL COST TO THE OWNER.
10. THE CONTRACTOR SHALL CREATE SWPPP AND SUBMIT TO ENGINEER AND OWNER FOR APPROVAL. THE CONTRACTOR SHALL OBTAIN A UPDES PERMIT FOR LANDFILL CONSTRUCTION. REFER TO TECHNICAL SPECIFICATIONS.
11. THE CONTRACTOR SHALL INSTALL, MAINTAIN, AND UPON COMPLETION OF THE PROJECT, REMOVE TEMPORARY EROSION AND SEDIMENT CONTROLS IN ACCORDANCE WITH THE SITE SWPPP AND PURSUANT TO REQUIREMENTS. SUCH CONTROLS SHALL BE PLACED AT THE LIMITS OF DISTURBED AREAS AND AT INTERMEDIATE LOCATIONS WHERE CONCENTRATED FLOW IS LIKELY.
12. THE CONTRACTOR SHALL KEEP THE LANDFILL HAUL ROAD OPERATIONAL AT ALL TIMES. THE CONTRACTOR SHALL SUBMIT A SCHEDULE TO THE OWNER FOR REVIEW AND APPROVAL 72 HOURS PRIOR TO CONDUCTING OPERATIONS THAT MAY AFFECT OPERATION OF THE LANDFILL ACCESS ROADS.
13. TEMPORARY CONSTRUCTION SLOPES SHALL NOT BE GREATER THAN 2H:1V. STEEPER SLOPES WILL ONLY BE ALLOWED IF THE CONTRACTOR PROVIDES A GEOTECHNICAL ENGINEERING REPORT SPECIFYING MAXIMUM SLOPES AND THE DURATION FOR WHICH SUCH SLOPES SHALL REMAIN IN PLACE.
14. THE CONTRACTOR SHALL REMOVE ALL VEGETATION WITHIN THE CONSTRUCTION LIMITS AS REQUIRED TO CONSTRUCT THE PROJECT. ALL VEGETATION MAY BE DISPOSED OF ON-SITE AS DIRECTED BY THE OWNER.
15. THE CONTRACTOR SHALL IMMEDIATELY REPORT TO THE ENGINEER ANY ERROR OR DISCREPANCY FOUND ONCE THE CONTRACT DOCUMENT IS CAREFULLY REVIEWED AND ALL ASPECTS OF FIELD WORK HAVE BEEN VERIFIED. IN THE EVENT THE CONTRACTOR CONTINUES TO WORK ON AN ITEM WHERE AN ERROR EXISTS, IT SHALL BE DEEMED THAT THE CONTRACTOR BID AND INTENDED TO EXECUTE THE MORE STRINGENT OR HIGHER QUALITY REQUIREMENT WITHOUT AN INCREASE IN CONTRACT SUM OR TIME. THE CONTRACTOR SHALL ALSO BE RESPONSIBLE TO CORRECT ANY FAILURE OF PARTS TO COORDINATE OR FIT PROPERLY INTO FINAL POSITION, AS A RESULT OF CONTRACTOR FAILURE TO RAISE OR RESOLVE A DISCREPANCY.
16. THE DRAWINGS AND SPECIFICATIONS SHOULD AGREE WITH EACH OTHER, AND WORK CALLED FOR BY DRAWINGS AND NOT MENTIONED IN SPECIFICATIONS, OR VICE VERSA, SHALL BE FURNISHED BY BOTH. WHEN DISCREPANCIES EXIST BETWEEN SCALE AND DIMENSIONS, THE DIMENSIONED FIGURE SHALL BE USED. IF DISCREPANCIES EXIST BETWEEN THE DRAWINGS AND SPECIFICATIONS, THE CONTRACTOR SHALL NOT WORK WITHOUT CLARIFICATION FROM ENGINEER AND RESOLUTION BY OWNER. THE OWNER'S DECISION ON THE RESOLUTION IS FINAL.
17. CONTRACTORS AND EACH SUB CONTRACTOR SHALL VERIFY ALL GRADES, LINES, LEVELS, AND DIMENSIONS AS INDICATED ON DRAWINGS, AND HE SHALL REPORT ERRORS TO THE ENGINEER. THE CONTRACTOR SHALL ESTABLISH BENCHMARKS IN AT LEAST TWO WIDELY SEPARATED PLACES, AND AS WORK PROGRESSES THE CONTRACTOR WILL MAINTAIN ADEQUATE HORIZONTAL AND VERTICAL CONTROL.

STANDARD ABBREVIATIONS

&	AND
APPROX	APPROXIMATELY
ASPH	ASPHALT
@	AT
AVG	AVERAGE
BOE	BOTTOM OF EXCAVATION
BM	BENCHMARK
BOL	BOTTOM OF LINER
X	BY
BLDG	BUILDING
CL	CENTERLINE
CMP	CORRUGATED METAL PIPE
CO	CLEAN OUT
CFS	CUBIC FEET PER SECOND
CY	CUBIC YARD
DIA	DIAMETER
DET	DETAIL
DWG	DRAWING
ELEV	ELEVATION
EXIST	EXISTING
EXC	EXCAVATION
FL	FLOW LINE
FML	FLEXIBLE MEMBRANE LINER
FT	FEET
G	GAS PROBE
GAL	GALLON
GND	GROUND
GCL	GEOCOMPOSITE LINER
GCDL	GEOCOMPOSITE DRAINAGE LAYER
GDL	GRAVEL DRAINAGE LAYER
GLER	GEOMEMBRANE LINER EVALUATION REPORT
GNDL	GEONET DRAINAGE LAYER
GP	GAS PROBE
HDPE	HIGH DENSITY POLYETHYLENE
HORIZ	HORIZONTAL
ID	INSIDE DIAMETER
IN	INCHES
IE	INVERT ELEVATION
LCRS	LEACHATE COLLECTION AND REMOVAL SYSTEM
LCS	LEACHATE COLLECTION SYSTEM
LCP	LEACHATE COLLECTION PIPE
LCPR	LEACHATE COLLECTION PIPE RISER
LF	LINEAR FEET
LFG	LANDFILL GAS
LB	POUND
LG	LONG
MH	MANHOLE
MAX	MAXIMUM
MIL	.001 INCHES
MIN	MINIMUM
MW	MONITOR WELL
MSL	MEAN SEA LEVEL
N	NORTH
NIC	NOT IN CONTRACT
NO	NUMBER
NTS	NOT TO SCALE
OC	ON CENTER
OZ	OUNCE
%	PERCENT
PLCP	PERFORATED LEACHATE COLLECTION PIPE
PERF	PERFORATED
PGV	PASSIVE GAS VENT
PC	POINT OF CURVATURE
PVI	POINT OF VERTICAL INTERSECTION
PT	POINT OF TANGENCY
PZ	PIEZOMETER
Q	FLOW
QTY	QUANTITY
R	RADIUS
RCP	REINFORCED CONCRETE PIPE
REF	REFERENCE
REQ	REQUIRED
RD	ROAD
SCH	SCHEDULE
SDL	SAND DRAINAGE LAYER
SEC	SECTION
SHT	SHEET
S	SOUTH
SDR	STANDARD DIMENSION RATIO
SP	STEEL PIPE
SQ	SQUARE
STA	STATION
SLER	SOIL LINER EVALUATION REPORT
SLQCP	SOIL LINER QUALITY CONTROL PLAN
SS	SIDE SLOPE
SWPPP	STORMWATER POLLUTION PREVENTION PLAN
TL	TANGENT LENGTH
TOC	TOP OF COVER
TOFC	TOP OF FINAL COVER
TOL	TOP OF LINER
TOS	TOE OF SLOPE
TS	TOP SLOPE
TEMP	TEMPORARY
TYP	TYPICAL
VCP	VITRIFIED CLAY PIPE
VERT	VERTICAL
VLDPE	VERY LOW DENSITY POLYETHYLENE
W	WEST
W/	WITH
YD	YARD

SYMBOLS

DRAWING ON WHICH SECTION IS CUT:

SECTION NUMBER
B
C11
SHEET NUMBER ON WHICH SECTION IS DRAWN

DRAWING ON WHICH SECTION APPEARS:

SECTION NUMBER
SECTION
SCALE
B
C11
SHEET NUMBER ON WHICH SECTION IS DRAWN

DRAWING ON WHICH DETAIL IS INDICATED:

DETAIL NAME
DETAIL NUMBER
3
C7
SHEET NUMBER ON WHICH DETAIL IS DRAWN

DRAWING ON WHICH DETAIL APPEARS:

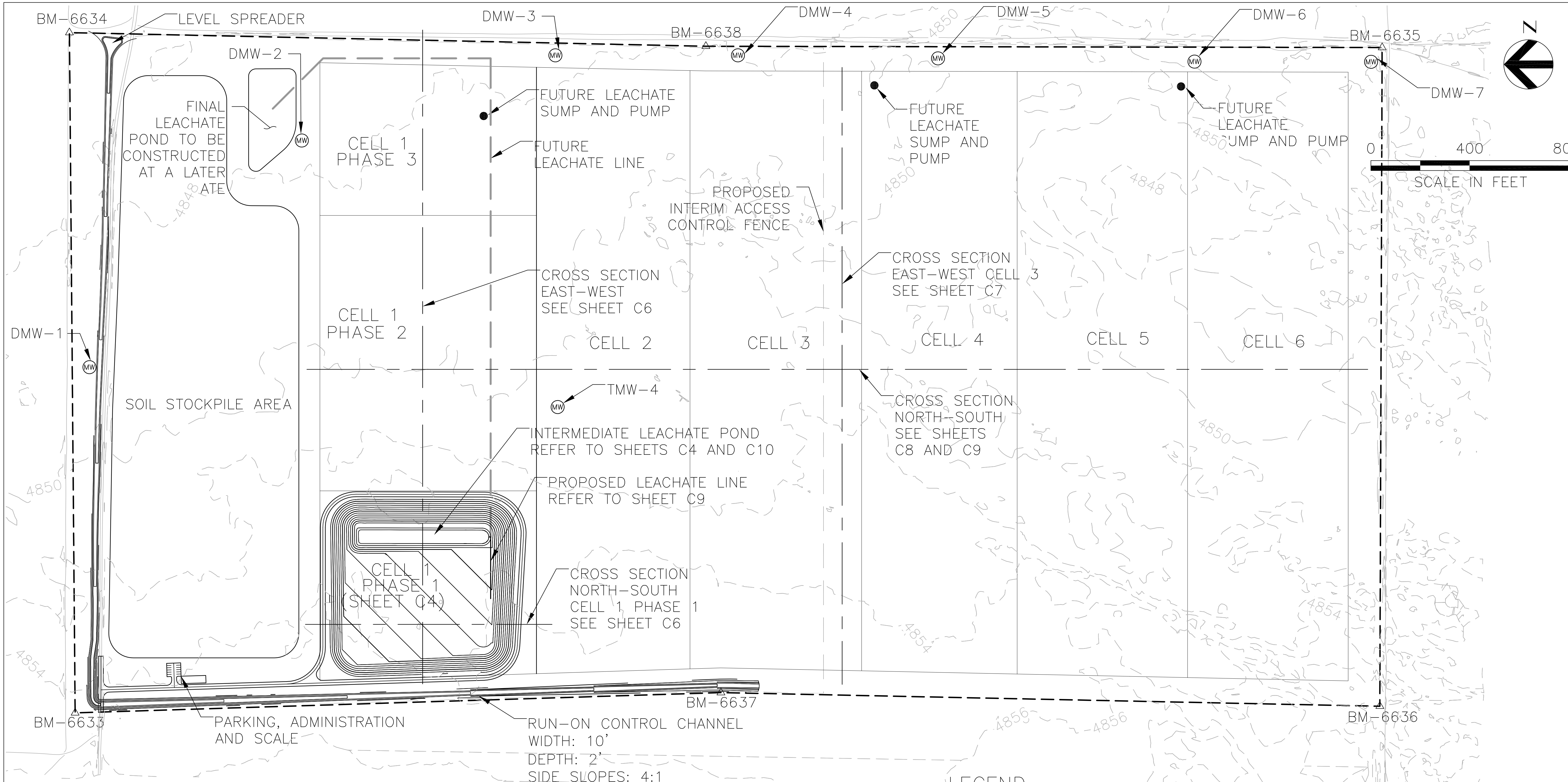
DETAIL NUMBER
DETAIL
SCALE
3
C7
SHEET NUMBER ON WHICH DETAIL IS DRAWN

VERTICAL CONTROL DESIGNATION

2.0%	GRADE
3:1	SLOPE DESIGNATION (HORIZONTAL : VERTICAL)
1 / 3	SLOPE DESIGNATION
N 14995.00 / E 12885.00	COORDINATE
	WATER SURFACE (PROFILE)
x 430	SPOT ELEVATION, FEET

HDR

PROJECT TITLE	INTERMOUNTAIN REGIONAL LANDFILL 2010 PERMIT APPLICATION
SHEET TITLE	GENERAL NOTES & ABBREVIATIONS
PROJECT NUMBER	
PROJECT MANAGER	T. WARNER
DATE	08/13/10
FILE NAME	01C002.DWG
SCALE	NTS
SHEET NUMBER	2 OF 13



LEGEND

Symbol	Description
--4640--	EXISTING CONTOURS
(solid line)	CELL FOOTPRINT BOUNDARY (APPROX.)
(solid line)	PROPOSED LEACHATE DRAIN LINE
— — —	PROPOSED INTERIM ACCESS CONTROL FENCE
(MW)	DEEP MONITORING WELL
DMW-X	DEEP MONITORING WELL NUMBER
TMW-X	TEMPORARY MONITORING WELL NUMBER

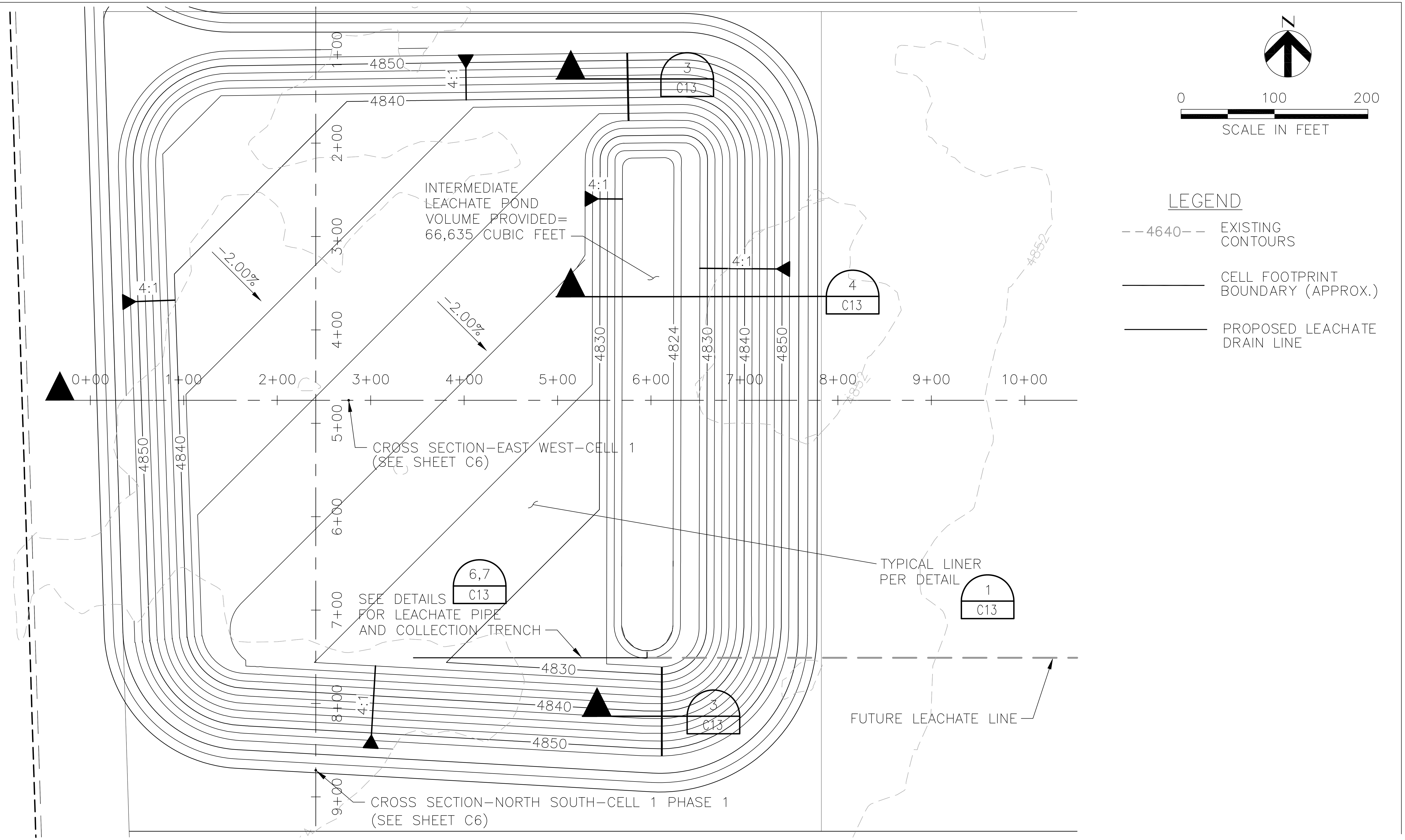
BENCHMARKS

BM	N	E	ELEVATION
6633	7248525.12	1477769.21	4854.44
6634	7248548.22	1480525.47	4847.01
6635	7243228.01	1480465.01	4850.36
6636	7243237.28	1477796.04	4852.51
6637	7245907.75	1477851.32	4854.87
6638	7245968.82	1480470.15	4847.96

NOTES:
EXISTING TOPOGRAPHIC DATA IS PROVIDED BY OLYMPUS AERIAL SURVEYS, INC., NOVEMBER 18, 2009.

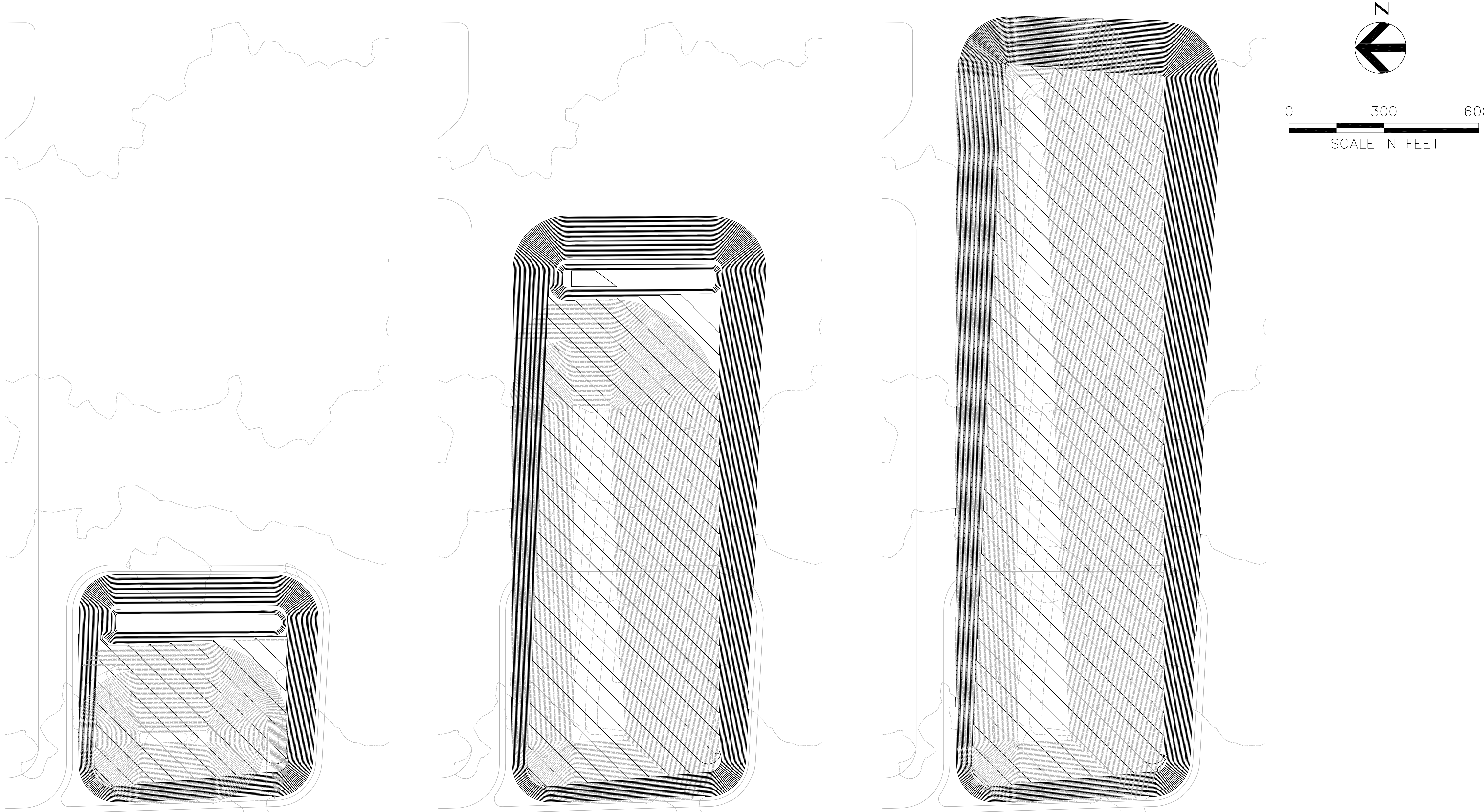
HDR

PROJECT TITLE	INTERMOUNTAIN REGIONAL LANDFILL 2010 PERMIT APPLICATION
SHEET TITLE	SITE PLAN
PROJECT NUMBER	
PROJECT MANAGER	T. WARNER
DATE	08/13/10
FILE NAME	01C003.DWG
SCALE	1"=400'
SHEET NUMBER	3 OF 13



HDR

PROJECT TITLE: INTERMOUNTAIN REGIONAL LANDFILL 2010 PERMIT APPLICATION		PROJECT NUMBER	FILE NAME: 01C004.DWG
SHEET TITLE: EXCAVATION LINER PLAN CELL 1 PHASE 1		PROJECT MANAGER: T. WARNER	SCALE: 1"=100'
		DATE: 08/13/10	SHEET NUMBER: 4 OF 13

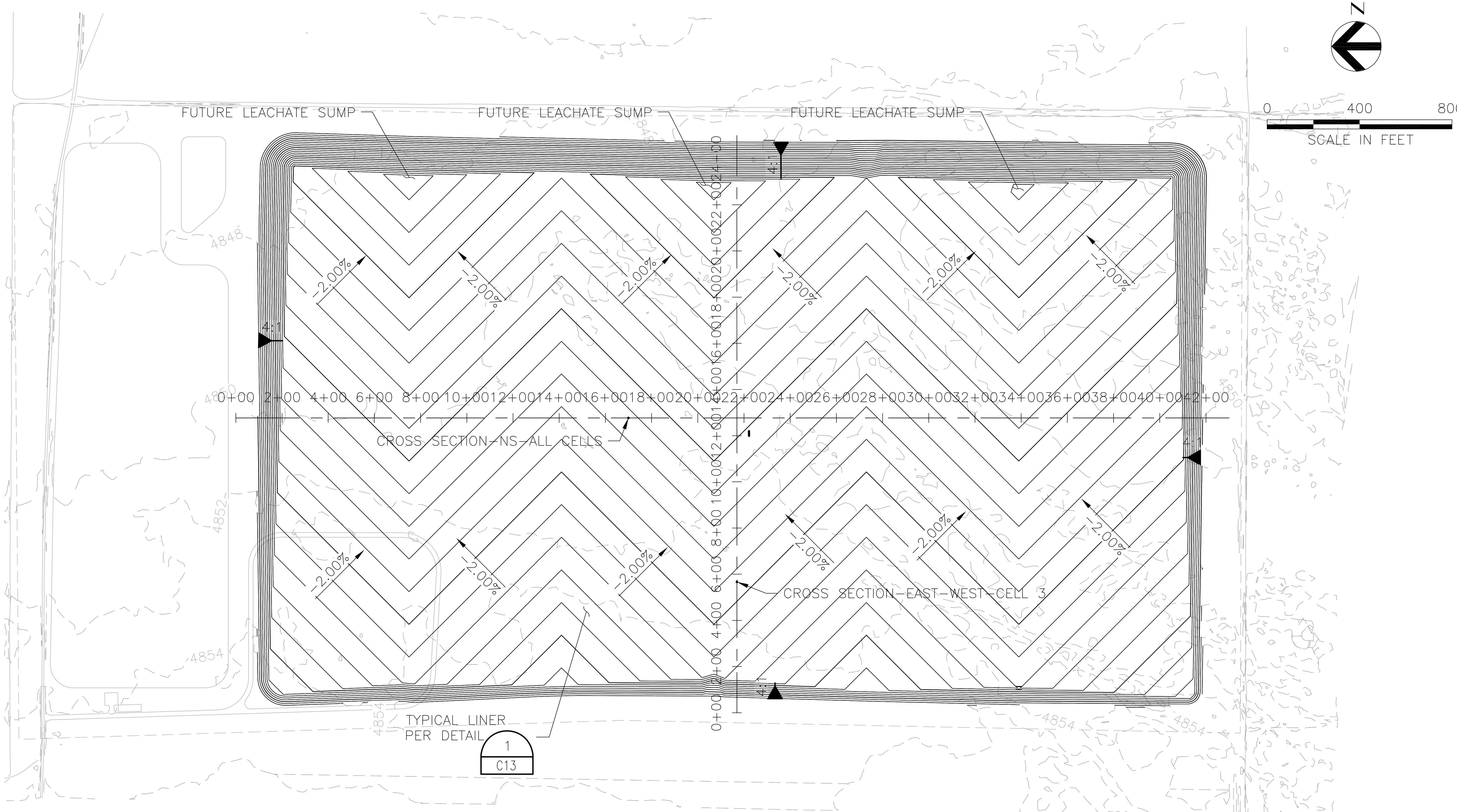


CELL 1 PHASE 1

CELL 1 PHASE 2

CELL 1 PHASE 3

HDR	PROJECT TITLE INTERMOUNTAIN REGIONAL LANDFILL 2010 PERMIT APPLICATION	PROJECT NUMBER	FILE NAME 01C005.DWG
	SHEET TITLE CELL 1 PHASING PLAN	PROJECT MANAGER T. WARNER	SCALE 1"=300'
		DATE 08/13/10	SHEET NUMBER 5 OF 13



HDR

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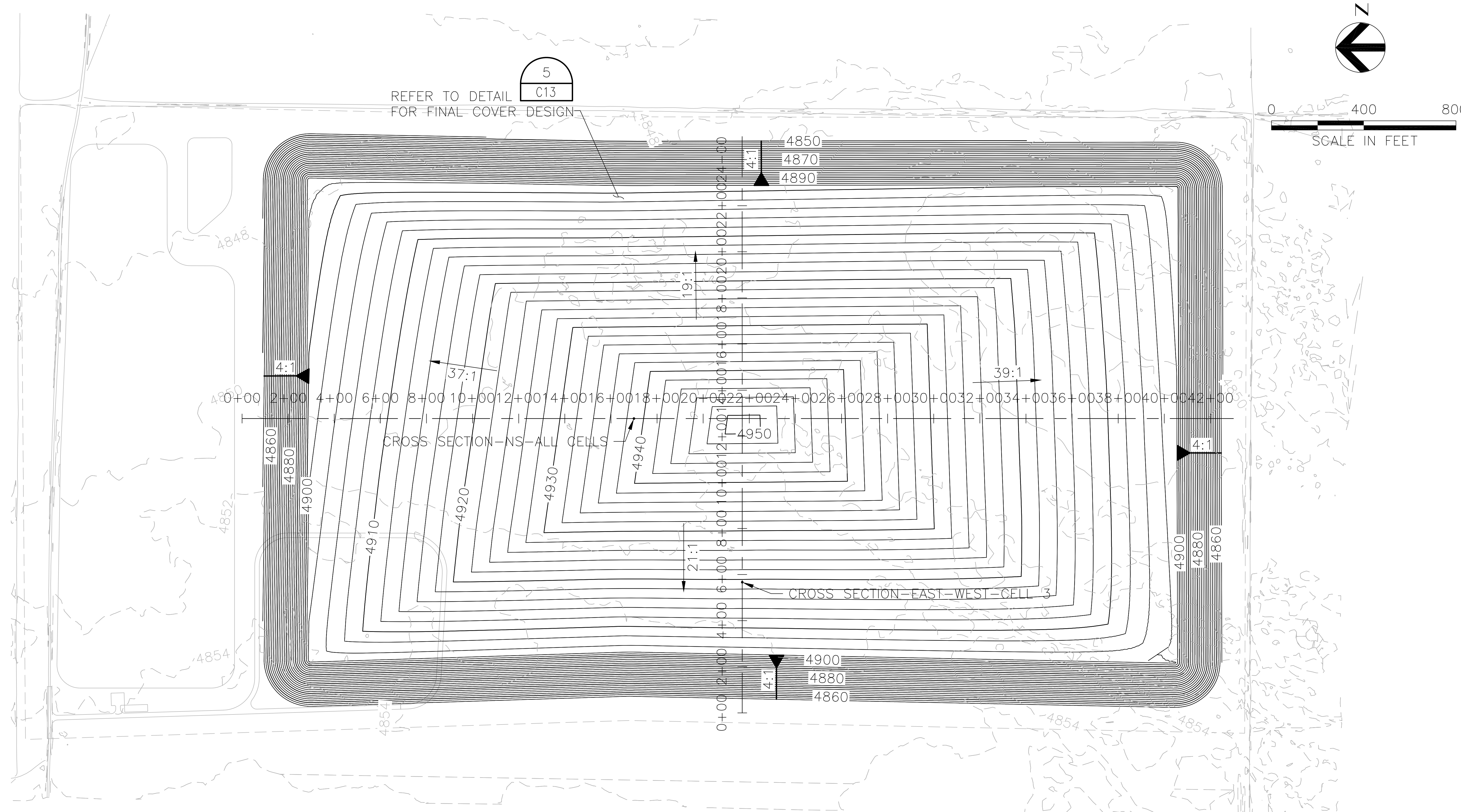
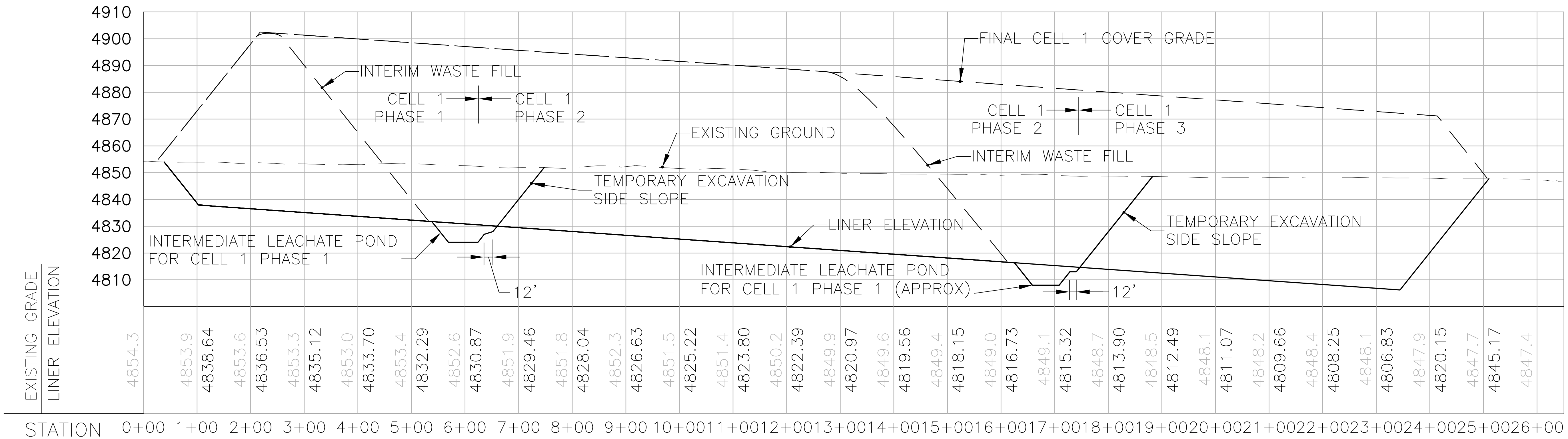
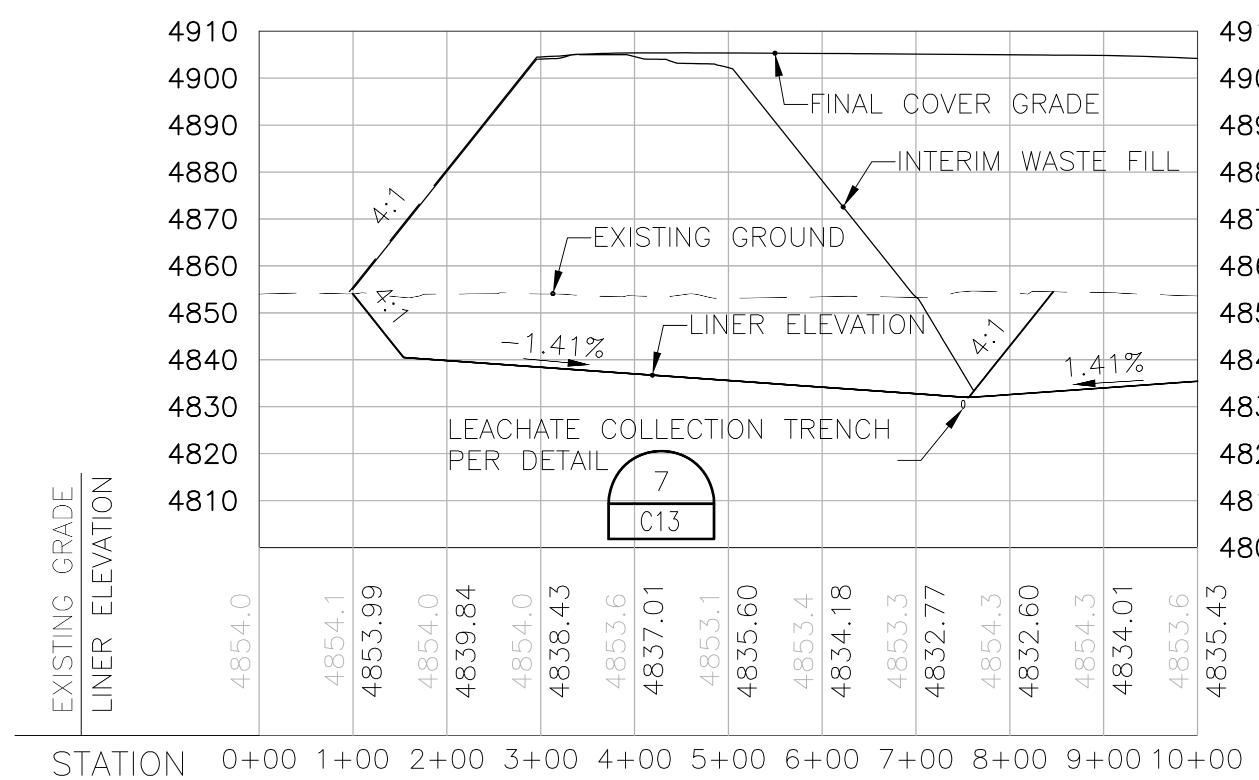
SHEET TITLE: EXCAVATION LINER PLAN ALL CELLS	PROJECT MANAGER: T. WARNER	SCALE: 1"=400'
	DATE: 08/13/10	SHEET NUMBER: 6 OF 13



PROJECT TITLE	PROJECT NUMBER	FILE NAME
INTERMOUNTAIN REGIONAL LANDFILL 2010 PERMIT APPLICATION		01C007.DWG
SHEET TITLE	PROJECT MANAGER	SCALE
FINAL COVER GRADING PLAN	T. WARNER	1"=400'
	DATE	SHEET NUMBER
	08/13/10	7 OF 13



CROSS SECTION EAST-WEST CELL 1

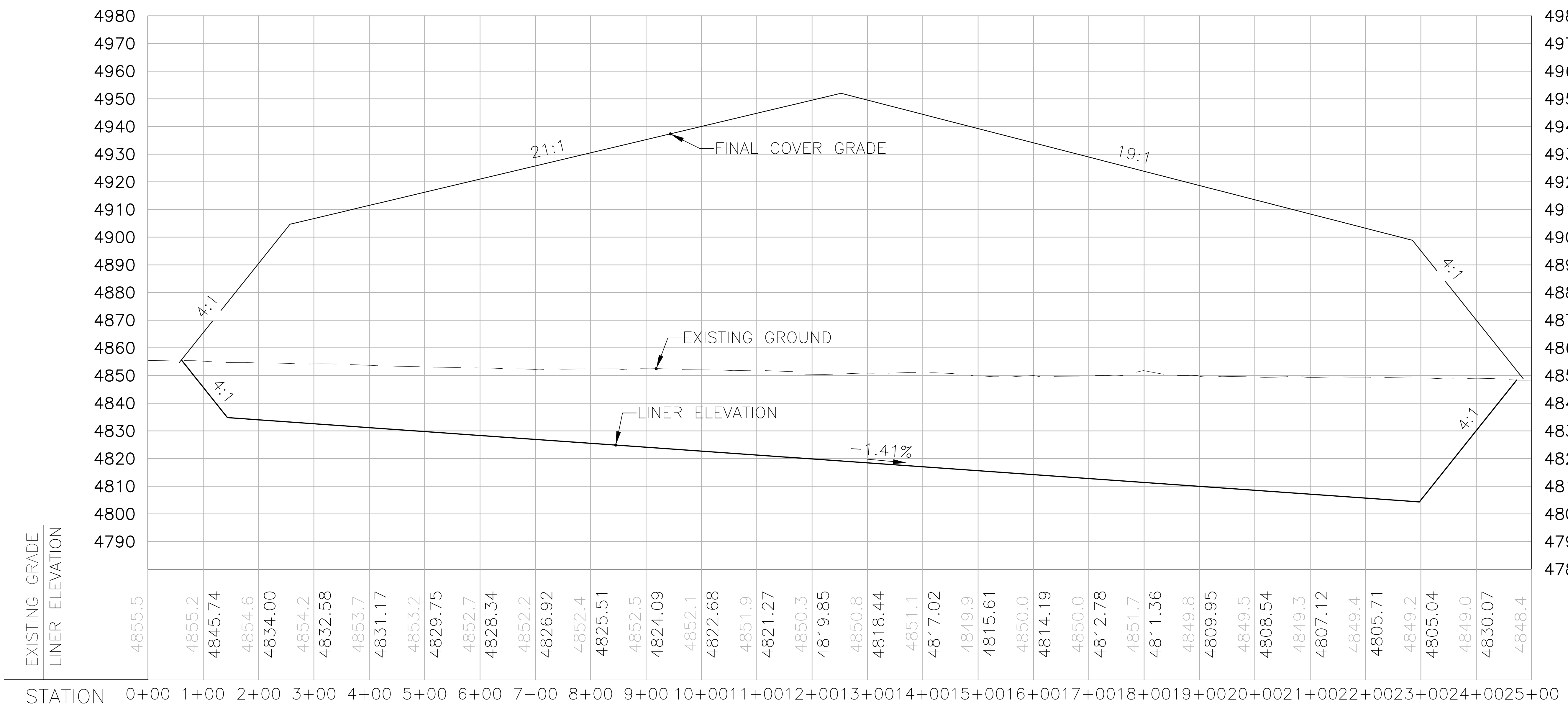


CROSS SECTION NORTH-SOUTH CELL 1 PHASE 1

0 200 400
SCALE IN FEET

HDR

PROJECT TITLE	PROJECT NUMBER	FILE NAME
INTERMOUNTAIN REGIONAL LANDFILL 2010 PERMIT APPLICATION		01C008.DWG
SHEET TITLE	PROJECT MANAGER T. WARNER	SCALE 1"=200'
CROSS SECTIONS	DATE 08/13/10	SHEET NUMBER 8 OF 13

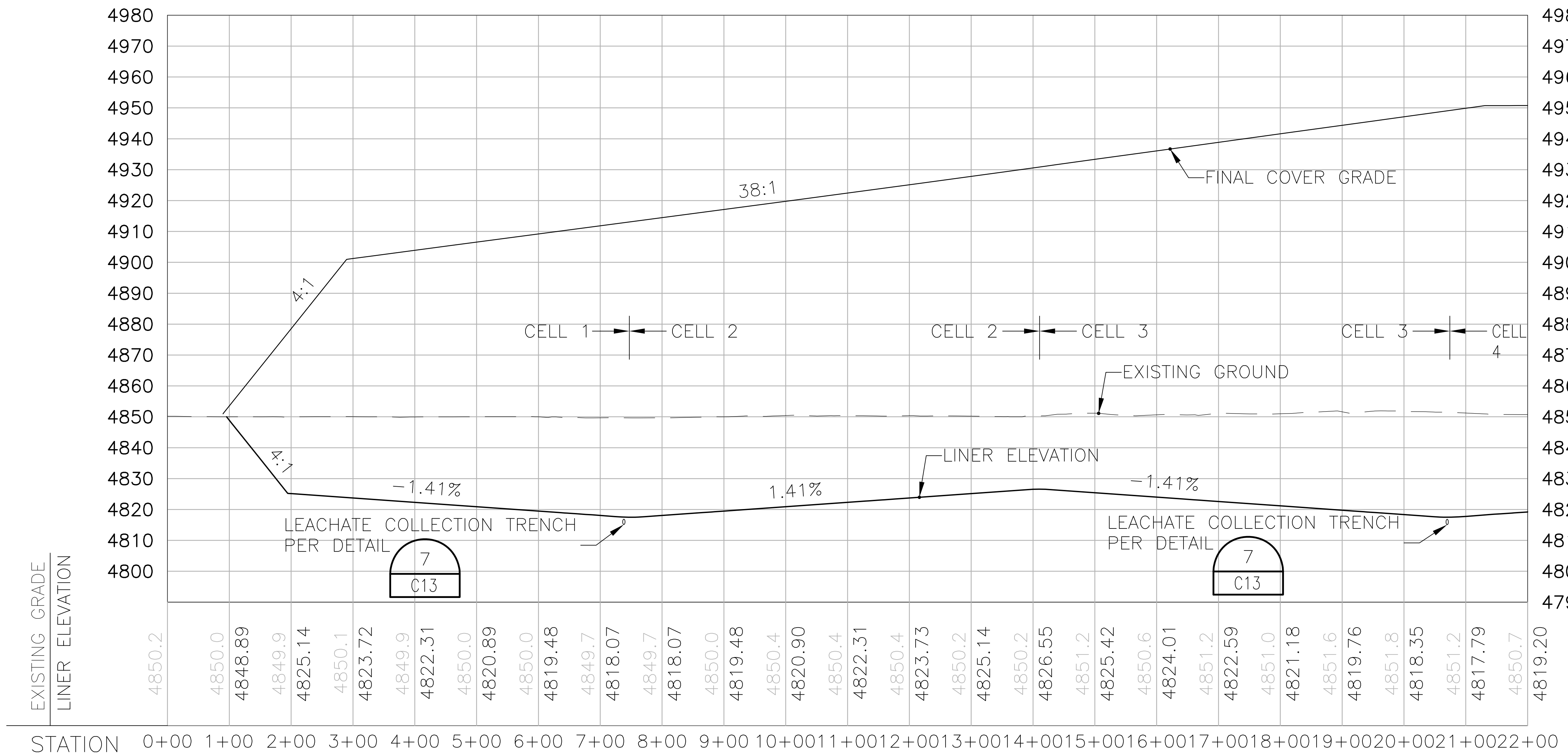


CROSS SECTION EAST–WEST
CELL 3

0 200 400
SCALE IN FEET

HDR

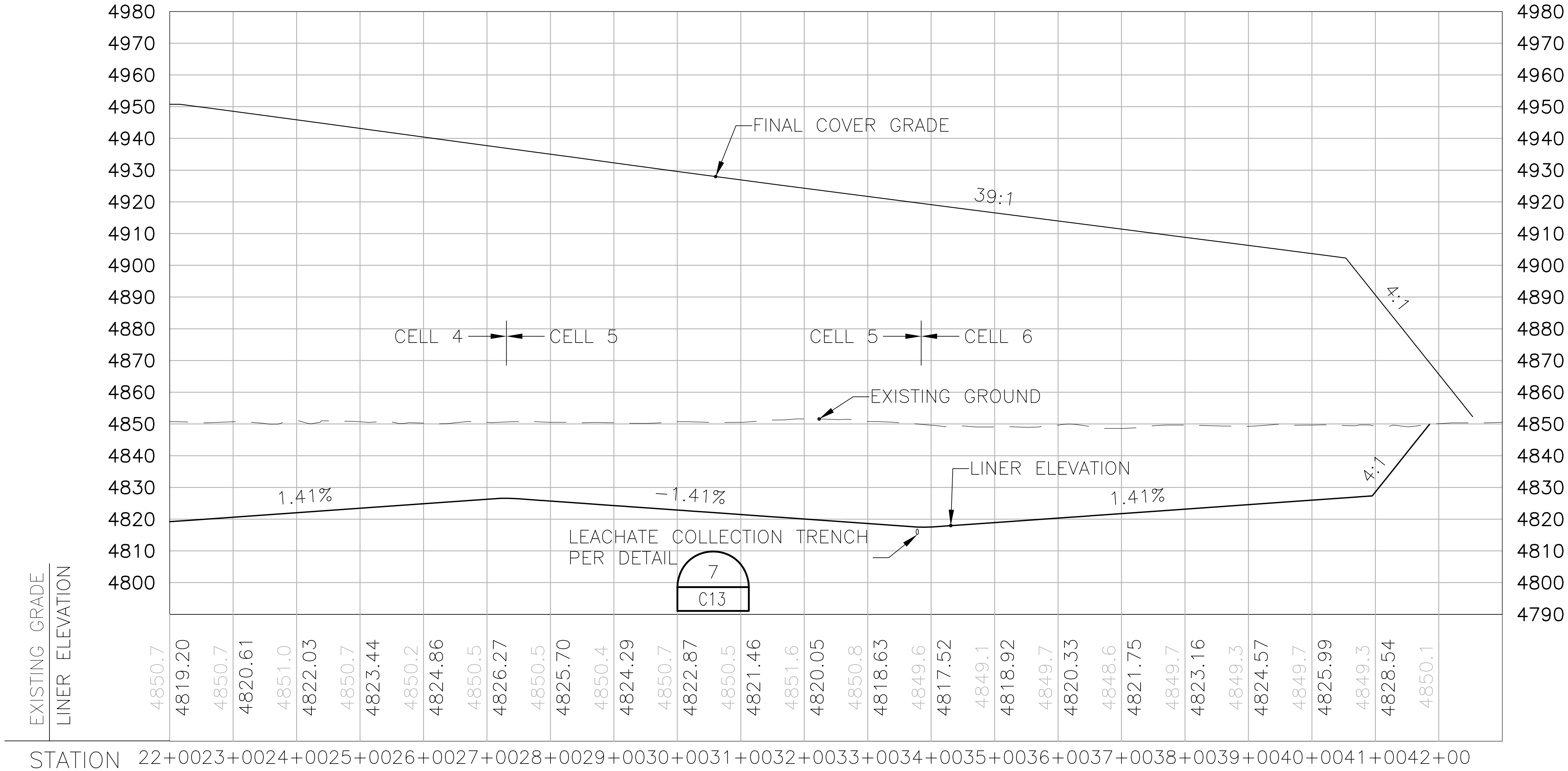
PROJECT TITLE	INTERMOUNTAIN REGIONAL LANDFILL 2010 PERMIT APPLICATION
SHEET TITLE	CROSS SECTIONS
PROJECT NUMBER	
PROJECT MANAGER	T. WARNER
DATE	08/13/10
FILE NAME	01C009.DWG
SCALE	1"=200'
SHEET NUMBER	9 OF 13



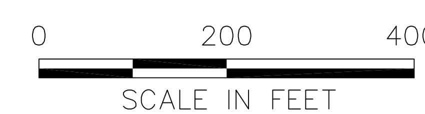
CROSS SECTION NORTH-SOUTH
ALL CELLS

HDR

PROJECT TITLE: INTERMOUNTAIN REGIONAL LANDFILL 2010 PERMIT APPLICATION		PROJECT NUMBER	FILE NAME: 01C010.DWG
SHEET TITLE: CROSS SECTIONS		PROJECT MANAGER: T. WARNER	SCALE: 1"=200'
		DATE: 08/13/10	SHEET NUMBER: 10 OF 13

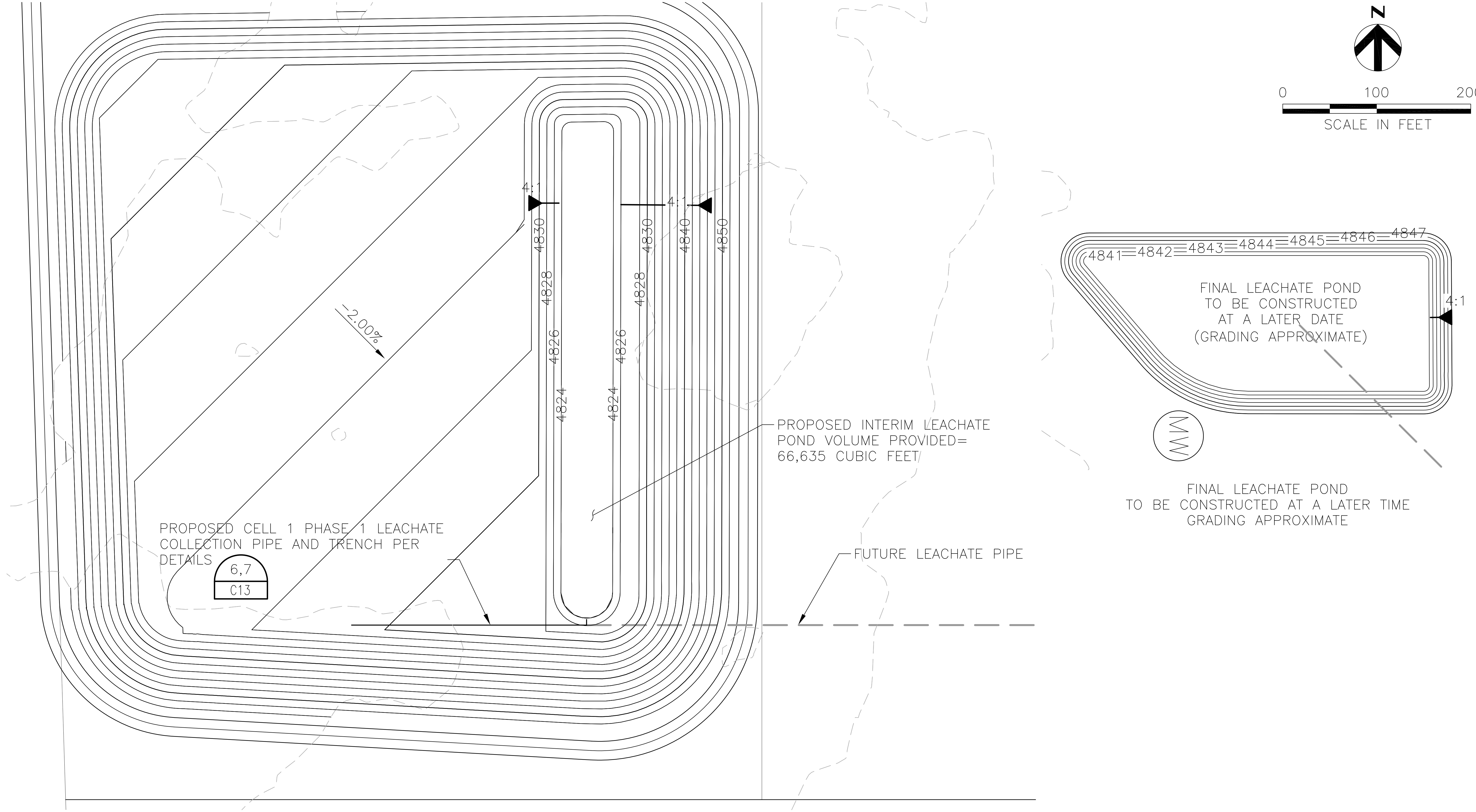


CROSS SECTION NORTH–SOUTH
ALL CELLS



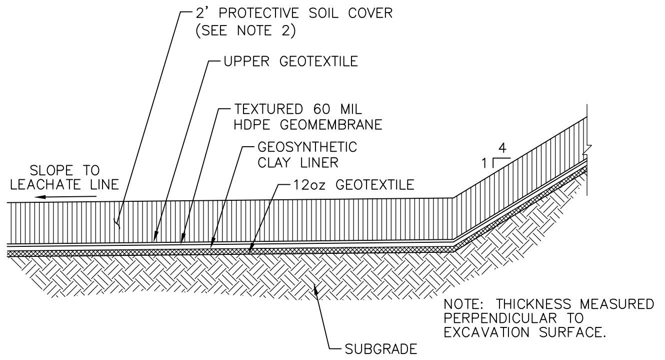
HDR

PROJECT TITLE	INTERMOUNTAIN REGIONAL LANDFILL 2010 PERMIT APPLICATION	PROJECT NUMBER	FILE NAME 01C011.DWG
SHEET TITLE	CROSS SECTIONS	PROJECT MANAGER T. WARNER	SCALE 1"=200'
		DATE 08/13/10	SHEET NUMBER 11 OF 13

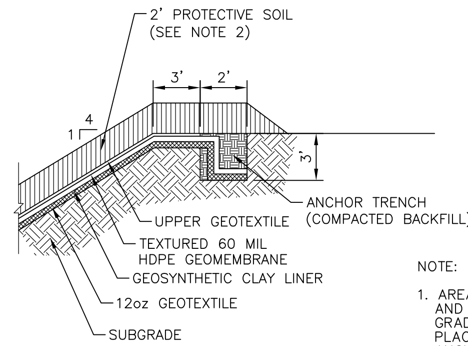


INTERIM LEACHATE POND CELL 1 PHASE 1

HDR	PROJECT TITLE: INTERMOUNTAIN REGIONAL LANDFILL 2010 PERMIT APPLICATION	PROJECT NUMBER	FILE NAME: 01C012.DWG
	SHEET TITLE: LEACHATE POND PLAN	PROJECT MANAGER: T. WARNER	SCALE: 1"=100'
		DATE: 08/13/10	SHEET NUMBER: 12 OF 13



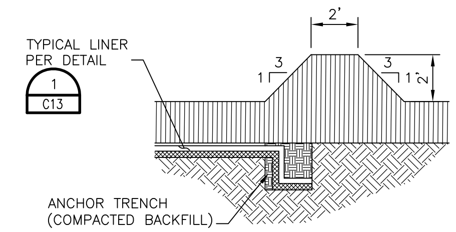
TYPICAL LANDFILL LINER DETAIL (1/C13)
NOT TO SCALE



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/C13)
NOT TO SCALE



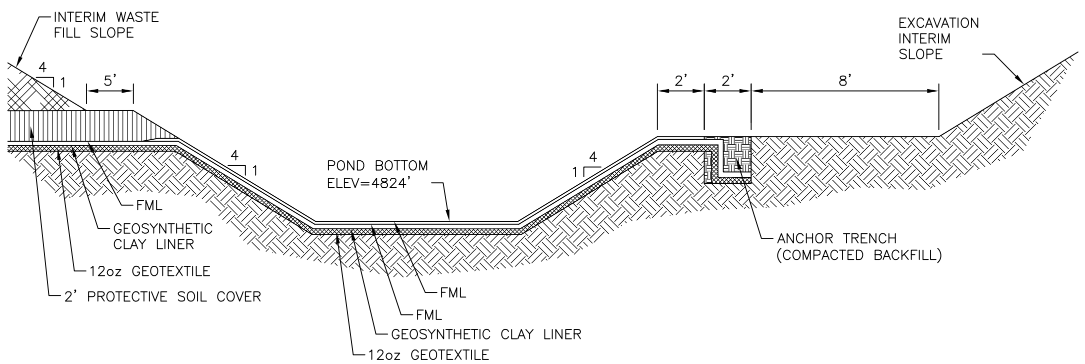
LINER TERMINATION BERM (3/C13)
NOT TO SCALE

NOTES:

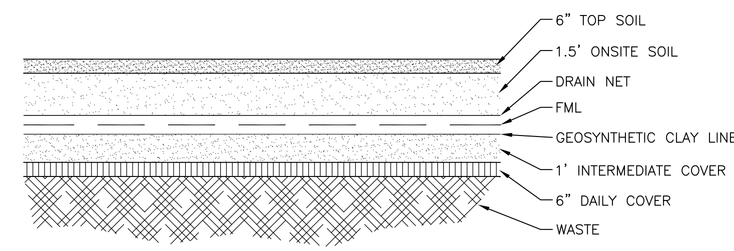
1. TEMPORARY STORMWATER INTERCEPTOR BERM TO BE PLACED IN FRONT OF WORKING AREA TO DIVERT STORMWATER AWAY FROM ACTIVE FACE. OWNER WILL RELOCATE AS NEEDED.
2. SEE SPECIFICATION 02240 FOR PROTECTIVE COVER MATERIAL REQUIREMENTS.

GEOTEXTILE SCHEDULE

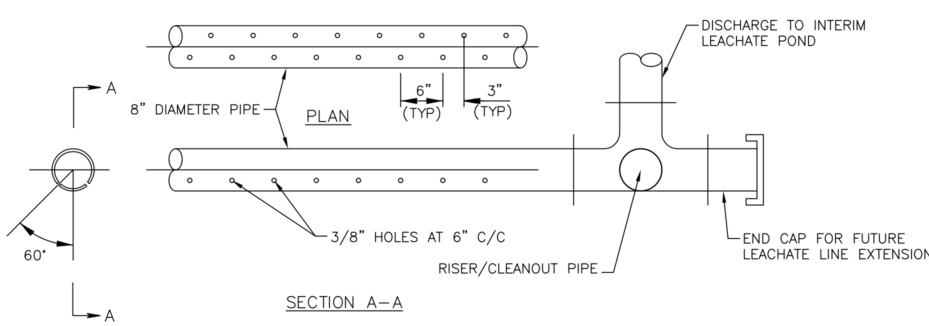
LOCATION	COMMENTS
ALL	REMOVE ALL ANGULAR STONES GREATER THAN 0.5" DIAMETER
LOWER GEOTEXTILE	USE 16 OZ/SY NON-WOVEN IF ROUNDED STONES GREATER THAN 2.5" ARE REMOVED. USE 20 OZ/SY NON-WOVEN IF ROUNDED STONES GREATER THAN 4" ARE REMOVED. NO HORIZONTAL SEAMS ON SIDE SLOPES.
UPPER GEOTEXTILE	USE 12 OZ/SY NON-WOVEN BENEATH PROTECTIVE SOIL COVER



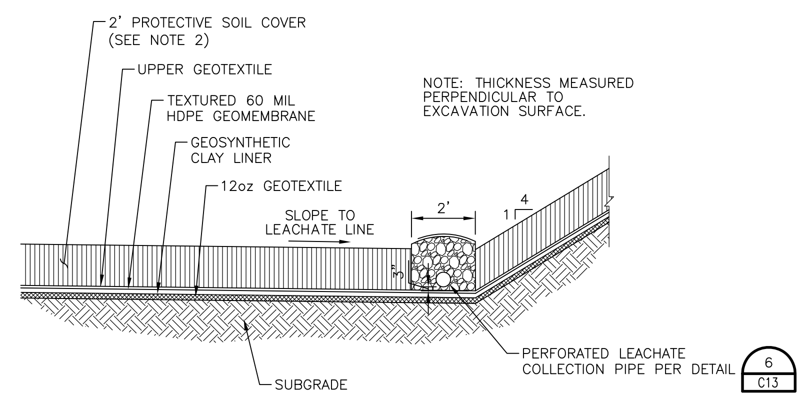
INTERIM LEACHATE POND (4/C13)
NOT TO SCALE



FINAL COVER (5/C13)
NOT TO SCALE



8" DIAMETER PERFORATED LEACHATE COLLECTION PIPE (6/C13)
NOT TO SCALE



LEACHATE COLLECTION TRENCH (7/C13)
NOT TO SCALE

HDR

PROJECT TITLE	INTERMOUNTAIN REGIONAL LANDFILL 2010 PERMIT APPLICATION
SHEET TITLE	DETAILS
PROJECT NUMBER	
PROJECT MANAGER	T. WARNER
DATE	08/13/10
FILE NAME	01C013.DWG
SCALE	NTS
SHEET NUMBER	13 OF 13

APPENDIX A:

PLAN OF OPERATIONS

Plan of Operations

in support of the
Utah Class V Landfill Permit Application

Intermountain Regional Landfill

Prepared by
HDR Engineering, Inc.
3949 South 700 East, Suite 500
Salt Lake City, UT 84107

September 29, 2010

Contents

Tables

Figures

1.0 Introduction

The purpose of this Plan of Operations is to assist the Landfill Foreman and landfill operating personnel in conducting day-to-day operations in a manner that is consistent with the various permit requirements and with the design of the Intermountain Regional Landfill. Section 2.0 describes the emergency response procedures applicable to the landfill, the permit conditions applicable to the landfill, the designed facilities at the landfill, and equipment and personnel requirements for proper operation of the landfill. Section 3.0 provides a discussion of landfill facilities at the site. Section 4.0 describes the procedures for handling wastes received at the landfill. Section 5.0 provides a schedule for conducting inspections, monitoring, and reporting for the landfill facilities. Section 6.0 provides contingency plans and corrective action programs to be implemented if emergency conditions (for example, fire or explosion) exist, or if data indicate that containment systems have failed. Section 7.0 discusses alternative waste handling and disposal during inclement weather. Section 8.0 describes the maintenance of landfill monitoring equipment. Section 9.0 describes routine and non-routine procedures to be implemented to control disease vectors. Section 10.0 addresses waste screening to exclude regulated hazardous wastes. Section 11.0 summarizes the general training program for landfill operators.

2.0 Emergency Response Information

Landfill emergencies include injury, dismemberment, or death of personnel; and fire, explosion, or other catastrophic events. Because of its remote location, the landfill maintains its own fire protection equipment for building and equipment, and personnel are trained in the operation of this equipment. Landfill fires at the surface will be controlled by using soil to smother any fires. A water truck will also be available to supplement fire suppression activities. Because of the landfill's remote location, injured personnel will be transported to medical facilities in landfill vehicles if their condition allows movement. The Landfill Foreman or his designee may request that ambulance and paramedical personnel meet the transporting vehicle enroute to the medical facility.

Table 1 below lists the phone numbers to access emergency services for other emergencies. This list is posted directly adjacent to each phone on the facility site in a colorless, protective plastic cover.

Table 1. Emergency Phone Numbers

Emergency Service Provider	Emergency Phone Number	Direct Phone Number
Fire and Rescue	911	
Hospital	911	
Utah Valley Regional Medical Center		(801) 371-7001
Mountain View Hospital		(801) 465-7190
Utah County Fire Marshal		(801) 370-8885
Sheriff		(801) 375-3601
Office		(801) 403-7651

In the event of any emergency, the personnel in Table 2 will also be notified. Landfill personnel will also be provided with 2-way radios for communicating while on site.

Table 2. Landfill Contact Information

Name	Title	Phone
Rob Richards	General Manager	(801) 403-7651
To be determined (TBD)	Scale Attendant	TBD
TBD	Lead Equipment Operator	TBD
TBD	Equipment Operator 2	TBD
TBD	Equipment Operator 2	TBD

3.0 Background Information

3.1 Fixed Landfill Features

The overall site plan consists of one large landfill divided into six units, or cells. These cells are each about 650 feet wide (north to south) and about 2,500 feet long (east to west), or about 37 acres each. Each cell will be developed in 8- to 20-acre phases. Cell 1 will be developed by moving west to east across the site. Future landfill cells will be developed from east to west. The first lined landfill phase will be an 8-acre Cell 1 Phase 1, which will be constructed in the northwest corner of the landfill. Cell 1 will be developed by excavating to an average depth of about 30 feet. The liner grading for Cell 1 will direct leachate generally south and east to leachate collection pipes, which will convey the collected leachate east to a retention pond. An interim leachate retention pond will be constructed along the eastern edge of Phase 1. Cell 1 will be fully developed once the landfill liner system is extended to the eastern limits of the planned Cell 1 excavation.

Initial landfill construction will also include a scale and scale house/administrative offices. An all weather access road will be constructed from the entrance to the area of the first landfill cell. Temporary internal access roads will be constructed to access the bottom of the Cell, initially; and the roads rerouted as waste is placed in the landfill and waste fill grades change. Other ancillary features include perimeter access control fencing and environmental monitoring equipment.

3.2 Landfill Equipment

Table 3 presents the equipment anticipated for landfill operations. Compactors are used to move and compact waste disposed at the landfill and for placing daily and intermediate cover. The dozer is used for general site operating activities suck as road maintenance, embankment construction, and snow removal. The track excavator will be used to excavate landfill units, maintain runoff and run-on controls, and load the dump truck, which will haul materials within the site. The water wagon will be used for dust control and the recycling of leachate, if needed.

Table 3. Landfill Equipment

Type	Model
Compactor	CAT 836 H
Dozer	CAT D8
Track Excavator	CAT 330
Dump Truck	TBD
Water Wagon	TBD
Electric Generator	TBD

4.0 Schedule of Construction

The Intermountain Regional Landfill, once permitted and constructed, will consist of a single municipal landfill constructed in phases. The major subunits of the landfill are called *cells*, and each cell will be developed in two or more *phases*. Other landfill facilities will include a dual-lined stormwater/leachate evaporation pond, a scale house, and administrative offices.

The overall site plan consists of one large landfill divided into six units, or cells. These cells are each about 650 feet wide (north to south) and about 2,500 feet long (east to west), or about 37 acres each. Each cell will be developed in 8- to 20-acre phases. The first lined landfill phase will be an 8-acre Cell 1 Phase 1, which will be constructed in the northwest corner of the landfill. Cell 1 will be developed by excavating to a depth of about 30 feet. The liner grading for Cell 1 will direct leachate generally south and east to leachate collection pipes, which will convey the collected leachate east to a retention pond.

5.0 Solid Waste Handling

5.1 Waste Disposal

All waste entering the site will be weighed and weights recorded. Customers will be directed to the working face where the driver will be instructed to discharge the load.

Landfill operations personnel will push the solid waste up the working face using a compactor. The waste will be placed in lifts with a loose thickness of 2 to 3 feet. After the waste has been placed in loose lifts, the operator will run the compactor over all parts of the lift at least two times parallel with the slope (up slope). At times, pushing the waste uphill might be impractical or poor practice (for example, when the first lift of waste is placed on protective cover soil). Equipment operators will also maintain the working face so that it is as small as practical to allow efficient unloading of transfer trucks and placing and compacting of solid wastes.

5.2 Placement of Cover Soils

Cover soils will be placed over solid wastes to minimize the potential for nuisance conditions, fire, and contact between disease vectors and solid wastes. Nuisance conditions include odor generation and air discharges, blowing of plastic and paper wastes, and other conditions that impair the use of adjoining properties.

At the end of each working day, the landfill operations personnel will cover all solid wastes received during that day with daily cover. The daily cover will consist of a minimum of 6 inches of soil excavated from other parts of the landfill site. Daily cover will be placed to minimize the nuisance, fire, and disease vector potential attributable to each day’s waste placement.

Whenever part of the landfill cell will be inactive for an extended period, landfill operations personnel will place an intermediate cover over the inactive part. The intermediate cover will reduce the potential for wind- and water-induced erosion of the cover and will reduce the production of leachate and contact stormwater within the landfill cell. The intermediate cover will consist of 6 additional inches of soil on the daily cover.

6.0 Inspections, Monitoring, and Reporting

6.1 Inspections

The Landfill Foreman is responsible for conducting and recording routine inspections of landfill facilities. The schedule for conducting routine inspections is provided in Table 4. Forms for recording routine inspections are presented in Attachment A. The Landfill Foreman is responsible for verifying the completeness of the inspection records on a quarterly basis.

Table 4. Inspections

Landfill Facility	Inspection	Frequency
Landfill cell	Daily and intermediate cover integrity	Daily
	Stormwater and leachate collection (surface ponding)	Daily

Table 4. Inspections

Landfill Facility	Inspection	Frequency
	Run-on/run-off control integrity	Daily
	Cell perimeter fence integrity	Daily
Stormwater/leachate pond	Perimeter fence integrity	Daily
	Water depth	Weekly
	Liner system integrity	Weekly
	Water volume	Quarterly
Other appurtenances	Entrance/main gate integrity	Daily
	Perimeter fence integrity	Weekly
	Monitoring well integrity	Monthly
	Equipment maintenance	Monthly
	Site road integrity	Quarterly
	Berm integrity	Quarterly

6.2 Groundwater Monitoring

6.2.1 Detection Monitoring

The Intermountain Regional Landfill will implement a program to determine the background water quality under the landfill. The Groundwater Monitoring Plan is included in the Permit Application as Appendix G. Monitoring wells will be installed during initial landfill development. As specified in the Utah Department of Environmental Quality (UDEQ) regulations (R315-308-2(4)(a)) and Subtitle D (40 Code of Federal Regulations [CFR] 258.53) regulations, background data for the detection monitoring constituents will be established on all monitoring wells as they are constructed. Background data will be generated by sampling the monitoring wells on a monthly basis after construction. To provide an acceptable level of confidence in the data, a minimum of eight samples will be collected and analyzed to establish background concentrations. The groundwater data will be maintained in a database and used as the foundation for determining statistically significant increases during assessment monitoring, described below.

6.2.2 Assessment Monitoring

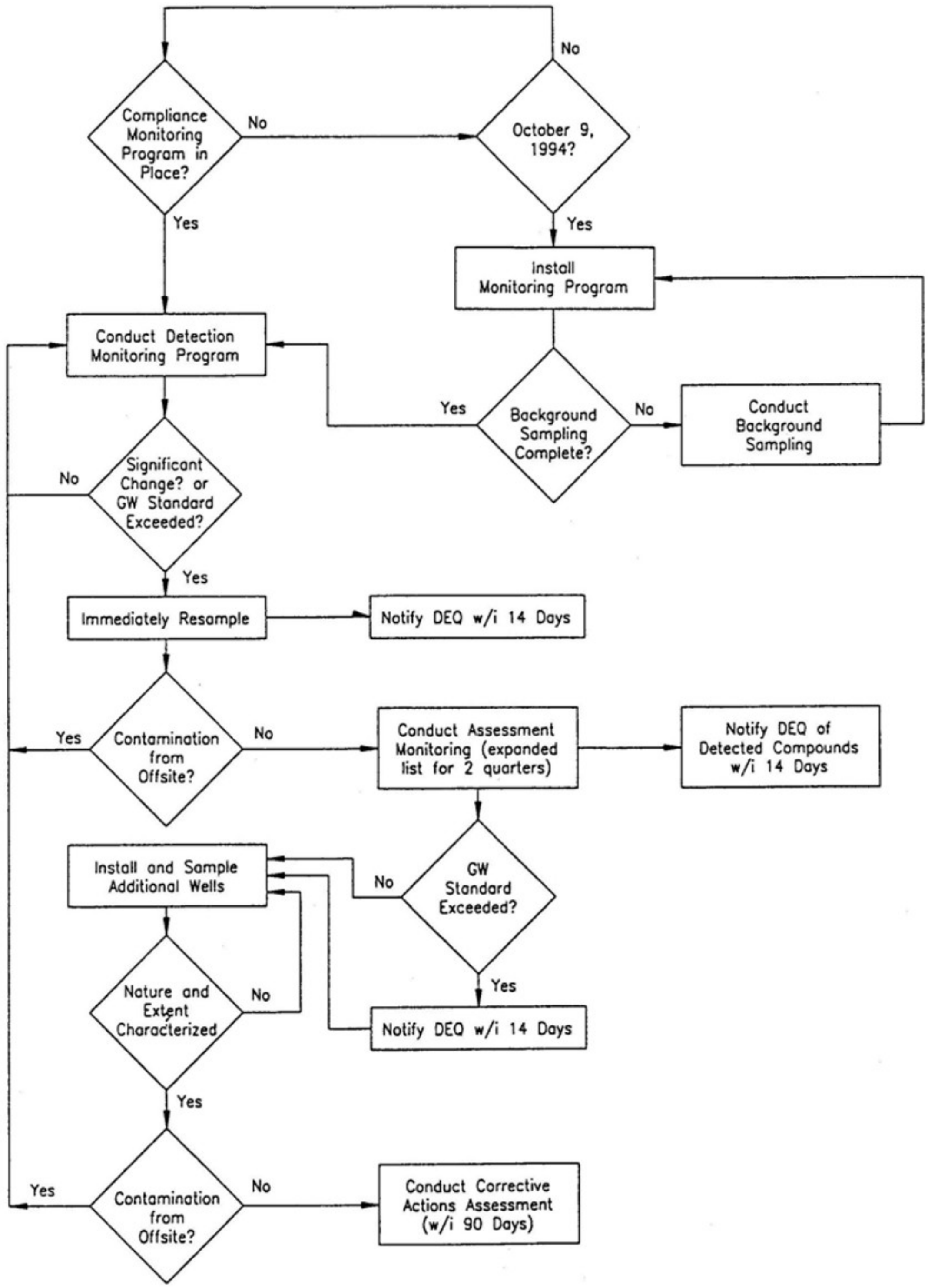
During assessment monitoring, groundwater samples will be collected semiannually. The results will be entered into a database and the data reviewed to determine if a statistically significant increase has occurred. If a statistically significant increase in groundwater contaminants is detected as part of the Detection Monitoring Program, the Intermountain Regional Landfill will initiate the following actions:

- Notify UDEQ in writing within 14 days of obtaining laboratory results. The notification will include identification of the constituents that have shown a statistically significant increase.

- Enter the laboratory results into the operating record for the landfill.
- Immediately resample the groundwater in all wells, or a subset of the wells as specified by the Executive Secretary, for all constituents listed in R315-308-4. Determine whether a statistically significant change has occurred such that the groundwater protection has been compromised.
- If a statistically significant change has occurred, notify UDEQ within 7 days of receipt of the results of the resampling.

Figure 1 below summarizes the requirements imposed on the Intermountain Regional Landfill by UDEQ regulations to define the nature and extent of groundwater contamination and to take corrective action if the source of the groundwater contamination is the landfill.

1 **Figure 1. Utah Requirements for Groundwater Monitoring**



2

6.3 Landfill Gas Monitoring

Once the Intermountain Regional Landfill is constructed, the owner will purchase a handheld combustible gas indicator which will be used to monitor landfill gases on a quarterly basis. Landfill gas monitoring locations will be established based on the configuration of landfill cells after construction. If concentrations of combustible gases exceed the standard set in the UDEQ rules, the owner will implement the requirements imposed on the Intermountain Regional Landfill by UDEQ regulations in effect at the time of the permit or revisions of the permit.

7.0 Contingency and Corrective Action Plans

The following sections describe the contingency and corrective action plans that will be implemented if fire, explosion, failure of run-off/run-on structures, release of explosive gases, or contamination of groundwater occurs.

7.1 Fire

No burning of wastes is planned in the active landfill cell area. Limited burning may be planned, permitted, and accomplished when the construction area for a new landfill cell is cleared and when perimeter fences and drainage channels are maintained. No other burning activities are planned at the Intermountain Regional Landfill.

Two other types of fires—fires in loaded vehicles and fires in disposed wastes—must be anticipated and response activities planned. Each of these is discussed below. The preferred method of fighting fires in the Intermountain Regional Landfill will be smothering the fire with soil. Water will contribute to the formation of leachate and should be used only as a last resort if the fire cannot be smothered.

7.1.1 Fire in a Loaded Vehicle

If a transport vehicle enters the landfill site carrying a burning or smoldering load of waste, landfill operations personnel will take the following actions:

- Direct the vehicle to a designated section of the landfill away from the working face. Direct the driver to deposit his load and to clear the area as quickly as possible.
- Immediately cover the burning waste with enough soil to completely smother the fire. Allow the waste to cool for several days, or longer if necessary.
- If necessary, spray equipment and the transfer vehicle with water to cool the equipment while working the fire. This will not be necessary if the

equipment is pushing or dumping soil on the burning wastes in front of the advancing equipment.

- If landfill operations personnel cannot control the fire, contact the County Fire Marshal.
- Notify UDEQ immediately and provide written documentation within 14 days of the fire.

7.1.2 Fire on the Working Face or Below Cover

In the event of a working face fire or a fire below cover, landfill operations personnel will take the following actions:

- Evacuate all nonessential personnel from the area of the fire. Nonessential personnel include transfer truck drivers, laborers/spotters, and visitors.
- To the extent possible, isolate the burning material from other wastes. Use compactor blades and dozers to move the burning materials away from other wastes; this might not be possible if the fire is below cover soil.
- Immediately cover the burning waste with enough soil or water to completely smother the fire. Allow the waste to cool for several days, or longer if necessary.
- If necessary, spray equipment and the transfer vehicle with water to cool the equipment while working the fire. This will not be necessary if the equipment is pushing or dumping soil on the burning wastes in front of the advancing equipment.
- If landfill operations personnel cannot control the fire, contact the County Fire Marshal.
- Notify UDEQ immediately and provide written documentation within 14 days of the fire.

7.2 Explosion

If an explosion occurs at the landfill or in any structure associated with the landfill, landfill operations personnel will take the following actions:

- Immediately evacuate the area surrounding the explosion, including any adjacent buildings. Shut down and abandon any equipment near the explosion that is hot and that could provide an ignition source for additional explosions.

- Account for all personnel. Contact the County Fire Marshal and the emergency dispatcher (911). Contact the General Manager.
- Keep people from entering the explosion area until emergency response personnel clear the area.
- Notify UDEQ immediately and provide written documentation within 14 days of the explosion.

7.3 Failure of Run-off/Run-on Structures

Failure of run-off structures can allow contaminated water to be released into the environment. Failure of run-on structures can allow stormwater to mingle with waste and become leachate. Neither of these conditions is desirable.

7.3.1 Failure of Run-off Structures

If a failure of run-off structures is discovered during routine or non-routine inspections, landfill operations personnel will take the following actions:

- As soon as practical, suspend acceptance of wastes at the landfill, if necessary, and inform customers of this suspension.
- Use landfill compactor and dozer equipment to construct temporary berms to contain the run-off over the liner. Divert the flow of run-off water away from surface water drainage ditches.
- Resume landfilling operations as soon as possible after the run-off is contained. Inspect the temporary berms at least once every 2 hours.
- Assess the impact of the release of run-off as soon as practicable following the event. Assess the need for permanent improvements in the temporary berms, or other run-off control structures, as soon as practicable after the run-off is controlled.
- Notify UDEQ immediately and provide written documentation within 14 days of the failure.

7.3.2 Failure of Run-on Structures

Failure of run-on control structures can temporarily overload the leachate collection system but is generally less serious than failure of run-off control structures. If failure of run-on control structures is discovered during routine or non-routine inspections, landfill operations personnel will take the following actions:

- Immediately mobilize landfill compactor or dozer equipment to construct temporary berms, swales, or other structures to temporarily divert surface water run-on from the active landfill cell. Assess the need to suspend acceptance of waste.

- As soon as practicable, assess the need for permanent run-on control structures.
- Notify UDEQ immediately and provide written documentation within 14 days of the failure.

7.4 Release of Explosive Gases

It is unlikely that explosive gas will be released from the lined Intermountain Regional Landfill cells. However, it is possible that landfill gas concentrations will exceed the regulatory requirements in one or more gas-monitoring locations during the life of the landfill. For the purpose of this contingency plan, a release is defined as the detection of more than 25% of the lower explosive limit (LEL) in a landfill building, or more than 100% LEL at the property boundary. The LEL is 5% by volume of methane in air. If a release of explosive gases is detected, landfill operations personnel will take the following actions:

- Immediately suspend landfilling operations and determine if landfill personnel or structures are threatened. If so, evacuate personnel immediately and open building doors to allow gases to escape.
- As soon as possible, determine if off-site buildings or other structures are threatened. If so, immediately notify the County Fire Marshal.
- Monitor the release area, and all other landfill gas monitoring locations, until the emergency condition has been eliminated.
- Determine temporary corrective actions as soon as possible, and permanent corrective actions as soon as practicable, after detection of the release.
- Notify UDEQ immediately and provide written documentation within 14 days of the release event.

7.5 Groundwater Contamination

Contingency and corrective actions plans will be developed after groundwater contamination is detected. Figure 1 shows the work flow required.

8.0 Control of Nuisance Conditions

8.1 Fugitive Dust

Fugitive dust from the working area will be controlled by timely placement of daily, intermediate, or final cover. Haul roads will be maintained by maintaining positive drainage and removing excessive trackout on paved roads within the property boundary and on entrance roads. Sprayed water or a dust palliative will be applied if operators notice that dust is migrating off-site. Disturbed areas not immediately needed for landfill operations will be revegetated if they are causing excessive dust.

8.2 Litter

The methods to reduce litter in and near the Intermountain Regional Landfill include the following:

- Intermountain Regional Landfill will encourage customers to deliver in covered loads. Potential methods include: placing signs along the main road to the landfill, a scaled pricing structure for self-haul customers (uncovered loads will be charged more), and educational campaigns, if needed due to complaints. Commercial vehicles will be required to deliver only covered loads.
- Operators will minimize the working face. This will reduce the waste surface area that is exposed to wind and reduce the potential for winds to transport out of the active Cell.
- Operators will placement of daily cover as soon as practical..
- Mobile litter control fencing will be placed near the working face to capture as much wind blown litter as possible.
- Active clean up of wind blow litter will be conducted within the property boundary as part of the daily operation. Periodically, Intermountain Regional Landfill operators will inspect adjacent properties for litter that has migrated offsite.
- Intermountain Regional Landfill will maintain the 6-foot perimeter fencing in good repair and pick up trash that has collected on the fence.

8.3 Rodent Control

The primary method of rodent control is to eliminate conditions favorable for the reproduction of rodents through properly compacting wastes and placing daily cover. If landfill personnel see signs of rodents, more-frequent application of cover soils will be considered.

If the primary method of rodent control does not produce satisfactory results, the landfill operators might use poisoning. A poison control program must include the following conditions:

- Poison traps must be set by experienced, professional exterminators.
- Poison traps may be set only within areas of controlled access. This means that the trapped area must be within the site's security fencing, and the security gates must be locked for the duration of the poisoning program whenever landfill personnel are not on-site.
- The Occupational Health and Safety Administration (OSHA) requires warning signs of acceptable color and size to be permanently fixed to the outside of the access gate and fencing, at spacings not to exceed 150 feet, for the duration of the poisoning program. A minimum of one sign per side of the fence is required.
- Landfill personnel must conduct a daily inspection of each poison trap and must notify the professional exterminator if disruptions of any traps are noted.
- The professional exterminator must conduct periodic inspections of the poison traps.
- Written documentation of the poisoning program must be maintained at the maintenance building. The documentation must include the number and exact location(s) of the poison traps, the name of the poison(s) (including both chemical and brand name and a list of ingredients), the quantity of poison contained in each trap, and the medically accepted antidotes or treatments for the poison(s).
- The professional exterminator must submit monthly reports to the General Manager documenting the status of the poisoning program. The reports shall include the number and location of traps, the quantities of poison(s) used during the past month, and any changes in the program instituted during the past month.
- Poison supplies shall be stored on-site in a separate, locked, and properly labeled enclosure. Access to the poison shall be restricted to the professional exterminator, the general manager, or his designee.

8.4 Bird Control

As with rodent control, the primary method of controlling birds is to control the conditions favorable to their existence. The following methods will be used as needed:

- Minimize the size of the working face. This is the most effective method of controlling birds, since it reduces the area available for feeding. More-frequent cover and greater compaction of the waste can also minimize the opportunities for feeding.

- Minimize the accumulation of water in depressions, ponds, or other features near the active working face. The lack of water makes a landfill a less attractive feeding area for birds.
- Use noise or other frightening techniques. These techniques cause a short-term reduction in the number of birds feeding at a landfill.

If the primary methods do not produce satisfactory results, a destructive method of control might need to be implemented. Destructive methods could cause harm or death to some birds, and authorization must be obtained from local officials before implementing a destructive program.

9.0 Alternate Waste-Handling Procedures

Landfill operations will be adapted for wet weather by constructing an all-weather road from the site entrance to the active cell. In the semi-arid climate of the Intermountain Regional Landfill site, experience has shown that precipitation has only a minor effect on the operation of the landfill. The owner does not believe that alternate waste-handling plans are necessary for this site to handle wet weather operations.

All reasonable caution and prudence will be exercised to not dispose of wastes during any unreasonable weather conditions. If unforeseen weather conditions occur, the General Manager, or his designee, will be informed and will coordinate any changes in operations. The General Manager will consider the system-wide requirements in determining what changes, if any, need to be made to operations at the landfill.

10.0 Monitoring Procedures

10.1 General

The inspection schedule for groundwater monitoring wells and landfill gas monitoring stations is presented in Section 6.0, Inspections, Monitoring, and Reporting. The following section describes the more-detailed inspection and maintenance of these proposed landfill monitoring features.

10.2 Groundwater Monitoring Wells

All groundwater monitoring wells will be thoroughly inspected during each sampling event. The detailed inspection will note signs of deterioration or failure of the protective steel casing, the concrete pad and bollards, and the polyvinyl chloride (PVC) well casing and screen. If damage is discovered, the nature of the problem will be recorded and reported to the General Manager, who will make a decision to repair, replace, or abandon the well. This decision will be documented in the operating record for the landfill, and the required actions will be completed before the next scheduled monitoring event.

The monitoring well locations will be maintained on a routine basis. Weeds will be removed at least every 6 months, about 2 weeks before each scheduled sampling event. During the weed removal, landfill personnel will note any obvious indications that the well has been damaged in order to allow the General Manager to assess the situation.

10.3 Gas-Monitoring Locations

Gas-monitoring locations will be established at a later date.

11.0 Waste-Screening Procedures

All vehicles entering the site will be stopped at the scale house. Scale attendants will inquire abut the contents of the waste entering the site. If a customer is suspected to be carrying unacceptable materials, they will be turned away and directed to an appropriate facility that is permitted to receive the waste materials. After a vehicle leaves the scale, they are directed to the working face. Wastes unloaded at the tipping face will be inspected regularly by landfill operators trained to identify unacceptable materials. All personnel will receive periodic training in detecting wastes that are prohibited for disposal at the landfill. This training will consist of an initial training and annual refresher training. These personnel will conduct routine inspections and random load inspections.

Loads will be selected randomly for a more detailed inspection to detect illegal or inadvertently deposited materials. A location for waste screening will be designated on the active landfill cell. For the more detailed random inspections, an unsuspecting collection or transfer vehicle will be directed to a waste screening area near the working face to unload. After being unloaded, waste will be spread with a dozer or compactor, to a 1 to 2 foot thickness, so that the majority of the load can be visually inspected. Information will be recorded on the general contents of the load as well as customer information.

The General manger will notify the Executive Secretary of the Division of Solid & Hazardous Waste with the material type and quantity and the remedial actions taken for the unaccepted waste.   The Conditional Use Permit (Permit Application Appendix B) specified the following 11 categories of Unacceptable Waste:

- ‘Hazardous waste’ as defined in 40 C.F.R. part 261, as such part may be amended and expanded from time to time, and in Utah Code Ann. Section 19-6-102(9) and the regulations promulgated there under as they may be amended and expanded from time to time;
- Any material that is now or hereafter defined by applicable Federal, State or Local Laws, regulation, or ordinance as radioactive, toxic, hazardous or extremely hazardous waste, excluding household hazardous waste and small quantity generator hazardous waste;

- Vehicle tires in excess of the amount of such tires permitted to be disposed of by applicable Federal, State or Local law, regulation, or ordinance;
- Lead acid batteries;
- Soils contaminated with hazardous, radioactive, or toxic wastes, or hazardous or toxic substances as such terms are defined by applicable Federal or State law or regulations;
- Asbestos, including the asbestiform varieties of serpentite (chrysolite), riebeckite (crocidolite), cummingtonite-grunerite, anthophylite and actinolite-termolite;
- Any material which contains asbestos ("ACM"), including asbestos waste from control devices, contaminated clothing, asbestos-waste material, materials used to enclose the work area during asbestos project, or bags or containers that previously contained asbestos;
- Dead animal carcasses in excessive amounts that will attract disease vectors;
- Any soils from coal mine sites, power plants, rail yards, and other industrial development sites and projects which may be removed as part of any voluntary or governmentally mandated environmental remediation plan or program;
- Infectious waste, medical waste, or sharps; and
- Any material whatsoever that the Permits or any Federal, State, or Local law, regulation, or ordinance may prohibit the disposal of at the Landfill now or in the future; provided, however, that any such future prohibition shall not operate retroactively such that any material previously determined to be Acceptable Waste and disposed of at the Landfill shall be a breach of this CUP [Conditional Use Permit] by virtue of such previous disposal.

12.0 Training Program

Landfill personnel will be trained according to the duties required by certain job categories. Training records will be submitted with annual landfill reports. In general personnel will receive one or more of the following:

- Hazardous Waste Operations and Emergency Response, pursuant to requirements of the Occupational Safety & Health Administration (OSHA)
- OSHA Safety Training
- First Aid Training
- Solid Waste Association of North America (SWANA) Manager of Landfill Operations (MOLO), which includes including waste screening, leachate and gas management, general information on landfill regulations.

Appendix A. Inspection Form

Inspection Report – Intermountain Regional Landfill

Type of Inspection: **Daily/Weekly/Monthly/Quarterly/Semiannually** (circle one)

Performed By: ___________________________ Date: _______

	Overall Condition		Monitoring
	Satisfactory	Needs Work*	Results
1. Structures & Roads			
Fences & Gates[1]	___	___	___
Access Roads[1]	___	___	___
Ditches[1]	___	___	___
2. Landfill Operations			
Fences & Gates[1]	___	___	___
Litter Control[1]	___	___	___
Protective Cover[1]	___	___	___
Daily Cover[1]	___	___	___
Intermediate Cover[2]	___	___	___
Final Cover[4]	___	___	___
Equipment[1]	___	___	___
Stormwater Ditches[2]	___	___	___
3. Leachate Pond			
Fences & Gates[1]	___	___	___
Liner System[2]	___	___	___
Influent Pipe[2]	___	___	___
Gravity Lines[2]	___	___	___
Monitoring Facilities			
Weed Control[4]	___	___	___
Groundwater Wells[4]	___	___	___

* Specify the work needed and timeframe.

Key: 1 = daily; 2 = weekly; 3 = monthly; 4 = quarterly; 5 = semiannually

Other Comments: ____

____

____

____

____

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APPENDIX B:

PROPERTY OWNERSHIP AND NOTICE OF INTENT

MEMORANDUM AGREEMENT

This Memorandum Agreement is entered into this 28th day of April, 2010 by and between the Town of Fairfield ("Fairfield"), a political subdivision of the State of Utah, and ROC Fund Landfill Holdings, LLC ("ROC"), a Nevada LLC, sometimes also jointly referred to herein as the "Parties."

WHEREAS, the Parties desire to develop and operate a Class V municipal solid waste landfill within the boundaries of Fairfield (the "Landfill);

WHEREAS, Fairfield will own the land upon which the Landfill will be situated; and

WHREAS, ROC will construct and operate the Landfill.

Now, therefore, the Parties agree as follows:

1. Negotiation of Agreements. The parties agree to negotiate in good faith such agreements and other instruments necessary and appropriate to carry out the intent of this Memorandum Agreement. These agreements shall consist of a base agreement and an operating agreement, and may also include such other agreements as may be necessary and appropriate to carry out the intent of the Parties.

2. Terms and Conditions. The agreements entered into by the Parties for the development and operation of the Landfill shall contain the following terms and conditions:

a. ROC shall have the right to discontinue development, construction or operation of the Landfill subject to the following conditions:

(i) ROC shall give to Fairfield notice in writing of its intent to discontinue as provided in subparagraph 2.j(i) of this Agreement.

(ii) If ROC elects to discontinue prior to the submittal of the permit application, ROC need only submit written notice to Fairfield of the discontinuance, and the agreements shall thereupon be terminated.

(iii) If ROC notifies Fairfield of its election to discontinue after the submittal of the permit application, Fairfield shall have the right to continue the application process and find another entity to be the operator of the landfill. ROC shall assign all of its rights represented by the application to Fairfield or to the new entity that Fairfield selects.

(iv) If ROC notifies Fairfield of its election to discontinue after the permit has been granted or after operations have commenced, Fairfield shall have the right to continue operation of the Landfill with an operator of its own choosing. ROC shall cooperate in assigning and transferring the permit and other authorizations to Fairfield or to such new entity as Fairfield may direct.

(v) If ROC notifies Fairfield of its election to discontinue after the ownership of the property on which the Landfill is to be situated or is situated (the "Property") has been transferred to Fairfield, Fairfield shall have the right to keep title to the Property and the Parties agree to negotiate in good faith the terms of the appropriate payments for the Property.

(vi) If ROC notifies Fairfield of its election to discontinue after the permit application has been filed or the permit has been granted but the Property has not yet been transferred to Fairfield, Fairfield shall have the right to purchase the Property at a rate to be negotiated in good faith and to select an operator for the Landfill.

b. Fairfield shall be the applicant for the permit from the Utah Department of Environmental Quality ("DEQ") for the Landfill. Fairfield shall be the permit holder as long as the Landfill is operational, or until ROC initiates a change to the Landfill classification and there is a mutually acceptable and qualified entity to which to transfer the permit.

c. ROC shall have responsibility for preparing the applications for the requisite permits.

d. ROC shall have direct control over and responsibility for the day-to-day operations of the Landfill.

e. ROC shall have the right to operate the Landfill as long as the Landfill is operational and maintained in compliance with applicable legal requirements and standards, unless the operating agreement is assigned to another entity by ROC, with Fairfield's consent, which consent shall not be unreasonably withheld.

f. ROC shall have the following obligations with regard to the Landfill, which may be fulfilled using the contractors or other third parties as appropriate:

(i) ROC shall be responsible for the collection, transporting, unloading and disposing of all acceptable waste into the Landfill.

(ii) ROC shall design, construct, operate, and close the Landfill, and maintain the Landfill during the post-closure period in accordance with all applicable legal requirements.

(iii) ROC shall improve the road from SR 73 to the main entrance of the Landfill and 100 ft. beyond to standards necessary to support the expected use and acceptable to Fairfield and to ROC. Additionally, ROC shall engineer and pave the road from SR 73 to the entrance gate of the Landfill in 10 segments of construction, over the course of 10 years. The segment from the SR 73 to the C&D landfill will be completed first. The roads shall be designed and constructed to provide for drainage and shall be of sufficient width that two large garbage trucks or other large vehicles may pass at the same time, and the road must be aligned and have sufficient road base in place to prevent large trucks and construction equipment from causing the road to become unusable. ROC shall take appropriate measures to suppress dust from unpaved roads.

(iv) ROC shall construct a fence around the active working face of sufficient height to control debris. ROC shall maintain a fifty (50) ft. firebreak free of debris around the perimeter fence, and shall maintain a buffer zone around the Landfill that will include visual enhancements to temper views associated with Landfills.

(v) The height of the Landfill shall not exceed one hundred (100) feet unless otherwise agreed to by Fairfield.

(vi) ROC shall be solely responsible for the costs of the engineering, permitting, operation, monitoring, and testing of the Landfill, including the costs for Fairfield's attorney.

(vii) ROC shall be responsible for the protection of the health, safety and welfare of employees, contractors or other persons legally entering the Landfill site.

(viii) ROC shall comply with all applicable federal, state and local legal requirements governing the control of fire, dust, odors, erosion, disease vectors, traffic, and litter at the Landfill.

(ix) ROC shall maintain and operate the scale house, set gate tipping rates, and bill and collect accounts receivable.

(x) ROC shall provide to Fairfield the results of all groundwater testing performed at the Landfill and the results of any other legally required testing.

(xi) The total Landfill area shall not exceed 330 acres without prior approval of Fairfield.

(xii) ROC shall provide to Fairfield copies of all licenses and other certification documents for any contractors or subcontractors working on the Landfill site or the roads to and within the Landfill.

(xiii) ROC shall allow residents of Fairfield free disposal of personal and/or household waste at the Landfill with proof of residency.

(xiv) ROC shall require commercial vehicles delivering waste to the Landfill to be covered in accordance with the Conditional Use Permit and the requirements of the Utah Department of Transportation.

(xv) ROC shall be responsible for the cleanup of litter within the Fairfield Town limits from any vehicle traveling to the Landfill.

(xvi) ROC shall make available to Fairfield the dump truck and grader provided in section 2.h(viii) below as may be needed by Fairfield for road maintenance.

(xvii) ROC shall comply with all requirements of the Conditional Use Permit issued by Fairfield for the Landfill ("CUP"). The provisions of the CUP shall apply except to the extent ROC and Fairfield otherwise agree in writing.

g. Fairfield shall have the following obligations:

(i) Fairfield shall grant to ROC any necessary permit or authorization from Fairfield for the Landfill in a timely manner upon satisfaction by ROC of the requirements for such permit or authorization.

(ii) The CUP shall be reviewed by Fairfield every 2 years to audit compliance. ROC shall pay the costs of such audit. Fairfield shall obtain prior approval from ROC of the costs of such audit, which approval shall not be unreasonably withheld. ROC shall have the right to require Fairfield to obtain multiple bids for such audit from qualified entities.

(iii) All permits and other authorizing documents relevant to the Landfill shall be filed with the Fairfield Town Clerk.

(iv) Fairfield shall have the right to inspect the Landfill without prior notice to ROC, <u>provided</u> that Fairfield shall provide credentials to any inspector certifying that the inspector is an authorized representative of Fairfield, and <u>provided further</u> that any inspector shall report to the supervisor of the Landfill before entering the site to assure that all applicable site safety and security requirements are met and that the inspector is accompanied by representative of ROC.

(v) Fairfield shall maintain in good condition the paved portions of the roads to and from the Landfill. ROC shall be responsible for maintenance of unpaved portions of such roads.

(vi) Fairfield shall have the right to audit the Landfill's books at Fairfield's expense no more than once each calendar quarter.

h. The payments by ROC to Fairfield shall be in accordance with the following terms:

(i) ROC shall pay to Fairfield at least $1,250 per month as provided in the CUP commencing on the date of the issuance of the CUP and ending at such time as the waste disposed of at the Landfill exceeds 1,000 tons during a month or when the Landfill ceases operations whichever occurs first. .

(ii) ROC shall pay to Fairfield a host fee of $1.25 per ton for waste disposed of at the Landfill upon the completion of the 36-month period set forth in paragraph 4.A of the CUP.

(iii) As provided in paragraph 4.D of the CUP, ROC shall submit to Fairfield a report of monthly waste tonnage disposed of at the Landfill and shall remit the hosting fee to Fairfield on a quarterly basis.

(iv) ROC shall be solely responsible for setting tipping rates at the Landfill.

(v) If ROC increases the tipping fee at the Landfill, the hosting fee shall increase proportionately

(vi) As provided in paragraph 4.C of the CUP, any changes to the fee schedule in paragraphs 4.A and 4.B of the CUP must be approved by the Fairfield Town Council.

(vii) ROC shall pay to Fairfield an annual sum equal to ROC's proportionate share for the maintenance of the roads to and from the Landfill as specified in paragraph 4.G of the CUP.

(viii) ROC shall purchase for or provide to Fairfield, within a reasonable time after the opening of the Landfill, a dump truck with a salter and blade for clearing snow, and shall rent a grader as needed by ROC and Fairfield for use in maintaining the road to and from the Landfill and for other roads within the town. ROC shall own and maintain the dump truck with blade and salter and shall keep it at the Landfill site available for use by Fairfield.

i. The term of the base and operating agreements governing the Landfill shall be for 99 years. The term shall be automatically renewed at the end of each term unless either party gives notice to the other in writing of its intent to terminate the agreement. The agreement(s) shall automatically terminate if the Property ever ceases to be used for a Landfill, provided that ROC's obligations regarding post-closure maintenance of any of the Property that has been used for the disposal of solid waste shall continue.

j. The agreement(s) between Fairfield and ROC may only be terminated if:

(i) One of the Parties gives written notice to the other at least 180 days before the end of the term, subject to the provisions of Paragraph 2.a of this Agreement:

(ii) One of the Parties is in material breach which is not cured within the period specified in the applicable agreement; or

(iii) The Parties otherwise mutually agree to terminate the agreement(s).

(vi) The Property ceases to be used for a Landfill.

k. The agreements between ROC and Fairfield shall be assignable by ROC as long as the assignee demonstrates the experience and financial resources to operate the Landfill in compliance with applicable legal requirements and standards. Fairfield has the right to consent to an assignment by ROC, which consent may not be unreasonably withheld.

l. ROC shall indemnify Fairfield for civil penalties or any other costs, damages, claims, injuries, or causes of action resulting from a violation of a permit, environmental law, or other legal requirement applicable to the Landfill or from any negligent or willful acts or omissions of ROC.

m. The agreements between the Parties shall be governed by the laws of the State of Utah.

3. Other terms and conditions. Any terms and conditions pertaining to the arrangement between the Parties to develop and operate the Landfill not otherwise specifically addressed in this Memorandum Agreement shall be subject to mutual agreement by the parties.

TOWN OF FAIRFIELD

____
Mayor

ROC FUND LANDFILL HOLDINGS, LLC

____

FAIRFIELD TOWN CLERK

____

LANDFILL CONDITIONAL USE PERMIT

ISSUED BY FAIRFIELD (TOWN) TO INTERMOUNTAIN REGIONAL LANDFILL LLC.

THIS CONDITIONAL USE PERMIT ("CUP") is granted and issued this 10th day, of April, 2008, by FAIRFIELD TOWN, a political subdivision of the State of Utah, ("Fairfield") to INTERMOUNTAIN REGIONAL LANDFILL, LLC, a Utah limited liability company ("IRL").

WHEREAS, Fairfield, is a political subdivision of the State of Utah, and has all requisite governmental and corporate powers and authority to issue this CUP.

WHEREAS, IRL has requested this CUP concerning the construction of a commercial or non-commercial landfill (the "Landfill"), as permitted by the relevant permits and the Utah Environmental Quality, Solid and Hazardous Waste, Administrative Rules within the boundaries of Fairfield. This CUP grants rights to and places restrictions on the transportation and disposal of Acceptable Waste as defined herein.

WHEREAS, IRL owns properties in the boundaries within Fairfield's incorporated area, and represents that it has received or will receive all necessary permits from the State of Utah's Department of Environmental Quality ("DEQ") and has or will have met all Federal, State, and Local requirements for the construction and operation of the Landfill.

WHEREAS, IRL and its designee(s) will be responsible for collecting, transporting, unloading, and disposing of all Acceptable Waste into the designated and approved Landfill.

WHEREAS, the Landfill will not exceed the 330 acres requested by IRL without the prior approval from the Fairfield Town Council.

NOW, THERFORE, in consideration of the promises, covenants and agreements made by IRL, the following CUP is granted to IRL:

Change to 2 yrs.

Section 1. <u>Terms.</u> This CUP shall become effective on the date above, and shall be reviewed every ~~five (5) years~~ as to the compliance of IRL to the terms and conditions set forth herein. If any changes or amendments are required such changes or amendments should be requested at each ~~five (5) year~~ 2 yrs. review and application made by IRL for modifications; provided, however, that nothing herein shall prevent IRL from requesting changes or amendments at any time, which Fairfield agrees to review and make a decision on a timely basis.

Section 2. Definitions. The terms used in this CUP shall have the following meanings:

A. "Acceptable Waste" means all waste that is permissible under the Utah Environmental Quality Code, Utah Code Ann. § 19-6-102 and as conditionally exempt under Utah Environmental Quality Administrative Rules R315 et seq., which is generated within the State of Utah, that is not Unacceptable Waste.

B. "Applicable Law" means those Federal, State, and Local laws, ordinances, regulations, permits applicable to non-hazardous solid waste landfills, including those relating to the disposal of and description of "Acceptable Waste."

C. "Changes in Law" means any new or revised Applicable Law enacted or amended by a Federal, State, or Local Governmental entity or agency, with proper authority to do so, directed to the disposal or transportation and disposing of solid waste, but not directed to businesses in general, which becomes effective after the effective date of this Agreement. Examples of "Changes in Law" include, but are not limited to, changes in the host fees or applicable taxes payable by the Landfill or other charges in applicable Laws that change IRL's cost of performance of this Agreement, or the cost of performance of their subcontractors, employees, or agents.

D. "Commencement Date" means the first date when all of the following have occurred: (i) Fairfield grants and issues this CUP, (ii) all other required permits and approvals are obtained by IRL from Federal, State and Local agencies having jurisdiction, (iii) all such documents are recorded with the Fairfield Clerk, and (iv) IRL obtains a Fairfield business license.

E. "Force Majeure" means any of the following acts or events whether or not foreseeable, which is not reasonably within the control of the party claiming the Force Majeure, that wholly, or in material part, results in a party being unable to carry out any material obligations under this CUP or results in IRL being unable to deliver Acceptable Waste to the Landfill: (i) an act of God, (ii) earthquake, lightning, storm, fire, flood, slide, or explosion, (iii) strike, lockout, or labor dispute (including slowdown), (iv) riot insurrection, act of the public enemy, sabotage, embargo, blockade, war, slowdown due to the act or process of unionization of IRL's labor force, or other acts of third parties not within the control of IRL or Fairfield, (v) breakdown or damage to plants or disposal facilities, equipment or facilities related thereto (including emergency outages of equipment or facilities for the purposes of making repairs to avoid breakdown thereof or damage thereto other than regularly scheduled repairs or regular maintenance—it is expected that an ongoing maintenance practice is in IRL's best interest, (vi) changes by the State or Federal government in waste materials qualifying as Acceptable Waste, (vii) major unforeseen adverse geologic conditions at the Landfill, (viii) Changes in Law orders, or (ix) acts of Military or Civil Authority. "Act of Civil Authority," as that term is herein used, shall include any act or order of any court possessing jurisdiction and any act or failure or refusal to act of any governmental agency or officer charged with enforcement and/or administration of any Applicable Law, whether or not foreseeable.

F. "Permits" means the solid waste disposal and ground water discharge permits in effect on the date of execution of this Agreement covering the Landfill, and any and all other applicable permits, authorizations, authorities, or licenses issued or granted thereto at any time.

G. "Unacceptable Waste" means all solid waste not authorized for disposal at the Landfill by Applicable Law, or by the Permits. Unacceptable Waste includes but is not limited to:

(1) "Hazardous Waste" as defined in 40 C.F.R.part 261, as such part may be amended and expanded from time to time, and in Utah Code Ann. Section 19-6-102(9) and the regulations promulgated there under as they may be amended and expanded from time to time;

(2) Any material that is now or hereafter defined by applicable Federal, State or Local Laws, regulation, or ordinance as radioactive, toxic, hazardous or extremely hazardous waste, excluding household hazardous waste and small quantity generator hazardous waste;

(3) Vehicle tires in excess of the amount of such tires permitted to be disposed of by applicable Federal, State or Local law, regulation, or ordinance;

(4) Lead acid batteries;

(5) Soils contaminated with hazardous, radioactive, or toxic wastes, or hazardous or toxic substances as such terms are defined by applicable Federal or State law or regulations;

(6) Asbestos, including the asbestiform varieties of serpentinte (chrystolie), riebeckite (crocidolite), cummingtonite-grunerite, anthophylite and actinolite-termolite;

(7) Any material which contains asbestos ("ACM"), including asbestos waste from control devices, contaminated clothing, asbestos-waste material, materials used to enclose the work area during asbestos project, or bags or containers that previously contained asbestos;

(8) Dead animal carcasses;

(9) Any soils from coal mine sites, power plants, rail yards, and other industrial development sites and projects which may be removed as part of any voluntary or governmentally mandated environmental remediation plan or program;

(10) Infectious waste, medical waste, or sharps; and

(11) Any material whatsoever that the Permits or any Federal, State, or Local law, regulation, or ordinance may prohibit the disposal of at the Landfill now or in the future; provided, however, that any such future prohibition shall not operate retroactively such that any material previously determined to be Acceptable Waste and disposed of at the Landfill shall be a breach of this CUP by virtue of such previous disposal.

Section 3. Conditions.

Fairfield's Representation:

Fairfield will insure that all licenses and permits required by IRL are issued in a timely manner, so as not to add any undue delay to IRL, including, without limitation, for the access to and construction of the Roads, ditches and related improvements and shall execute all such documents as required to grant such access. Fairfield will inspect on occasion the operation of the Landfill and the construction of the improvements set forth below, and will do so in a manner, as to not interfere with or interrupt the operation of the Landfill or the construction of such improvements, as the case may be. These inspections may be conducted by the Fairfield Town Council, or its appointed agent or agency, or the Mayor. For safety and security reasons, Fairfield shall provide prior notice to IRL as to who will be conducting such inspections. Fairfield also shall maintain the Roads (as defined below) in a good working condition to service the needs of the Landfill.

IRL's Responsibilities:

IRL will acquire all Federal, State, and Local permits and licenses required to operate the Landfill. A copy of each such permit and license will be recorded with the Fairfield Clerk.

IRL will design, construct, operate, and close the Landfill, and maintain the Landfill post-closure in material accordance with all Federal EPA requirements, all Utah State DEQ rules, and all Fairfield requirements in effect as of the date of such closure, which include zoning ordinances and the special requirements stated herein.

Ground water run-off will be handled in accordance with Federal EPA, State DEQ regulation and proper permits. All such permits, licenses and special additional requirements will become a part of this CUP.

In the event that Unacceptable Waste is tendered for disposal, IRL shall bear all expenses and costs incurred for all remedial, removal, and clean up work necessitated thereby, whether such work is performed by IRL or an outside company approved and licensed to handle such Unacceptable Waste. Remedial work shall commence as soon as reasonably possible upon IRL's discovery that Unacceptable Waste has been disposed of at the Landfill. IRL will also pay any and all legal fees and fines incurred by IRL or Fairfield associated with the disposal of Unacceptable Waste.

The Landfill shall be a landfill that is permitted by the State of Utah to receive for disposal: (i) municipal solid waste; (ii) any other nonhazardous solid waste, not otherwise limited by rule or solid waste permit; or (iii) in conjunction with municipal solid waste or other nonhazardous solid waste, waste from a conditionally exempt small quantity generator of hazardous waste, as defined by Utah Administrative Rules R315 et seq.

Subject to receiving the required permits and licenses for the construction and operation of the Landfill and for the construction of the improvements set forth below, IRL will accept responsibility for the construction of the improvements set forth below for the following roads.

(1) Allen Ranch road, starting at SR 73 and proceeding south to the south boundary of Fairfield, is hereby called road phase one (1) and the east road at the south boundary of Fairfield, to the location of the Landfill's main entrance, and one hundred (100)feet beyond, is hereby called road phase two (2). The phase two ~~(2)~~ road from the Allen Ranch Road to the Main entrance of the MSW landfill and 100 feet beyond ~~will,~~ prior to starting construction, of the landfill, will have sufficient road base so that the vehicles used in the construction will not create ruts and will not get stuck. This road will also be widened so as two of ~~the same vehicle may pass in different directions~~ safely, without leaving the road. All roads when selected under the one of the 10 segments will be constructed under and in accordance with the selected engineering design and specifications for the types of vehicles that will be using said roads. The engineer will also design bar pits to hold and disperse run off water away from the road base. The improvements to the Roads will be completed as follows: All construction will be under the supervision of the selected engineer. After the design of the road by the engineer, the Town of Fairfield will let said segment out for bid after selecting the bids the lowest bid that meets all of the engineering standards and specifications will be awarded and said segment will then be constructed under the supervision of the selected engineer. Under the conditions of this CUP phase one (1) ~~and~~ phase two (2) will be combined and broken down into 10 equal segments ~~and a segment will be built~~ over the next 10 years. The segments that have been built will inspected and repaired as required by the parties on the percent of usage of said road.

Change wording to state: prior to starting const. the phase 2 rd. from Allen Ranch Rd to the main entrance of the MSW landfill & 100 ft. beyond, will have sufficient rd base so that the vehicles used in the const. will not create ruts & will not get stuck.

(2) The starting point will be given to IRL at a later date, by The Town Council, but in no event later than thirty (30) days after request for the same by IRL.

(3) Weather permitting, IRL will also keep the Roads wet down with water or other dust preventive non toxic agencies during its construction of the improvements set forth above.

IRL will construct a six (6) foot fence with an eighteen inch angle on the top around the active perimeter of the work area. The fence on the North West corner will be built on a berm of sufficient height to restrict the view from a ground level viewpoint of the equipment at the landfill. IRL will also erect two additional fences around the active working area that will contain all blowing debris from leaving the Landfill property. If any fence is found to be not in good repair or not properly containing the debris within the boundaries ~~of the Landfill,~~ IRL shall begin corrective steps to solve this problem ~~within~~ 72 hours of receiving notice from Fairfield, or its appointed agent or agency. If the problem is not corrected within a ~~reasonable period~~, Fairfield may require a temporary closure of the Landfill until a proper fence is in place to contain all debris on the Landfill property; provided, however, that prior to Fairfield requiring any such temporary closure, Fairfield will provide to IRL reasonable written notice under the circumstances of its intent to require a temporary closure.

10 days

IRL will take commercially reasonable efforts to keep the Landfill debris on the Landfill property, and the Landfill will be maintained as a clean operation in accordance with industry standards. Any Rds to & from the landfill within the boundaries of Fairfield.

IRL will cut a fire break along the inside of IRL's outer fence of no less than fifty (50) feet. This firebreak will be kept clear of all debris. In the event that firebreak contains debris, IRL shall ~~immediately remove the same~~ upon written notice from Fairfield, or its appointed agent or agency.

Truck tarps owned by IRL will be kept in repair and of the type which will cover and tie down around the complete truck bed top in accordance with industry standard, to prevent trash from falling, blowing or leaving the truck while traveling to and from the Landfill. IRL will insure that all trash is swept from the truck and trailer prior to the truck leaving the Landfill.

IRL will provide Fairfield the results of all groundwater testing done at the Landfill property and the results of any required testing by Utah State DEQ.

Fairfield and IRL shall select the Engineering Firm that IRL will use in the planning and construction of the Landfill, in conjunction with IRL's representative. The Engineering Firm will advise and also work with the Fairfield Town Council throughout the planning, design, construction, and operation phases of the Landfill, provided, however, that all planning, design, construction, and operation of the Landfill shall be specifically approved by IRL. All expenses of the Engineering Firm shall be borne by IRL. Fairfield agrees that it shall take all reasonable steps in working with the Engineering Firm to minimize any costs borne by IRL with respect to such Engineering Firm's advising and working with the Fairfield Town Council.

Fairfield and IRL shall select a properly licensed engineer for each phase of the construction of the Roads (the same engineer may be used for all phases of said road, or another firm may be selected, to plan and oversee the remaining phases of the Roads.) The Engineer that is selected will oversee the construction of the Roads, in conjunction with IRL, and Fairfield's representatives. The Road Engineer will plan and design the assigned phase of the road to sustain type of traffic and types of vehicles, which will be using the road. Upon completion of the assigned segment of the road, the Engineer will in accordance with Utah State Codes, certify that the said road meets all required specifications and requirement as set forth in State Codes. Fairfield will then accept the road as Fairfield is the road authority.

All information, representations, statements, documents, and warranties provided by IRL to Fairfield shall be true and accurate and shall not be falsified or contain any untrue statement of a material fact.

Any subsequent owners will be bound to the terms of this CUP.

IRL represents and warrants that it is a duly organized limited liability company, validly existing and in good standing under the laws of the State of Utah, and has all requisite company power and authority to perform its obligations under this CUP, and will provide all proper documentation to support this fact.

In the event that IRL is unable to meet its obligations hereunder as a result of Force Majeure, its obligations shall be suspended for the duration of same: provided, however, that IRL shall make all reasonable efforts to continue to meet its obligations for the duration of the Force Majeure condition; PROVIDED FURTHER, that if IRL declares a Force Majeure, it shall notify Fairfield promptly by telephone or telefax of when the Force Majeure began, the nature of the Force Majeure, and when Force Majeure conditions are expected to end. The suspension of any obligation owing to Force Majeure shall cause the term of this CUP to be extended and shall not affect the rights accrued under this CUP prior to the Force Majeure condition.

Section 4: Payments to Fairfield.

In addition to the foregoing conditions, IRL will:

A. Pay to Fairfield the sum of at least $1,250 (One Thousand Two Hundred Fifty Dollars) per month commencing on the date of the issuance of this CUP. Checks will be made payable to the Fairfield General Fund. These payments shall continue for a period of 24 months (with a total of 24 payments). A payment shall be increased by $1.00 (One Dollar) per ton for every ton over 1,250 disposed of at the Landfill in the previous month covered by such payment.

B. At the end of the 24-month period set forth in paragraph 4.A, IRL will thereafter pay Fairfield, a host fee of $1.00 (One Dollar) per ton for waste disposed of at the Landfill. If IRL increases its disposal fee, the amount paid per ton to Fairfield will increase at the same proportionate rate that IRL has increased its disposal fee. For example, if IRL raises its disposal fee 20 percent, then the amount IRL must pay Fairfield under this paragraph will increase 20 percent on the same effective date as IRL's increase.

C. Any changes in the above fee schedule must be approved by Fairfield's Town Council.

D. IRL will provide Fairfield with a report of its monthly tonnage disposed of at the Landfill and will remit to Fairfield the payment under paragraph 4.B on a quarterly basis. Any checks will be made payable to Fairfield General Fund.

E. Fairfield reserves the right to audit, at any time, IRL's books at Fairfield's expense, but no more than once quarterly. IRL shall make any or all of its accounting records available to Fairfield during normal business hours upon reasonable request.

F. Fairfield holds the right to enter IRL property at any time under Fairfield Ordinance number 12 Nuisances to Inspect. Persons entering will be appointed by or be part of the Fairfield Town Council and said person's names will be given to IRL in advance.

G. Pay annually to Fairfield a sum equal to IRL's proportionate share for the maintenance of the Roads, which share shall be determined on an annual basis and based on Fairfield's budget for the maintenance of the Roads for such year and the use of the Roads by IRL over the total usage of the Roads. Fairfield shall provide such budgeted amount to IRL and IRL shall have thirty (30) days to review the amount and provide Fairfield with any proposed changes or comments or concerns to such budget. Fairfield and IRL agree to work in good faith to resolve any such concerns.

A traffic study will be performed annually to determine the usage of the Rd.

Section 5: <u>Methane Gas, Power Plant and Closure of Landfill Site.</u>

A. To the extent methane gas is produced in sufficient amounts by the Landfill for reasonable use, IRL agrees to negotiate and use good faith efforts to provide such methane gas to Fairfield for use in the event that Fairfield determines such use to be desirable. If after notice to Fairfield of the availability of methane gas, Fairfield does not respond in writing to IRL within sixty (60) days of its desire to use such methane gas such failure to notify shall be deemed by IRL to be notice that Fairfield does not desire to use such methane gas. IRL shall then use or dispose of the methane gas as IRL determines.

B. Fairfield shall be allowed to place a small electrical power generation plant on IRL Landfill property, if it desires, in a location acceptable to IRL and at no cost to IRL. The construction, maintenance, and operation of any such small electrical power generation plant shall not interfere with or interrupt the operation of the Landfill.

C. The height that the Landfill may rise above the surrounding ground level will not exceed fifty (50) feet, and slopes will be adjusted in accordance with requirements of the Federal EPA and Utah State DEQ.

D. IRL will follow all requirements for closure of the Landfill as may be imposed by the Federal EPA and Utah State DEQ at the time of closure. IRL will maintain at all times an appropriate closure and post-closure fund as required by Federal and State law.

E. At closure, the land shall be returned to the condition required by any State of Utah DEQ permit, unless otherwise approved by the Fairfield Town Council.

Section 6: Indemnity.

To the extent permitted by law, IRL shall defend, indemnify and hold harmless Fairfield, its Mayor, Council Members, directors, officers, agents, employees, subcontractors, successors and assigns (the "Indemnified Parties") from all losses, damage, demands, suits, judgments of any kind, on account of any violation of a material provision of this CUP; provided, however, that such indemnification shall not apply to the negligent or purposeful acts or omissions of the Indemnified Parties.

Section 7: Independent Contractors.

IRL will acquire all permits from Fairfield that are required by Fairfield.

IRL will provide to Fairfield copies of all licenses and other documents of any contractors or subcontractors that will be working on the Landfill site or the Roads.

Section 8: Notices.

All official notices or approvals shall be in writing. Unless otherwise directed, notice shall be delivered or mailed to the parties at the following respective address:

DATED and Issued this 10th day of April, 2008.

FAIRFIELD TOWN

By: ______________________

Its: Mayor

Attest:

Courtney Sapl

Town Recorder

Accepted by:

FAIRFIELD Mayor/Recorder SEAL

INTERMOUNTAIN REGIONAL LANDFILL, LLC

By:______________________________

Its: MANAGER

Intermountain Regional Landfill

ID #	Name	Address 1	Address 2	City	State	Zip Code	Legal Description
59 124 3	c/o LDS Church Tax Administration	50 E North Temple, Floor 22	RE: FILE #509-1071	Salt Lake City	UT	84150	E 1/2 OF SEC. 16, T7S, R2W, SLB&M. AREA 329.619 AC.
59 117 1	Corporation of the Presiding Bishopric	The Church of Jesus Christ of Latter-day Saints	50 E North Temple	Salt Lake City	UT	84150-0002	N 1/2 OF SW 1/4 OF SEC. 9, T7S, R2W, SLB&M. AREA 81.277 AC.
59 117 4	Corporation of the Presiding Bishopric	The Church of Jesus Christ of Latter-day Saints	50 E North Temple	Salt Lake City	UT	84150-0002	S 1/2 OF SW 1/4; S 1/2 OF NW 1/4; W 1/2 OF NE 1/4; SE 1/4 OF NE 1/4; AND SE 1/4 ALL IN SEC. 9, T7S, R2W, SLB&M. AREA 448.952 AC.
59 129 6	c/o Utah Trust Lands Administration	675 E 500 S	Suite 500	Salt Lake City	UT	84102	NW SEC 21, T7S, R2W, SLB&M. AREA 160 ACRES.
59 129 5	Myrna B. Carter	13218 S 6200 W		Herriman	UT	84096	NW 1/4 OF NE 1/4 OF SEC 21, T7S, R2W, SLM. AREA 40 ACRES.
59 129 1	Myrna B. Carter	13218 S 6200 W		Herriman	UT	84096	NE 1/4 OF NE 1/4 OF SEC 21, T7S, R2W, SLM. AREA 40 ACRES.
59 129 3	Claude J. & Evelyn M. Curley	1409 Bryan Avenue		Salt Lake City	UT	84105	COM CEN OF SEC 21, T7S, R2W, SLM; N 09'12"W 1320.35 FT; S 89-49'48"E 1008.01 FT; S 18"E 1325.54 FT; N 89-32'W 1004.63 FT TO BEG. AREA 30.60 ACRES. SUBJ TO R/W.
59 129 4	Claude J. & Evelyn M. Curley	1409 Bryan Avenue		Salt Lake City	UT	84105	COM E COR OF SEC 21, T7S, R2W, SLM; N 89-32'W 1674.26 FT; N 18"W 1325.54 FT; S 89-49'49"E 1679.97 FT; S 14'32"W 1334.21 FT TO BEG. AREA 51.17 ACRES. SUBJ TO R/W
59 128 9	Norbert A. & Lorna A. Martinez	1142 Randers Lane		Draper	UT	84020	COM AT N 1/4 COR OF SEC 20, T7S, R2W, SLM; & ALONG SEC IN S 89 58'53"E 1321.23 FT; S 19'4"W 1326.90 FT; S 89 57'5"W 131.73 FT TO 1/4 SEC IN; LEAVING 1/4 SEC IN S 89 55'41"W 896.23 FT; N 38'24"E 1329.22 FT; N 89 58'21"E 887.23 FT TO BEG. AREA 67.45 AC.
59 128 11	John J. & Julie Kolar	642 Glorietta Blvd.		Lafayette	CA	94549	THE NE 1/4 OF NE 1/4 OF SEC 20, T7S, R2W, SLM. AREA 40 ACRES.
59 128 12	John J. & Julie Kolar	642 Glorietta Blvd.		Lafayette	CA	94549	THE SE 1/4 OF NE 1/4 OF SEC 20, T7S, R2W, SLM. AREA 40 ACRES.
59 125 3	Hacienda Land Holding Trust	510 N 1100 E		American Fork	UT	84003-1992	NE1/4 OF SEC 17, T 7 S, R 2 W, SLM. AREA 160 ACRE.
59 125 4	Brent O. Ault	510 N 1100 E		American Fork	UT	84003-1992	N 1/2 OF SE 1/4 SEC 17, T7S, R2W, SLM. AREA 80 ACRES.
59 125 5	Richard S. Fullmer	2150 Willow Brook Way		Sandy	UT	84092	N 1/2 OF S 1/2 OF SE 1/4 OF SEC 17, T7S, R2W, SLM. AREA 40 ACRES M OR L. SUBJ TO R/W.
59 125 6	Larry D. & Sheena L. Mitchell	8721 Oakwood Park Circle		Sandy	UT	84094	S 1/4 SE 1/4 SEC 17, T7S, R2W, SLM. AREA 40 ACRES.
59 116 7	Melinda Word	PO Box 301		American Fork	UT	84003	COM AT E1/4 COR. SEC. 8 T7S R2W SLB&M.; S 0 DEG 30' 24" E 172.57 FT; S 89 DEG 31' 5" W 1329.22 FT; N 0 DEG 4' 45" W 173.05 FT; N 89 DEG 32' 20" E 1327.92 FT TO BEG. AREA 5.271 AC.
59 116 8	Don Kaufer	PO Box 301		American Fork	UT	84003	COM S 0 DEG 30' 24" E 1220 FT FR E1/4 COR. SEC. 8 T7S R2W SLB&M.; S 0 DEG 30' 24" E 103.57 FT; S 89 DEG 31' 5" W 1337.8 FT; N 0 DEG 4' 45" W 103.57 FT; N 89 DEG 31' 5" E 1337.03 FT TO BEG. AREA 3.180 AC.
59 116 9	Howard H. & Oliver R. Holmes	c/o Bonnie Kaufer	PO Box 301	American Fork	UT	84003	COM S 0 DEG 30' 24" E 172.57 FT FR E1/4 COR. SEC. 8 T7S R2W SLB&M.; S 0 DEG 30' 24" E 1047.43 FT; S 89 DEG 31' 5" W 1337.03 FT; N 0 DEG 4' 45" W 1047.43 FT; N 89 DEG 31' 5" E 1329.22 FT TO BEG. AREA 32.055 AC.

36	31	32	33	34	35	36	31
1	6	5	4	3	2	1	6
12	7	8	9	10	11	12	7
13	18	17	16	15	14	13	18
24	19	20	21	22	23	24	19
25	30	29	28	27	26	25	30
36	31	32	33	34	35	36	31
1	6	5	4	3	2	1	6

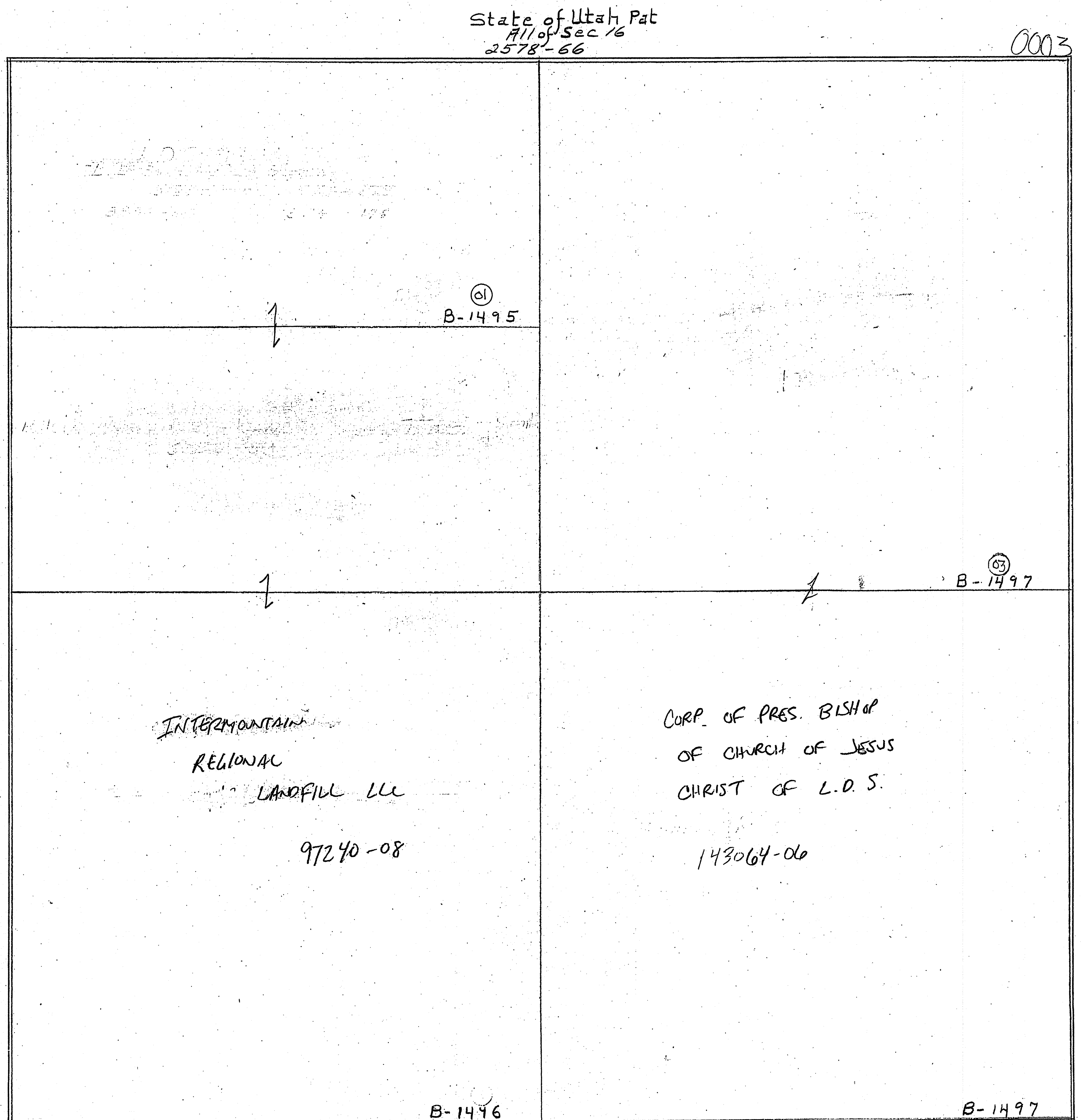
Master Township Sheet   Drn. by B. Thompson for Utah County 1976

54-124-Parcel
Tax Unit-056 124

UTAH COUNTY PLATS

Section 16 Township 7 South Range 2 West

0003



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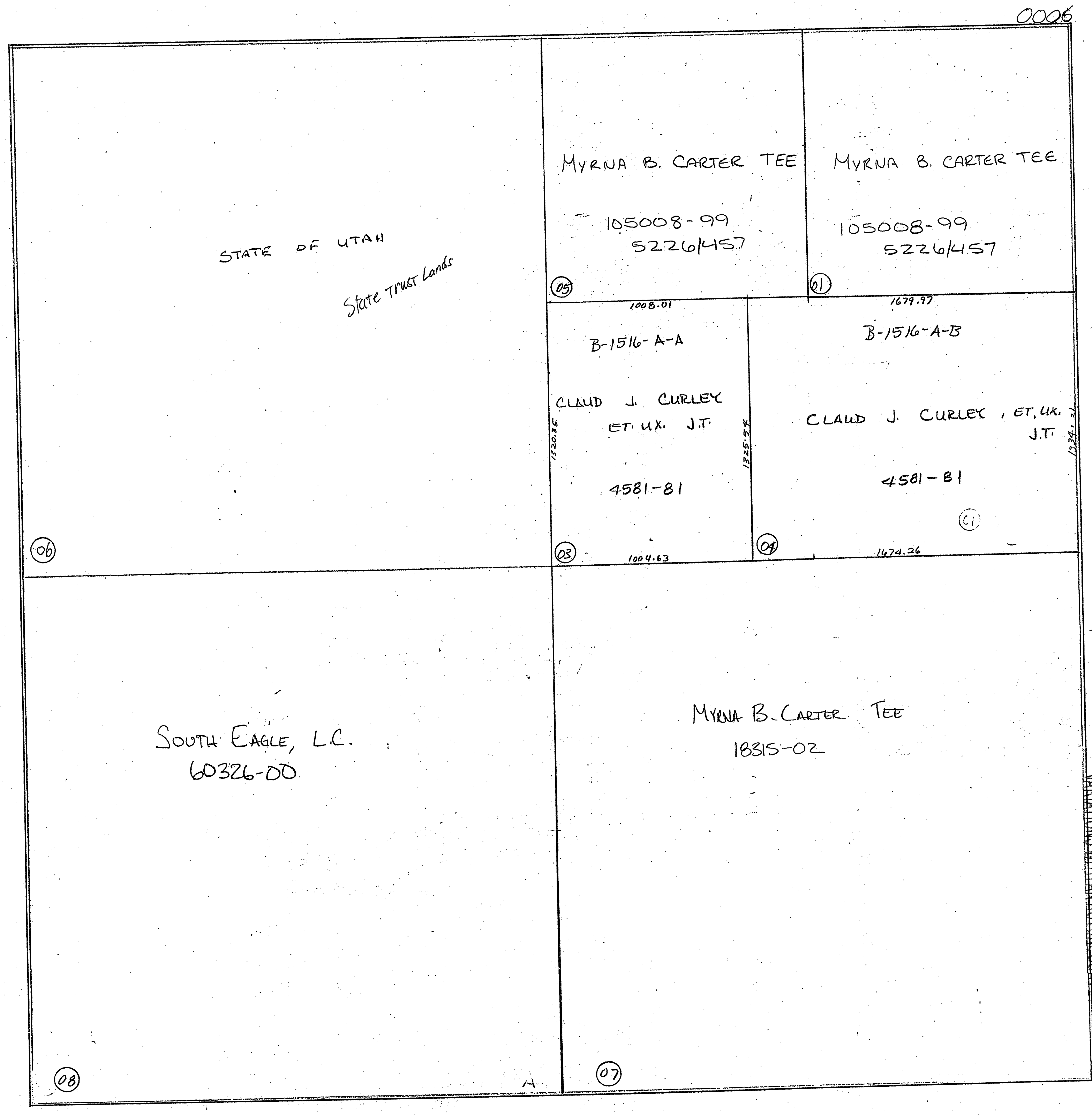
Scale 6 Chains To An Inch

Tax Unit-035 129

UTAH COUNTY PLATS

Section 21 **Township** 7 **South** **Range** 2 West



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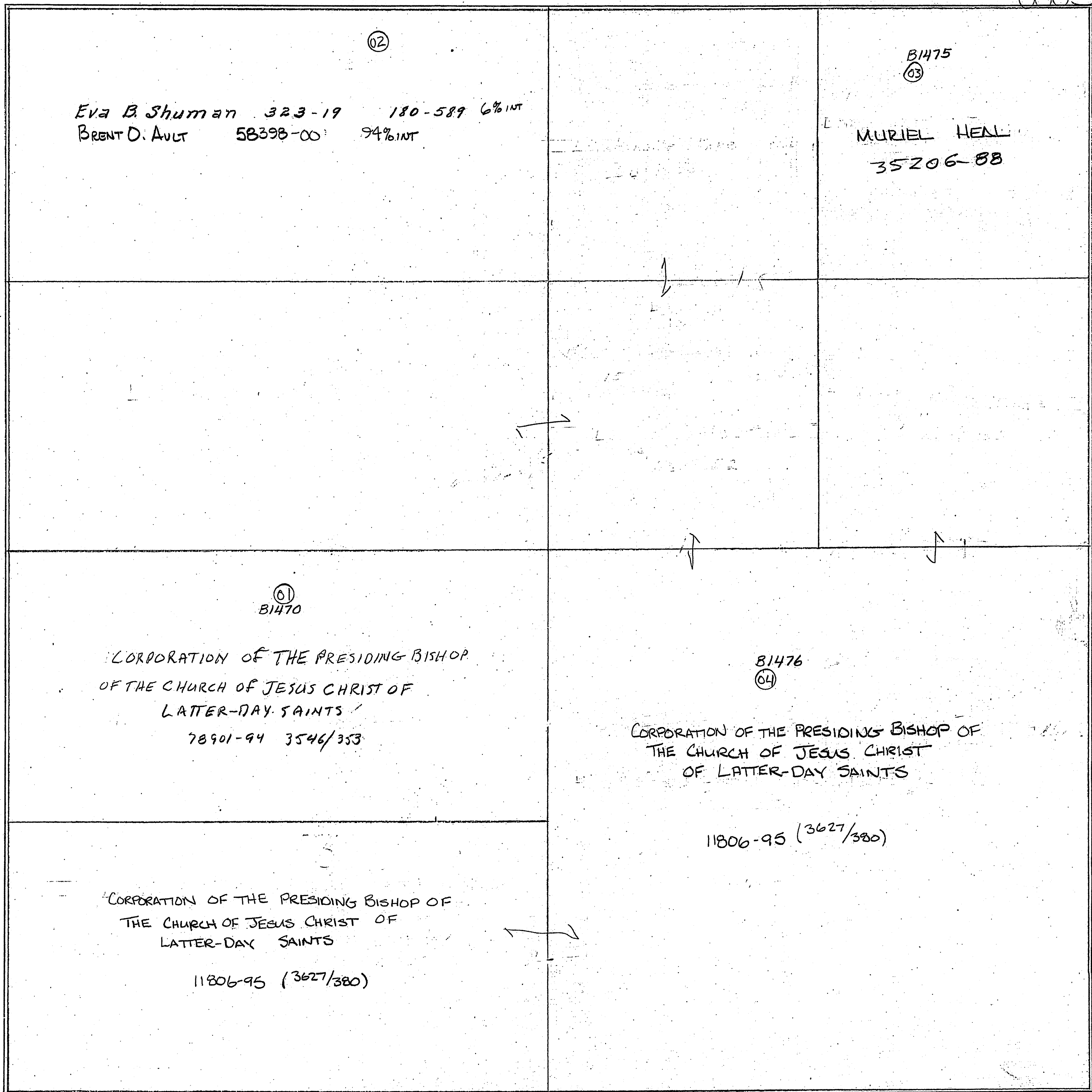
Scale 6 Chains **To An Inch**

54-117-Parcel
Tax Unit-056
117

UTAH COUNTY PLATS

Section 9 Township 7 South Range 2 West

0005



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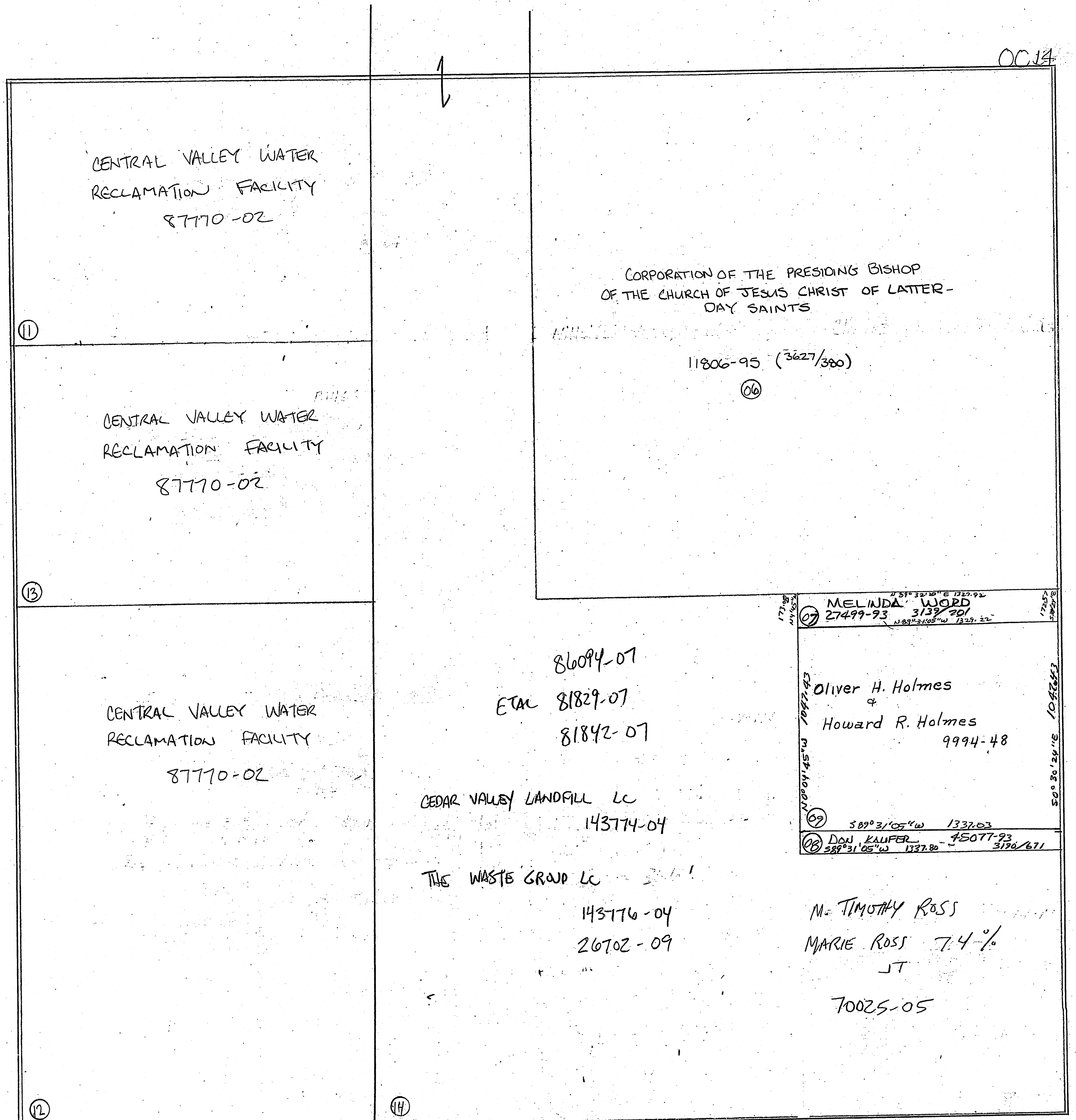
UTAH COUNTY PLATS

Section 8 Township 7 South Range 2 West



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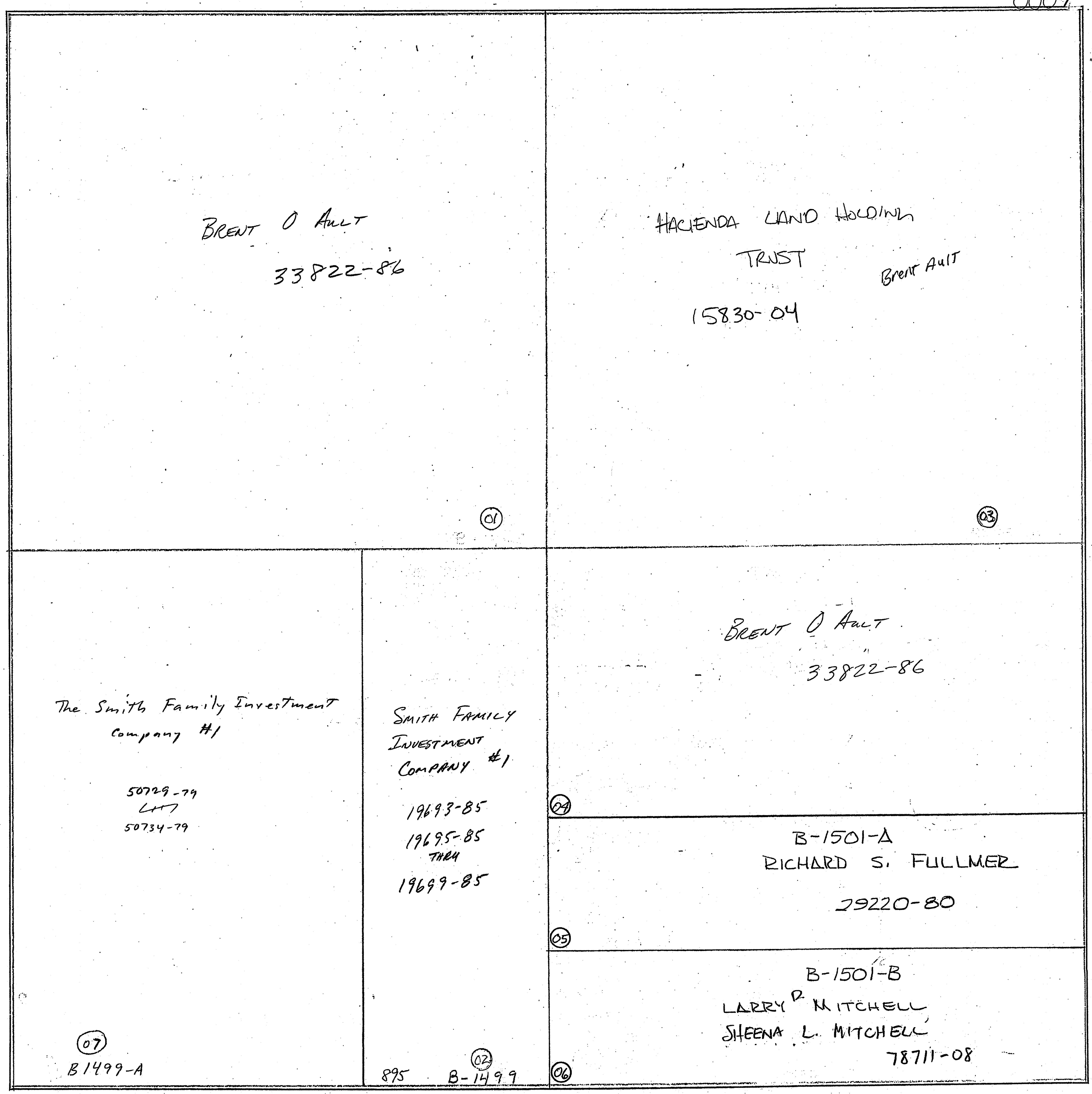
Scale 6 Chains To An Inch

54-125-Parcel
Tax Unit-035 125

UTAH COUNTY PLATS

Section 17 Township 7 South Range 2 West

0007



Scale 6 Chains To An Inch

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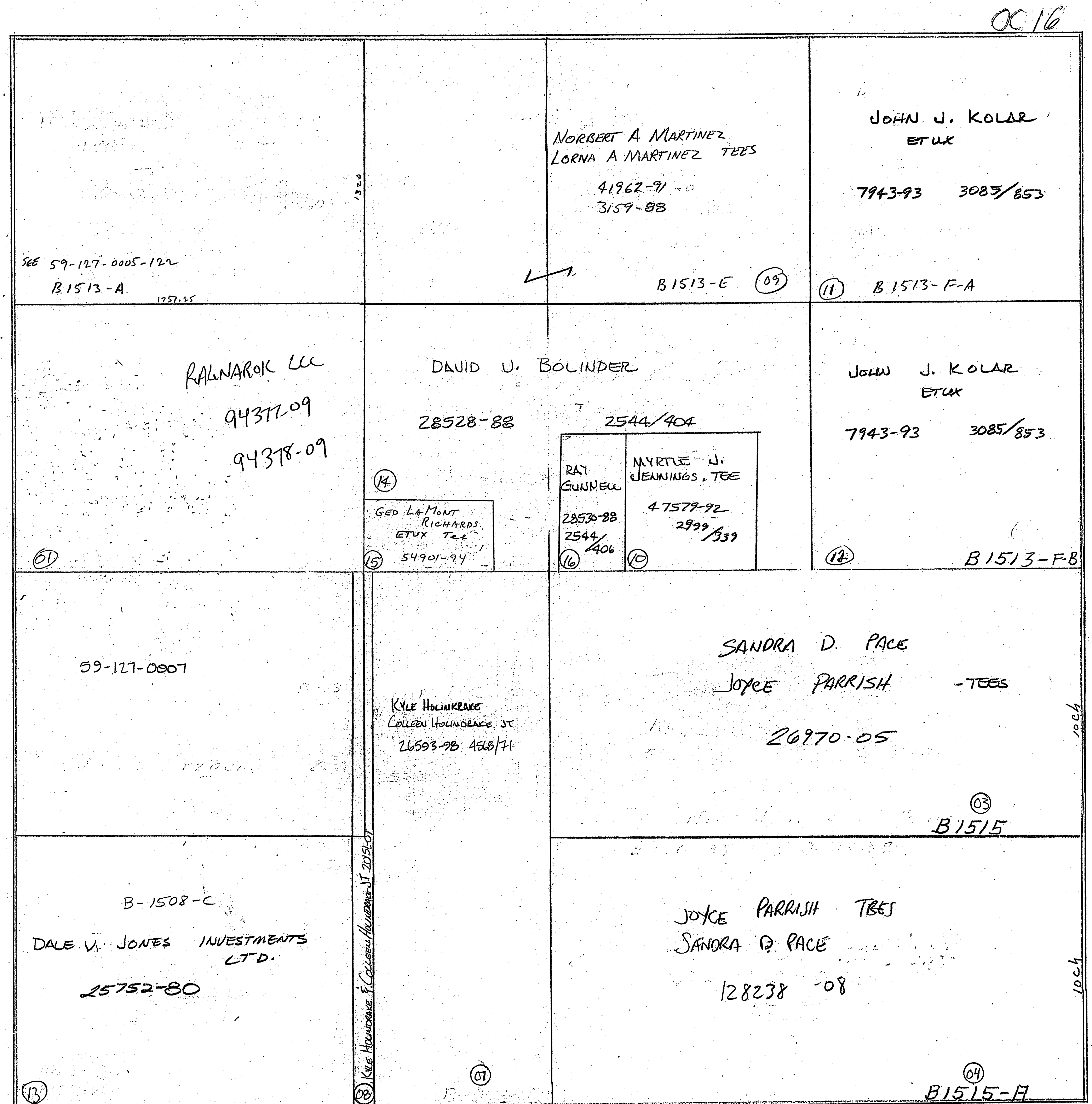
VARIATIONS WITH AN ACTUAL SURVEY

59-128-Parcel
Tax Unit-035 128

UTAH COUNTY PLATS

Section 20 Township 7 South Range 2 West



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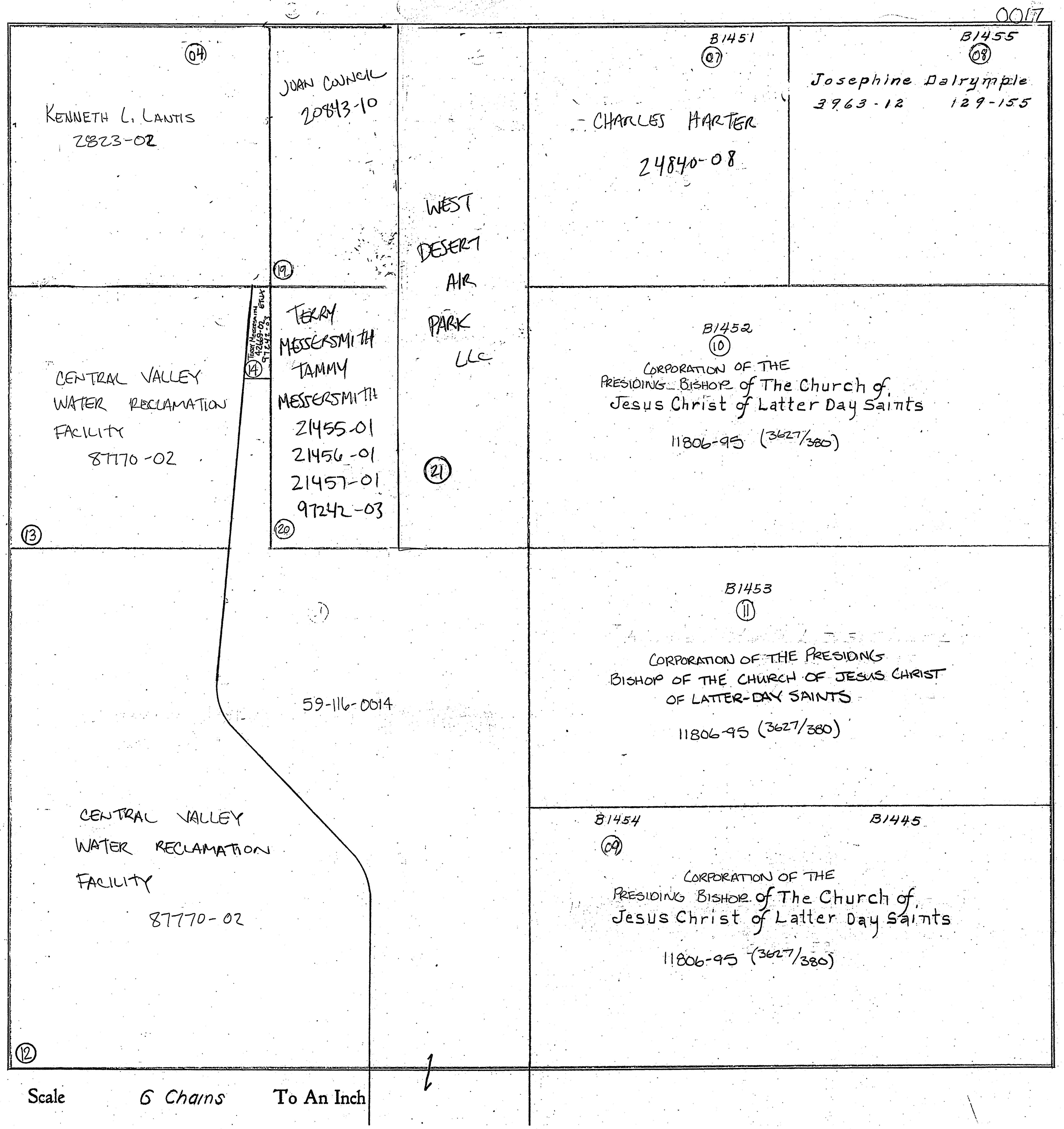
VARIATIONS WITH AN ACTUAL SURVEY

Tax Unit - 056 113
59-113-Parcel

UTAH COUNTY PLATS

Section 5 Township 7 South Range 2 West



Scale 6 Chains To An Inch

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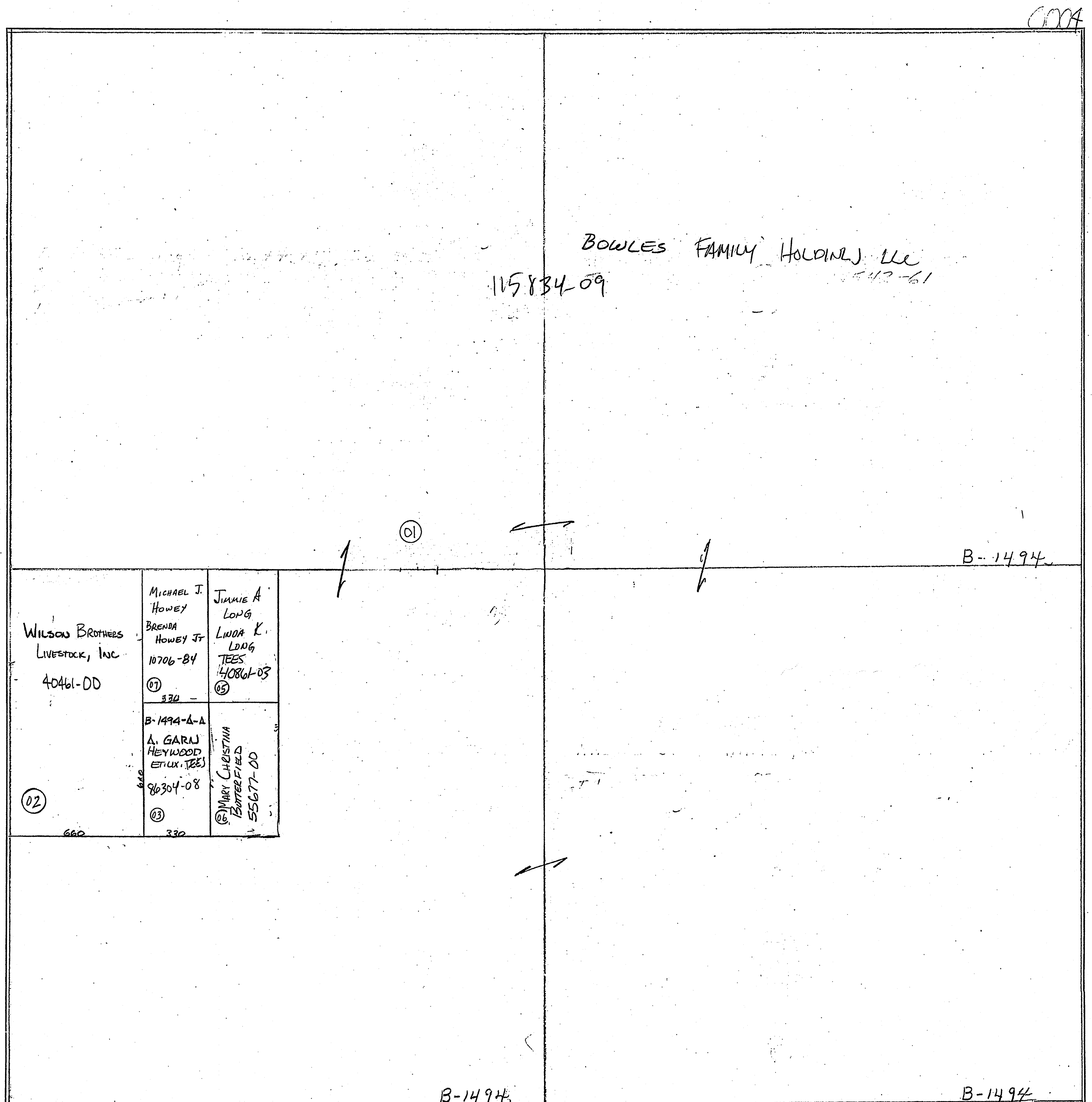
ACCURACY, INCORRECT DATA OR
VARIATIONS WITH AN ACTUAL SURVEY

59-123-Parcel
Tax Unit-035
123

UTAH COUNTY PLATS

Section 15 Township 7 South Range 2 West



Scale 6 Chains To An Inch

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August 19, 2010

Corporation of the Presiding Bishopric
50 E. North Temple
Salt Lake City, UT 84150

Subject: **Notice of Intent to Submit a Landfill Permit Application for the Proposed Intermountain Regional Landfill in Fairfield, Utah**

Dear Property Owner:

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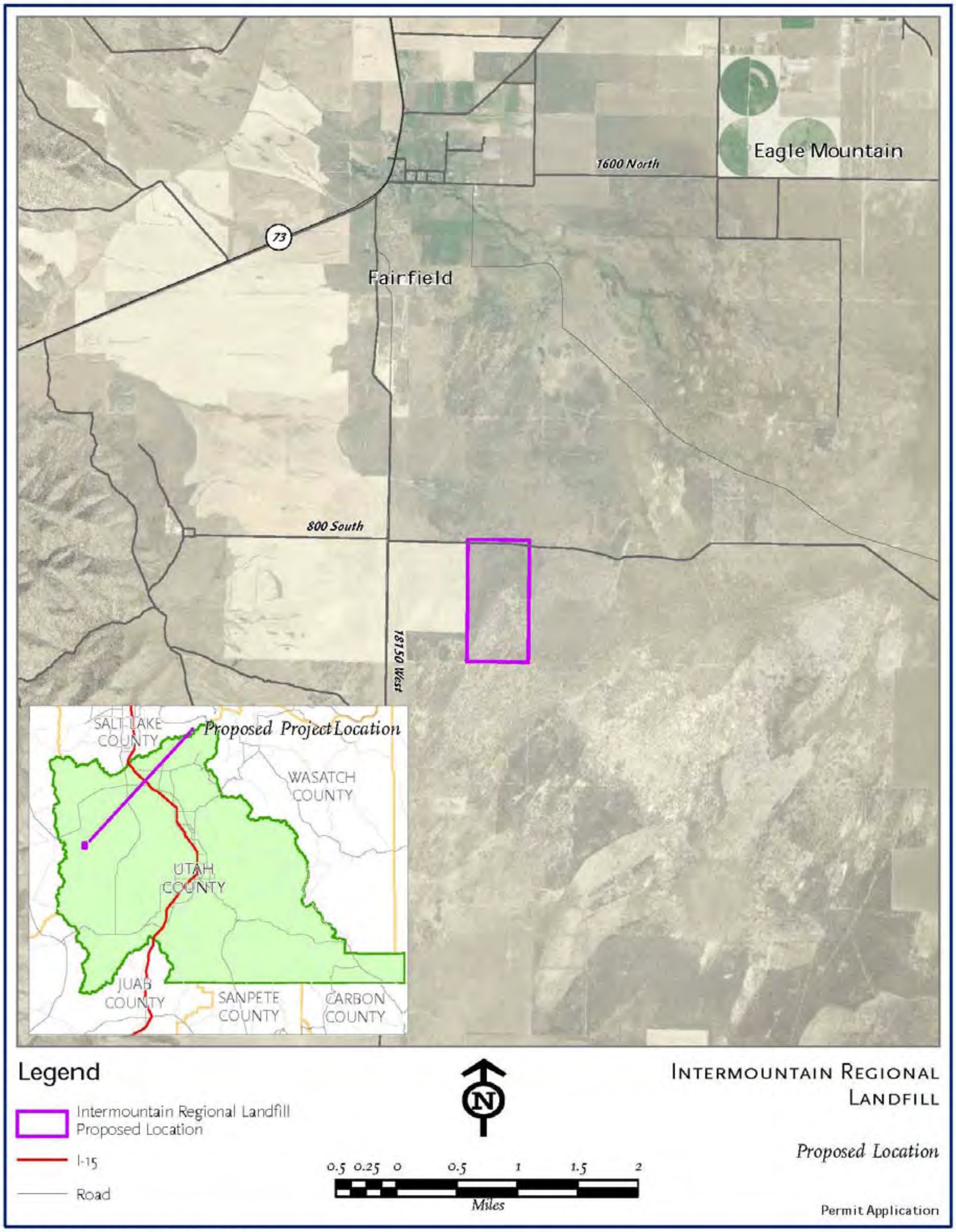
If you have any questions about the proposed landfill or the permitting process, please call me at (801) 743-7800.

Sincerely,
HDR Engineering, Inc.

Terry Warner, PE
Engineering Project Manager

Enclosure



Eagle Mountain
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800 South
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SALT LAKE COUNTY
Proposed Project Location
WASATCH COUNTY
UTAH COUNTY
JUAB COUNTY
SANPETE COUNTY
CARBON COUNTY
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Intermountain Regional Landfill Proposed Location
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Miles
INTERMOUNTAIN REGIONAL LANDFILL
Proposed Location
Permit Application

August 19, 2010

Utah Trust Lands Administration
675 East 500 South
Salt Lake City, UT 84102

Subject: **Notice of Intent to Submit a Landfill Permit Application for the Proposed Intermountain Regional Landfill in Fairfield, Utah**

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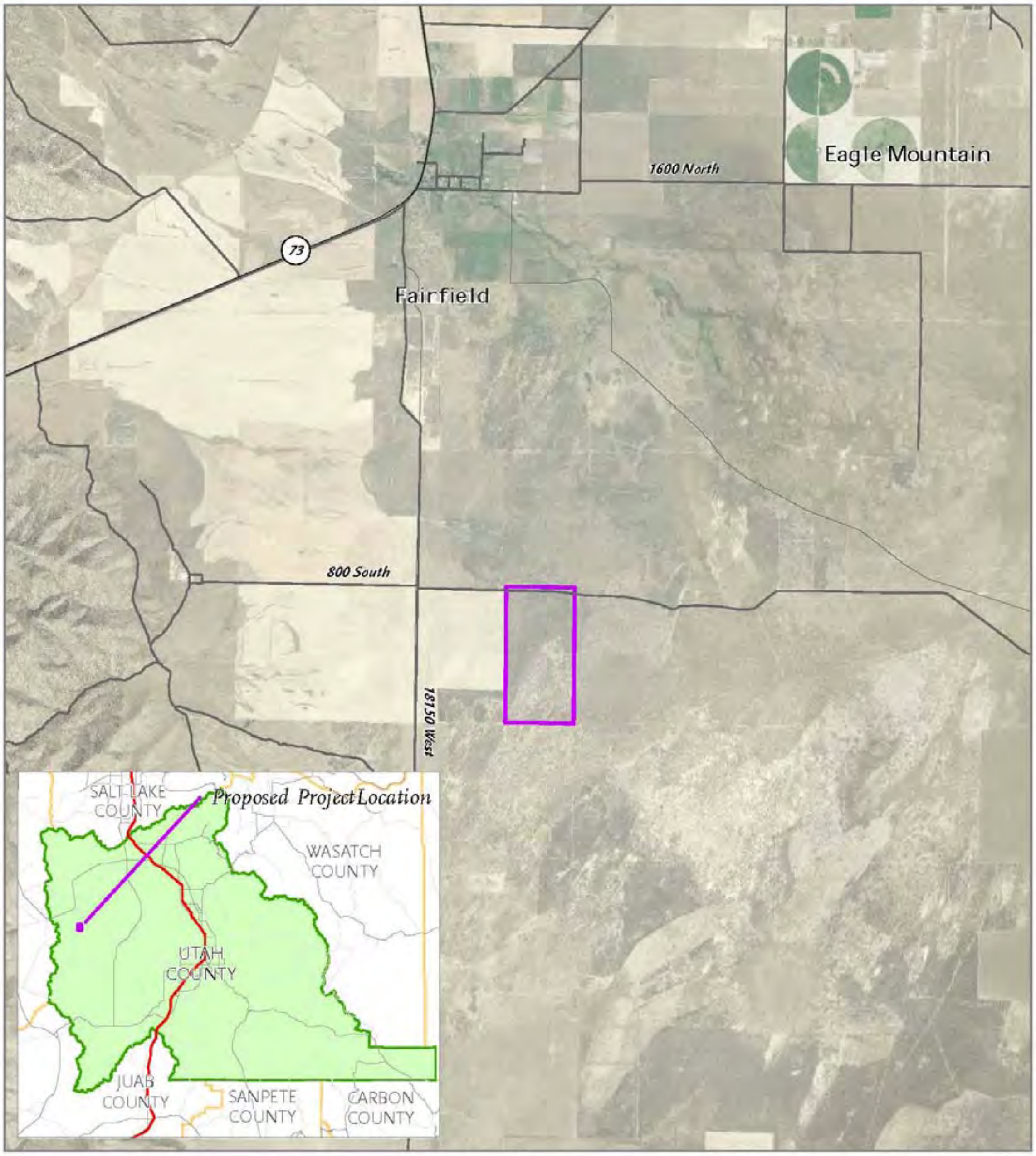

Legend

- Intermountain Regional Landfill Proposed Location
- I-15
- Road

0.5 0.25 0 0.5 1 1.5 2
Miles

INTERMOUNTAIN REGIONAL LANDFILL

Proposed Location

Permit Application

August 19, 2010

Myrna B. Carter
13218 South 6200 West
Herriman, UT 84096

Subject: **Notice of Intent to Submit a Landfill Permit Application for the Proposed Intermountain Regional Landfill in Fairfield, Utah**

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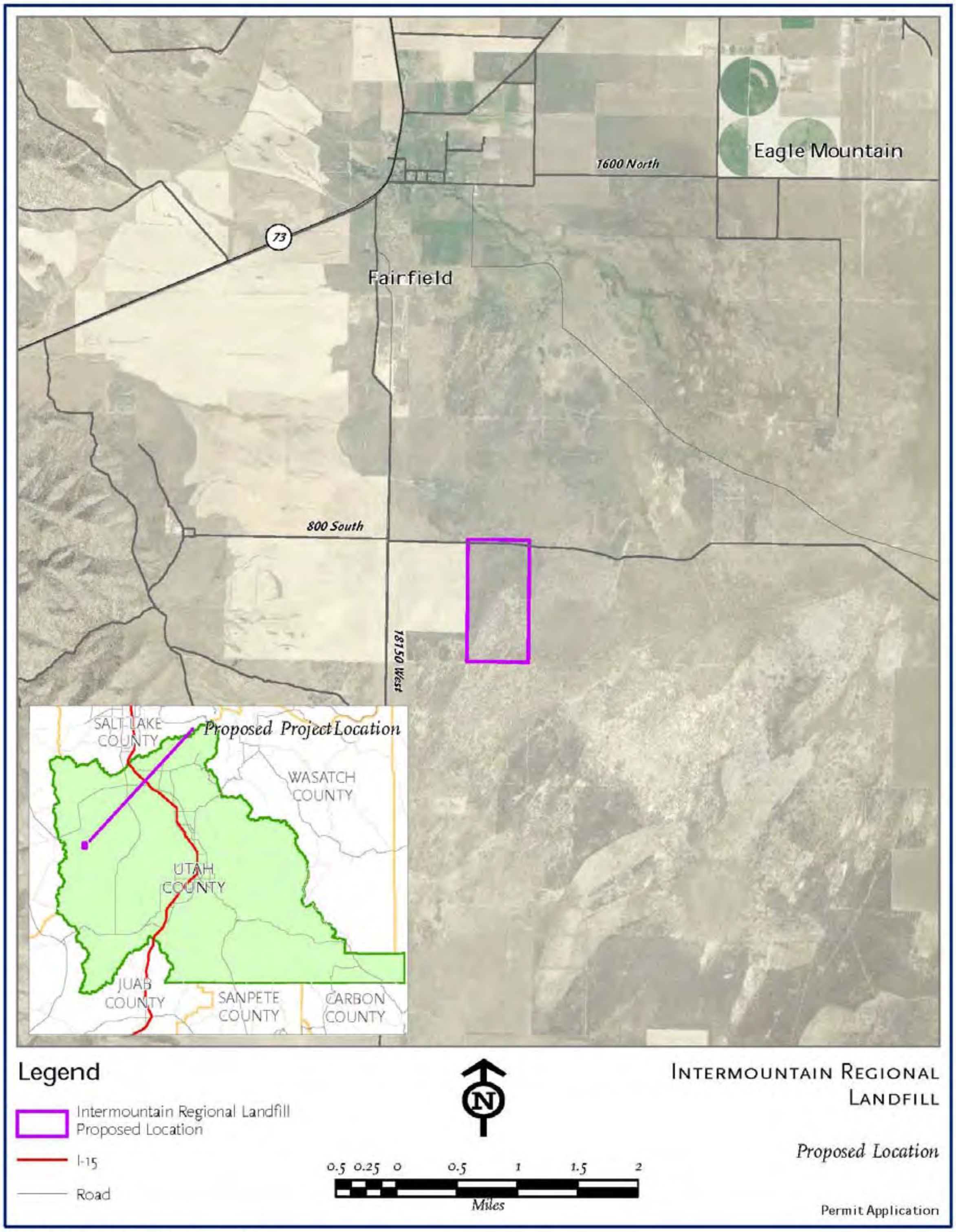

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Proposed Location
Permit Application

August 19, 2010

Claude J. & Evelyn M. Curley
1409 Bryan Avenue
Salt Lake City, UT 84096

Subject: **Notice of Intent to Submit a Landfill Permit Application for the Proposed Intermountain Regional Landfill in Fairfield, Utah**

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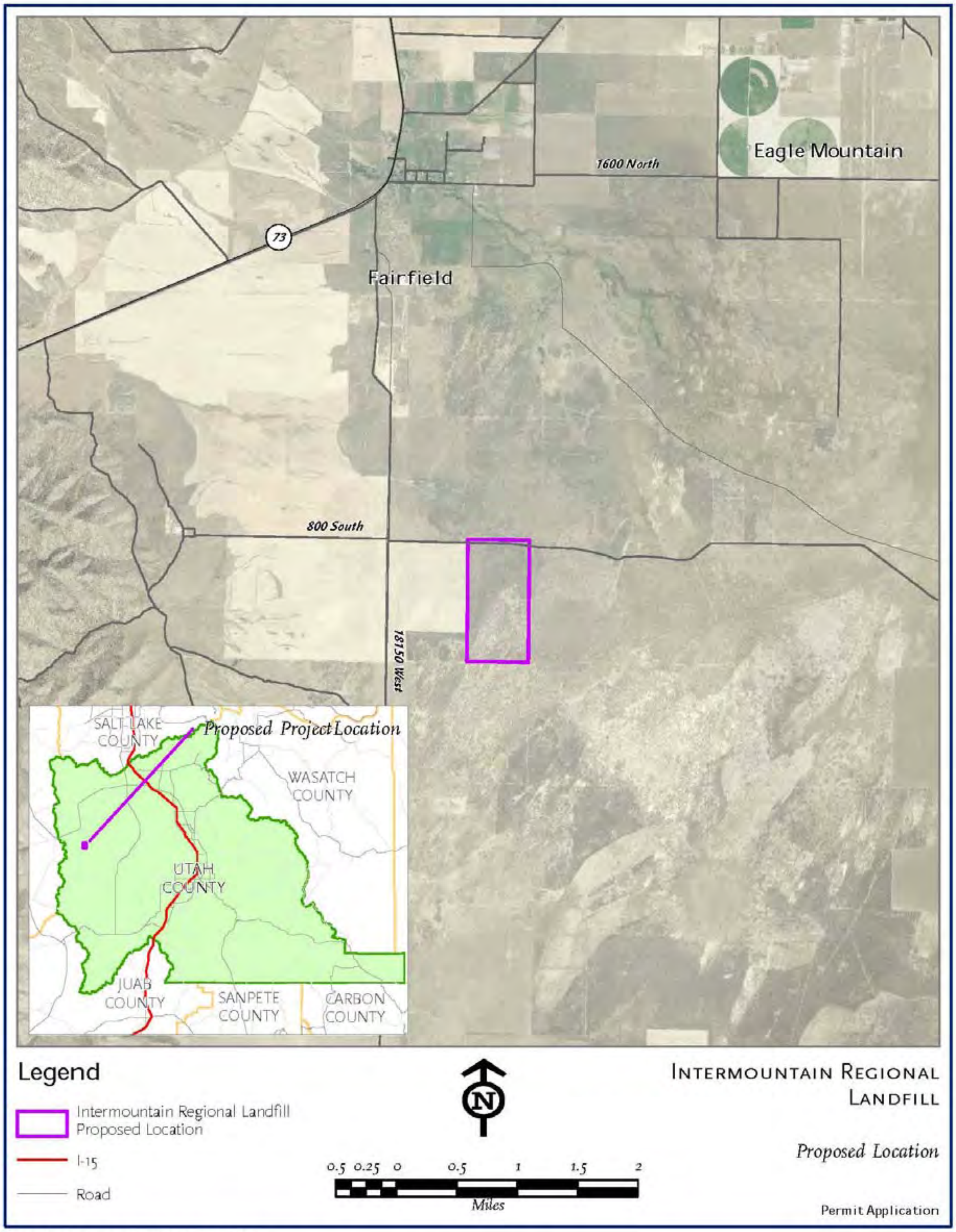
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Miles
INTERMOUNTAIN REGIONAL LANDFILL
Proposed Location
Permit Application

August 19, 2010

Norbert A. & Lorna A. Martinez
1142 Randers Lane
Draper, UT 84020

Subject: **Notice of Intent to Submit a Landfill Permit Application for the Proposed Intermountain Regional Landfill in Fairfield, Utah**

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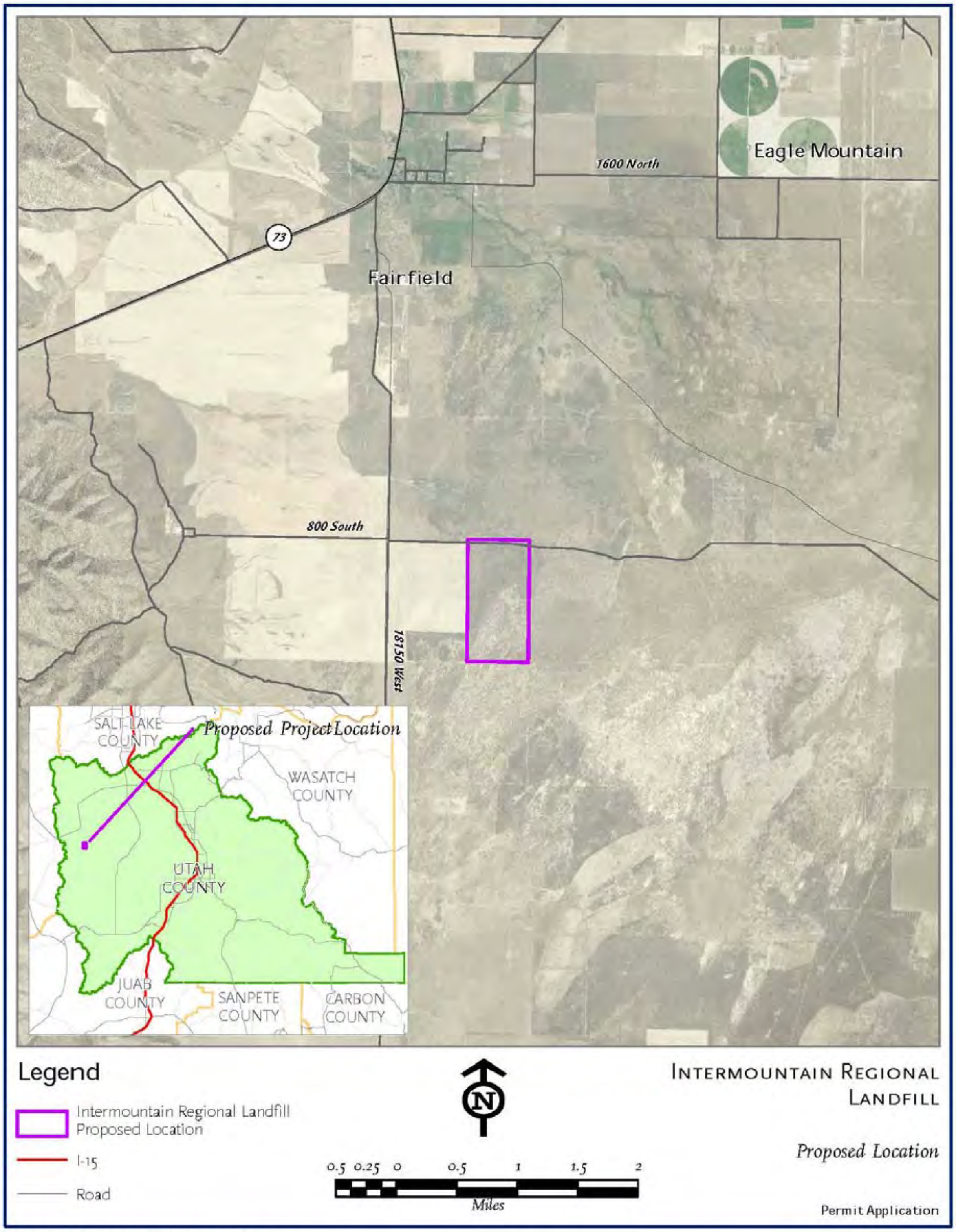
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Proposed Location
Permit Application

August 19, 2010

John J. & Julie Kolar
612 Glorietta Blvd.
Lafayette, CA 94549

Subject: **Notice of Intent to Submit a Landfill Permit Application for the Proposed Intermountain Regional Landfill in Fairfield, Utah**

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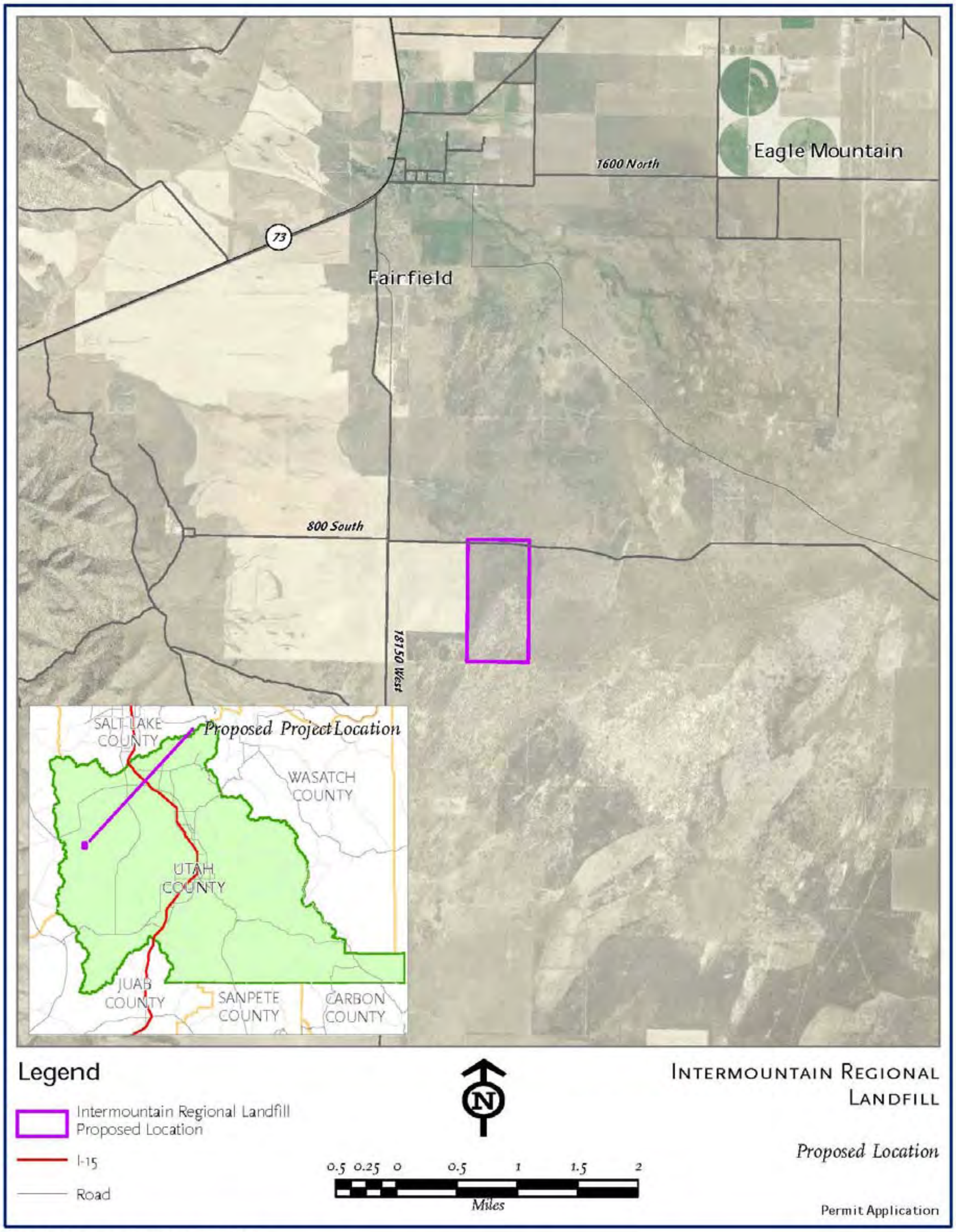

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Proposed Location
Permit Application

August 19, 2010

Brent O. Ault
510 North 1100 East
American Fork, UT 84003

Subject: **Notice of Intent to Submit a Landfill Permit Application for the Proposed Intermountain Regional Landfill in Fairfield, Utah**

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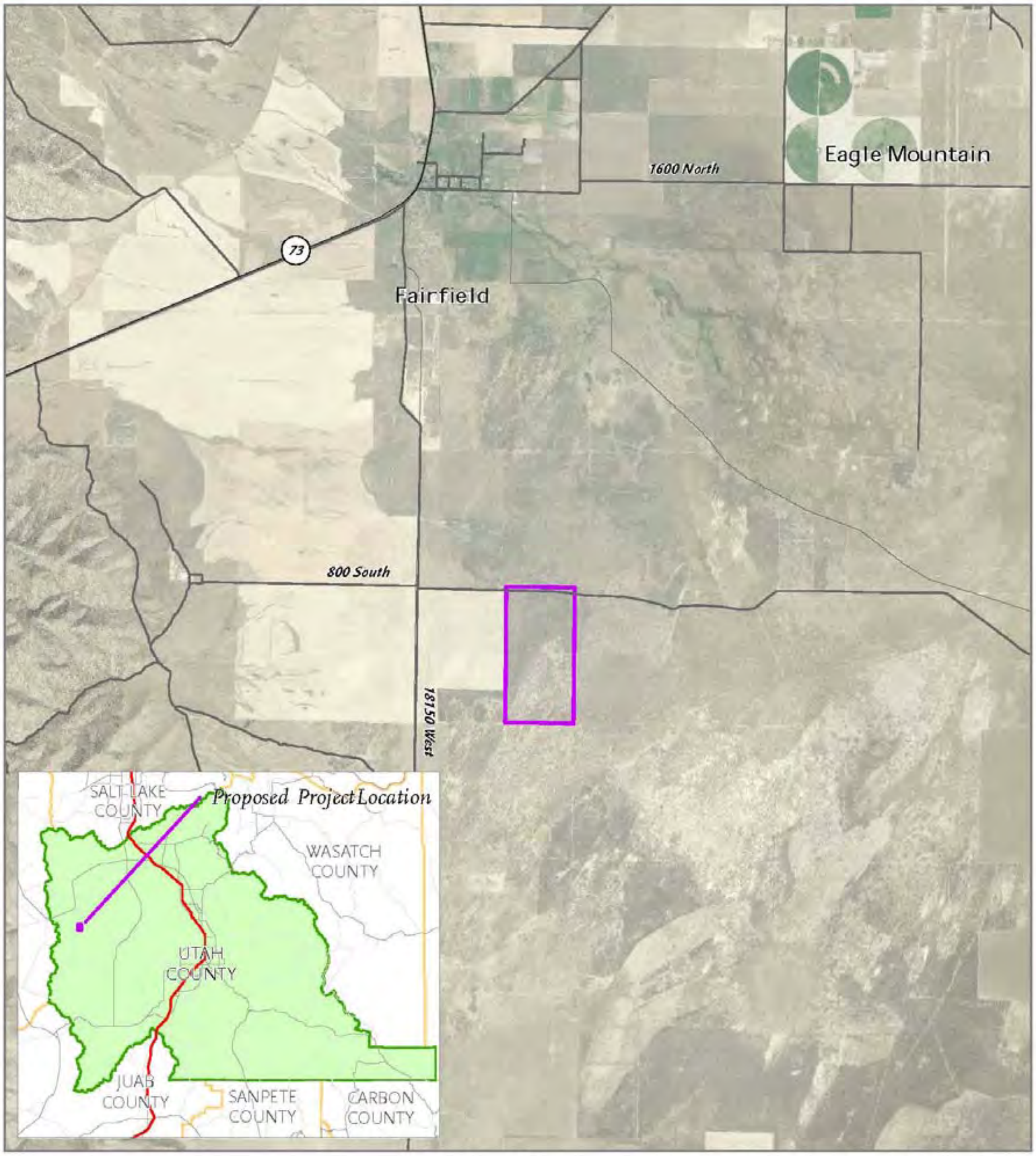

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Miles

INTERMOUNTAIN REGIONAL LANDFILL

Proposed Location

Permit Application

August 19, 2010

Richard S. Fullmer
2150 Willow Brook
Sandy, UT 84092

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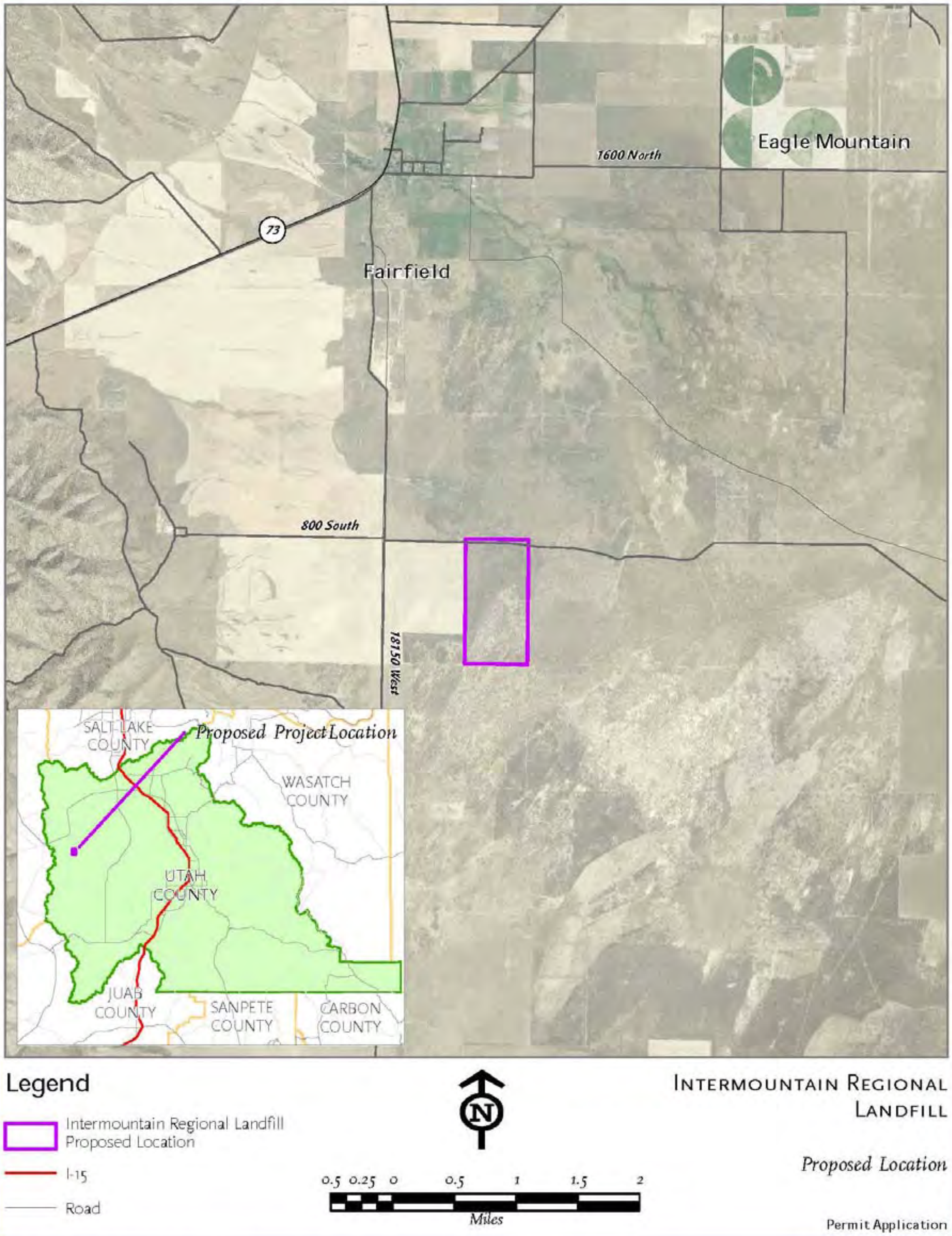

INTERMOUNTAIN REGIONAL LANDFILL

Proposed Location

Permit Application

August 19, 2010

Larry D. & Sheena L. Mitchell
8721 Oakwood Park
Sandy, UT 84094

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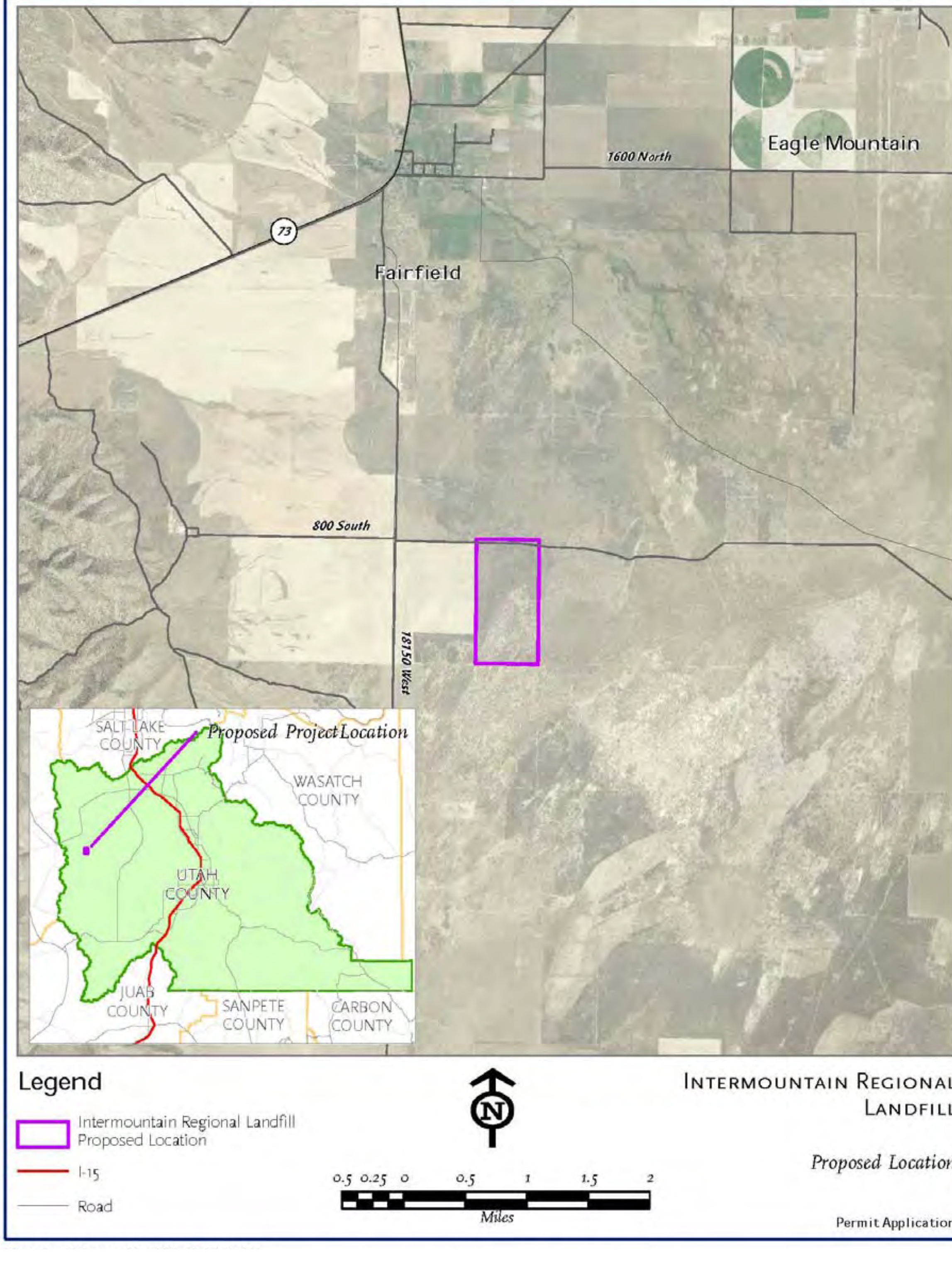

Legend

- Intermountain Regional Landfill Proposed Location
- I-15
- Road

Intermountain Regional Landfill

Proposed Location

Permit Application

August 19, 2010

Melinda Word
P.O. Box 301
American Fork, UT 84003

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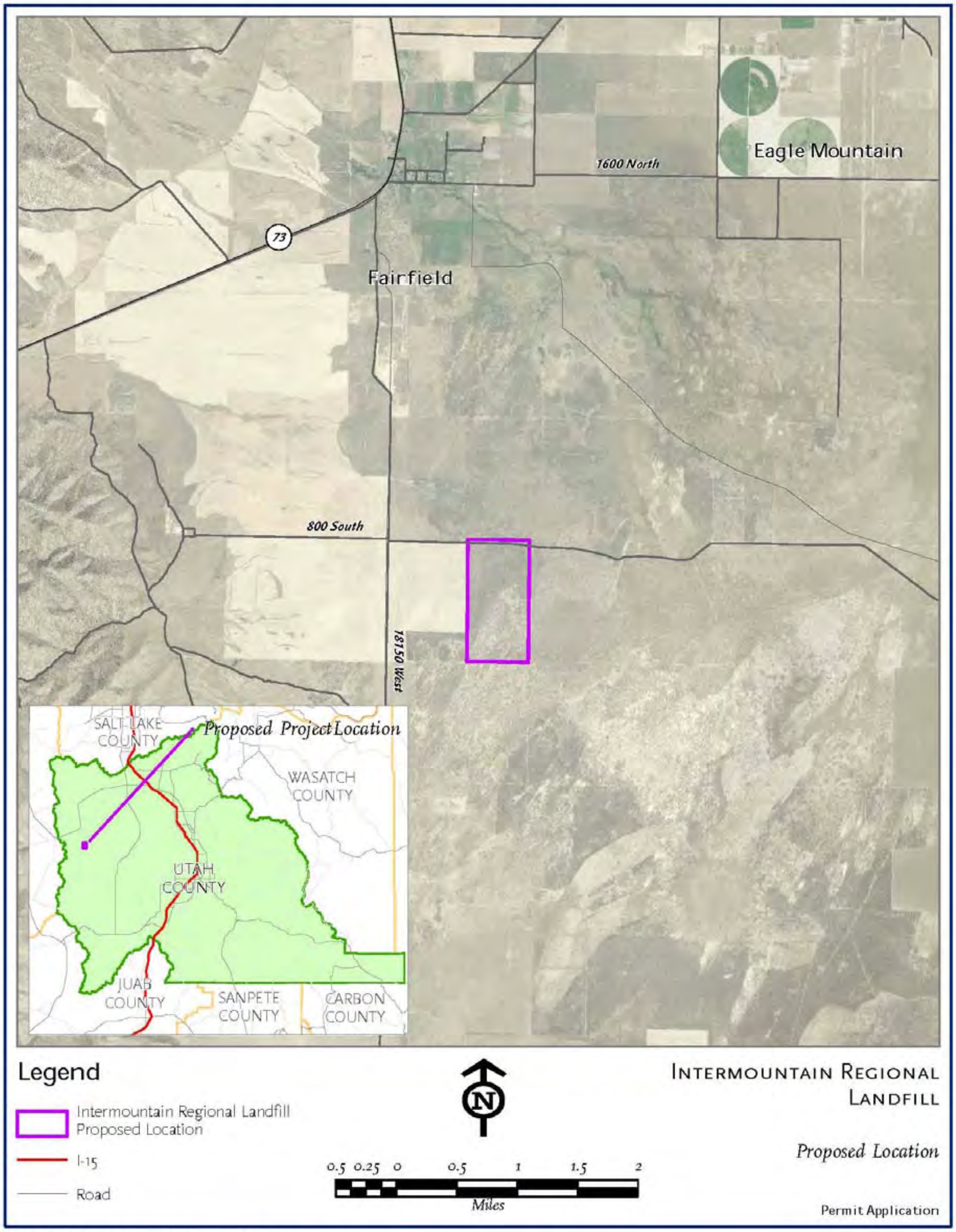
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Proposed Location
Permit Application

August 19, 2010

Don Kaufer
P.O. Box 301
American Fork, UT 84003

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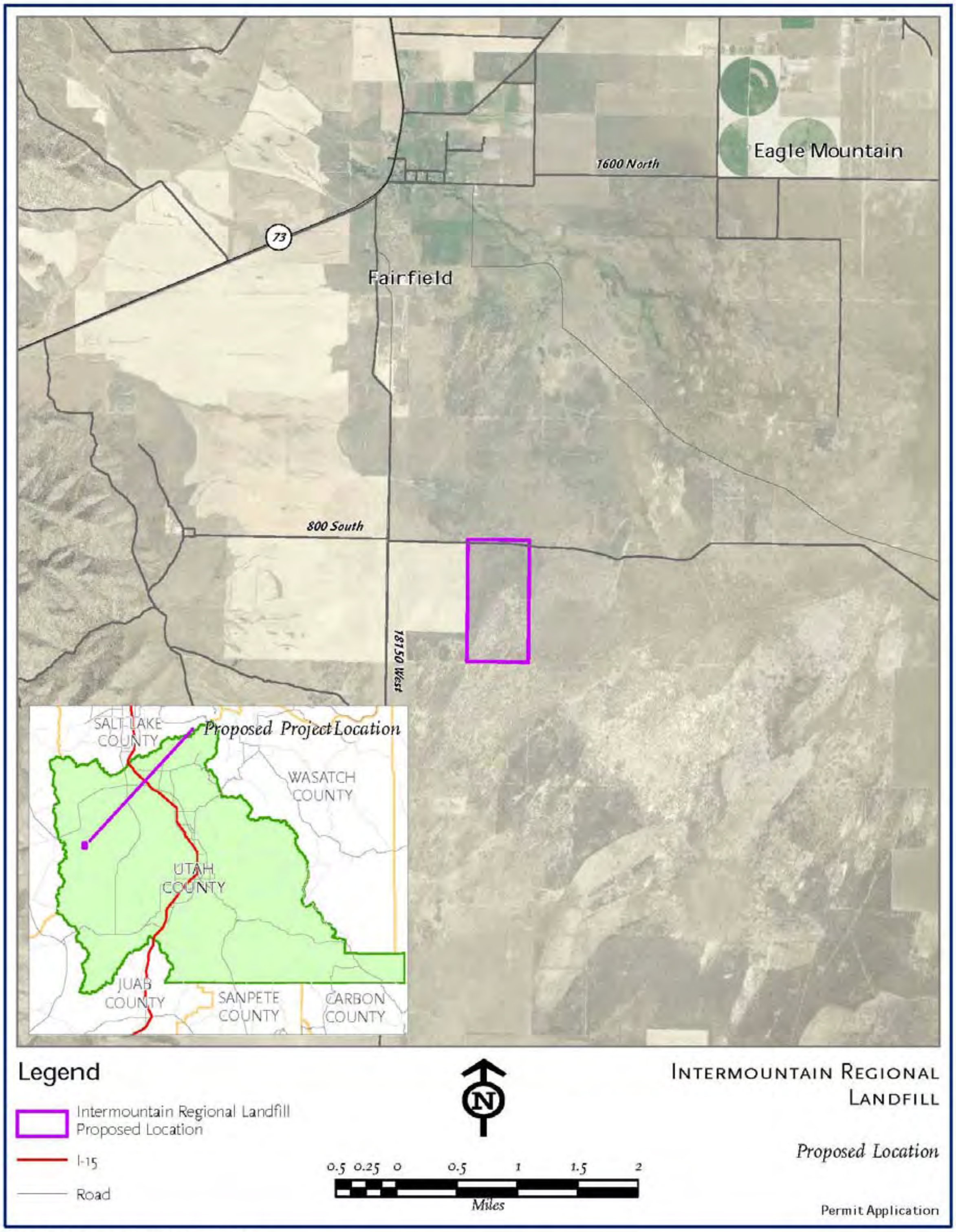

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Proposed Location
Permit Application

August 19, 2010

Howard H. & Oliver R. Holmes
c/o Bonnie Kaufer
P.O. Box 301
American Fork, UT 84003

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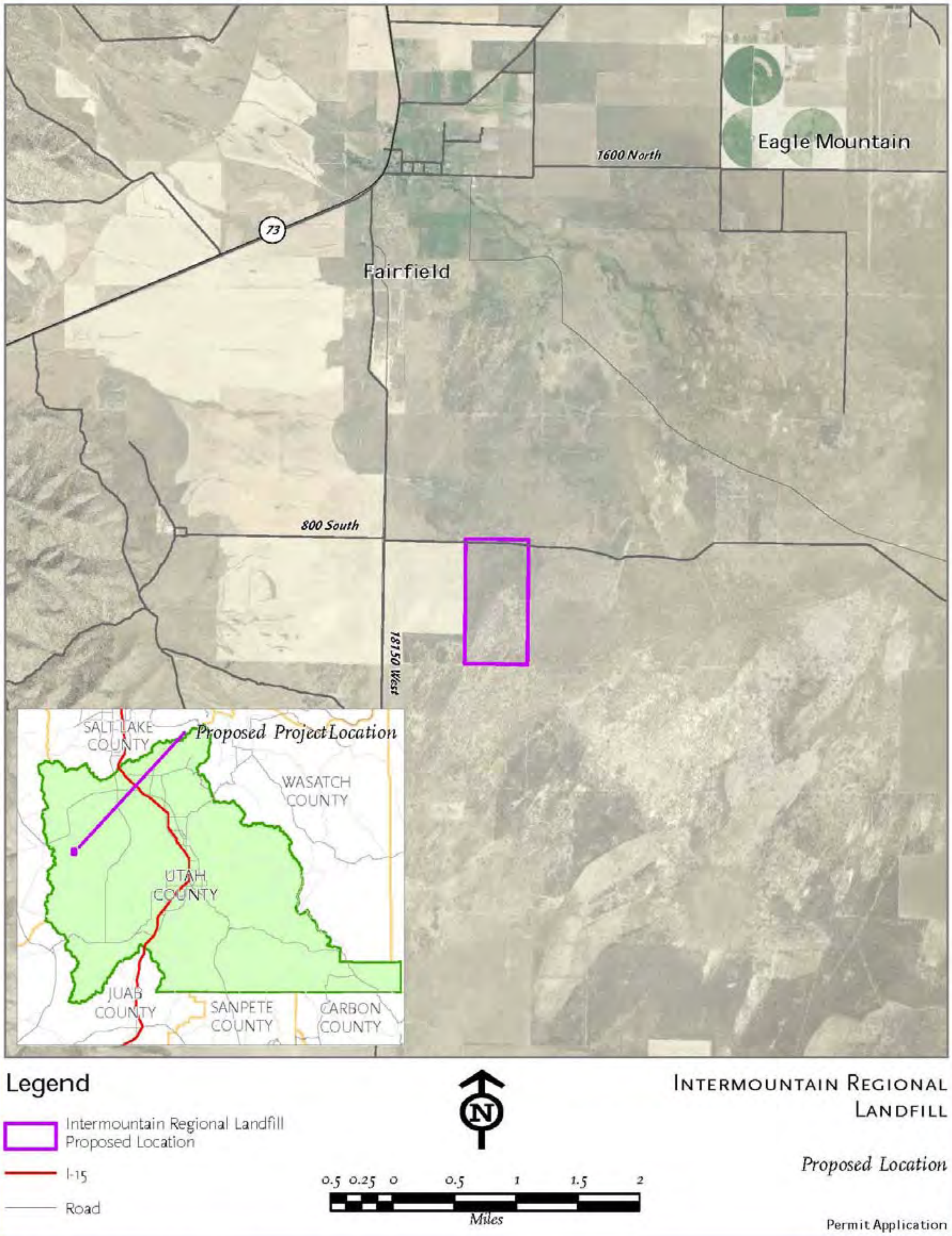


Legend

- Intermountain Regional Landfill Proposed Location
- I-15
- Road

Intermountain Regional Landfill

Proposed Location

Permit Application

ENT 57940:2009 PG 1 of 6
RANDALL A. COVINGTON
UTAH COUNTY RECORDER
2009 May 27 9:11 am FEE 20.00 BY SS
RECORDED FOR TITLE WEST TITLE COMPANY
ELECTRONICALLY RECORDED

When Recorded Mail to:
Paul W. Hess
Strong & Hanni
3 Triad Center, Suite 500
Salt Lake City, Utah 84180

TRUST DEED
WITH ASSIGNMENT OF RENTS AND FIXTURE FILING

TW 282607

THIS TRUST DEED, made effective March 12, 2009, among Intermountain Regional Landfill, LLC, a Utah limited liability company, as TRUSTOR, whose address is 1270 West 1130 South, Suite 145, Orem, Utah 84058, Paul W. Hess, attorney at law, as TRUSTEE, whose address is 3 Triad Center, Suite 500, Salt Lake City, Utah 84180, ROC Fund Landfill Holdings, LLC, a Nevada limited liability company, whose address is 1240 East 2100 South, 1st Floor, Salt Lake City, Utah 84106, as BENEFICIARY.

WITNESSETH: That Trustor CONVEYS AND WARRANTS TO TRUSTEE IN TRUST, WITH POWER OF SALE, the following described property, situated in Utah County, State of Utah:

> The West half of Section 16, Township 7 South, Range 2 West, Salt Lake Base and Meridian.
> (59:124:0001)

Together with all buildings, fixtures, and improvements thereon and all water rights, rights of way, easements, rents, issues, profits, income, tenements, hereditaments, privileges and appurtenances thereunto belonging, now or hereafter used or enjoyed with said property, or any part thereof, SUBJECT, HOWEVER, to the right, power and authority hereinafter given to and conferred upon Beneficiary to collect and apply such rents, issues, and profits;

FOR THE PURPOSE OF SECURING (1) payment of the indebtedness evidenced by a Promissory Note of even date herewith, in the principal sum of $10,971,108.00 (the "**Note**"), made by Trustor, IRL Holdings I, LLC, a Utah limited liability company, and IRL Holdings II, LLC, a Utah limited liability company (collectively, "**Borrowers**" and individually "**Borrower**"), payable to the order of Beneficiary at the times, in the manner and with interest as therein set forth, and any extensions and/or renewals or modifications thereof; (2) the payment and performance of each covenant, obligation, and agreement of Borrowers under a Loan Agreement of even date herewith between Borrowers and Beneficiary and under all of the Loan Documents as defined in the Loan Agreement (the "**Loan Documents**"); (3) the performance of each agreement of Trustor herein contained; (4) the payment of such additional loans or advances as hereafter may be made to any Borrower, or its successors or assigns, when evidenced by a promissory note or notes reciting that they are secured by this Trust Deed; and (5) the payment of all sums expended or advanced by Beneficiary under or pursuant to the terms hereof or of any of the Loan Documents, together with interest thereon as herein provided.

Trustor represents and warrants that Trustor is receiving valuable benefits and consideration as a result of Borrowers and Beneficiary entering into the Loan Agreement and the making of the Loan (as defined in the Loan Agreement).

TO PROTECT THE SECURITY OF THIS TRUST DEED, TRUSTOR AGREES:

1. To keep said property in good condition and repair; not to remove or demolish any building thereon, to complete or restore promptly and in good and workmanlike manner any building which may be constructed, damaged or destroyed thereon; to comply with all laws, covenants and restrictions affecting said property; not to commit or permit waste thereof; not to commit, suffer or permit any act upon said property in violation of law; to do all other acts which from the character or use of said property may be reasonably necessary, the specific enumerations herein not excluding the general; and, if the loan secured hereby or any part thereof is being obtained for the purpose of financing construction of improvements on said property.

2. To provide and maintain insurance, of such type or types and amount as set forth in the Loan Agreement, on the Project (as defined in the Loan Agreement) and improvements now existing or hereafter erected or placed on said property. Such insurance shall be carried in companies approved by Beneficiary with loss payable clauses in favor of and in form acceptable to Beneficiary. In the event of loss, Trustor shall give immediate notice to Beneficiary, who may make proof of loss, and each insurance company concerned is hereby authorized and directed to make payment for such loss directly to Beneficiary instead of to Trustor and Beneficiary jointly up to the amount of the then outstanding balance under the Note; and the insurance proceeds, or any part thereof, may be applied by Beneficiary, at its option, to reduction of the indebtedness hereby secured or to the restoration or repair of the property damaged.

3. To deliver to, pay for and maintain with Beneficiary until the indebtedness secured hereby is paid in full, such evidence of title as Beneficiary may require, including abstracts of title or policies of title insurance and any extensions or renewals thereof or supplements thereto.

4. To appear in and defend any action or proceeding purporting to affect the security hereof, the title to said property, or the rights or powers of Beneficiary, or Trustee; and should Beneficiary or Trustee elect to also appear in or defend any such action or proceeding, to pay all costs and expenses, including cost of evidence of title and attorney's fees in a reasonable sum incurred by Beneficiary or Trustee.

5. To pay at least ten (10) days before delinquency all taxes and assessments affecting said property, including all assessments upon water company stock and all rents, assessments and charges for water, appurtenant to or used in connection with said property; to pay, when due, all encumbrances, charges and liens with interest, on said property or any part thereof, which at any time appear to be prior or superior hereto; to pay all costs, fees and expenses of this Trust.

6. Should Trustor fail to make any payment or to do any act as herein provided after the applicable cure period set forth below, then Beneficiary or Trustee, but without obligation so

to do and without notice to or demand upon Trustor and without releasing Trustor from any obligation hereof, may: make or do the same in such manner and to such extent as either may deem necessary to protect the security hereof; (Beneficiary or Trustee being authorized to enter upon said property for such purposes); commence, appear in and defend any action or proceeding purporting to affect the security hereof or the rights or powers of Beneficiary or Trustee; pay, purchase, contest, or compromise any encumbrances, charge or lien which in the judgment of either appears to be prior or superior hereto; and in exercising any such powers, incur any liability, expend whatever amounts in its absolute discretion it may deem necessary therefor, including cost of evidence of title, employment of counsel, and pay his reasonable attorneys fees. Notwithstanding the foregoing, Beneficiary shall take no action provided that (a) if such default is a default in the payment due and Borrowers cure such default not later than five (5) days after receipt of written notice; (b) if such default is a default in observing or performing any other covenant or condition to be observed or performed by Borrowers under the Loan Documents, and Borrowers remedy such default within thirty (30) days after receipt of written notice; provided, however, in the case of a default that cannot with diligence be cured, or the curing of which cannot be commenced, within such thirty (30) days, Borrowers shall have such additional period as may be reasonably necessary to cure such default with diligence and continuity.

7. To pay within thirty (30) days written of written demand with documentation sufficient to support such sums, all sums expended hereunder by Beneficiary or Trustee, with interest from date or expenditure at the rate of EIGHTEEN per cent (18%) per annum until paid, and the repayment thereof shall be secured hereby.

IT IS MUTUALLYAGREED THAT

8. Should said property or any part thereof be taken or damaged by reason of any public improvement or condemnation proceeding, or damaged by fire; or earthquake; or in any manner, Beneficiary shall be entitled to all compensation, awards, and other payments or relief therefor up to the amount of the then outstanding balance under the Note, and shall be entitled at its option to commence, appear in and prosecute in its own name, any action or proceedings, or to make any compromise or settlement, in connection with such taking or damage. All such compensation, awards, damages, rights of action and proceeds, including the proceeds of any policies of fire and other insurance affecting said property up to the amount of the then outstanding balance under the Note, are hereby assigned to Beneficiary, who may, after deducting therefrom all its expenses, including attorney's fees, apply the same on any indebtedness secured hereby. Trustor agrees to execute such further assignments of any compensation, award, damages, and rights of action and proceeds as Beneficiary or Trustee may require.

9. Beneficiary may, at its option, declare immediately due and payable all sums secured by this Trust Deed upon the sale or transfer, without the Beneficiary's prior written consent, of all or any part of the property, or any interest in the property.

10. At any time and from time to time upon written request of Beneficiary, payment of its fees and presentation of this Trust Deed and the note for endorsements (in case of full

reconveyance, for cancellation and retention), without affecting the liability of any person for the payment of the indebtedness secured hereby, Trustee may: (a) consent to the making of any map or plat of said property; (b) join in granting any easement or creating any restriction thereon; (c) join in any subordination or other agreement affecting this Trust Deed or the lien or charge thereof; and or (d) reconvey, without warranty, all or part of said property. The grantee in any reconveyance may be described as "the person or persons entitled thereto," and the recitals therein of any matters or facts shall be conclusive proof of truthfulness thereof. Trustor agrees to pay reasonable Trustee's fees for any of the services mentioned in this paragraph.

11. As additional security, Trustor hereby assigns Beneficiary, during the continuance of this trust, all rents, issues, royalties, and profits of the property affected by this Trust Deed and of any personal property located thereon. Until Trustor shall be in default in the payment of any indebtedness secured hereby or in the performance of any agreement hereunder, Trustor until such default is cured shall have the right to collect all such rents, issues, royalties, and profits earned prior to default as they become due and payable. If Trustor shall default as aforesaid, Trustor's right to collect any of such moneys shall cease and Beneficiary shall have the right, with or without taking possession of the property affected hereby, to collect all rents, royalties, issues, and profits. Failure of discontinuance of Beneficiary at any time or from time to time to collect any such moneys shall not in any manner affect the subsequent enforcement by Beneficiary of the right, power, and authority to collect the same. Nothing contained herein, nor the exercise of the right by Beneficiary to collect, shall be, or be construed to be, an affirmation by Beneficiary of any tenancy, lease or option, not an assumption of liability under, nor a subordination of the lien or charge of this Trust Deed to any such Tenancy, lease or option.

12. Upon any default and during the pendency of such default by Trustor hereunder, Beneficiary may at any time without notice either in person, by agent, or by a receiver to be appointed by a court (Trustor hereby consenting to the appointment of Beneficiary as such receiver), and without regard to the adequacy of any security for the indebtedness hereby secured, enter upon and take possession of said property or any part thereof, in its own name sue for or otherwise collect said rents, issues, and profits, including those past fees, or indebtedness secured hereby, and in such order as Beneficiary may determine.

13. The entering upon and taking possession of said property, the collection of such rents, issues, and profits, or the proceeds of fire and other insurance policies, or compensations or awards for any taking or damage of said property, and the application or release thereof as aforesaid, shall not cure or waive any default or notice of default hereunder or invalidate any act done pursuant to such notice.

14. The failure on the part of Beneficiary to promptly enforce any right hereunder shall not operate as a waiver of such right and the waiver by Beneficiary of any default shall not constitute a waiver of any other or subsequent default.

15. Time is of the essence hereof. Upon default by Trustor in the payment of any indebtedness secured hereby or in the performance of any agreement hereunder, all sums secured hereby shall immediately become due and payable at the option of Beneficiary. In the event of such default, Beneficiary may execute or cause Trustee to execute a written notice of default and

of election to cause said property to be sold to satisfy the obligations hereof, and Trustee shall file such notice for record in each county wherein said property or some part or parcel thereof is situated. Beneficiary also shall deposit with Trustee, the note and all documents evidencing expenditures secured hereby.

16. After the lapse of such time as may then be required by law following the recordation of said notice of default, and notice of default and notice of sale having been given as the required by law, Trustee, without demand on Trustor, shall sell said property on the date and at the time and place designated in a said notice of sale either as a whole or in separate parcel, and in such order as it may determine (but subject to any statutory right of Trustor to direct the order in which such property, if consisting of several known lots or parcels, shall be sold), at public auction to the highest bidder, the purchase price payable in lawful money of the United States at the time of sale. The person conducting the sale may, for any cause he deems expedient, postpone the sale from time to time until it shall be completed and, in every case, notice of postponement shall be given by public declaration thereof by such person at the time and place last appointed for sale; provided, if the sale is postponed for longer than one day beyond the day designated in the notice of sale, notice thereof shall be given in the same manner as the original notice of sale. Trustee shall execute and deliver to the purchaser its Deed conveying said property so sold, but without any covenant or warranty, express or implied. The recitals in the Deed of any matters or facts shall be conclusive proof of the truthfulness thereof. Any person, including Beneficiary, may bid at the sale. Trustee shall apply the proceeds of the sale to payment of (a) the costs and expenses of exercising the power of sale and of the sale, including the payment of; the Trustee's and attorney's fees; (b) cost of any evidence of title procured in connection with such sale and revenue stamps on Trustee's Deed; (c) all sums expended under the terms hereof, not then repaid, with accrued interest at 18% per annum from date of expenditure; (d) all other sums then secured hereby; and (e) the remainder, if any, to the person or persons legally entitled thereto, or the Trustee, in its discretion, may deposit the balance of such proceeds with the County Clerk of the county in which the sale took place.

17. Upon the occurrence of any default hereunder, Beneficiary shall have the option of declaring all sums secured hereby immediately due and payable and foreclose this Trust Deed in the manner provided by law for the foreclosure of mortgages on real property and Beneficiary shall be entitled to recover in such proceeding all costs and expenses incident thereto, including a reasonable attorney's fee in such amounts as shall be fixed by the court.

18. Beneficiary may, at its option, declare immediately due and payable all sums secured by the Trust Deed upon the sale, transfer, or lease without Beneficiary's prior written consent, of all or any part of the Property, or any interest in the Property or an interest in any of Borrowers other than as contemplated by the Loan Documents including the IRL Option Agreement (as defined in the Loan Agreement).

19. Beneficiary may appoint a successor trustee at any time by filing for record in the office of the county recorder of each county in which said property or some part thereof is situated, a substitution of trustee. From the time the substitution is filed for record, the new trustee shall succeed to all the powers, duties, authority and title of the trustee named herein or of

any successor trustee. Each such substitution shall be executed and acknowledged, and notice thereof shall be given and proof thereof made, in the manner provided by law.

20. This Trust Deed shall apply to, inure to the benefit of, and bind all parties hereto, their heirs, legatees, devices, administrators, executors, successors and assigns. All obligations of Trustor hereunder are joint and several. The term "**Beneficiary**" shall mean the owner and holder, including any pledgee, of the Note secured hereby. In this Trust Deed, whenever the content requires, the masculine gender includes the feminine and/or neuter, and the singular includes the plural.

21. Trustee accepts this Trust when this Trust Deed, duly executed and acknowledged, is made a public record as provided by law. Trustee is not obligated to notify any party hereto of pending sale under any other Trust Deed or of any action or proceeding in which Trustor, Beneficiary, or Trustee shall be a party, unless brought by Trustee.

22. This Trust Deed shall be construed according to the laws of the State of Utah.

23. The undersigned Trustor requests that a copy of any notice of default and of any notice of sale hereunder be mailed to its address hereinbefore set forth.

INTERMOUNTAIN REGIONAL LANDFILL, LLC,
a Utah limited liability company

By: *[signature]*
David N. Johnston, sole Manager

STATE OF UTAH)
:ss
COUNTY OF UTAH)

On the 18 day of May, 2009, personally appeared before David N. Johnston, as the sole Manager of Intermountain Regional Landfill, LLC, the signer of the above instrument, who duly acknowledged to me that he executed the same.

[signature]
Notary Public

BRITTANY JEPSEN
NOTARY PUBLIC • STATE of UTAH
727 N 1550 E
SUITE 150
OREM, UT 84097
COMM. EXP. 01/10/2011

ENT 34181:2010 PG 1 of 2
Rodney D. Campbell
UTAH COUNTY RECORDER
2010 Apr 27 2:19 pm FEE 12.00 BY SS
RECORDED FOR STRONG AND HANNI
ELECTRONICALLY RECORDED

Send Tax Notices To:
ROC Fund Landfill Holdings, LLC
1240 East 2100 South, 1st Floor
Salt Lake City, UT 84106

WARRANTY DEED

INTERMOUNTAIN REGIONAL LANDFILL, LLC, a Utah limited liability company, Grantor of Utah County, Utah, hereby CONVEYS AND WARRANTS to ROC FUND LANDFILL HOLDINGS, LLC, a Nevada limited liability company, Grantee, of 1240 East 2100 South, 1st Floor, Salt Lake City, Salt Lake County, Utah 84106 for TEN DOLLARS and other good and valuable consideration, the following described tract of land in Utah County, State of Utah:

The West half of Section 16, Township 7 South, Range 2 West, Salt Lake Base and Meridian.
(59:124:0001)

TOGETHER WITH any and all buildings, improvements, water rights, water shares, mineral rights and interests, and all rights-of-way, easements, privileges and appurtenances.

SUBJECT TO:

1. Trust Deed, dated effective March 12, 2009,recorded May 27, 2009 in the Utah County Recorder's Office, as Entry No. 57940:2009; and
2. Easements, restrictions, and rights of way of record and general property taxes for the current year which remain unpaid to the date hereof.

WITNESS, the hand of said Grantor this 22 day of April, 2010.

INTERMOUNTAIN REGIONAL LANDFILL, LLC

By: ______________________
David N. Johnston, Manager

By: ______________________
Heath Johnston, Manager

ENT 34181:2010 PG 2 of 2

STATE OF UTAH)
:ss.
COUNTY OF Utah)

The foregoing instrument was acknowledged before me this 22 day of April, 2010, by Heath Johnston and David N. Johnston, as Managers of Intermountain Regional Landfill, LLC, Grantor.

Jennifer Browning
Notary Public

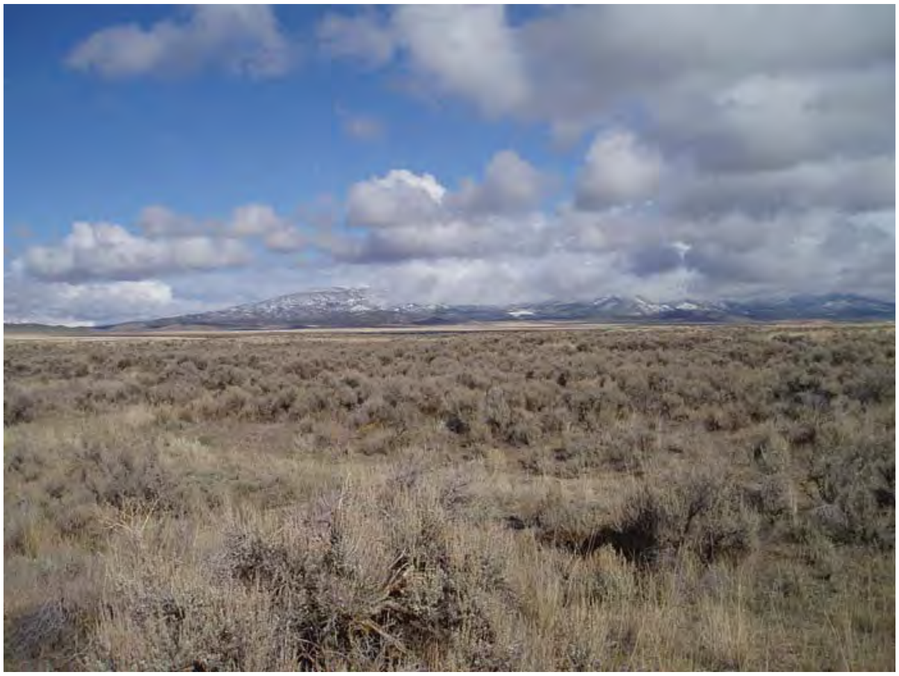
JENNIFER BROWNING
NOTARY PUBLIC • STATE of UTAH
939 N. 520 W.
OREM, UT 84057
COMM. EXP. 8-15-2011

APPENDIX C:

CLASS III CULTURAL RESOURCES SURVEY

APPENDIX C

A Class III Cultural Resources Inventory for the Fairfield Municipal Landfill Project, South of Fairfield, Utah County, Utah



Utah State Antiquities Project Number: U-10-HK-0093p

Prepared by:
HDR Engineering, Inc.

HDR Cultural Resources Report 10-13
May 26, 2010

A Class III Cultural Resources Inventory for the Fairfield Municipal Landfill Project, South of Fairfield, Utah County, Utah

Prepared for:

Fairfield Town and ROC Fund Landfill Holdings, LLC

Prepared by:

Mark Brodbeck, M.A. RPA
Principal Investigator

HDR Engineering, Inc.
3949 South 700 East, Suite 500
Salt Lake City, UT 84107-2386

Under the Authority of:
State of Utah Archaeological Survey Permit: 170
Utah State Antiquities Project Number: U-10-HK-0093p

Abstract

HDR Engineering (HDR) conducted a Class III pedestrian inventory for cultural resources for the proposed Fairfield Landfill Project south of Fairfield in Utah County, Utah. The proposed project site includes 320 acres of private land in the western half of Section 16 of Township 7 South, Range 2 West, Great Salt Lake Base and Meridian. The project area is currently undeveloped except for a few hundred feet at its western edge, which has been developed as an agricultural field. The project would be privately funded.

The proposed landfill project requires compliance with the Utah Division of Solid and Hazardous Waste's Administrative Code Rule R315, which requires a project proponent to identify historical and archaeological resources that could be affected by a new or expanded landfill facility (R315-310-3[1][k]). Furthermore, because the project requires permitting by the Utah Department of Environmental Quality (UDEQ), it also must comply with Utah Code Annotated 9-8-404, which requires state agencies and developers using state funds to take into account how their expenditures or undertakings will affect prehistoric and historic properties. They must also provide the State Historic Preservation Officer (SHPO) with a written evaluation of the project and an opportunity to comment.

The area of potential effects (APE) for the project is defined as the 320-acre project footprint. There are no standing buildings or structures within 3 miles of the project area; therefore, there will be no indirect effects, such as visual, auditory, or seismic influences, on historic properties beyond the limits of the project footprint.

The Class III survey was conducted on April 12 and 13, 2010. The work was authorized under Utah State Antiquities Project Number U-10-HK-0093p and State of Utah Archaeological Survey Permit 170. Prior to conducting the fieldwork, HDR staff conducted a Class I records check at the Utah Division of State History, accessed the National Register of Historic Places online database, and reviewed historic General Land Office maps. The records check indicated that no previous cultural resource projects have taken place within a 1-mile radius of the APE.

The Class III cultural resources survey was conducted in order to identify and document cultural resources within the APE that may be affected by the proposed project. No archaeological sites or other significant cultural resources were identified in the APE. Based on the results of the Class III investigation, HDR recommends that a finding of "no historic properties affected" is appropriate for the undertaking and that the project proceed as planned. If unanticipated cultural resource materials are encountered during construction, work should cease in the vicinity of the discovery and immediate contact should be made with the Utah Division of Solid and Hazardous Waste to arrange for an assessment by a qualified archaeologist.

Introduction

The Fairfield Landfill is a proposed 320-acre landfill near the town of Fairfield, Utah (see Figures 1 and 2). Once permitted and constructed, the Fairfield Landfill will consist of a single municipal landfill that will be constructed in phases. The major subunits of the landfill are called cells, and each cell will be developed in two or more phases. Other landfill facilities will include a dual-lined stormwater/leachate evaporation pond, a scale house, and administrative offices. The perimeter of the active work area will be fenced using a 6-foot-high fence with an 18-inch angled top.

The landfill project involves permitting approval from the Utah Department of Environmental Quality's (UDEQ) Division of Solid and Hazardous Waste. As such, the project requires compliance with state laws and policies (Administrative Code Rule R315; Utah Code Annotated 9-8-404), which require state agencies and developers using state funds to take into account how their expenditures or undertakings will affect prehistoric and historic properties. Therefore, HDR Engineering (HDR) conducted a Class III cultural resources survey to identify, document, and evaluate any cultural resources that could potentially be affected by the Fairfield Landfill.

Prior to conducting the fieldwork, site, project, and preservation files were reviewed at the Utah Division of State History. HDR conducted the Class III survey on April 12 and 13, 2010. The work was authorized under Utah State Antiquities Project Number U-10-HK-0093p and State of Utah Archaeological Survey Permit 170.

Project Area and Environmental Setting

The project area is located on private land about 3 miles south of the town of Fairfield in Utah County (see Figure 1). The project area includes the west ½ of Section 16 in Township 7 South and Range 2 West (Goshen Pass, UT 7.5' USGS Quadrangle Map) (see Figure 2).

The project is located in the Cedar Valley between the Oquirrh Mountains and the Lake Mountains west of Utah Lake. This area is part of the Uinta Extension of the Basin and Range Province (Stokes 1977). Surface deposits are composed of Pleistocene alluvial and lacustrine deposits associated with Lake Bonneville (Hintze 1980). The terrain is fairly flat with slight undulations and occasional dune formations. Elevation is about 4,850 feet above mean sea level.

Except for the far western edge of the project area, which has been developed as an agricultural field, the proposed project site is undeveloped and retains its native vegetation (see Photograph 1). Prominent vegetation includes tall sagebrush (*Artemisia tridentate*) and rabbitbrush (*Chrysothamnus* spp.) with a variety of native grasses and occasional cacti (*Opuntia* spp.). A large expanse of wheat fields is to the west.

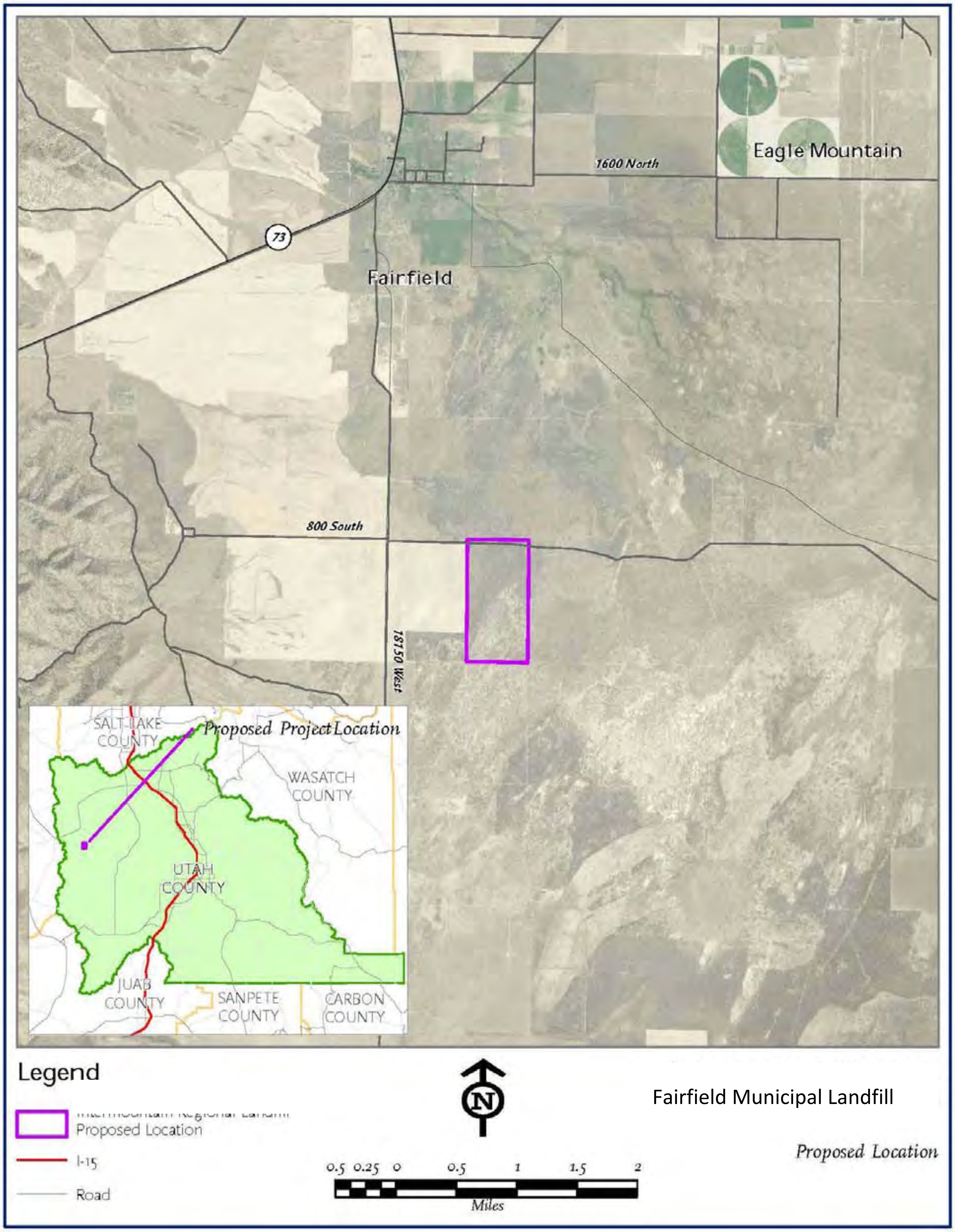


Figure 1. Project vicinity map.

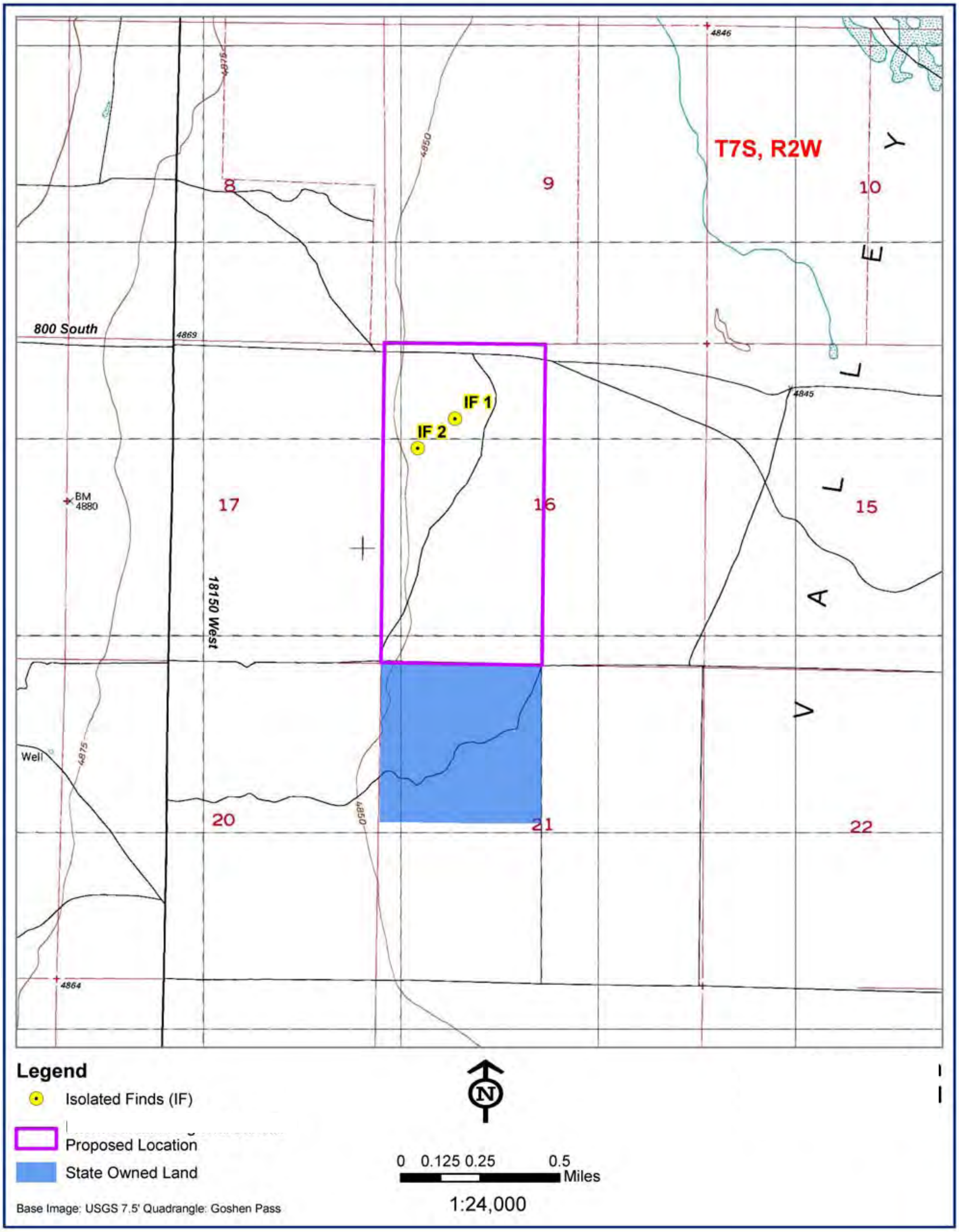


Figure 2. Project location map.

Photograph 1. Looking east across the project area.

Area of Potential Effects

The area of potential effects (APE) is the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if such properties exist (Title 36, Code of Federal Regulations, Section 800.16(d) [36 CFR § 800.16(d)]). The APE is influenced by the scale and nature of the undertaking and may be different for different kinds of effects caused by the undertaking. The APE for the landfill project is the 320-acre project footprint. There are no standing buildings or structures within 3 miles of the project area; therefore, there will be no indirect effects, such as visual, auditory, or seismic influences, on historic properties beyond the limits of the project footprint.

Regulatory Context

Developing the Fairfield Landfill requires permitting and approval from the Utah Division of Solid and Hazardous Waste. As part of the permitting process, compliance with the Division's Administrative Code Rule R315 is required, which requires a project proponent to identify historical and archaeological resources that could be affected by a new or expanded landfill facility (R315-310-3[1][k]). Furthermore, because the project requires permitting by a state agency, it also must comply with Utah Code Annotated 9-8-404, which requires state agencies, and developers using state funds, to take into account how their expenditures or undertakings will affect prehistoric and historic properties. They must also provide the State Historic Preservation Officer (SHPO) with a written evaluation of the project and an opportunity to comment.

Cultural Context

Cultural contexts are developed for cultural resource surveys so that the researchers can assess the potential for encountering cultural resources, gain an understanding of the types of resources that might be encountered, and understand the historical significance of such resources. Cultural contexts provide a summary of the prehistoric and historical activities and events that occurred in an area and provide a chronological and thematic framework for interpreting and evaluating identified cultural resources.

The prehistory of the Cedar Valley follows descriptions of the eastern Great Basin provided by Jennings and others (Jennings 1978; Madsen 1982; Aikens and Madsen 1986). The region's prehistory is characterized archaeologically by four broad periods of cultural development: the Archaic Period (10,000 BC–AD 500), the Formative Period (AD 500–1200), the Late Prehistoric Period (AD 1300–1700s), and the Historic Period (late 1700s to mid-1900s). The temporal divisions are based on distinct cultural patterns—projectile point typologies, pottery and basketry styles, the appearance of new technology, architecture, changes in subsistence and settlement strategies—identifiable in the archaeological record. The Historic Period is understood through a combination of archaeological data and written records.

The Archaic Period (10,000 BC–AD 500) is characterized by a generalized mode of subsistence used by regional hunters and gatherers. During this time, people moved across the landscape in small groups, foraging within seasonal rounds. Subsistence was based on a generalized hunting and gathering strategy focused on exploiting the wild flora and fauna resources. One of the primary technologies used by Archaic people that is visible in the archaeological record is the use of large dart points propelled by atlatls.

The Formative Period (AD 500–1200) is defined largely by the development of the Fremont Cultural Tradition. During this period there is a shift in the region toward more sedentary settlement-subsistence systems, the introduction of bow and arrow and ceramic technologies, and the adoption of horticulture as a primary subsistence resource.

Although people developed agriculture and more-permanent settlements during this time, hunting and gathering continued to be important subsistence practices. Morss (1931) first described the Fremont culture as a peripheral variant of the Anasazi; however, subsequent researchers have convincingly argued that the cultural traits of this era in northern Utah warrant distinction as a separate archaeological culture (Cordell 1984). The Fremont tradition fades from the archaeological record around AD 1200. Archaeological evidence suggests that Numic speakers from the Mojave Desert appeared in Utah sometime around AD 1100. Their archaeological remains primarily consist of lithic scatters with low quantities of brownware ceramics, rock art, and occasional wickiups (Barlow 2002). The influx of new people precipitated a shift back to a hunter-gatherer way of life.

The Late Prehistoric Period (AD 1300–1700s) is marked by the abandonment of horticultural practices in the region and the return to hunting and gathering wild foods. Late Prehistoric populations along Utah Lake appear to have occupied a series of long-term camps used for seasonal procurement activities. Many long-term camps have been documented along the mouths of rivers and streams emptying into Utah Lake, as well as spring fishing camps along the Jordan River north of Cedar Valley (Janetski 1990). These camps date between AD 1400 and 1600, just before the arrival of Spanish explorers (Janetski 1991).

The Historic Period (late 1700s to the mid-1900s) generally spans the time from initial contact between Native American populations, European and American explorers, and settlers to the present. The period includes development and change in Native American culture and the restriction of indigenous peoples to reservation lands because of pressure by white settlers. As Euroamericans began exploring and moving into the Great Basin in the 19th century, they found the area inhabited by several groups of linguistically related, Numic-speaking peoples. The southern Great Salt Lake area was occupied by the Gosiute (or Weber Ute) subgroup of the Western Shoshone. The area from the Jordan River south to the eastern and southern Utah Valley was the home of the Uinta and Timpanogots Ute tribes.

Following the early explorers, the Mormons began settling the Salt Lake City area in the late 1840s. Other settlements and agricultural development soon followed along the Wasatch Front. Of particular interest to the current project was the establishment of Camp Floyd by the U.S. military about 3 miles north of the project area where the town of Fairfield is situated today. Camp Floyd was a pre–Civil War army post established in 1858 by order of President James Buchanan to suppress an assumed Mormon rebellion. The post had 400 buildings and housed 3,500 soldiers, which at the time was the largest concentration of U.S. troops in the nation (Utah State Parks 2009). The troops were ordered back east in 1861 with the outbreak of the Civil War, and the post was dismantled. Fairfield, which developed next to the army post, continued as an agricultural center and stagecoach stop. Today, three properties in Fairfield are listed on the National Register: the Camp Floyd site, the Stagecoach Inn, and the Fairfield District Schoolhouse.

Records Check

Prior to conducting the Class III survey, HDR’s cultural staff conducted a records search at the Utah State Division of History. The records search was conducted on February 4, 2010. The purpose of background research is to document previous survey coverage and gain an understanding of the types of sites that might be encountered during the field investigation. The records check covered a 1-mile radius around the project area. In addition, HDR staff accessed the National Register of Historic Places online database and reviewed historic General Land Office maps for uses of the area during the historical period.

The records check indicated that no previous archaeological projects and no archaeological sites or historic resources have been documented within 1 mile of the project area. The nearest documented cultural resources in the area are about 3 miles to the north in the town of Fairfield.

Prehistoric Resources

Although no archaeological surveys have taken place in the immediate vicinity of the current project, a 760-acre block survey conducted about 6 miles to the northeast provides some perspective on the potential for prehistoric sites in the area. The survey was conducted in 1991 by Archaeological Research Consultants (ARCON) (Norman 1991). The survey covered terrain similar to the flat desert scrub in the project area. ARCON identified four prehistoric sites (42UT825–42UT828). All four sites were lithic scatters representing temporary camps. Artifacts included flakes, projectile point fragments, butchering tools, an awl, and grinding tools (Norman 1991).

Furthermore, the presence of certain favorable natural features suggests the potential for prehistoric use of the valley. In particular, a perennial spring on the west side of Fairfield would have been an attractive place for people in prehistoric times. The spring is labeled Big Spring on the Fort Cedar USGS 7.5' topographic quadrangle.

Historic Resources

The Camp Floyd site is located about 3 miles north of the project area. The camp exists today as an archaeological site and cemetery; no buildings or structures were left in place following its dismantlement in 1861. The only building that remains from the post is the commissary building, which was purchased by a local family in 1861 and relocated across the creek to Fairfield. Today, the commissary building serves as the museum and visitors' center for Camp Floyd State Park.

Survey Methods

HDR staff conducted the Class III survey on April 12 and 13, 2010. The crew included archaeologists Mark Brodbeck, Deil Lundin, and Shawn Fackler. As standard protocol, HDR conducted the inventory in accordance with the *UDOT Guidelines for Archaeological Survey and Testing* (2000). Sites and isolates were defined as follows:

> A **site** is a relatively discrete, definable entity, which includes features and/or a reasonable quantity and aggregation of artifacts. Further, a site displays integrity of location and is potentially interpretable (in terms of past human behavior).
>
> An **isolate** (or isolated find) is a spatially scattered and/or disassociated manifestation that consists of a single artifact or relatively few artifacts that lack contextual information.

The APE was surveyed in 15-meter parallel pedestrian transects. Field documentation included written notes, photographs, and sketch maps. Location data were collected with a global positioning system (GPS) Trimble Geo XT unit with ArcPad 6. Cultural resources were also plotted in the field on USGS 7.5' topographic quadrangle maps and aerial photographs.

Results

The project area was covered by a fairly homogenous distribution of tall sagebrush and grasses. The vegetation allowed on average for about 75% visual inspection of the ground surface. Numerous ant hills dispersed through the project area were inspected for micro-artifacts and indications of subsurface cultural deposits. Modern shotgun shells and an abundance of articulated rabbit skeletons indicated that the area is currently used for sport hunting.

No archaeological sites or other significant cultural resources were identified during the Class III survey. Two isolated finds were documented. Isolates 1 and 2 consist of church-key-opened cans that date to the 1950s or 1960s.

Management Recommendations

The Class III cultural resources survey was conducted in order to identify and document cultural resources within the APE that may be affected by the proposed project. No archaeological sites or other significant cultural resources were identified in the APE. Based on the results of the Class III investigation, HDR recommends that a finding of “no historic properties affected” is appropriate for the undertaking and that the project proceed as planned. If unanticipated cultural resource materials are encountered during construction, work should cease in the vicinity of the discovery and immediate contact should be made with the Utah Division of Solid and Hazardous Waste to arrange for an assessment by a qualified archaeologist.

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APPENDIX D:

COST BREAKDOWN FOR CLOSURE/POST-CLOSURE

Intermountain Regional Landfill
Closure Cost Estimate
Cell 1 (2010 Dollars)

Cell 1 Phase 1	8.0	Acres
Total	8.0	Acres

	Item	Unit	Unit Cost	Quantity	Cost
1.00	**Engineering/Management**				
1.01	Topo Survey Initial	HR	$150	25	$3,750
1.02	Topo Survey Final	HR	$150	20	$3,000
1.03	Site Reconnaissance	HR	$150	16	$2,400
1.04	Boundary Survey	HR	$150	16	$2,400
1.05	Construction Plans/Specs	LUMP	$45,000	1	$45,000
1.06	Bidding and Award	LUMP	$5,000	1	$5,000
1.07	Quality Control Testing	LUMP	$10,000	1	$10,000
1.08	Construction Management/QC	LUMP	$85,000	1	$85,000
1.09	Closure Report/As-Builts	LUMP	$25,000	1	$25,000
1.10	Obtain UPDES and other permits	LUMP	$10,000	1	$10,000
			Subtotal		$191,550
			Contingency	20%	$38,310
			Engineering Subtotal		**$229,860**

2.00	**Construction**				
2.01	Grading Top of Intermediate Cover	SY	$1.25	38,720	$48,400
2.02	Top Liner (60 mil FML)	SF	$0.55	348,480	$191,664
2.03	Clay Final Cover (1.5') [3]	CY	$13.50	19,360	$261,360
2.04	Topsoil (0.5') [4]	CY	$4.00	6,453	$25,813
2.05	Silt Fence/Erosion Control	LF	$2.50	5,500	$13,750
2.06	Dust Control and Watering	LS	$11,000.00	1	$11,000
2.07	Drainage Ditches	LF	$2.00	5,500	$11,000
2.08	Temporary Drainage Control	LS	$11,000.00	1	$11,000
2.09	Gas Collection System [5]	ACRE	$15,000.00	0	$0
			Subtotal		$573,987
			Contingency	25%	$143,497
			Construction Subtotal		**$717,484**

	Summary		Engineering		$229,860
			Construction		$717,484
			Legal	5%	$47,367
				Total	**$994,711**

Assumptions/Notes:

1 Estimate assumes closure of Cell 1 Phase 1 only.
2 No permanent culverts or drainage piping is required.
3 Assumes cover is imported from an off-site source TBD.
4 Assumes topsoil is available onsite.
5 Active gas collection system not required at this time.

Intermountain Regional Landfill
Post-Closure Care Cost Estimate for
Cell 1 (2010 Dollars)

COST ESTIMATE FOR LANDFILL POST-CLOSURE CARE

	Item	Unit	Unit Cost	Quantity	Cost
1.0	ENGINEERING				
1.1	Post Closure Plan	LUMP	$9,000	1	$9,000
1.2	Site Inspection & Recordkeeping (quarterly)	PER YEAR	$2,500	30	$75,000
1.3	Correctional Plans & Specs (annual)	PER YEAR	$1,200	30	$36,000
1.4	Site Monitoring (semi-annually) (1)	PER YEAR	$10,000	30	$300,000
2.0	MAINTENANCE COSTS (2)	PER YEAR	$6,000	30	$180,000
			Subtotal		**$600,000**
			Contingency (20%)		$120,000
			Total		**$720,000**

Closure Estimate (previous page) **$994,711**

Total Closure/Post Closure **$1,714,711**

Assumptions/Notes:
1. Includes groundwater monitoring and statistical analysis but no gas sampling
2. Includes repairing eroded final cover material with on site material, compost and seed

APPENDIX E:

FAIRFIELD SITE GEOTECHNICAL STUDY BY EARTHTEC

Earthtec Testing & Engineering, P.C.

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Orem, Utah - 84057
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GEOTECHNICAL STUDY
INTERMOUNTAIN REGIONAL LANDFILL
FAIRFIELD, UTAH

Prepared By:

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Testing and Engineering, P.C.

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Job No. 062496

Prepared for:

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P.O. Box 1503
Orem, Utah 84059

October 13 , 2006

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FIGURES

TABLES

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 in the test pits and test holes, representative samples were selected for laboratory testing to assess pertinent engineering properties and to aid in refining field classifications, if needed. Laboratory testing consisted of natural moisture content and dry density tests, one-dimensional consolidation tests, Atterberg limits determinations, and mechanical gradation analyses. The following table summarizes the results of the laboratory testing. 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 rig 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 supporting structural loads:	90%
Less than 5 feet of fill below foundations, flatwork and pavements:	95%
Five or more feet of fill below foundations, flatwork and pavements:	98%

Generally, placing and compacting fill at a moisture content within 2% of the optimum moisture content, as determined by ASTM D-1557, will facilitate compaction. Typically, the further the moisture content is from optimum the more difficult it will be to achieve the required compaction.

Fill should be tested frequently during placement and early testing (initial lift) is recommended to demonstrate that placement methods and compaction efforts are achieving the required compaction. It is the contractor's responsibility to ensure that fill materials and compaction efforts are consistent so that tested areas are representative of the entire fill.

9.0 SEISMIC CONSIDERATIONS

9.1 Faulting

Based on published data no active faults are known to traverse the site and no surficial evidence of faulting was observed during our field investigation. The nearest mapped[1] fault trace considered to be active is one of a group of faults located beneath Utah Lake and is located approximately 12 miles east of the site.

9.2 Liquefaction Potential

The site appears to be located in an area mapped by the Utah Geological Survey[2] as having very low liquefaction potential. Liquefaction is a phenomenon where a soil loses intergranular strength due to an increase in soil pore water pressures during a dynamic event such as an earthquake. The potential for liquefaction is based on several factors, including 1) the grain size

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[1]Hecker, S., 1993, Quaternary Faults and Folds, Utah, Utah Geologic Survey, Bulletin 127.

[2]Liquefaction Potential Map, Utah Geological Survey, Public Information Series 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 <u>IRC Seismic Design Category</u>

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}
		$S_{MS} = F_a S_s$	$S_{DS} = 2/3\ S_{MS}$
0.65 g	1.28	0.83 g	0.55 g

S_S = The mapped spectral accelerations for short periods 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}
		$S_{M1} = F_v S_1$	$S_{D1} = 2/3\ S_{M1}$
0.24 g	1.92	0.46 g	0.31 g

S_1 = The mapped spectral accelerations for 1-second period 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 period

10.0 FOUNDATIONS

10.1 General

The foundation recommendations presented in this report are based on the soil 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 estimate that consolidation settlement of about 4 inches will occur under the weight of 20 feet of debris fill. Deeper fill depths could cause additional settlement.

11.0 FLOOR SLABS

The swell potential of the native soils could have the most detrimental impact to floor slabs if allowed to become saturated after construction. To minimize this potential we recommend that crawl-spaces be constructed between the floor slabs and the native soils. Suspended concrete floor slabs would require proper design by a structural engineer.

For exterior concrete flat work, to facilitate construction, act as a capillary break, and aid in distributing loads we recommend that exterior flatwork be underlain by four inches of free-draining granular material such as "pea" gravel or three-quarters to one-inch minus clean gravel supported on native soils or structural fill.

Special precautions should be taken during placement and curing of all concrete slabs and flatwork. Excessive slump (high water-cement ratios) of the concrete and/or improper finishing and curing procedures used during hot or cold weather conditions may lead to excessive shrinkage, cracking, spalling, or curling of slabs. We recommend all concrete placement and curing operations be performed in accordance with American Concrete Institute (ACI) codes and practices.

12.0 MOISTURE CONTROL AND SURFACE DRAINAGE

The native subsurface soils were found to have high plasticity characteristics and a potential to swell when wetted. To minimize the potential for subsurface soils to become wetted below and adjacent to any structures constructed at this site we recommend that the following precautions be taken:

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

2. The ground surface should be graded to drain away from structures in all directions. We recommend a minimum fall of 8 inches in the first 10 feet. More slope may be needed96 in areas where settlement due to debris fill will occur.

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

4. Sprinklers should be aimed away from foundation walls and sprinkler heads, lines, and valves should be kept at least 5 feet from foundations. Sprinkler systems should be well maintained, checked for leaks frequently, and repaired promptly. Over watering should be avoided and consideration should be given to minimizing lawn areas.

5. Any additional precautions which may become evident during construction.

13.0 GENERAL CONDITIONS

The exploratory data presented in this report was collected to provide geotechnical design recommendations for this project. The test pits and test holes may not be indicative of subsurface conditions outside the study area or between points explored and thus have a limited value in depicting subsurface conditions for contractor bidding. Variations from the conditions portrayed in the test pits and test holes may occur and may be sufficient to require modifications in the design. If during construction, conditions are different than presented in this report, please advise us so that the appropriate modifications can be made.

The geotechnical study as presented in this report was conducted within the limits prescribed by our client, with the usual thoroughness and competence of the engineering profession in the area. No other warranty or representation, either expressed or implied, is intended in our proposals, contracts or reports.

We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please call.

Respectfully;

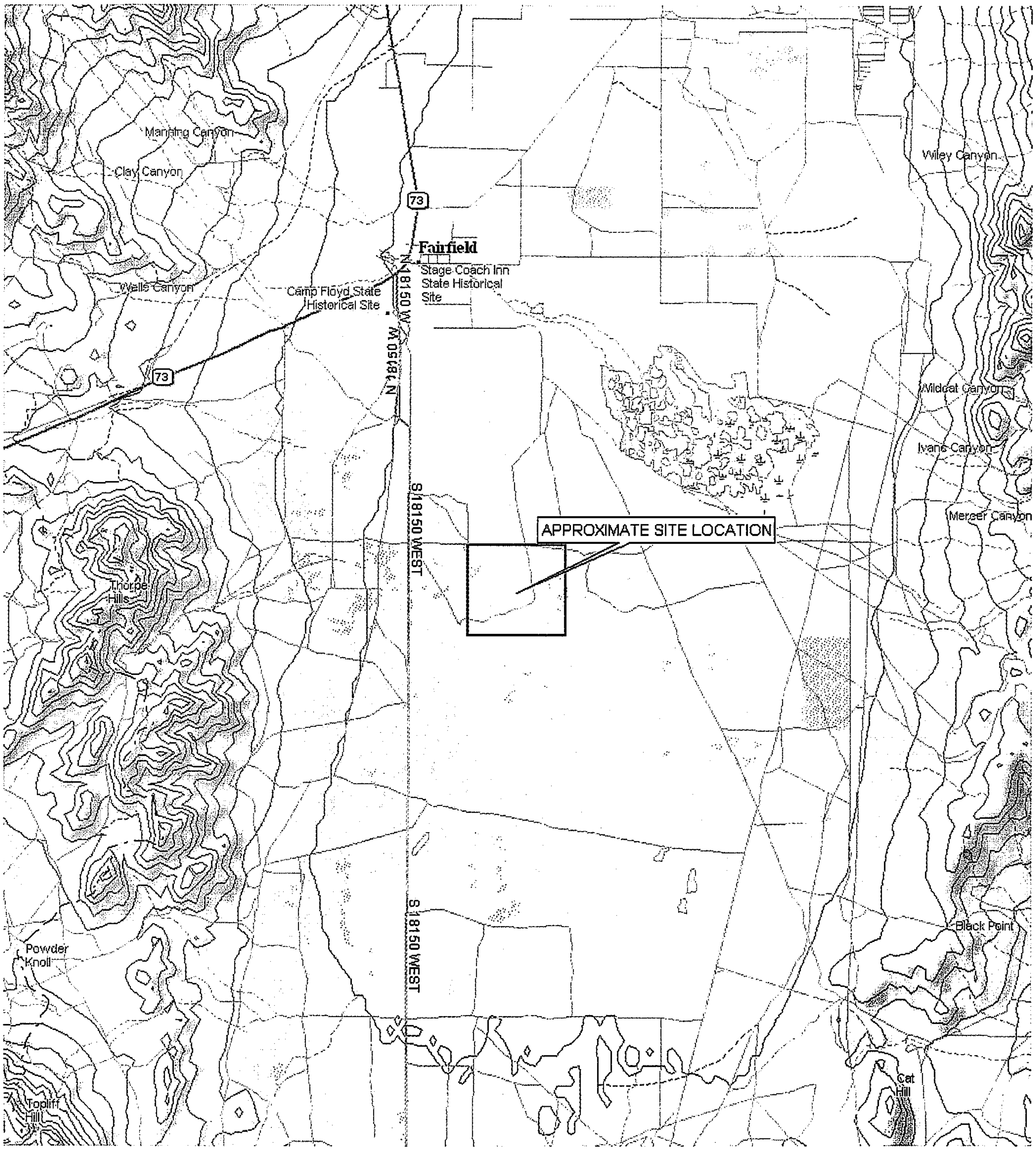
EARTHTEC TESTING AND ENGINEERING, P.C.

Jeffrey J. Egbert, P.E.
Project Geotechnical Engineer

William G. Turner, P.E.
Senior Geotechnical Engineer

VICINITY MAP

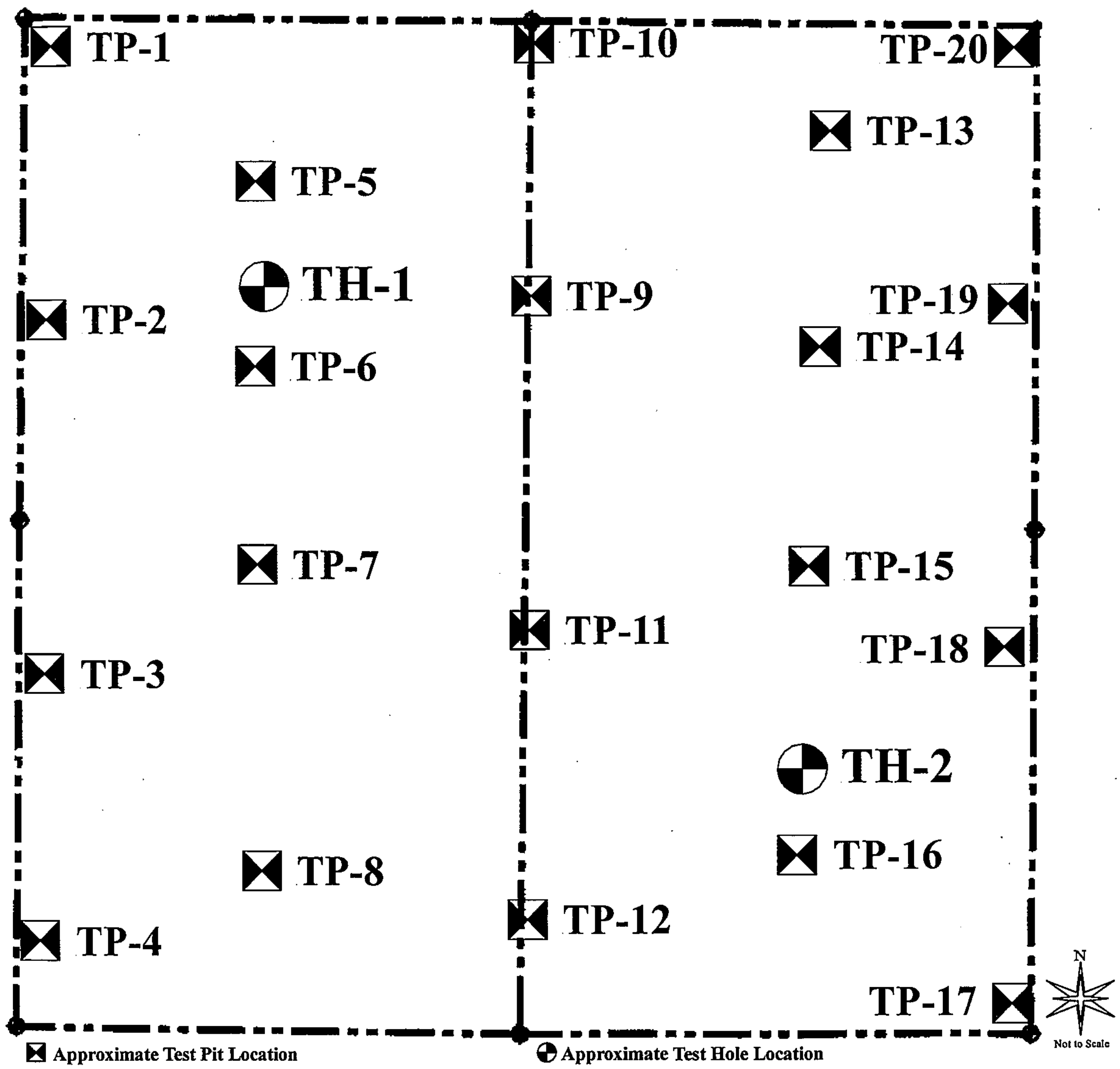
INTERMOUNTAIN REGIONAL LANDFILL



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	USCS	Description	Samples	Water Cont. (%)	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 (at ~4), X (at ~5.5)								
6.5–10		SM	SILTY SAND, medium dense, moist, brown.	X (at ~8)								
10–11		CH	FAT CLAY with sand, very stiff, moist, gray.	X (at ~11)								
11–12			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

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

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.)	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.									
2–6		CH	FAT CLAY with sand, minor pinholes, very stiff, slightly moist to moist, gray.	X (~3–3.5)								
				X (~5–5.5)								
6–10		SM	SILTY SAND, medium dense, moist, brown.	X (~9–9.5)	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
CLIENT: David Johnston
LOCATION: Refer to Figure 2.
OPERATOR: Halls
EQUIPMENT: RTB
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 062496
DATE: 09/07/06 - 09/08/06
ELEVATION: NM
LOGGED BY: P.E.
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 (4–4.5), X (6–6.5)								
7–10		SM	SILTY SAND, medium dense, moist, brown.	X (9.5–10)								
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- 4

PROJECT: Intermountain Regional Landfill
CLIENT: David Johnston
LOCATION: Refer to Figure 2.
OPERATOR: Halls
EQUIPMENT: RTB
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 062496
DATE: 09/07/06 - 09/08/06
ELEVATION: NM
LOGGED BY: P.E.
AT COMPLETION ▼ :

Depth (Ft.) 0	Graphic Log	USCS	Description	Samples	TEST RESULTS Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
1, 2			TOPSOIL: Silt with sand, dry, brown.									
3, 4, 5, 6, 7		MH	ELASTIC SILT with sand, minor pinholes, very stiff, slightly moist, gray.	X	19		50	17				
				X								
8, 9, 10		SM	SILTY SAND, medium dense, moist, brown.	X								
11, 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
CLIENT: David Johnston
LOCATION: Refer to Figure 2.
OPERATOR: Halls
EQUIPMENT: RTB
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 062496
DATE: 09/07/06 - 09/08/06
ELEVATION: NM
LOGGED BY: P.E.
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
10–12			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.: 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.									
5–5.5				X								
8–8.5				X	22		63	41				
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.:** 8

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

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				■	23	90	70	37				C
10			Bottom at approximately 10 feet.									

Depth (Ft.): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

TEST RESULTS

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 (8.5–9)								
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.:** 10

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.									Perc
3.5				X								
7.5				X	23		73	50				
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-10

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.									
4.5				X								
8				X								
9				X	26	91	70	50				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.: 12

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

TEST PIT LOG

NO.: TP-11

PROJECT: Intermountain Regional Landfill
CLIENT: David Johnston
LOCATION: Refer to Figure 2.
OPERATOR: Halls
EQUIPMENT: RTB
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 062496
DATE: 09/07/06 - 09/08/06
ELEVATION: NM
LOGGED BY: P.E.
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.									
5–5.5				☒								
8.5			Minor pinholes at 8.5 feet.									
9–9.5				☒								
10			Bottom at approximataly 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.: 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								
10–12			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-13

PROJECT: Intermountain Regional Landfill
CLIENT: David Johnston
LOCATION: Refer to Figure 2.
OPERATOR: Halls
EQUIPMENT: RTB
DEPTH TO WATER; INITIAL ▽:

PROJECT NO.: 062496
DATE: 09/07/06 - 09/08/06
ELEVATION: NM
LOGGED BY: P.E.
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, minor pinholes, very stiff, slightly moist, white.									
				X								
			Moist, gray-brown at 4 feet,	X								
				X								
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.:** 15

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			Moist, gray at 4 feet.	X								
6.5				■	20	93	71	47				C
9.5				X								
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.:** 16

TEST PIT LOG
NO.: TP-15

PROJECT: Intermountain Regional Landfill
CLIENT: David Johnston
LOCATION: Refer to Figure 2.
OPERATOR: Halls
EQUIPMENT: RTB
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 062496
DATE: 09/07/06 - 09/08/06
ELEVATION: NM
LOGGED BY: P.E.
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0–1.5			TOPSOIL: Silt with sand, dry, brown.									
1.5		CH	FAT CLAY with sand, minor pinholes, very stiff, slightly moist, light brown.									
4.5				X								
5			Moist, gray at 5 feet.									
8				▮	19	93	61	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.: 17

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

TEST PIT LOG
NO.: TP-16

PROJECT: Intermountain Regional Landfill
CLIENT: David Johnston
LOCATION: Refer to Figure 2.
OPERATOR: Halls
EQUIPMENT: RTB
DEPTH TO WATER; INITIAL ∇ :

PROJECT NO.: 062496
DATE: 09/07/06 - 09/08/06
ELEVATION: NM
LOGGED BY: P.E.
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.									
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.: 18

TEST PIT LOG
NO.: TP-17

PROJECT: Intermountain Regional Landfill
CLIENT: David Johnston
LOCATION: Refer to Figure 2.
OPERATOR: Halls
EQUIPMENT: RTB
DEPTH TO WATER; INITIAL ▽:

PROJECT NO.: 062496
DATE: 09/07/06 - 09/08/06
ELEVATION: NM
LOGGED BY: P.E.
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 (3–3.5), X (7–7.5)								
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.: 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
0–1			TOPSOIL: Silt with sand, dry, brown.									
1–10		CH	FAT CLAY with sand, minor pinholes, very stiff, slightly moist, light brown.									
4.0–4.5				X								
5			Moist, gray at 5 feet.									Perc
9.0–9.5				X	22		71	47				
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-19

PROJECT: Intermountain Regional Landfill
CLIENT: David Johnston
LOCATION: Refer to Figure 2.
OPERATOR: Halls
EQUIPMENT: RTB
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 062496
DATE: 09/07/06 - 09/08/06
ELEVATION: NM
LOGGED BY: P.E.
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.									
4–4.5				X	16		53	28				Perc
8–8.5				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

TEST PIT LOG
NO.: TP-20

PROJECT: Intermountain Regional Landfill
CLIENT: David Johnston
LOCATION: Refer to Figure 2.
OPERATOR: Halls
EQUIPMENT: RTB
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 062496
DATE: 09/07/06 - 09/08/06
ELEVATION: NM
LOGGED BY: P.E.
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, very stiff, slightly moist, light brown.									
3.5				X	16		58	35				
4.5				X								
5			Moist, gray at 5 feet.									
8				X								
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.: 22

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

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.) 0	Graphic Log	USCS	Description	Samples	Blows per foot	Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
			TOPSOIL: Silt with sand, dry, brown.										
			FAT CLAY with sand, stiff to hard, slightly moist to moist, brown.										
3					25								
6					26								
9					35								
					15								
12		CH											
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
CLIENT: David Johnston
LOCATION: Refer to Figure 2.
OPERATOR: Great Basin
EQUIPMENT: Mobile A.T.
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 062496
DATE: 09/27/06 - 09/27/06
ELEVATION: NM
LOGGED BY: P.E.
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	Blows per foot	Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
27, 30		CH	FAT CLAY with sand, stiff to hard, slightly moist to moist, brown.		20	19		52	26				
					17 35 50/5.5"								
33, 36, 39, 42, 45, 48			Bottom at approximately 31 feet 5.5 inches.										

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.:** 23b

LOG OF TESTHOLE 062496.GPJ EARTHTEC.GDT 4/12/07

TEST HOLE LOG

NO.: TH-2

PROJECT: Intermountain Regional Landfill
CLIENT: David Johnston
LOCATION: Refer to Figure 2.
OPERATOR: Great Basin
EQUIPMENT: Mobile A.T.
DEPTH TO WATER; INITIAL ∇ :

PROJECT NO.: 062496
DATE: 09/27/06 - 09/27/06
ELEVATION: NM
LOGGED BY: P.E.
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		CH	FAT CLAY with sand, hard to very stiff, slightly moist to moist, brown.										
6					47								
9													
					24								
12													
15					45								
18													
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

PROJECT NO.: 062496 | Earthtec Testing and Engineering, P.C. | **FIGURE NO.:** 24a

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
27		CH	FAT CLAY with sand, hard to very stiff, slightly moist to moist, brown.										
30				◣	60	15		55	33				
33													
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

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

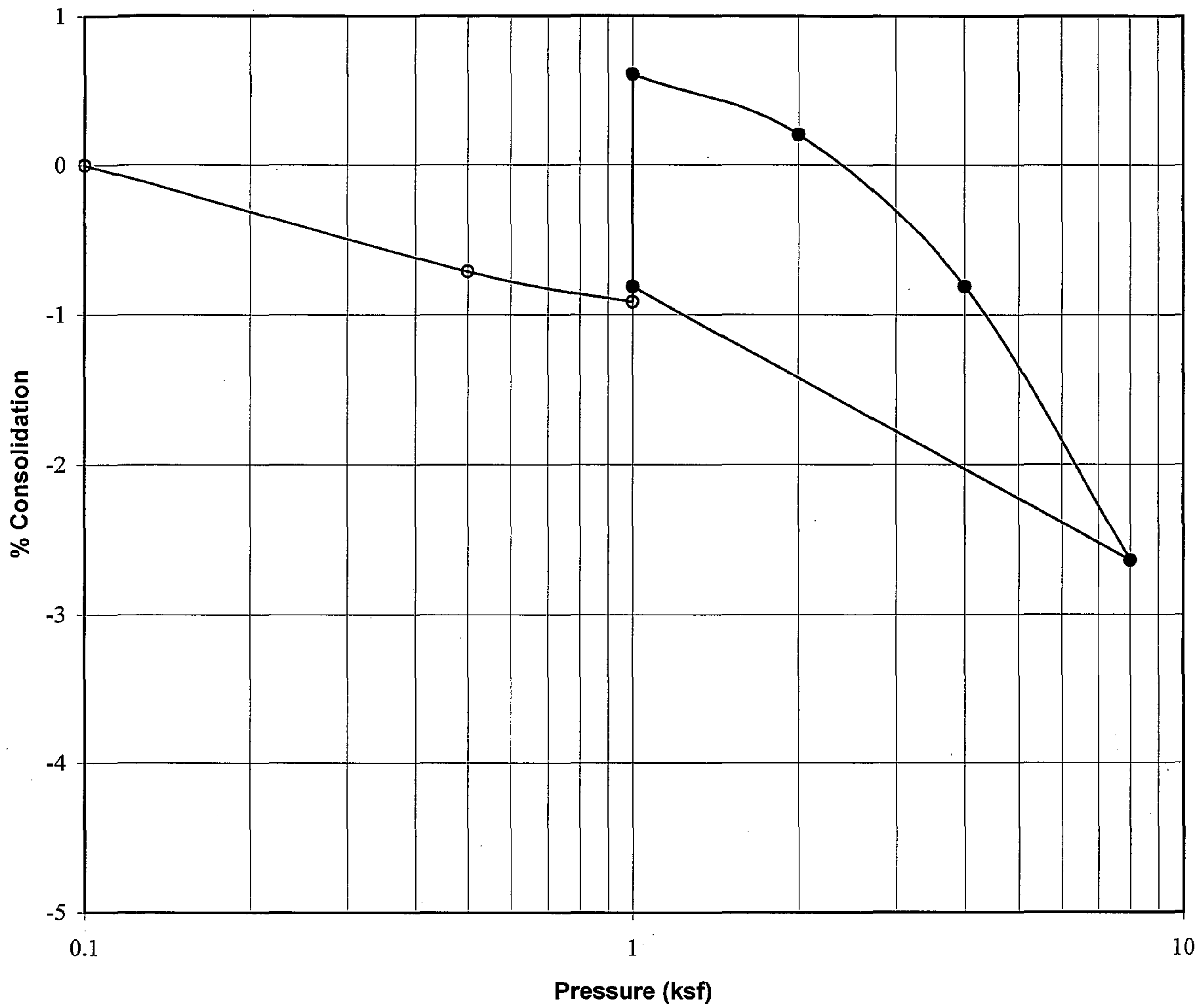
WATER SYMBOLS

- ∇ 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

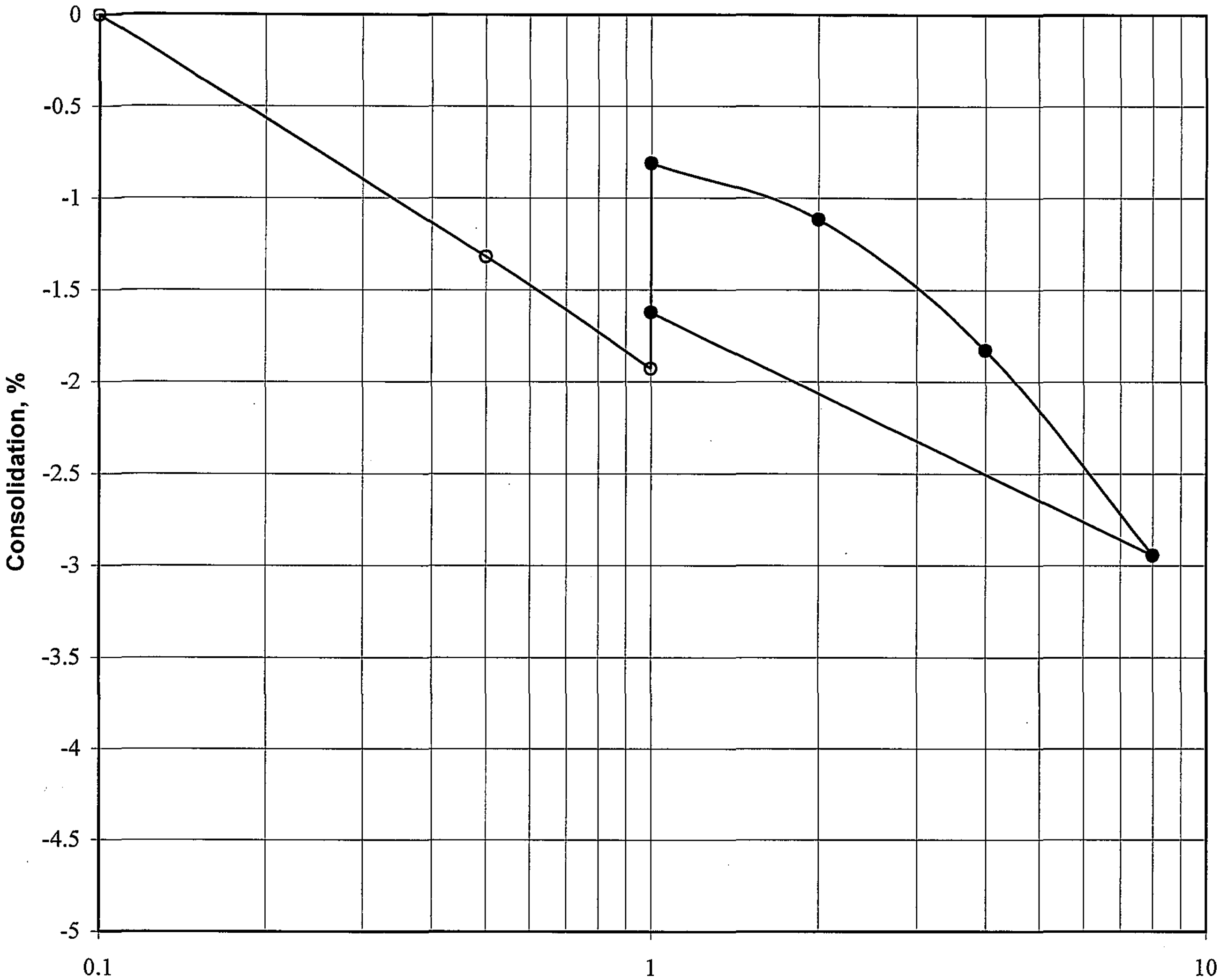
CONSOLIDATION - SWELL TEST



Project:	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

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

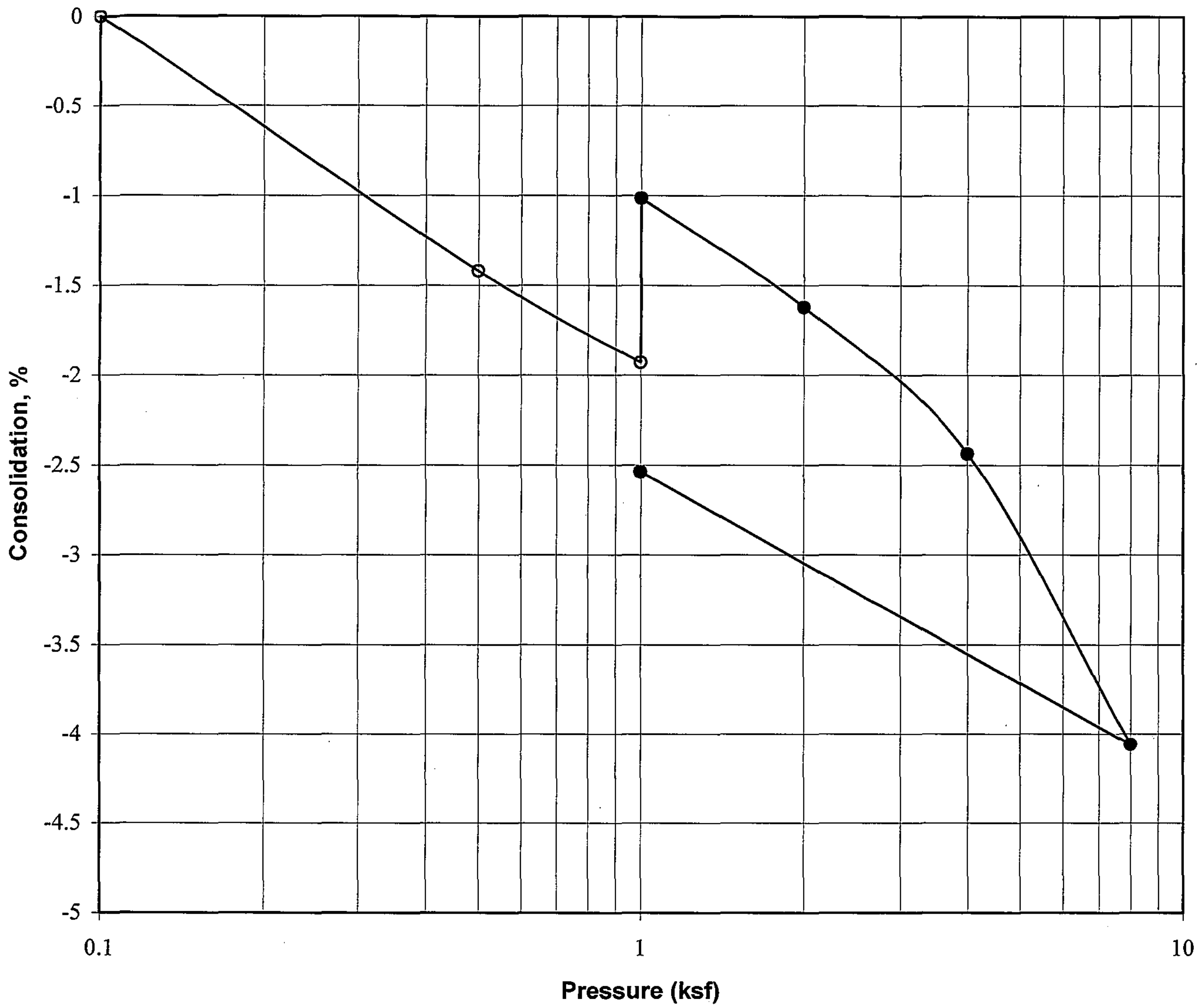
CONSOLIDATION - SWELL TEST



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

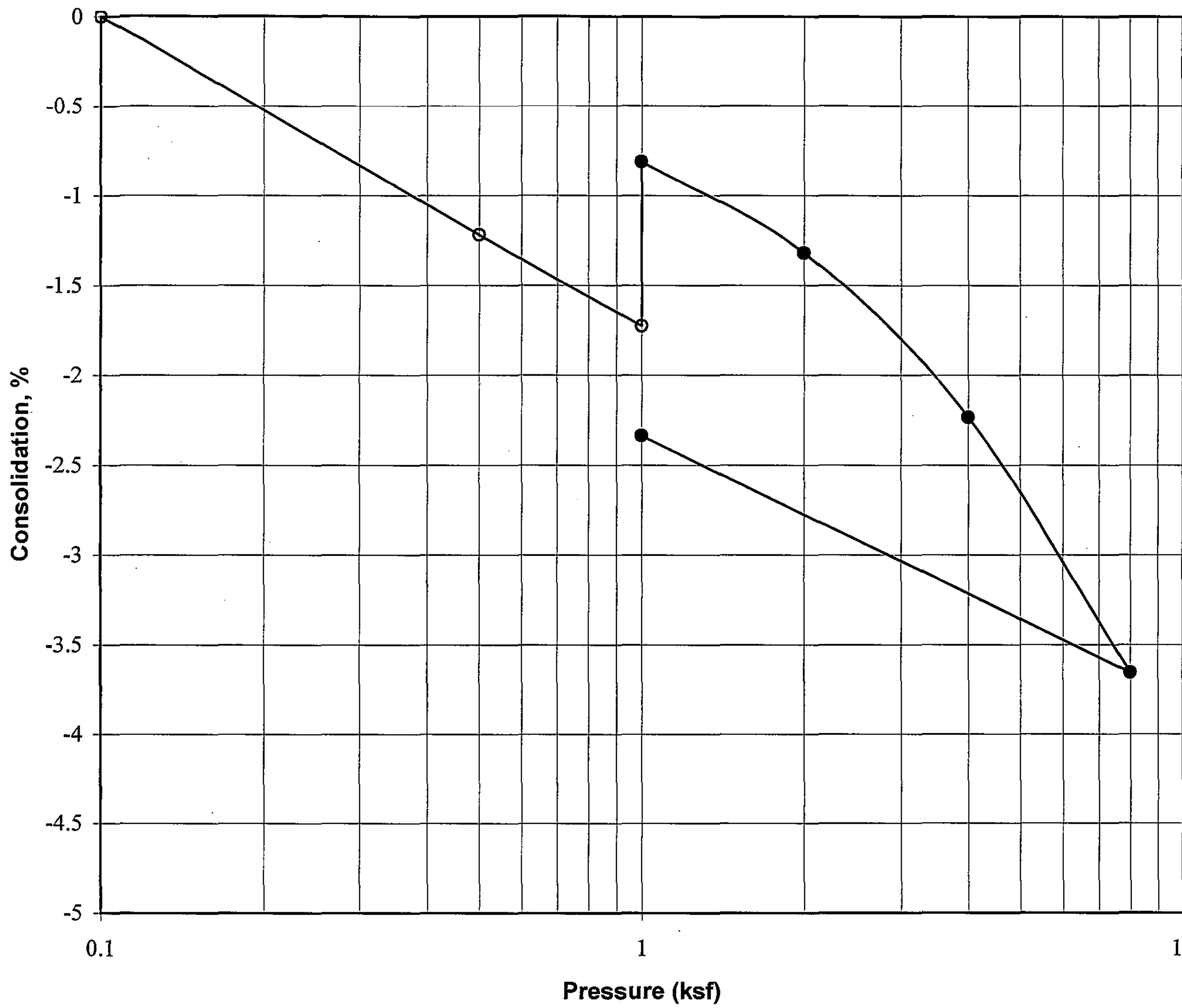
CONSOLIDATION - SWELL TEST



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

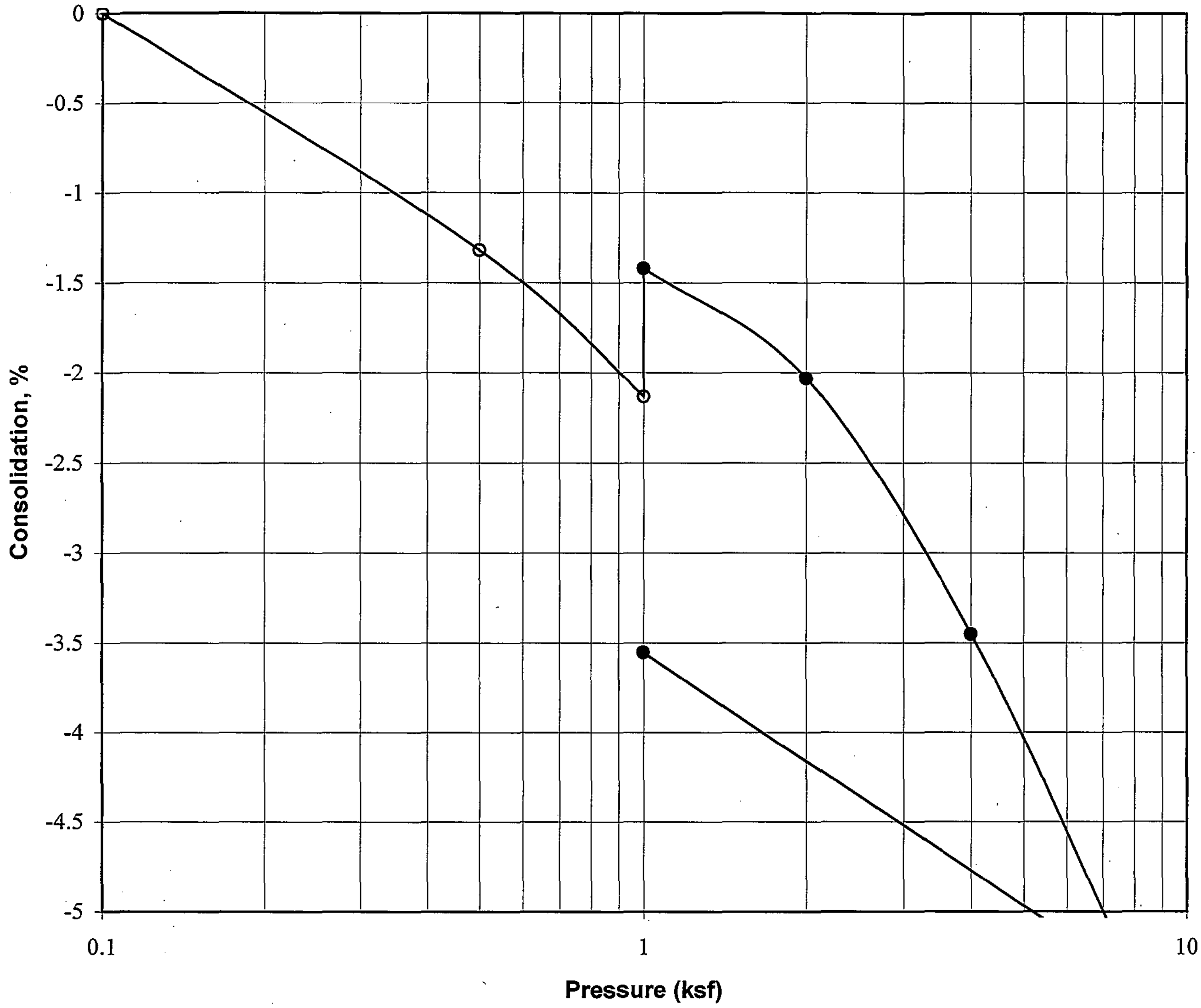
CONSOLIDATION - SWELL TEST



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 F:

SLOPE STABILITY AND SETTLEMENT ANALYSIS

APPENDIX F

SLOPE STABILITY AND SETTLEMENT ANALYSIS

INTERMOUNTAIN REGIONAL LANDFILL
FAIRFIELD, UTAH

CLASS V 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 equilibrium 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 variable slope break, ranging between from El. 4898 to 4905. The side slopes are 1V:4H (25%) from the slope break to original grade. Maximum waste fill heights in Cell 4 are 130 feet above the cell bottom and 100 feet above original 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 material) 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), material 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 friction angle, *S*, between adjacent materials normally controls slope stability, with the lowest interface friction angle controlling overall slope stability. Adopted friction 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 friction)	0.13g	8.0

SECTION 4.0 SETTLEMENT AND LINER STRAIN

4.1 SETTLEMENT

For this analysis, settlement was calculated along the Cell 3 leachate collection pipe alignment for the worst-case scenario. Points along the alignment were evaluated to determine if the slope toward the sump would be positive after final waste has been placed. The results are shown in Table 4.1.

Table 4.1
Differential Settlement Results

Point	Location	Thickness of Waste (ft)	Settlement (ft)	Final Slope between Points (%)
1	Interior 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 strain in the liner between the points above was also determined based on the initial and final (after settlement) slope information. The calculated strains 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. Factoring 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 Intermountain 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

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

D. Das, B.; (1990) Principles of Foundation Engineering, 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

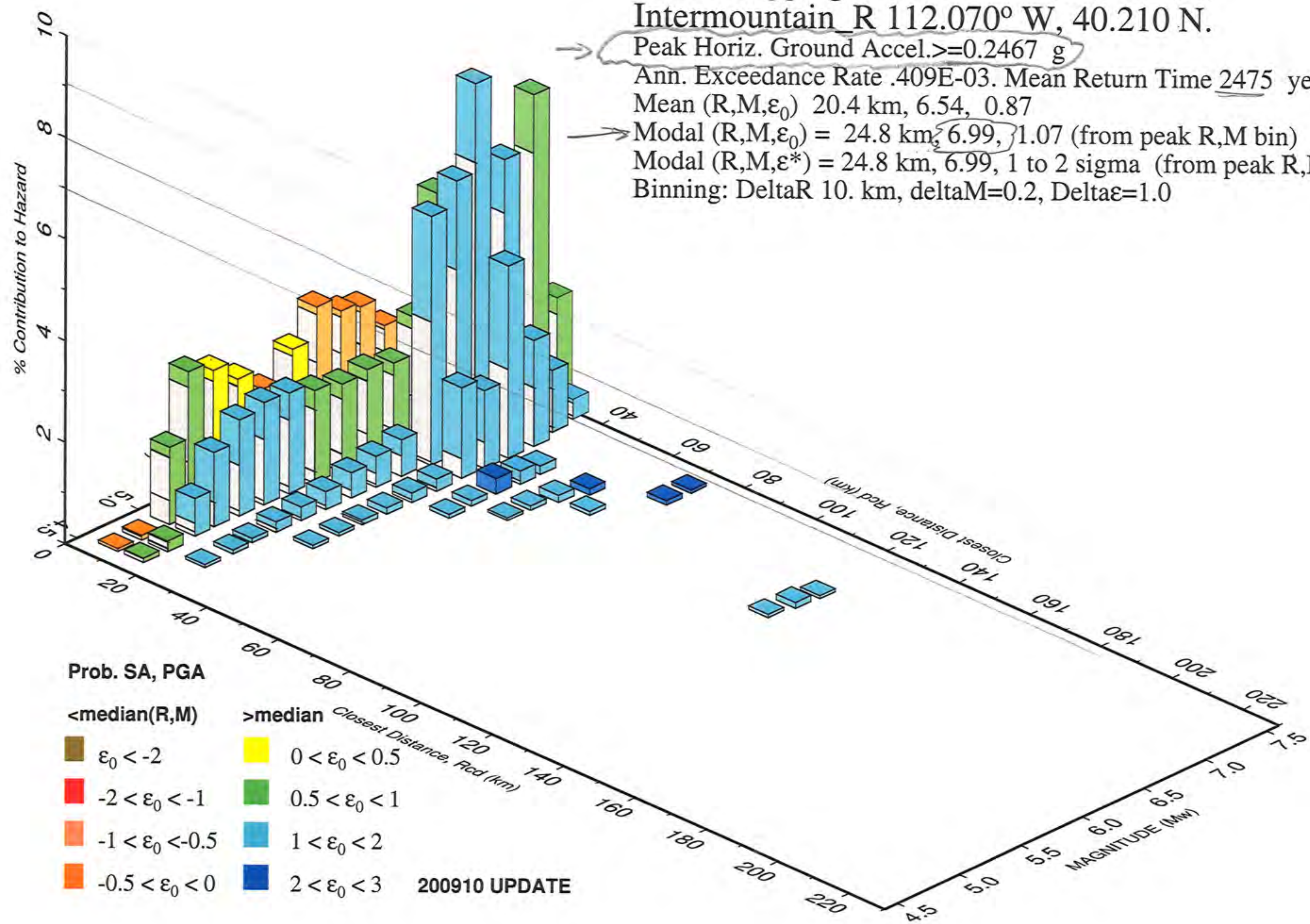
1.4 Results:

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.

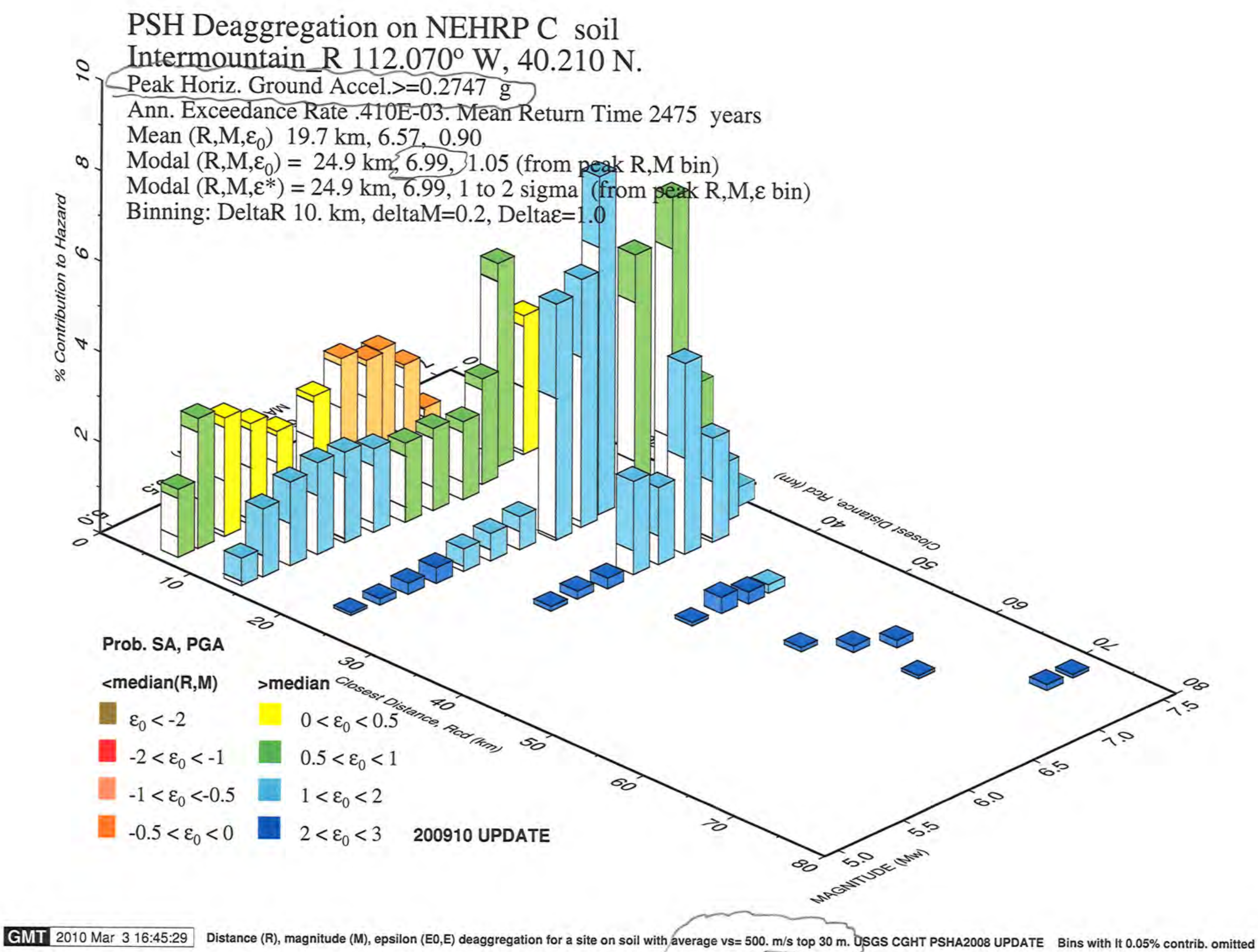
ATTACHMENT 1A: USGS MAPPING, REFERENCE B

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,ε_0) 20.4 km, 6.54, 0.87
Modal (R,M,ε_0) = 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



1/2

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


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,ε0) 19.7 km, 6.57, 0.90
Modal (R,M,ε0) = 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
% 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 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

2/2

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.

Table 2.3 Consistency of Clays and Approximate Correlation to the Standard Penetration Number, N

$1 \text{ kN/m}^2 = 0.01044 \text{ Tons/ft}^2$ pg. 719

Standard penetration number, N	Consistency	Unconfined compression strength, q_u (kN/m^2)	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

$$\boxed{N_{cor} = C_N N_F} \tag{2.4}$$

where N_{cor} = corrected N-value to a standard value of σ'_v [95.6 kN/m^2 (1 ton/ft^2)]
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, 2nd 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

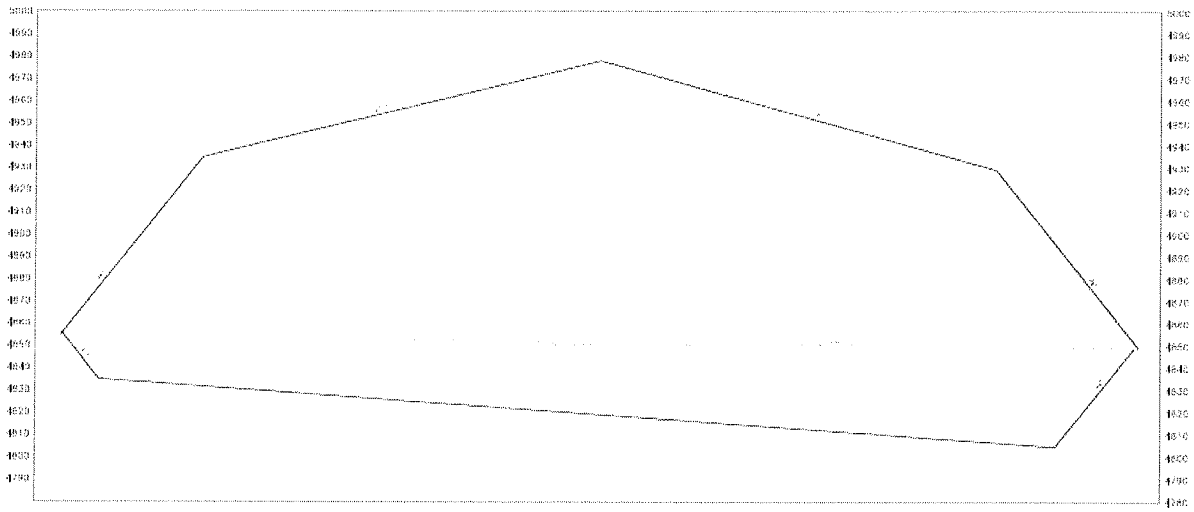
C. Design values:

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	Varies	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:

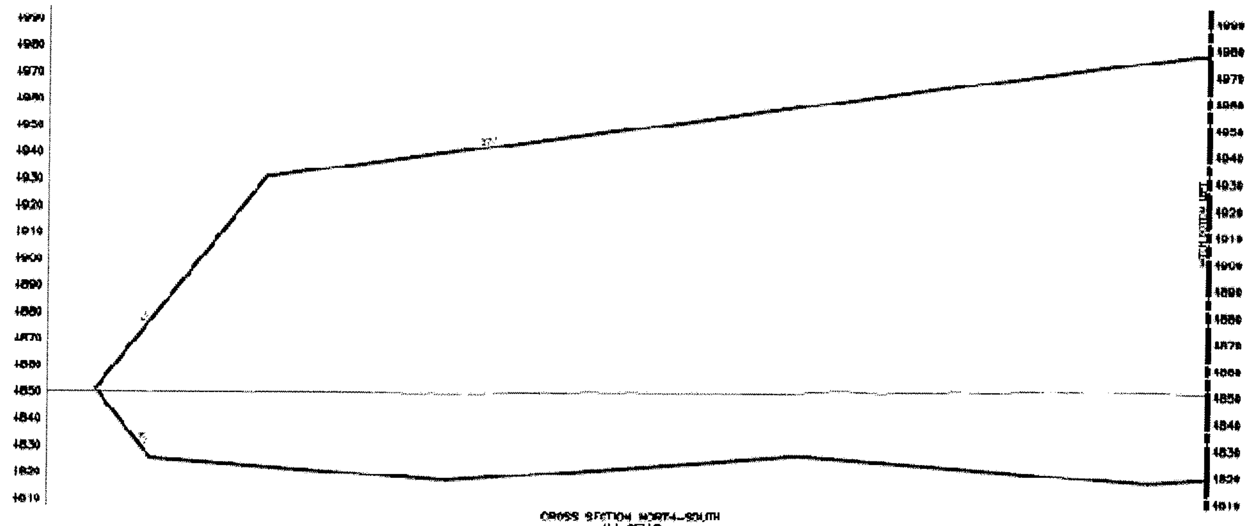
A. West-East Cross Section (see attached):



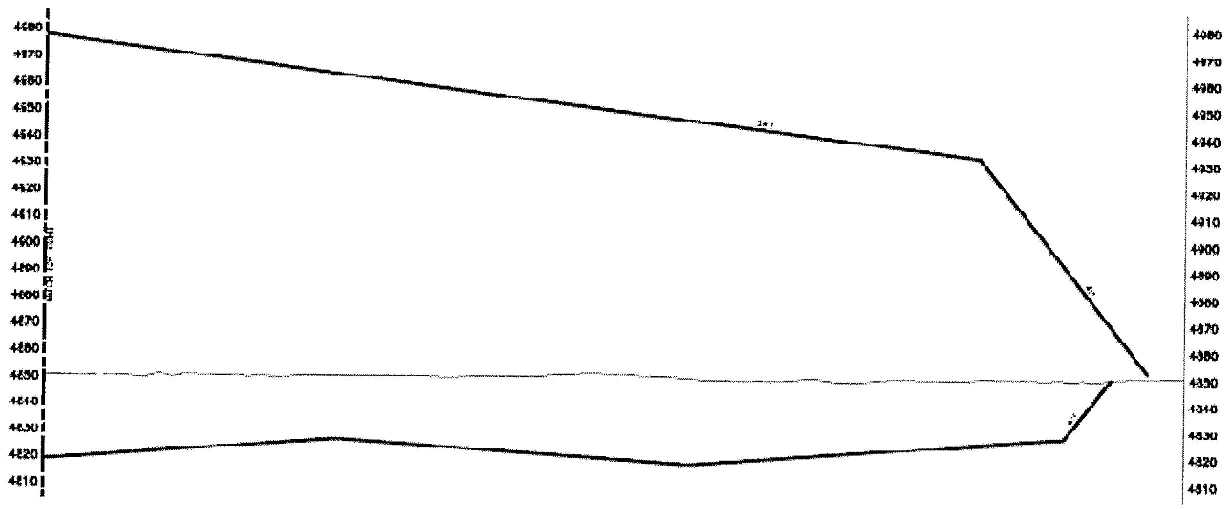
CROSS SECTION EAST—WEST
FILL CELLS

Project:	Intermountain Regional Landfill	Computed:	GMS	Date: March 2010	
Subject:	Slope Stability	Checked:	RWP	Date:	4-26-10
Task:	Slope Stability: Cases	Page: 5 of 6			
Job #:	Dept: 00143	No:	125184		

B. North-South Cross Sections (see attached):



CROSS SECTION NORTH-SOUTH
ALL CELLS



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.

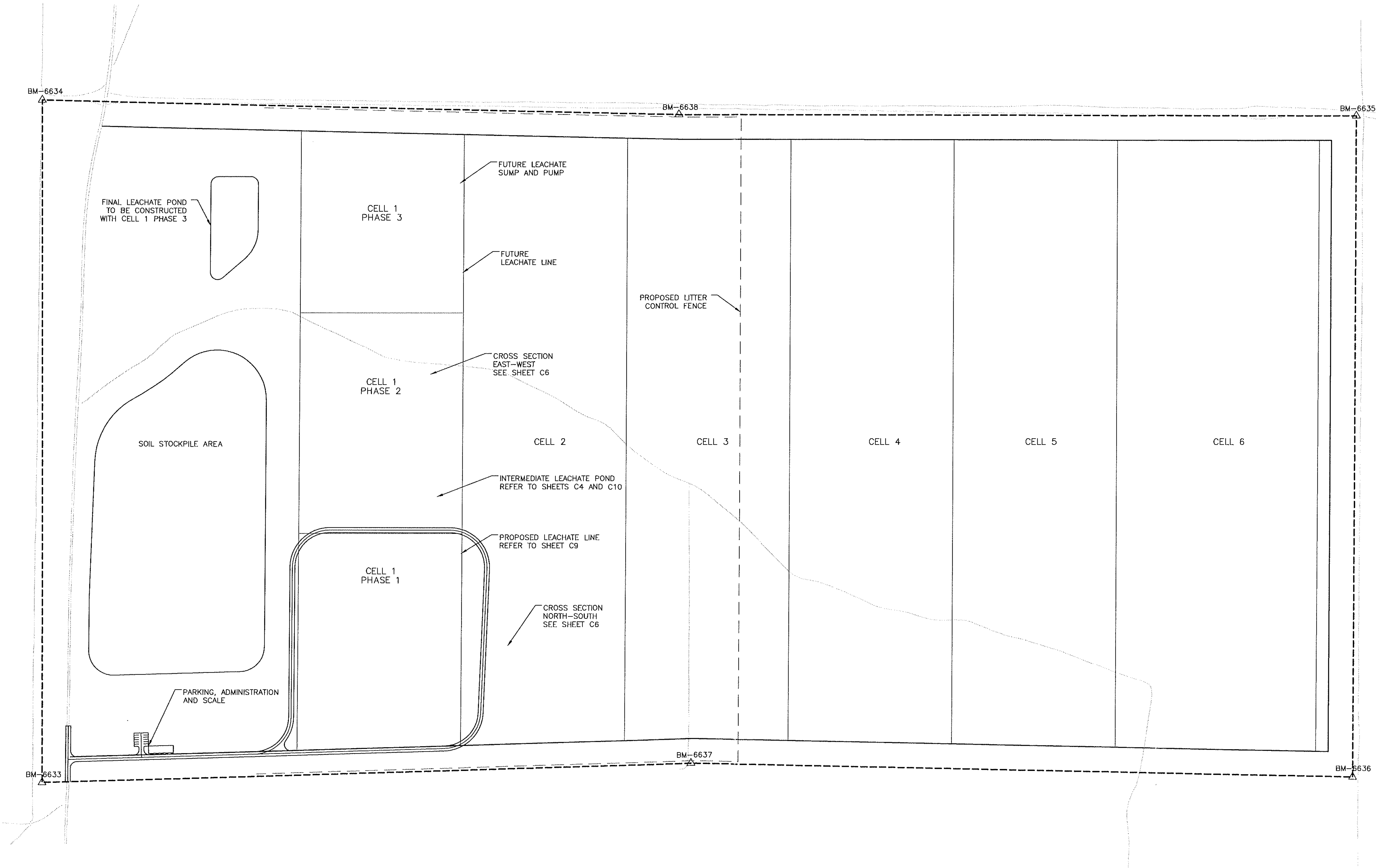
E. Case 3 – Maximum Operational Fill Slope (Cell 4/Cell 5):
   i) Maximum waste height = 130 FT above cell floor.
   ii) Waste slope = 3H:1V.
   iii) See Attachment 2C-3 for stability output.

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 Friction)	0.13g	8.0

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

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

4640 EXISTING CONTOURS

CELL FOOTP BOUNDARY

PROPOSED DRAIN LINE

LITTER CON FENCE LOC

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

HDR
HDR Engineering, Inc.

ISSUE	DATE	DESCRIPTION

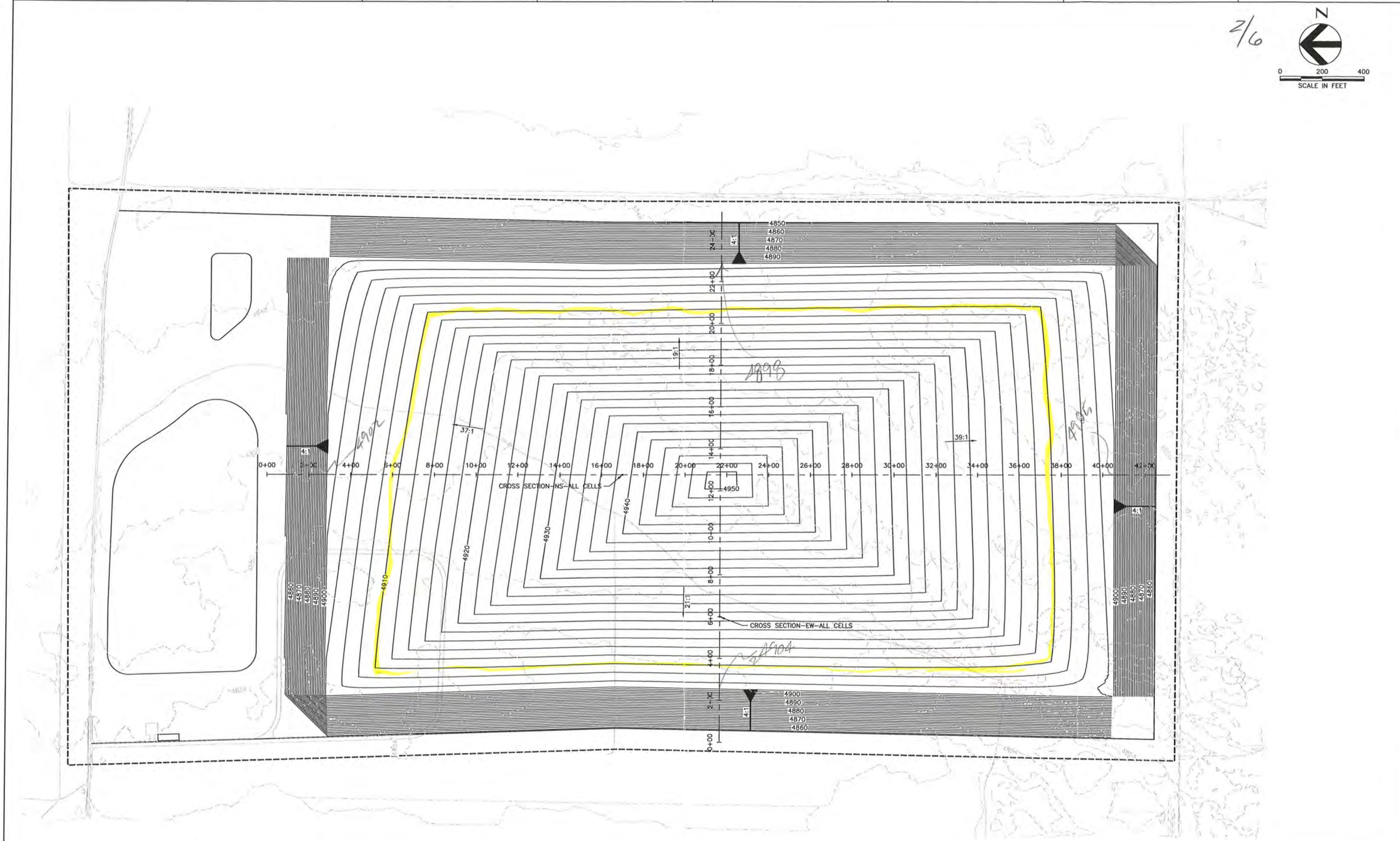
PROJECT MANAGER	T. WARNER
CHECKED BY	S. WOMACK
DESIGNED BY	C. MCCARTY
DRAWN BY	C. MCCARTY
PROJECT NUMBER	

INTERMOUNTAIN
REGIONAL
LANDFILL

SITE PLAN

0 1" 2"

FILENAME	01C003.DWG
SCALE	1"=200'



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

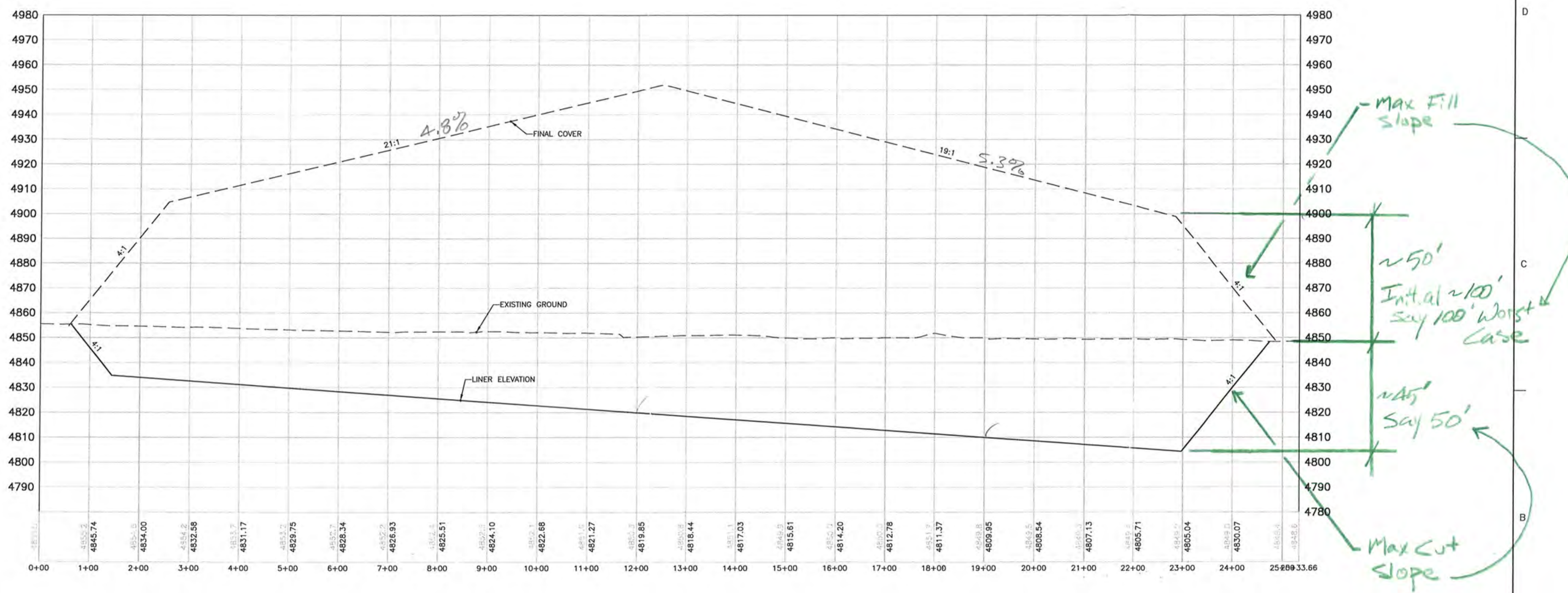
HDR
HDR Engineering, Inc.

ISSUE	DATE	DESCRIPTION

INTERMOUNTAIN REGIONAL LANDFILL

FINAL COVER PLAN

FILENAME 01C005.DWG
SCALE 1"=200'
SHEET 5 OF 13



CROSS SECTION EAST–WEST
ALL CELLS

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

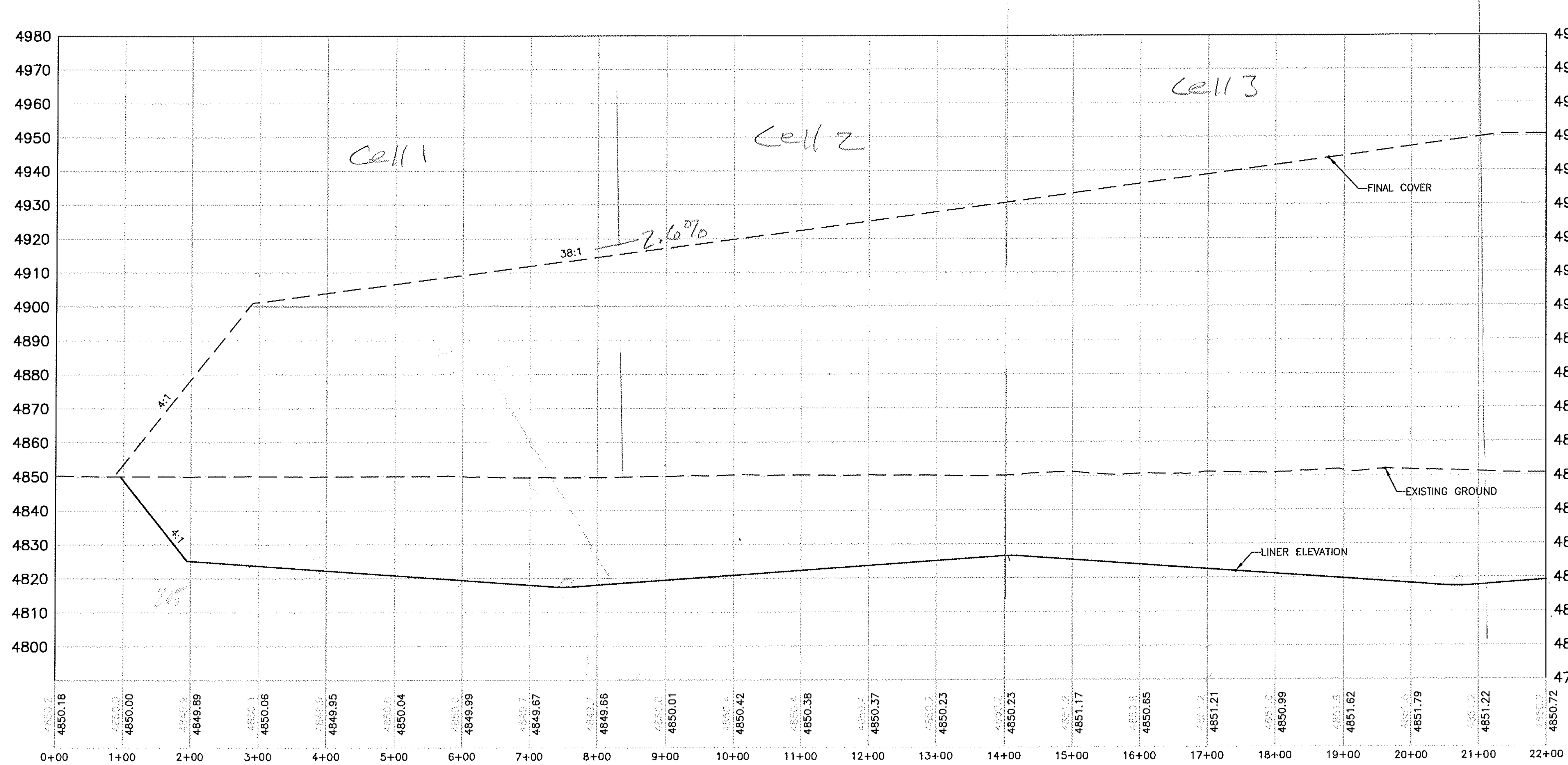
CROSS SECTION

0 1" 2"

FILENAME	01C007.DWG
SCALE	1"=100'

SHEET 7 OF 12

4/6



CROSS SECTION NORTH–SOUTH
ALL CELLS

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

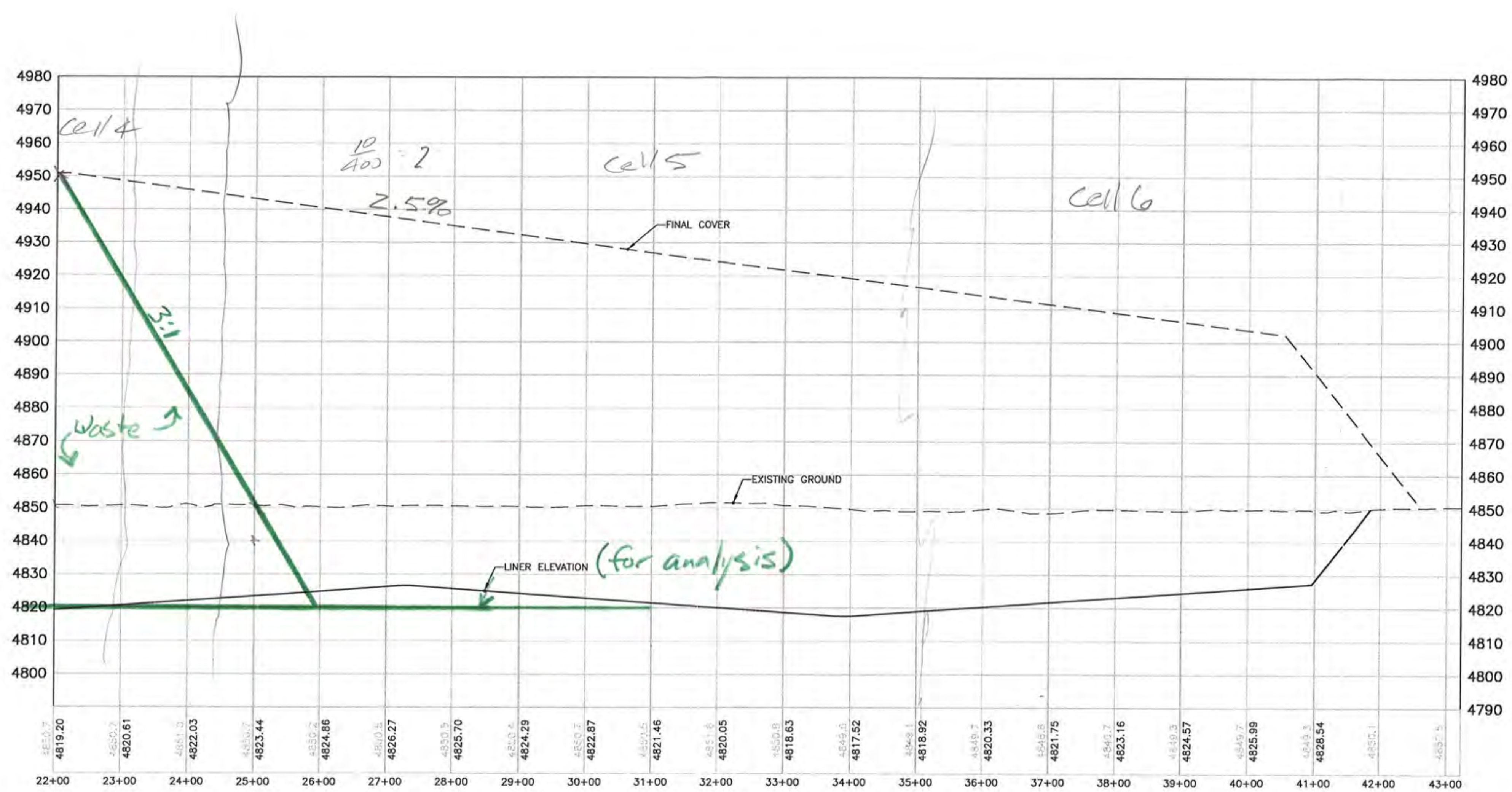
CROSS SECTION

0 1" 2"

FILENAME	01C008.DWG
SCALE	1"=100'

SHEET
8 OF 13

5/6



CROSS SECTION NORTH–SOUTH
ALL CELLS

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	

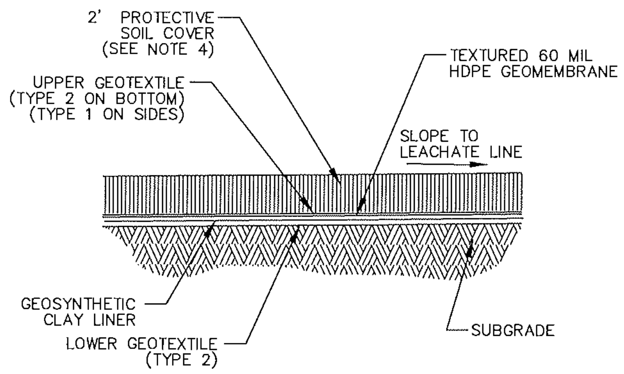
INTERMOUNTAIN
REGIONAL
LANDFILL

CROSS SECTION

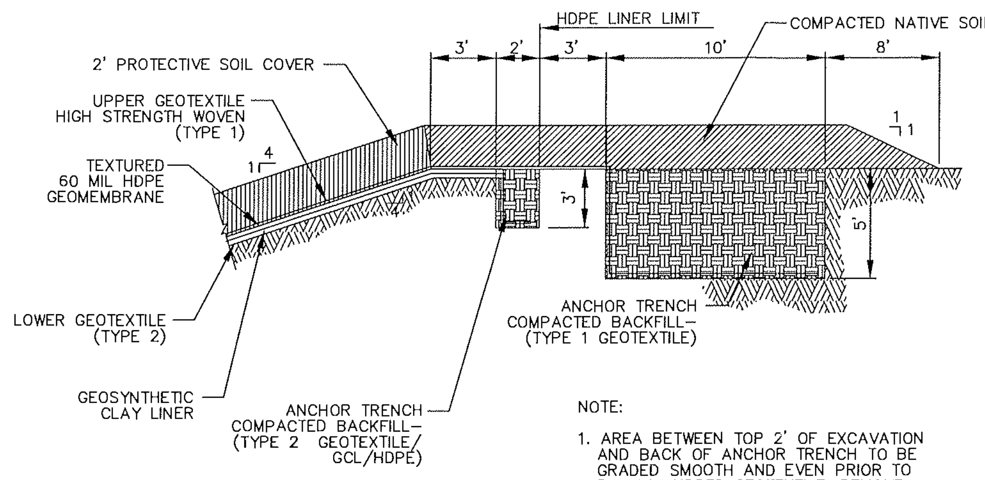
FILENAME	01C009.DWG
SCALE	1"=100'

SHEET 9 OF 13

6/6



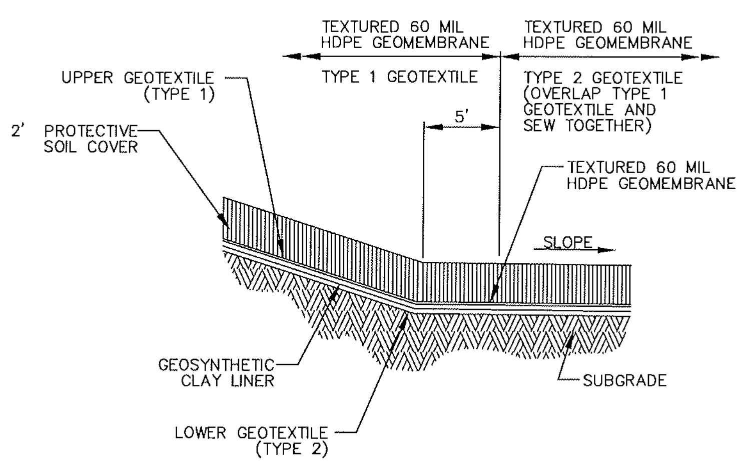
TYPICAL LANDFILL LINER DETAIL 1/C9
NOT TO SCALE



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 I 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 GCL. 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

0 1" 2"

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

✓ PWP 4-9-10

Ref. A

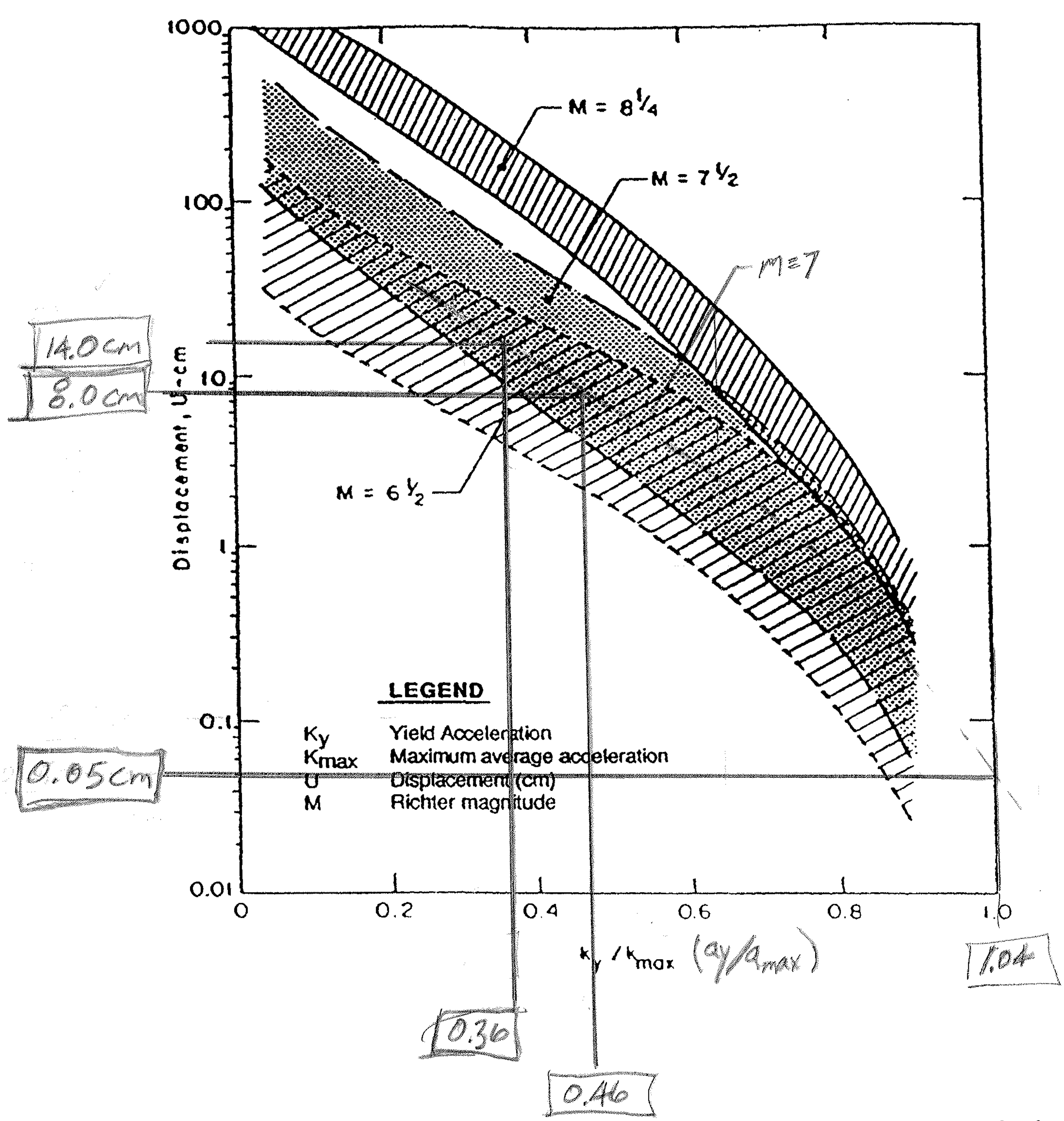


Figure 6.6 Makdisi and Seed Permanent Displacement Chart (Makdisi and Seed, 1978).

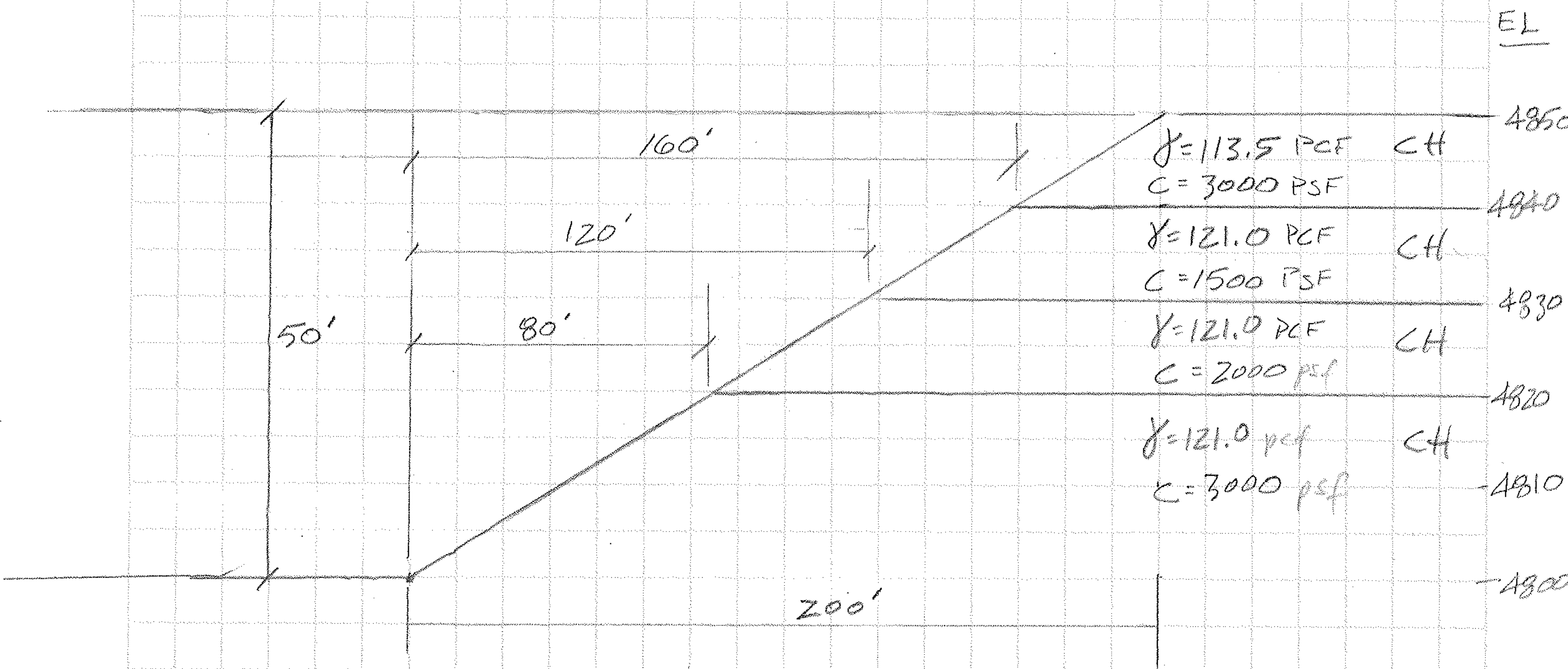
ATTACHMENT 2C: SLOPE STABILITY RUNS & RESULTS

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

HDR | ONE COMPANY *Many Solutions*®

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

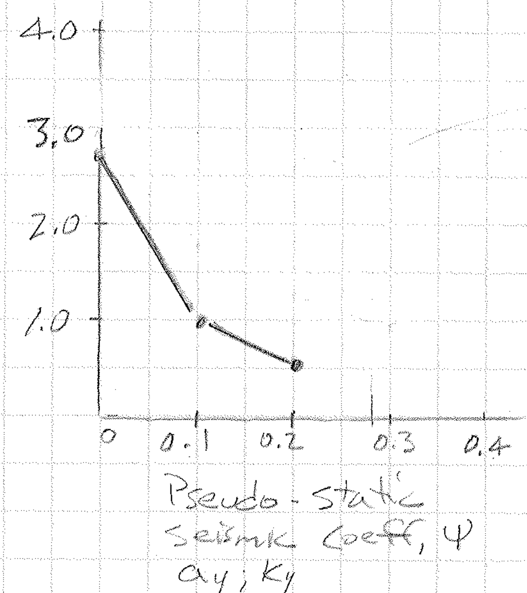
Cut slope (Max)
H=50



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	0.51	1.33

↑
Controls



HDR | ONE COMPANY *Many Solutions*®

Project: IRL	Computed: GMS	Date: 4/2010	
Subject: Slope stability	Checked: PAR	Date: 4-26-10	
Task: Cut slope	Page: 2	of: 130	
Job #: 125184 Dept. 143	No:		

Maximum Cut Slope Results / Displacement

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

$a_y = 0.1g$ (Previous page)

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

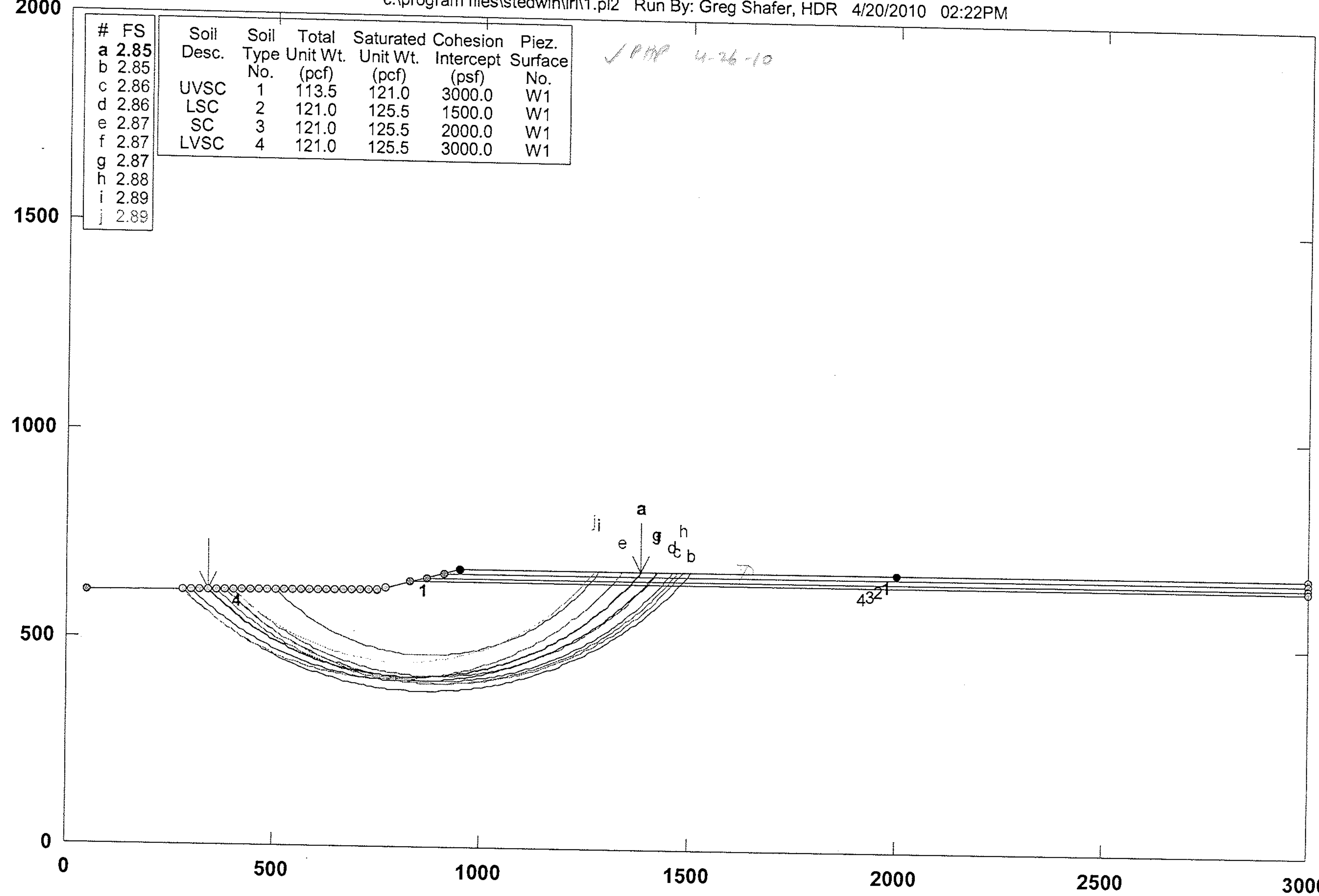
Attachment 2B (Reference A)

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

3/130

Intermountain 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

**** 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 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	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	608.00
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	432.61
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

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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	1256.61	548.58
102	1264.59	554.60
103	1272.49	560.74
104	1280.30	566.98
105	1288.02	573.34
106	1295.65	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 Bot (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

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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	6.5	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	64826.2	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	614.26
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	996.86	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	1261.13	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	637.59
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	409.26
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	1429.68	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	660.06
126	1469.53	667.75
127	1471.35	670.00

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	575.68	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	706.37	425.92
40	716.03	423.36
41	725.73	420.93
42	735.47	418.64
43	745.23	416.48
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	406.40
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
66	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	413.68
73	1043.08	415.65
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	469.43
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	565.56
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	649.23
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	586.69
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	363.23	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	462.94
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	426.58
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	466.08
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	1287.86	612.70
114	1294.88	619.82
115	1301.80	627.04
116	1308.61	634.36
117	1315.33	641.77
118	1321.93	649.28
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	469.74	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	505.65
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	465.48
29	633.96	461.68
30	643.26	458.01
31	652.62	454.49
32	662.02	451.10
33	671.48	447.84
34	680.98	444.73
35	690.53	441.75
36	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	426.86
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	1046.21	430.57
72	1055.93	432.94
73	1065.61	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	464.34
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	599.69
108	1366.52	606.62
109	1373.63	613.66
110	1380.63	620.80
111	1387.53	628.04
112	1394.32	635.38

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113	1401.00	642.82
114	1407.57	650.36
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	360.93	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	409.68	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	446.46
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	646.49	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	774.61	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
60	834.55	399.47
61	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	1061.22	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	464.34
93	1154.72	468.40
94	1163.80	472.59
95	1172.83	476.89
96	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	634.26
123	1397.46	641.48
124	1404.28	648.79
125	1411.01	656.19
126	1417.64	663.68

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	566.28	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	442.60
34	657.77	439.14
35	667.20	435.82
36	676.68	432.62
37	686.19	429.54
38	695.75	426.60
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	396.16
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
66	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	435.16
85	1157.74	438.46
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	460.92
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	566.77
112	1389.97	573.23
113	1397.52	579.78
114	1404.98	586.44
115	1412.35	593.20
116	1419.63	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	666.02
126	1484.00	670.00

Circle Center At X = 908.7 ; Y = 1135.0 and Radius, 739.8
*** 2.875 ***
Failure Surface Specified By 90 Coordinate Points

Point	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	589.56	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	696.72	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	464.02
45	903.17	464.54
46	913.14	465.26
47	923.10	466.16
48	933.04	467.27
49	942.96	468.56
50	952.85	470.05
51	962.70	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	506.51
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	1283.67	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	409.65	608.76
3	416.92	601.90
4	424.31	595.16
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	630.48	475.64
29	640.00	472.59
30	649.58	469.69
31	659.20	466.96
32	668.86	464.40
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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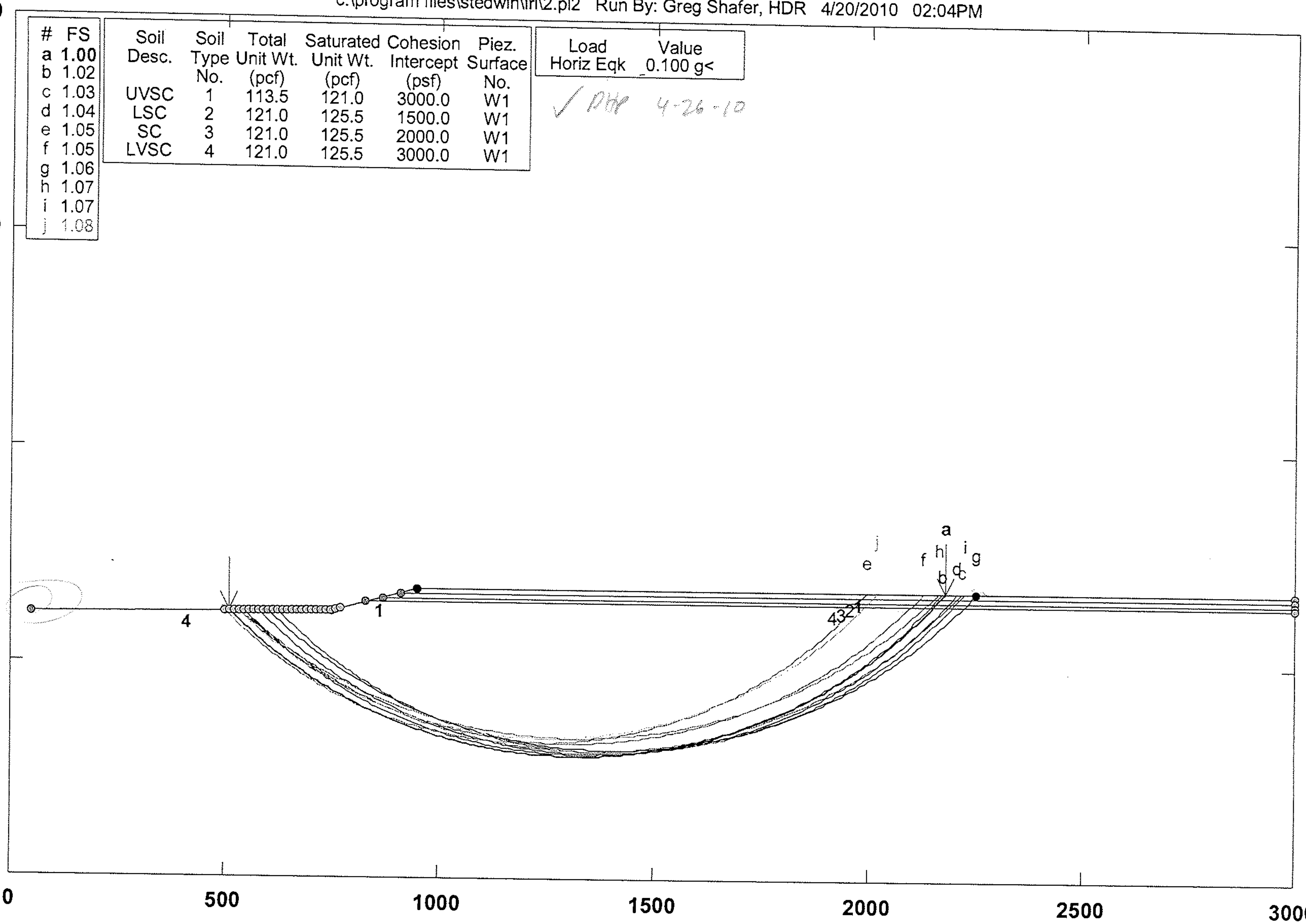
41	757.42	448.87
42	767.38	447.99
43	777.36	447.28
44	787.34	446.75
45	797.34	446.39
46	807.34	446.19
47	817.34	446.17
48	827.33	446.33
49	837.33	446.65
50	847.32	447.14
51	857.29	447.81
52	867.26	448.65
53	877.21	449.65
54	887.14	450.83
55	897.05	452.18
56	906.93	453.70
57	916.79	455.39
58	926.61	457.24
59	936.41	459.27
60	946.16	461.46
61	955.88	463.82
62	965.56	466.35
63	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	496.43
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	1103.76	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	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 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	698.39	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	969.08	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	286.36
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	1463.05	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	336.52
126	1667.88	339.50
127	1677.40	342.57
128	1686.89	345.72
129	1696.35	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	511.69
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	601.66
179	2119.07	608.58
180	2126.23	615.56
181	2133.33	622.60
182	2140.37	629.70
183	2147.35	636.86
184	2154.27	644.08
185	2161.12	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	5361.2	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	14496.6	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	8.6	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	200686.8	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	216432.1	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	259634.3	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	34406.1	0.0	0.0
54	9.4	351596.0	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	46327.8	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	464146.8	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
106	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
116	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	9.6	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	382669.9	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	34877.6	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	262119.8	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
162	8.4	197090.6	0.0	0.0	0.0	0.0	19709.1	0.0	0.0
163	8.3	190399.6	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	18369.0	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	136356.8	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	116054.9	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	603.42	562.87
10	610.99	556.34
11	618.63	549.88
12	626.32	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	681.72	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	926.80	366.84
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	1486.68	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	1899.26	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	667.54
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
16	660.61	522.08
17	668.74	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	979.65	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	1066.03	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	1263.21	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

107	1522.54	309.78
108	1532.43	311.25
109	1542.31	312.81
110	1552.17	314.45
111	1562.02	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	1659.59	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	533.46
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	2146.75	603.39
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	644.78
184	2197.22	651.89
185	2204.19	659.06
186	2211.10	666.28
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	610.87
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	1036.65	341.71
56	1046.22	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
65	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	1391.61	291.80
92	1401.60	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	1609.67	318.11
114	1619.42	320.32
115	1629.15	322.62
116	1638.86	325.00
117	1648.55	327.48
118	1658.22	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	1762.85	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	2065.58	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	2133.48	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
182	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	536.85
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	462.59
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
36	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	1010.46	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	1069.48	327.08
67	1079.37	325.62
68	1089.28	324.26
69	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	316.02
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	1961.07	632.80
165	1967.91	640.09
166	1974.68	647.45
167	1981.38	654.87
168	1988.01	662.36
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	617.36
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	658.37	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	484.35
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	868.56	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	368.01
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	1039.53	346.63
60	1049.27	344.34
61	1059.02	342.14
62	1068.80	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	327.63
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
116	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	1745.06	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	1835.30	448.02
142	1844.11	452.75
143	1852.88	457.56
144	1861.60	462.45
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	1929.76	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

163	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	629.01
173	2092.99	635.95
174	2100.13	642.95
175	2107.21	650.02
176	2114.22	657.14
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	692.51	540.35
14	700.47	534.29
15	708.48	528.31
16	716.55	522.39
17	724.66	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

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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
61	1122.10	333.96
62	1131.82	331.61
63	1141.56	329.35
64	1151.32	327.17
65	1161.10	325.08
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

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116	1666.97	331.53
117	1676.69	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
126	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	390.16
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	660.25

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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	604.50
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	596.26	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	687.30	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	461.66
30	774.62	457.11
31	783.57	452.65
32	792.56	448.25
33	801.57	443.94
34	810.63	439.69
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
61	1066.17	354.28

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62	1075.96	352.23
63	1085.76	350.25
64	1095.58	348.36
65	1105.42	346.55
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	1184.57	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	363.16
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

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130	1745.00	404.69
131	1754.34	408.25
132	1763.66	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	456.84
144	1872.92	461.38
145	1881.80	465.99
146	1890.63	470.67
147	1899.43	475.43
148	1908.18	480.26
149	1916.90	485.16
150	1925.58	490.13
151	1934.21	495.17
152	1942.81	500.29
153	1951.36	505.47
154	1959.86	510.73
155	1968.33	516.06
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	2026.30	555.27
163	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	611.39
3	637.96	604.39
4	645.16	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

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13	712.75	538.05
14	720.56	531.80
15	728.42	525.63
16	736.34	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	1168.65	319.96
65	1178.43	317.90
66	1188.24	315.92
67	1198.06	314.04
68	1207.89	312.24
69	1217.75	310.53
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	1326.96	297.75

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81	1336.94	297.14
82	1346.92	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	296.90
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	1536.54	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

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	2026.04	493.31
155	2034.20	499.09
156	2042.31	504.94
157	2050.36	510.87
158	2058.36	516.87
159	2066.30	522.95
160	2074.19	529.09
161	2082.02	535.31
162	2089.80	541.60
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	2142.55	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	636.86
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	533.75	617.36
2	540.98	610.45
3	548.27	603.61
4	555.63	596.84
5	563.06	590.14
6	570.55	583.51
7	578.10	576.96
8	585.71	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	656.98	515.56
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	429.64
35	812.48	425.35
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
46	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	360.93
55	1000.63	358.46
56	1010.35	356.08
57	1020.08	353.80
58	1029.84	351.61
59	1039.62	349.52
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	330.26
74	1188.16	329.61
75	1198.15	329.05
76	1208.13	328.59
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	1268.12	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	1427.25	342.93

99	1437.09	344.69
100	1446.92	346.55
101	1456.73	348.50
102	1466.52	350.54
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	376.16
113	1572.66	379.23
114	1582.14	382.40
115	1591.60	385.66
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	1666.01	414.98
124	1675.14	419.05
125	1684.24	423.21
126	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	474.65
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	560.85
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	620.79
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

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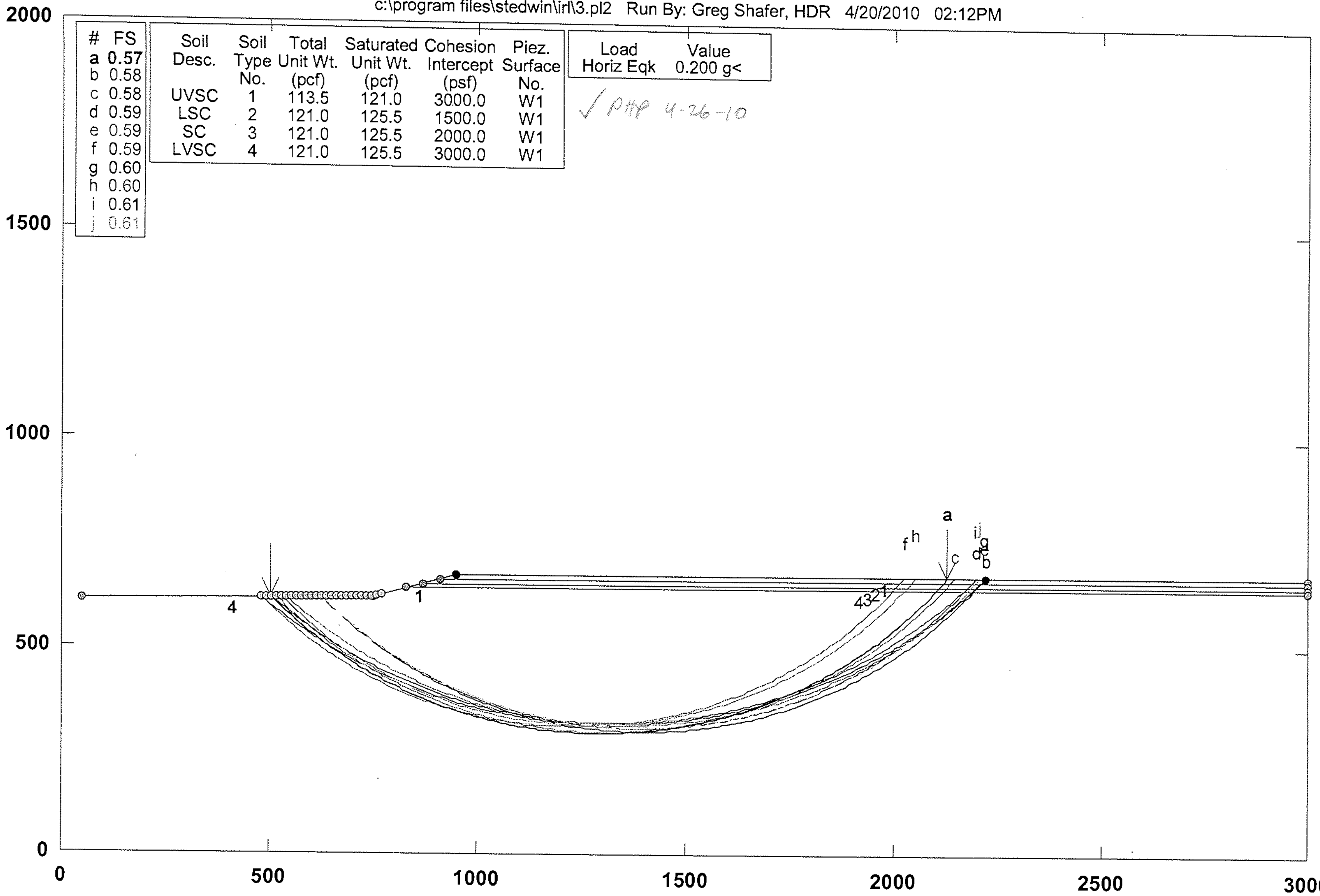
  167        2018.34       670.00
Circle Center At X = 1250.7 ; Y = 1359.8  and Radius, 1032.0
      ***      1.080    ***
```

Intermountain Regional Landfill Cut slope 1

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



PCSTABL7 FSmin=0.57

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:             02:12PM
 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     X-Left     Y-Left    X-Right    Y-Right    Soil Type
   No.         (ft)       (ft)       (ft)       (ft)     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   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
 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 Terminates 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
         Point      X-Surf      Y-Surf
          No.        (ft)        (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
```

9	562.88	562.69
10	570.49	556.20
11	578.16	549.78
12	585.88	543.43
13	593.67	537.15
14	601.50	530.93
15	609.39	524.79
16	617.34	518.72
17	625.34	512.72
18	633.40	506.80
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	456.77
28	716.73	451.59
29	725.33	446.48
30	733.98	441.45
31	742.67	436.50
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	795.70	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	850.16	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	357.69
51	924.73	354.37
52	934.19	351.13
53	943.68	347.98
54	953.20	344.91
55	962.74	341.93
56	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	307.60
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
76	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	292.66
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	294.67
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	1555.29	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	1660.69	355.79
127	1670.11	359.15
128	1679.50	362.59
129	1688.86	366.12
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

145	1833.72	433.72
146	1842.44	438.63
147	1851.11	443.61
148	1859.73	448.67
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	480.65
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	515.30
161	1967.44	521.33
162	1975.37	527.43
163	1983.24	533.60
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	2058.76	599.10
174	2065.98	606.02
175	2073.14	613.00
176	2080.24	620.04
177	2087.27	627.15
178	2094.24	634.32
179	2101.15	641.55
180	2107.99	648.85
181	2114.76	656.20
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	15467.2	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	7.5	40810.0	0.0	0.0	0.0	0.0	8162.0	0.0	0.0
8	7.6	47236.8	0.0	0.0	0.0	0.0	9447.4	0.0	0.0
9	7.6	53692.7	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	66680.7	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	8.5	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	8.6	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	36771.4	0.0	0.0
30	8.7	190164.0	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	191459.2	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	47692.1	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	318637.0	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	193578.7	0.0	0.0	0.0	0.0	38715.7	0.0	0.0
54	9.4	349593.4	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	397542.8	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
66	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	89485.6	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
85	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	455260.8	0.0	0.0	0.0	0.0	91052.2	0.0	0.0

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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	91156.2	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	454540.2	0.0	0.0	0.0	0.0	90908.0	0.0	0.0
98	10.0	453857.4	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	446741.8	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	436936.0	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	426627.6	0.0	0.0	0.0	0.0	85325.5	0.0	0.0
114	9.8	423719.5	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	387653.6	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	76677.3	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	365214.4	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	355489.3	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	65893.0	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	63683.6	0.0	0.0
139	9.2	312770.7	0.0	0.0	0.0	0.0	62554.1	0.0	0.0
140	9.1	307038.3	0.0	0.0	0.0	0.0	61407.7	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	295345.6	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	55453.4	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	258607.8	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	232964.3	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	8.5	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	29164.5	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	71568.4	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	5131.5	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	610.34
3	495.49	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	551.16	561.63
11	559.30	555.81
12	567.48	550.06
13	575.70	544.37
14	583.97	538.74
15	592.27	533.18
16	600.62	527.68
17	609.02	522.24
18	617.45	516.87
19	625.92	511.56
20	634.44	506.31
21	642.99	501.13
22	651.59	496.02
23	660.22	490.97
24	668.89	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

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	400.56
45	858.87	397.02
46	868.25	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	925.05	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	360.16
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
67	1070.39	337.49
68	1080.22	335.63
69	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
76	1159.28	323.48
77	1169.21	322.30
78	1179.15	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
85	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	315.03
99	1388.85	315.52
100	1398.83	316.09
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	1468.56	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	1664.77	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
136	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	1797.64	403.80
142	1806.94	407.47
143	1816.21	411.22
144	1825.46	415.03
145	1834.67	418.92
146	1843.85	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
157	1942.76	470.94
158	1951.55	475.72
159	1960.29	480.56
160	1969.01	485.47
161	1977.68	490.45
162	1986.32	495.49
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
169	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	572.83
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	2150.27	609.69
183	2158.00	616.04
184	2165.67	622.45
185	2173.30	628.92
186	2180.87	635.45
187	2188.40	642.03
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

*** 0.576 ***

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	545.38	589.73
6	552.81	583.04
7	560.30	576.42
8	567.85	569.86
9	575.46	563.37
10	583.12	556.94
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	721.55	458.55
28	730.14	453.42
29	738.77	448.37
30	747.45	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	410.76
38	818.36	406.41
39	827.41	402.14
40	836.49	397.96

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41	845.61	393.85
42	854.76	389.82
43	863.95	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	360.56
51	938.64	357.28
52	948.12	354.07
53	957.62	350.96
54	967.15	347.92
55	976.70	344.97
56	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	1054.01	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	296.32
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	1500.90	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	1617.76	340.31
121	1627.36	343.12
122	1636.93	346.02
123	1646.48	349.00
124	1656.00	352.06
125	1665.49	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	1786.05	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	1839.64	430.62
145	1848.43	435.39
146	1857.18	440.24
147	1865.88	445.16
148	1874.54	450.17
149	1883.15	455.24
150	1891.72	460.40
151	1900.25	465.63
152	1908.72	470.93
153	1917.15	476.31
154	1925.54	481.76
155	1933.87	487.29
156	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
162	1990.79	528.02
163	1998.71	534.12
164	2006.58	540.30
165	2014.39	546.54
166	2022.15	552.85
167	2029.85	559.23
168	2037.49	565.68
169	2045.08	572.19
170	2052.60	578.77
171	2060.07	585.42
172	2067.49	592.14
173	2074.84	598.92
174	2082.13	605.76
175	2089.36	612.67
176	2096.53	619.64

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177	2103.63	626.68
178	2110.68	633.77
179	2117.66	640.93
180	2124.57	648.16
181	2131.43	655.44
182	2138.22	662.78
183	2144.77	670.00

Circle Center At X = 1305.1 ; Y = 1426.1 and Radius, 1130.0

*** 0.577 ***

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	542.96	585.45
7	550.86	579.33
8	558.82	573.27
9	566.82	567.27
10	574.87	561.34
11	582.96	555.47
12	591.10	549.66
13	599.29	543.92
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	666.37	500.35
22	674.95	495.21
23	683.56	490.13
24	692.22	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
36	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	386.15
49	919.94	382.94
50	929.43	379.80
51	938.95	376.74
52	948.50	373.75
53	958.06	370.84
54	967.65	368.01
55	977.26	365.25
56	986.90	362.57

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57	996.55	359.96
58	1006.23	357.43
59	1015.92	354.98
60	1025.64	352.60
61	1035.37	350.30
62	1045.12	348.08
63	1054.88	345.94
64	1064.67	343.87
65	1074.47	341.88
66	1084.28	339.97
67	1094.11	338.13
68	1103.96	336.37
69	1113.82	334.69
70	1123.69	333.09
71	1133.57	331.57
72	1143.47	330.12
73	1153.37	328.76
74	1163.29	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	1382.85	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	1502.25	330.57
109	1512.14	332.04
110	1522.02	333.59
111	1531.89	335.22
112	1541.74	336.92
113	1551.58	338.70
114	1561.41	340.56
115	1571.22	342.50
116	1581.01	344.52
117	1590.79	346.61
118	1600.55	348.78
119	1610.30	351.02
120	1620.02	353.35
121	1629.73	355.75
122	1639.42	358.23
123	1649.09	360.78
124	1658.74	363.41

125	1668.36	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	1864.60	440.21
147	1873.61	444.55
148	1882.59	448.95
149	1891.53	453.42
150	1900.44	457.97
151	1909.31	462.58
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
160	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
167	2045.89	545.73
168	2054.06	551.49
169	2062.19	557.32
170	2070.27	563.21
171	2078.30	569.16
172	2086.29	575.18
173	2094.23	581.26
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	625.56
181	2155.96	632.13
182	2163.45	638.76
183	2170.88	645.45
184	2178.26	652.19
185	2185.59	659.00
186	2192.86	665.86
187	2197.18	670.00

Circle Center At X = 1321.3 ; Y = 1582.2 and Radius, 1264.6

*** 0.586 ***

Failure Surface Specified By186 Coordinate Points

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

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1	540.42	617.44
2	547.95	610.86
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	594.25	572.71
9	602.15	566.58
10	610.09	560.50
11	618.09	554.50
12	626.13	548.56
13	634.22	542.68
14	642.36	536.87
15	650.55	531.13
16	658.78	525.45
17	667.06	519.84
18	675.39	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	743.56	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	439.56
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	406.35
42	887.34	402.54
43	896.62	398.80
44	905.92	395.14
45	915.26	391.55
46	924.62	388.04
47	934.01	384.60
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	1048.69	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
65	1107.18	336.09
66	1116.99	334.14
67	1126.82	332.28
68	1136.66	330.50

69	1146.51	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	330.56
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

137	1813.75	402.67
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	426.70
144	1877.76	430.97
145	1886.77	435.31
146	1895.75	439.72
147	1904.68	444.20
148	1913.58	448.76
149	1922.45	453.39
150	1931.27	458.10
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	509.02
161	2025.67	514.50
162	2033.99	520.04
163	2042.27	525.65
164	2050.50	531.33
165	2058.69	537.07
166	2066.83	542.89
167	2074.92	548.76
168	2082.96	554.71
169	2090.95	560.72
170	2098.90	566.79
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	2160.61	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	651.48
184	2204.65	658.42
185	2211.79	665.41
186	2216.39	670.00

Circle Center At X = 1350.4 ; Y = 1537.5 and Radius, 1225.8

*** 0.587 ***

Failure Surface Specified By175 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	480.00	616.70
2	487.13	609.69
3	494.33	602.75
4	501.60	595.88
5	508.93	589.08
6	516.32	582.35
7	523.78	575.68
8	531.30	569.09
9	538.88	562.57
10	546.52	556.12
11	554.22	549.74
12	561.98	543.44
13	569.81	537.20

14	577.68	531.05
15	585.62	524.96
16	593.62	518.96
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
36	764.34	415.35
37	773.36	411.03
38	782.42	406.80
39	791.52	402.65
40	800.66	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	353.78
54	932.20	350.95
55	941.82	348.22
56	951.46	345.58
57	961.13	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	1088.67	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	1387.65	321.48
101	1397.53	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	395.77
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	1736.31	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	1804.96	480.64
146	1813.32	486.13
147	1821.63	491.70
148	1829.88	497.35
149	1838.08	503.07

150	1846.22	508.87
151	1854.31	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
158	1909.34	558.00
159	1916.97	564.47
160	1924.53	571.01
161	1932.03	577.62
162	1939.47	584.31
163	1946.84	591.06
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	661.00	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	525.66
16	737.60	519.56
17	745.58	513.53
18	753.62	507.57
19	761.70	501.69
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	457.36
28	836.83	452.17
29	845.42	447.06
30	854.06	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	413.51
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	988.76	376.29
46	998.05	372.58
47	1007.36	368.95
48	1016.72	365.41
49	1026.10	361.96
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
56	1092.62	340.21
57	1102.24	337.45
58	1111.87	334.79
59	1121.54	332.21
60	1131.22	329.72
61	1140.93	327.32
62	1150.66	325.01
63	1160.41	322.79
64	1170.18	320.66
65	1179.97	318.62
66	1189.78	316.67
67	1199.60	314.80
68	1209.44	313.03
69	1219.30	311.35
70	1229.18	309.77
71	1239.06	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	1398.50	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	297.96
93	1458.47	298.49
94	1468.45	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	1538.10	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	313.58
107	1597.35	315.38
108	1607.17	317.27
109	1616.97	319.25
110	1626.76	321.32
111	1636.52	323.48
112	1646.26	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	1761.31	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
165	2112.87	565.84
166	2120.36	572.47
167	2127.80	579.16
168	2135.17	585.91
169	2142.48	592.74
170	2149.72	599.63
171	2156.90	606.59
172	2164.02	613.62
173	2171.07	620.71

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174	2178.06	627.86
175	2184.98	635.08
176	2191.83	642.36
177	2198.62	649.70
178	2205.34	657.11
179	2211.99	664.58
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	528.33	617.29
2	535.45	610.26
3	542.63	603.30
4	549.87	596.41
5	557.19	589.59
6	564.56	582.84
7	572.01	576.16
8	579.51	569.55
9	587.08	563.02
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
15	633.78	525.36
16	641.77	519.35
17	649.82	513.41
18	657.92	507.55
19	666.08	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
25	716.18	468.76
26	724.70	463.54
27	733.28	458.40
28	741.91	453.35
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	794.67	424.78
35	803.61	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	858.16	395.35
42	867.39	391.50
43	876.66	387.73
44	885.96	384.06
45	895.29	380.47
46	904.66	376.97
47	914.06	373.57
48	923.50	370.25
49	932.96	367.02
50	942.46	363.89
51	951.98	360.85
52	961.54	357.89
53	971.12	355.03
54	980.73	352.27
55	990.36	349.59
56	1000.03	347.01

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57	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	1446.17	328.90
102	1456.01	330.69
103	1465.83	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	1666.40	393.58

125	1675.61	397.48
126	1684.78	401.47
127	1693.91	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
146	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	560.06
157	1945.82	566.56
158	1953.35	573.14
159	1960.82	579.78
160	1968.23	586.50
161	1975.57	593.29
162	1982.85	600.15
163	1990.06	607.08
164	1997.20	614.07
165	2004.28	621.14
166	2011.29	628.27
167	2018.23	635.47
168	2025.10	642.74
169	2031.90	650.07
170	2038.63	657.47
171	2045.29	664.93
172	2049.73	670.00

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	564.22
10	691.39	557.75
11	699.08	551.35
12	706.82	545.02
13	714.62	538.77
14	722.48	532.58
15	730.40	526.47

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16	738.37	520.44
17	746.40	514.47
18	754.48	508.59
19	762.62	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
35	899.60	420.38
36	908.55	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	1000.16	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	356.05
53	1066.31	353.04
54	1075.87	350.13
55	1085.47	347.30
56	1095.08	344.56
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	1351.46	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	305.01
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	308.96
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	1540.91	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	1925.86	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	565.32
163	2096.28	571.88
164	2103.77	578.50
165	2111.21	585.19
166	2118.57	591.95
167	2125.88	598.78
168	2133.12	605.68
169	2140.30	612.64
170	2147.41	619.67
171	2154.46	626.76
172	2161.44	633.92
173	2168.36	641.15
174	2175.20	648.43
175	2181.98	655.78
176	2188.70	663.20
177	2194.74	670.00

Circle Center At X = 1385.6 ; Y = 1383.5 and Radius, 1078.8

*** 0.606 ***

Failure Surface Specified By178 Coordinate Points

Point 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	552.00
12	707.46	545.74
13	715.31	539.54
14	723.22	533.42
15	731.18	527.37
16	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	460.60
28	839.44	455.53
29	848.10	450.55
30	856.82	445.64
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

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	1135.50	337.13
61	1145.24	334.86
62	1155.00	332.67
63	1164.77	330.57
64	1174.57	328.56
65	1184.38	326.64
66	1194.22	324.81
67	1204.06	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	307.53
84	1373.16	307.33
85	1383.16	307.22
86	1393.16	307.21
87	1403.16	307.28
88	1413.16	307.45
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
95	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	1582.16	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
125	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	1848.56	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	575.62
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	2152.25	616.19
171	2159.40	623.18
172	2166.48	630.24
173	2173.50	637.36

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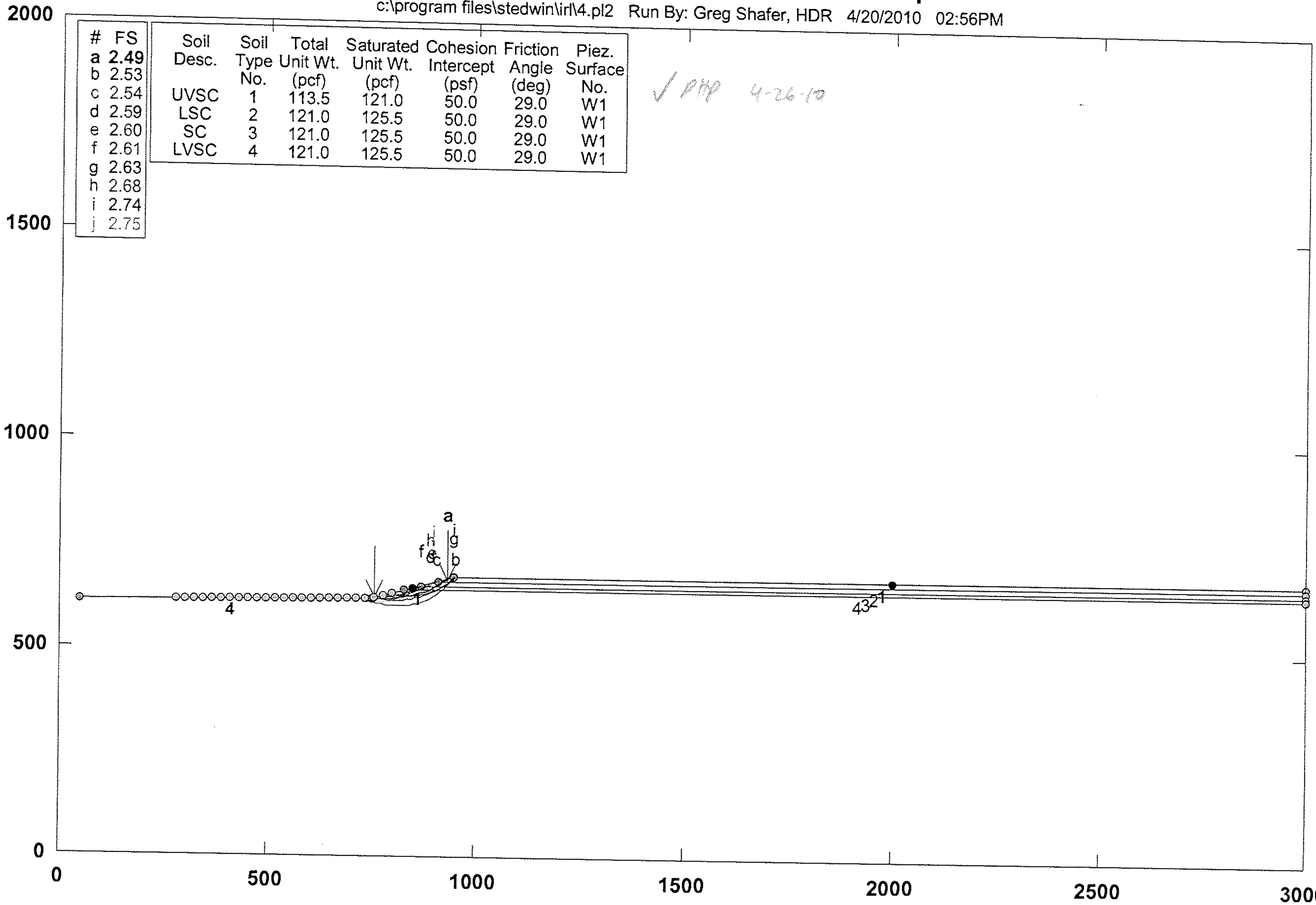
174	2180.45	644.55
175	2187.34	651.80
176	2194.16	659.12
177	2200.91	666.49
178	2204.07	670.00

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



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

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	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	125.5	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.

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 = 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	626.56
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	647.36
17	910.98	652.12
18	919.58	657.22
19	927.97	662.66
20	931.98	665.50

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	5792.7	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	2950.3	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	8.6	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	756.67	621.67
2	766.43	619.52
3	776.29	617.82
4	786.21	616.59
5	796.18	615.82
6	806.18	615.51
7	816.18	615.66
8	826.16	616.28
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	622.32
5	796.60	623.24
6	806.52	624.52
7	816.39	626.14
8	826.19	628.12
9	835.92	630.44
10	845.56	633.11
11	855.10	636.11
12	864.52	639.45
13	873.82	643.12
14	882.99	647.12
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 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	756.67	621.67
2	766.67	621.88

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	835.63	632.88
10	845.20	635.79
11	854.66	639.02
12	864.01	642.58
13	873.23	646.45
14	882.31	650.64
15	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	627.08
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	632.50
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
15	932.94	656.40
16	940.75	662.64
17	948.14	669.39
18	948.32	669.58

Circle Center At X = 842.5 ; 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	632.85
7	859.14	635.71
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	851.90	606.63
14	861.56	609.22
15	871.05	612.36
16	880.35	616.04
17	889.42	620.25
18	898.23	624.98
19	906.76	630.21
20	914.97	635.92
21	922.84	642.09
22	930.34	648.70
23	937.44	655.74
24	944.13	663.17
25	949.50	669.88

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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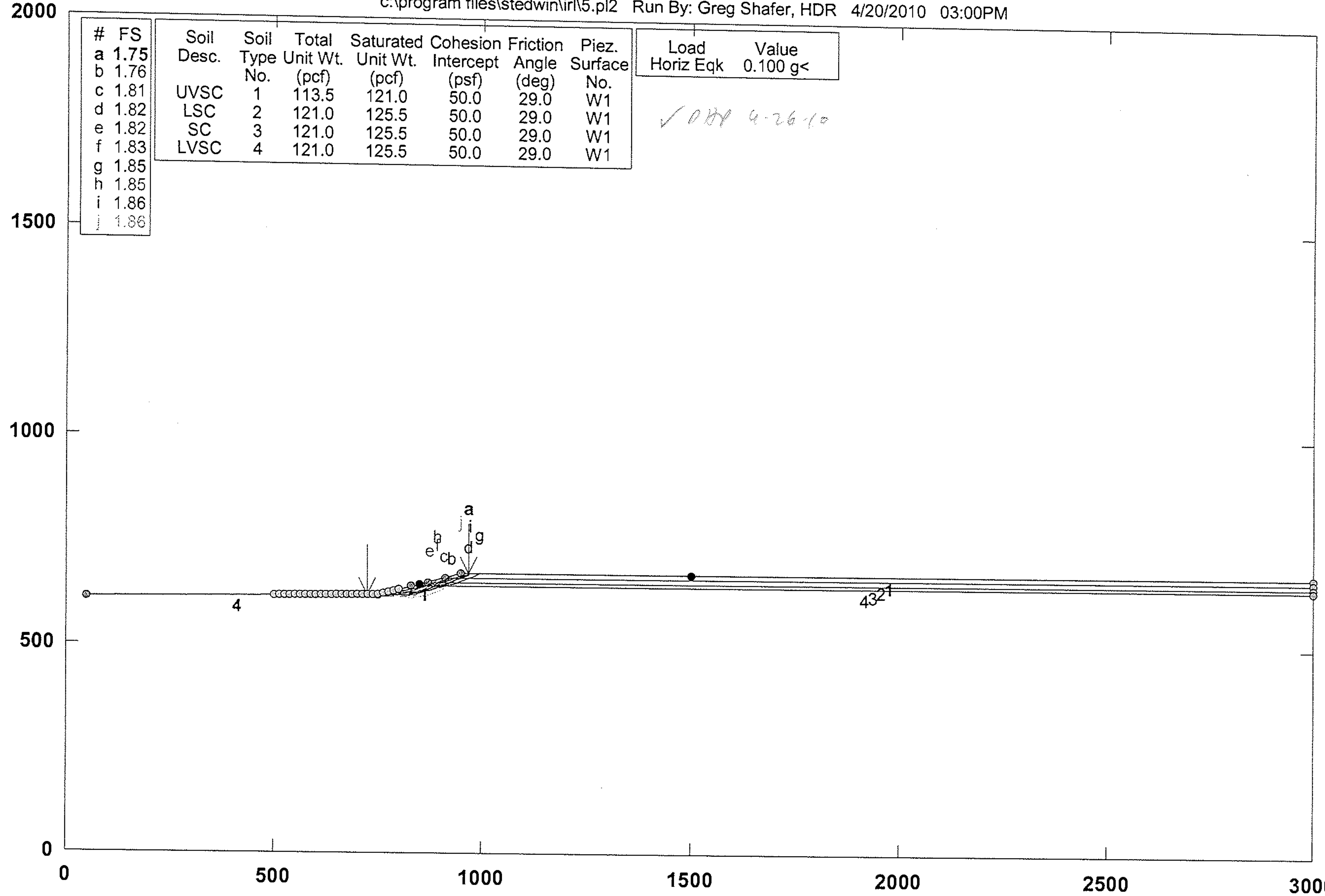
11	812.20	614.79
12	821.95	617.02
13	831.57	619.73
14	841.05	622.92
15	850.36	626.58
16	859.47	630.69
17	868.37	635.26
18	877.03	640.26
19	885.44	645.68
20	893.56	651.51
21	901.38	657.74
22	901.54	657.89

Circle Center At X = 772.2 ; Y = 811.9 and Radius, 201.2

*** 2.749 ***

Intermountain Regional Landfill Cut slope 1

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



#	FS
a	1.75
b	1.76
c	1.81
d	1.82
e	1.82
f	1.83
g	1.85
h	1.85
i	1.86
j	1.86

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

Load	Value
Horiz Eqk	0.100 g<

✓ DBH 4-26-10

PCSTABL7 FSmin=1.75

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: 03:00PM
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
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	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	618.63
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

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	911.64	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	664.25
26	965.67	669.15
27	967.10	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	22255.6	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
25	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	621.87
3	782.39	621.08
4	792.38	620.74
5	802.38	620.85

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	651.53
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	759.73	617.68
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	630.68
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	646.08
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 ***

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	757.39	617.84
4	767.39	617.63
5	777.39	617.96
6	787.35	618.81
7	797.25	620.19
8	807.07	622.10
9	816.77	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	633.51
8	856.47	636.55
9	865.77	640.23
10	874.79	644.54
11	883.50	649.46
12	891.85	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	625.07
8	832.39	626.06
9	842.32	627.22
10	852.23	628.58
11	862.11	630.12
12	871.96	631.85
13	881.77	633.76
14	891.55	635.85
15	901.29	638.13
16	910.98	640.59
17	920.63	643.24
18	930.22	646.06
19	939.76	649.07
20	949.24	652.25
21	958.66	655.61
22	968.01	659.15
23	977.30	662.86
24	986.51	666.74
25	993.84	670.00

Circle Center At X = 775.2 ; Y = 1154.9 and Radius, 532.0

*** 1.850 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	775.00	626.25
2	784.73	623.95
3	794.62	622.44
4	804.59	621.74
5	814.59	621.85
6	824.55	622.77
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	644.57
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	694.94	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	616.95
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	623.13
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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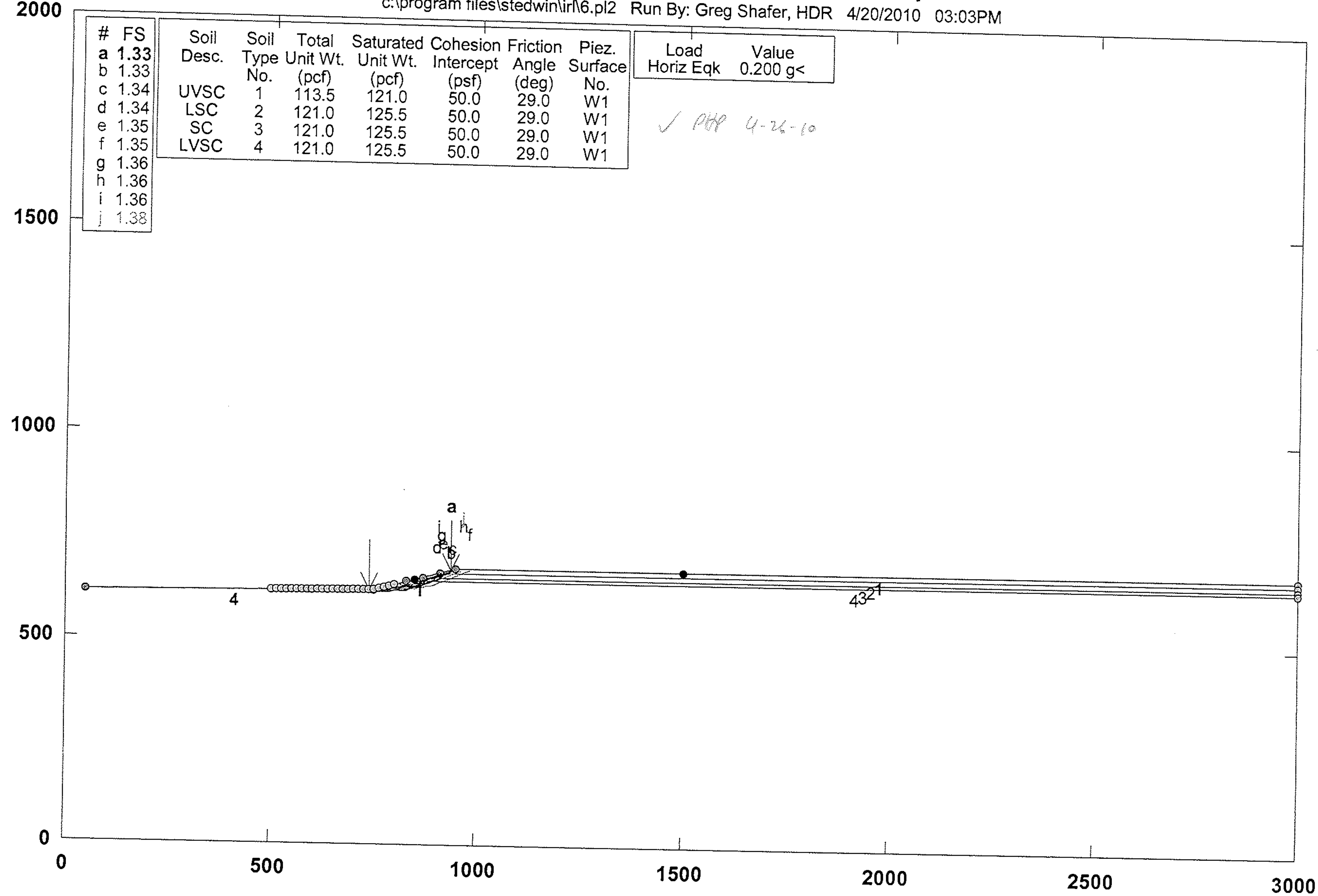
9	841.21	613.51
10	851.11	614.91
11	860.91	616.88
12	870.59	619.41
13	880.10	622.50
14	889.41	626.14
15	898.50	630.32
16	907.33	635.01
17	915.87	640.21
18	924.09	645.90
19	931.98	652.06
20	939.48	658.66
21	946.60	665.69
22	950.48	670.00

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

105/130

** 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: 03:03PM
Run By: Greg Shafer, HDR
Input Data Filename: C:6.in
Output Filename: C:6.OUT
Unit: ENGLISH
Plotted Output Filename: C:6.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	125.5	50.0	29.0	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 = 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	627.30
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	928.69	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
5	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	620.00
2	759.99	620.33
3	769.98	620.89
4	779.95	621.67
5	789.90	622.69
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	633.45
12	858.54	636.02
13	868.15	638.81
14	877.68	641.81

15	887.15	645.03
16	896.54	648.47
17	905.85	652.11
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
16	919.94	654.40
17	928.62	659.37
18	937.08	664.70
19	941.82	667.96

Circle Center At X = 803.2 ; Y = 868.1 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	619.99
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	636.05
13	867.39	639.66
14	876.58	643.61
15	885.61	647.90
16	894.48	652.52
17	903.17	657.47
18	905.41	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
5	789.80	616.61
6	799.79	616.96
7	809.76	617.78
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
6	799.94	618.45
7	809.93	618.90
8	819.91	619.60
9	829.86	620.55
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	634.18
17	908.00	637.11
18	917.48	640.27
19	926.88	643.68
20	936.20	647.32
21	945.41	651.20
22	954.53	655.31
23	963.54	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	860.94	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)

1	800.00	632.50
2	809.99	632.02
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	946.26	658.58
17	955.34	662.77
18	964.28	667.26
19	969.35	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	851.41	629.02
11	860.84	632.35
12	870.07	636.20
13	879.07	640.55
14	887.83	645.38
15	896.30	650.68
16	904.48	656.44
17	908.51	659.63

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	869.45	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	655.39
15	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 ***

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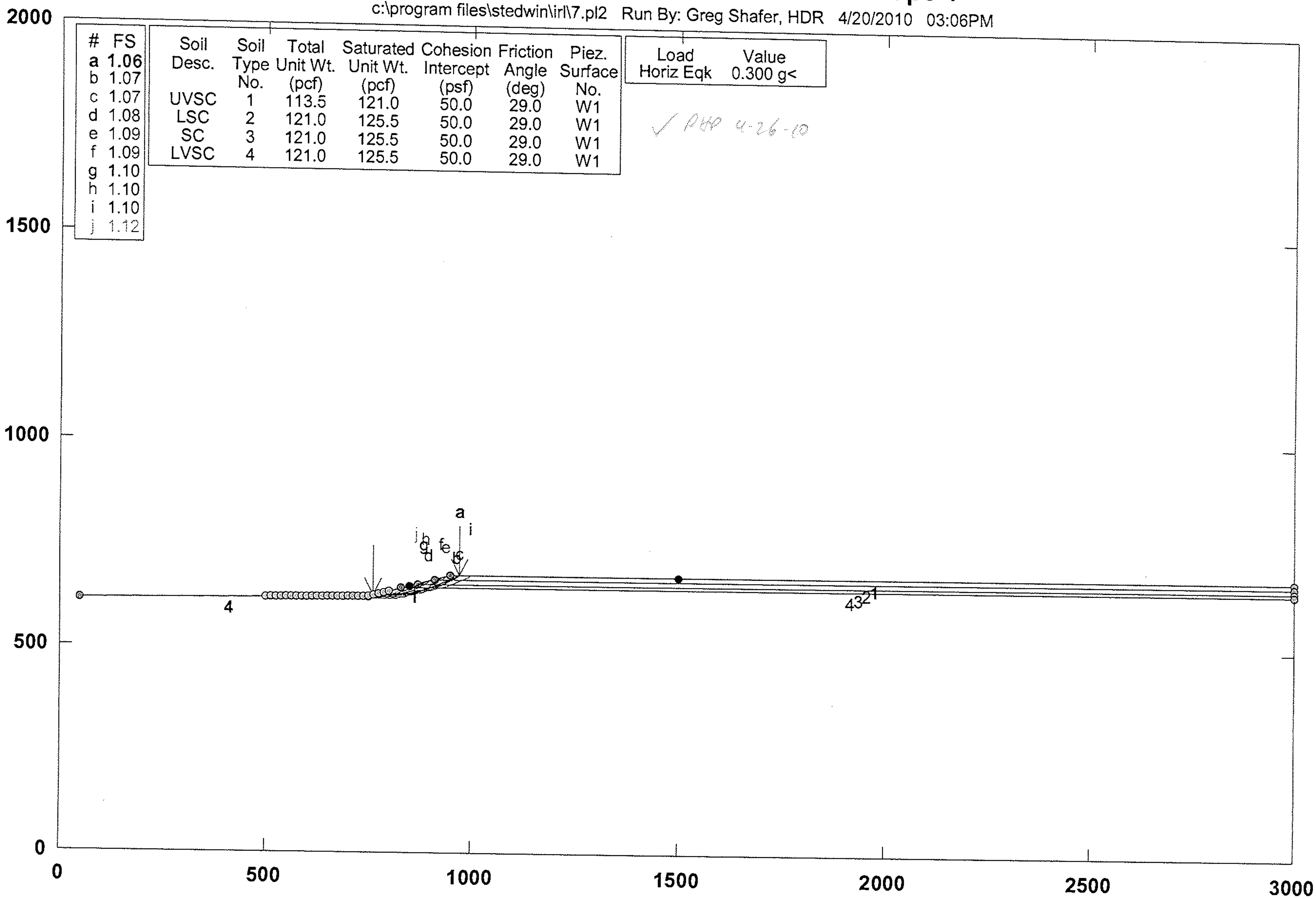
Intermountain Regional Landfill Cut slope 1

c:\program files\stedwin\irl\7.pl2 Run By: Greg Shafer, HDR 4/20/2010 03:06PM



PCSTABL7 FSmin=1.06

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: 03:06PM
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
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	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	622.35
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	629.92
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	919.53	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	5991.0	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	5615.7	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	619.54
2	722.44	618.46
3	732.41	617.61
4	742.39	617.01
5	752.38	616.65
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	619.57
12	822.17	620.90
13	832.04	622.47
14	841.88	624.28

15	851.67	626.33
16	861.40	628.61
17	871.08	631.13
18	880.69	633.89
19	890.24	636.87
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	664.11
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	616.42
5	764.80	615.87
6	774.79	615.59
7	784.79	615.58
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	625.29
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	643.71
22	930.26	647.68
23	939.33	651.89
24	948.28	656.35
25	957.11	661.05
26	965.80	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	750.00	620.00
2	759.95	619.01
3	769.94	618.50
4	779.94	618.47
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	628.16
11	848.41	631.40
12	857.71	635.08
13	866.82	639.19
14	875.73	643.74
15	884.41	648.71
16	892.84	654.08
17	896.42	656.60

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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 = 1165.5 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	615.18
6	799.65	615.22
7	809.63	615.75
8	819.58	616.78
9	829.46	618.31
10	839.26	620.32
11	848.94	622.82
12	858.49	625.80
13	867.87	629.25
14	877.08	633.16
15	886.07	637.53
16	894.84	642.33
17	903.36	647.57
18	911.60	653.23
19	919.56	659.29
20	924.78	663.70

Circle Center At X = 793.9 ; Y = 815.7 and Radius, 200.6
*** 1.090 ***
Failure Surface Specified By 16 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
5	789.92	621.69
6	799.82	623.11
7	809.66	624.92
8	819.41	627.13
9	829.07	629.72
10	838.61	632.70
11	848.03	636.06
12	857.31	639.79

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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	762.50	623.13
2	772.44	621.99
3	782.42	621.43
4	792.42	621.44
5	802.40	622.03
6	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 26 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
6	812.47	622.30
7	822.46	622.81
8	832.43	623.54
9	842.38	624.49
10	852.31	625.67
11	862.22	627.06
12	872.08	628.68
13	881.91	630.52
14	891.70	632.58
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	664.96
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	760.00	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	626.19
8	819.17	628.76

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   9         828.71      631.76
  10         838.11      635.18
  11         847.34      639.01
  12         856.40      643.26
  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    ***
```

**** 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	125.5	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	779.96	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	897.66	638.83
17	907.03	642.31
18	916.30	646.07
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	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	20802.6	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	4256.5	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

```
       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        X-Surf        Y-Surf
    No.          (ft)          (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        X-Surf        Y-Surf
    No.          (ft)          (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        633.82
     7          847.14        635.42
     8          856.97        637.26
     9          866.76        639.34
    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        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        X-Surf        Y-Surf
    No.          (ft)          (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
     6          812.21        618.65
```

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	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	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	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	616.19
13	856.71	617.83
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	923.50	638.25
21	932.60	642.40
22	941.55	646.86
23	950.35	651.61
24	958.99	656.65

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25	967.46	661.96
26	975.74	667.56
27	979.11	670.00

Circle Center At X = 802.1 ; Y = 915.8 and Radius, 302.9
*** 0.903 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	762.50	623.13
2	772.34	621.34
3	782.26	620.10
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 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	794.67	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
16	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	655.62
28	987.33	660.07
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 No.	X-Surf (ft)	Y-Surf (ft)
1	762.50	623.13

123/130

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	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	668.76
21	947.76	669.44

Circle Center At X = 706.4 ; Y = 1241.5 and Radius, 621.0

*** 0.918 ***

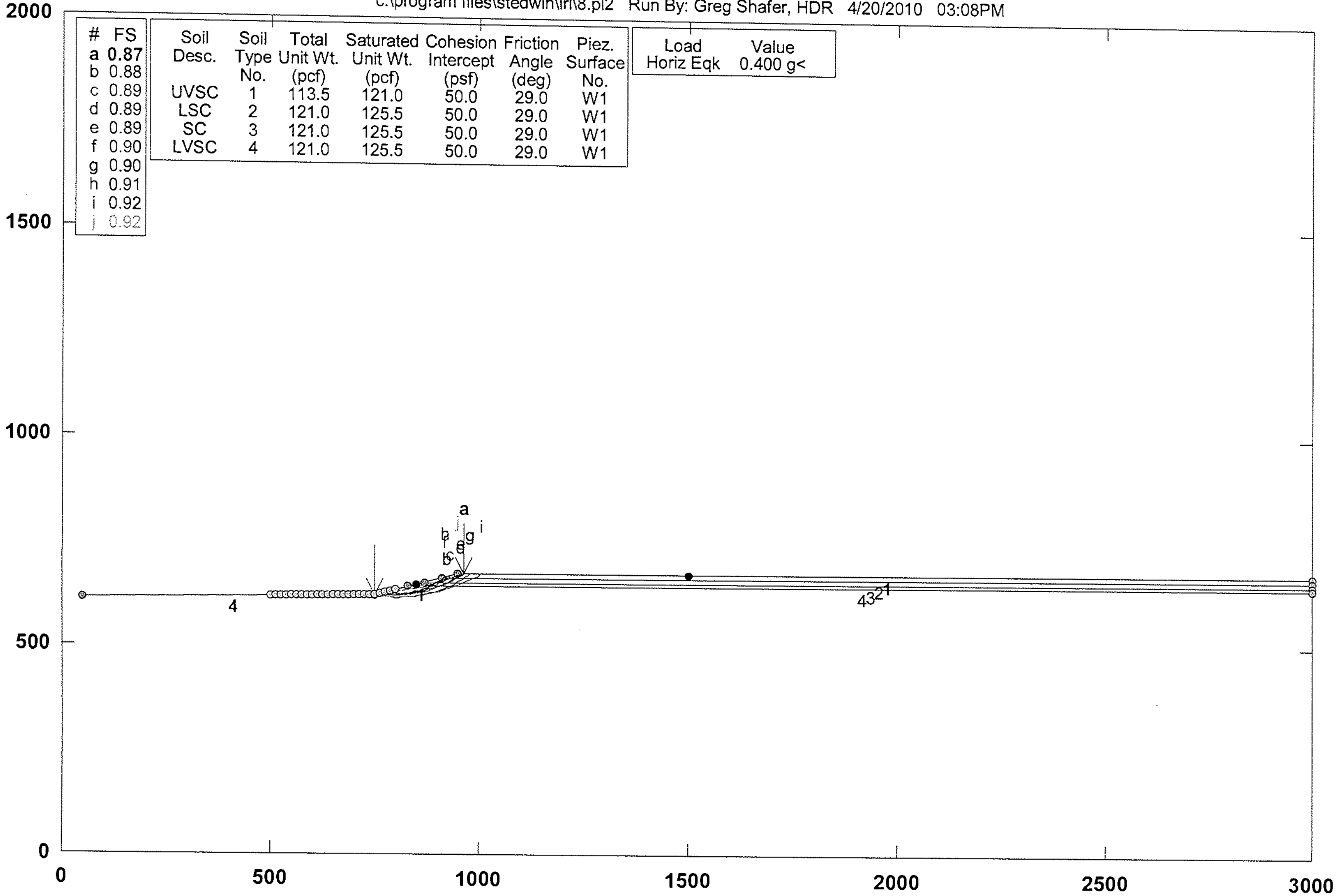
Intermountain Regional Landfill Cut slope 1

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

#	FS
a	**0.87**
b	0.88
c	0.89
d	0.89
e	0.89
f	0.90
g	0.90
h	0.91
i	0.92
j	0.92

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

Load	Value
Horiz Eqk	0.400 g<



PCSTABL7 FSmin=0.87
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: 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	125.5	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	779.96	618.64
5	789.96	618.77
6	799.95	619.17
7	809.93	619.87

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	646.07
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	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	20802.6	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	4256.5	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

127/130

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	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	633.82
7	847.14	635.42
8	856.97	637.26
9	866.76	639.34
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	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
6	812.21	618.65

128/130

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	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

*** 0.902 ***

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	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	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	616.19
13	856.71	617.83
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	923.50	638.25
21	932.60	642.40
22	941.55	646.86
23	950.35	651.61
24	958.99	656.65

129/130

25	967.46	661.96
26	975.74	667.56
27	979.11	670.00

Circle Center At X = 802.1 ; Y = 915.8 and Radius, 302.9
*** 0.903 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	762.50	623.13
2	772.34	621.34
3	782.26	620.10
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 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	794.67	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
16	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	655.62
28	987.33	660.07
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 No.	X-Surf (ft)	Y-Surf (ft)
1	762.50	623.13

130/130

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	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	668.76
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

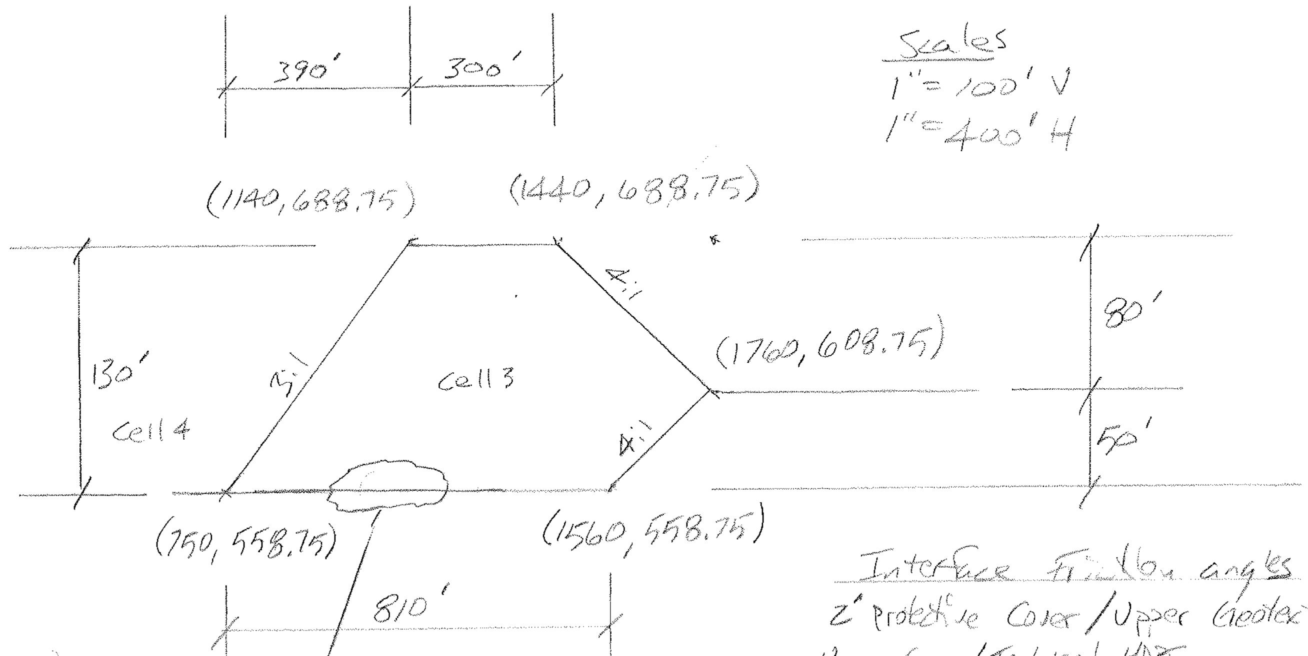
Project: IRL		Computed: GMS	Date: 3/2010 4/2010
Subject: Slope Stability		Checked: PMP	Date: 4-9-10
Task: Sliding Block		Page: 1	of: 22
Job #: 125134 Dept. 143		No:	

HDR | ONE COMPANY *Many Solutions*

Liner stability - Sliding Block

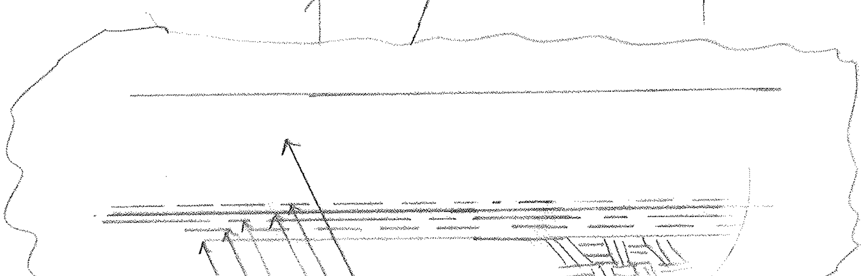
Worst case @ Cell 3 / Cell 4 - 130 ft from top of Waste to cell floor

Scales
1" = 100' V
1" = 400' H



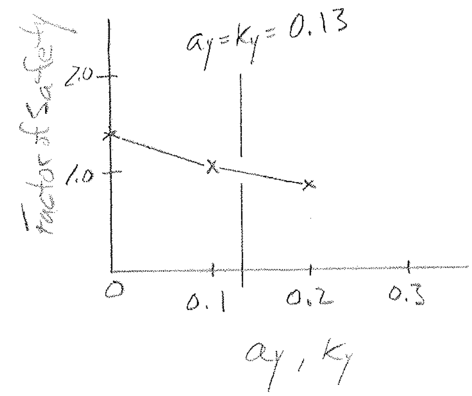
Interface Friction angles	δ
2' protective Cover / Upper Geotextile	25°
Upper Geo / Textured HDPE	25°
Textured HDPE / GCL	* 18°
GCL / Lower Geotextile	* 18°
Lower Geotextile / Subgrade	25°

* Anticipated critical Interface to be verified.



- 2' Protective Cover Soil / LCRS
- Upper Geotextile (Nonwoven on cell floor; Reinforced woven on sideslope)
- Texture 60 MIL HDPE Geomembrane
- Geosynthetic Clay Liner (GCL)
- Lower Geotextile (Nonwoven)
- Subgrade

Results



acceleration, g	F.S.
0 (static)	1.4
0.1g	1.07
0.2g	0.83

X → 1.0

@ F.S. = 1.0

$$\frac{1.07-0.83}{0.1-0.2} = \frac{1.07-1.0}{0.1-x} \Rightarrow \frac{0.24}{-0.1} = \frac{0.07}{0.1-x}$$

$$0.22(0.1-x) = (-0.1)(0.06) \Rightarrow 0.022 - 0.22x = -0.006$$

$$-0.22x = -0.028 \qquad x = 0.13$$

Project: IRL	Computed: GMS	Date: 3/2010 4/2010
Subject: Slope stability	Checked:	Date:
Task: Sliding Block	Page: 3	of: 22
Job #: 125184 Dept. 143	No:	

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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

4/22

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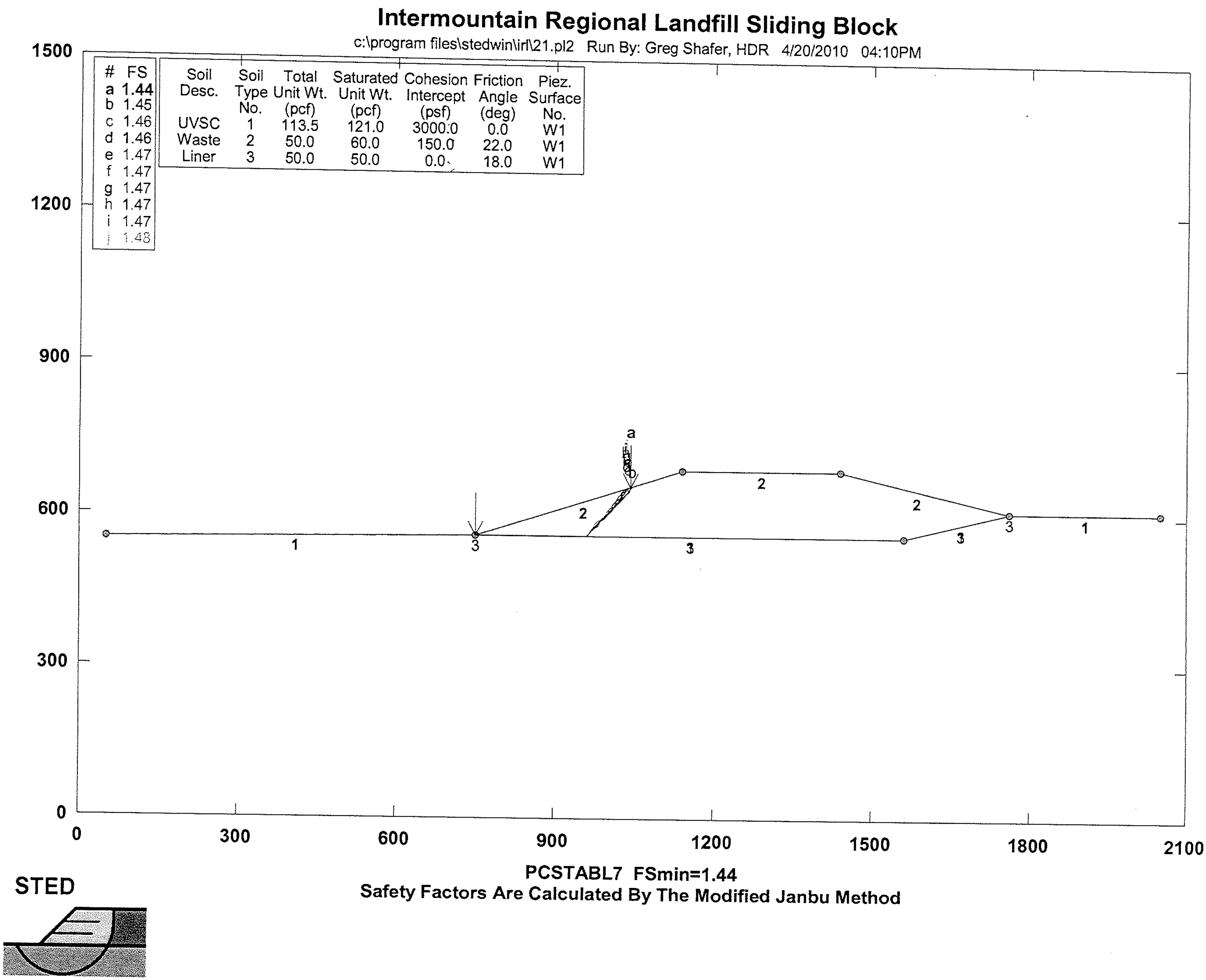

Intermountain Regional Landfill Sliding Block
c:\program files\stedwin\irl\21.pl2 Run By: Greg Shafer, HDR 4/20/2010 04:10PM
FS
a 1.44
b 1.45
c 1.46
d 1.46
e 1.47
f 1.47
g 1.47
h 1.47
i 1.47
j 1.48
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | 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
1500
1200
900
600
300
0
0
300
600
900
1200
1500
1800
2100
PCSTABL7 FSmin=1.44
Safety Factors Are Calculated By The Modified Janbu Method
STED

5/22

**** 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

10/22

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	***

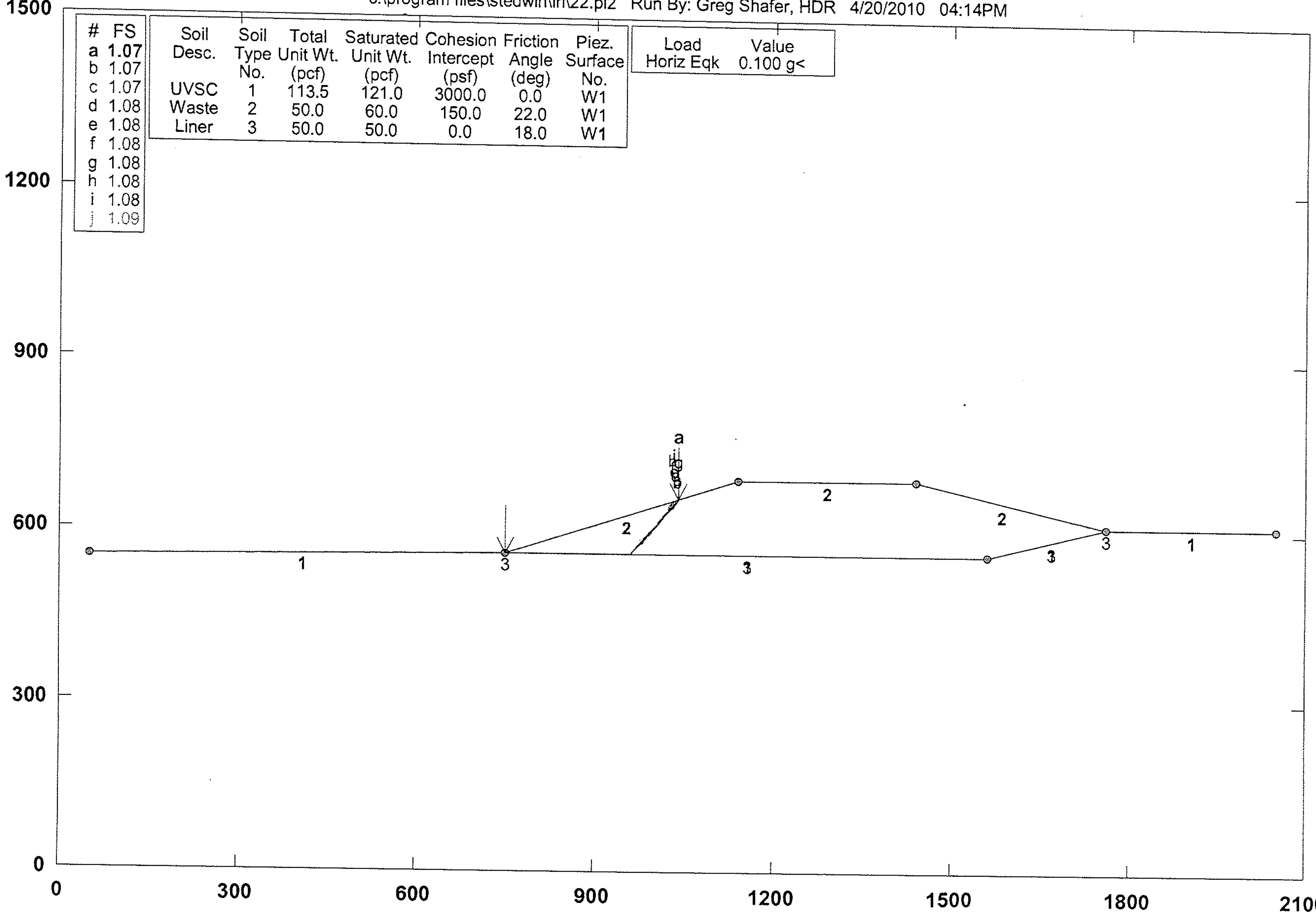
Intermountain Regional Landfill Sliding Block

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	34.8	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	***

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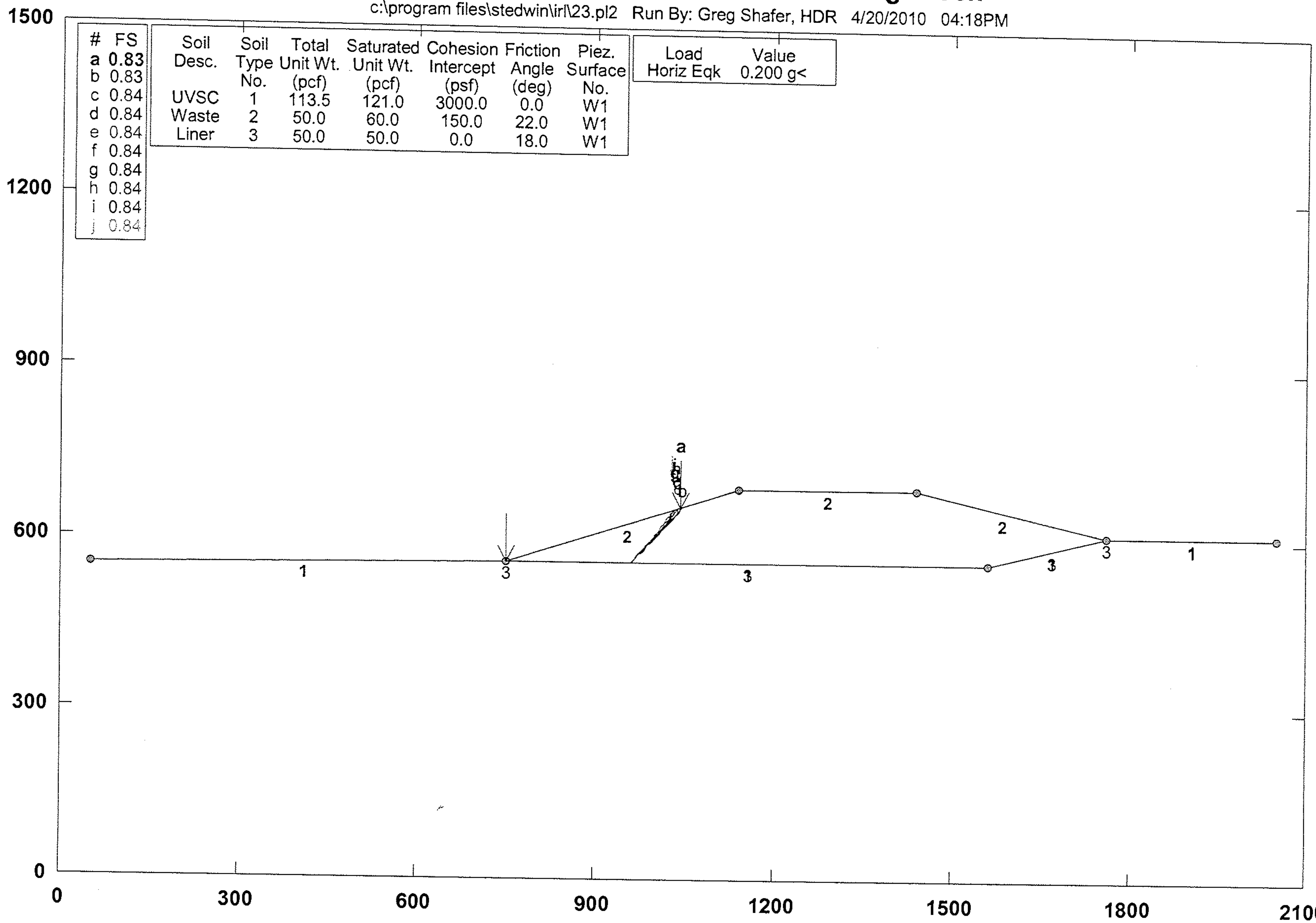
Intermountain Regional Landfill Sliding Block

c:\program files\stedwin\irl\23.pl2 Run By: Greg Shafer, HDR 4/20/2010 04:18PM



PCSTABL7 FSmin=0.83
Safety Factors Are Calculated By The Modified Janbu 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: 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

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	636.15
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	966.59	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	***

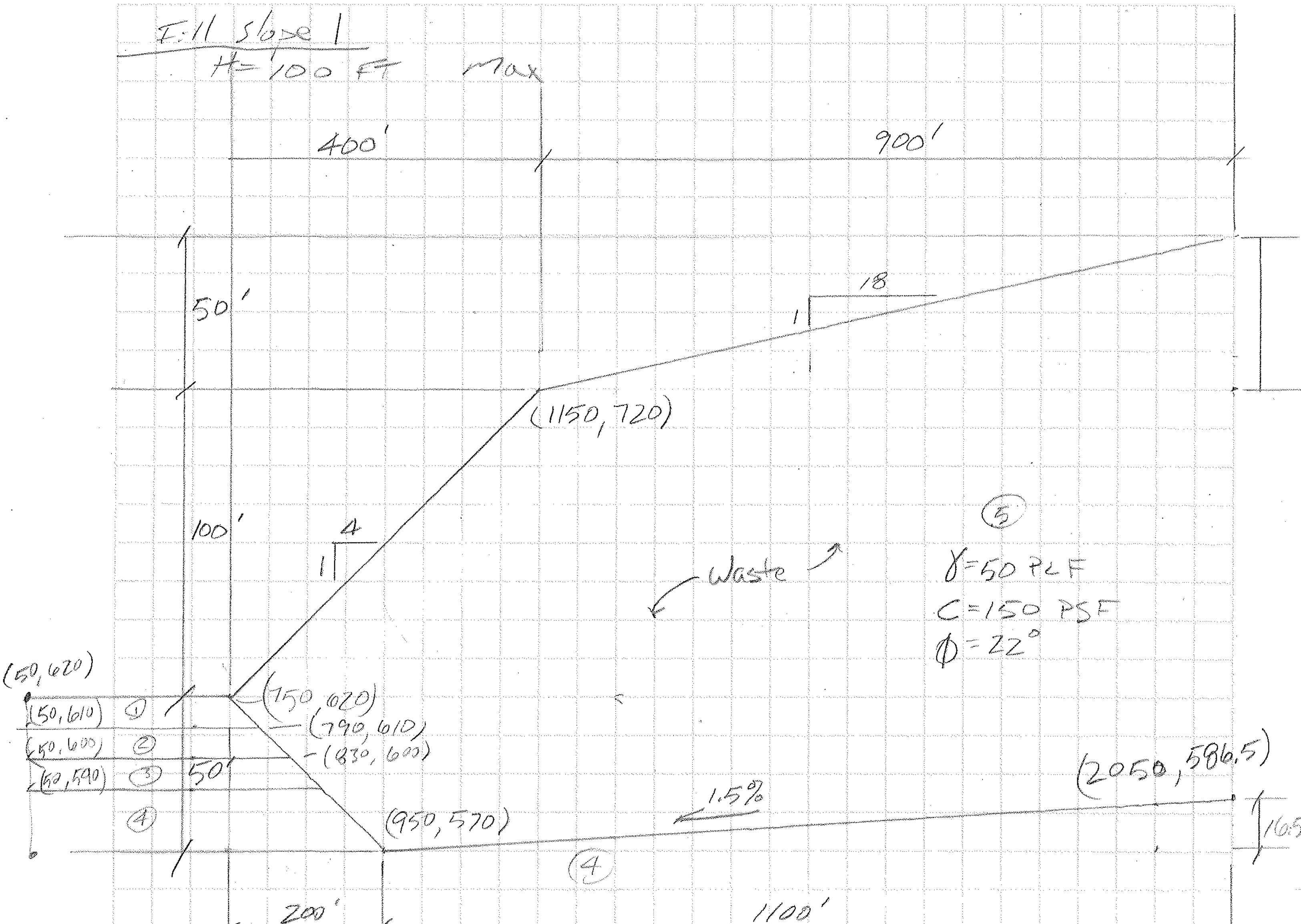
ATTACHMENT 2C-2: SLOPE STABILITY RUNS & RESULTS – FILL SLOPE

HDR | ONE COMPANY *Many Solutions*®

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:	

Fill Slope 1

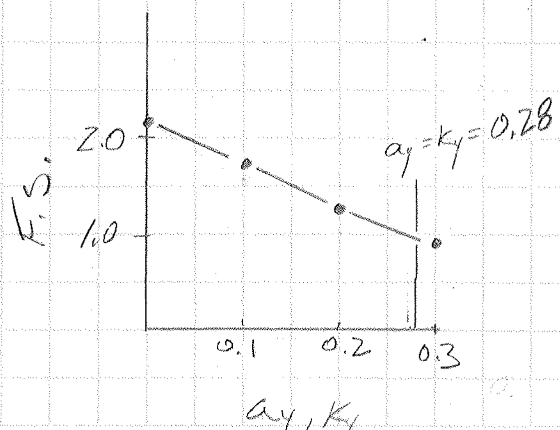
H = 100 FT Max



Horizontal Accel. a	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

$\rightarrow \frac{1.33-0.94}{0.2-0.3} = \frac{1.33-1.0}{0.2-x} \rightarrow \frac{0.39}{-0.1} = \frac{0.33}{0.2-x}$

$\rightarrow \frac{-0.033}{0.39} = 0.2 - x$

$\boxed{x = 0.28}$

Project: IRL		Computed: GMS	Date: ~~4/2010~~ 3/2010
Subject: Slope Stability		Checked:	Date:
HDR ONE COMPANY *Many Solutions®*	Task: Waste mass	Page: 2	of: 46
Job #: 125184 Dept. 143		No:	

Maximum Fill Slope Results / Displacement

$a_{max} = 0.28$ (Reference E)

$a_y = 0.28$ (Previous page)

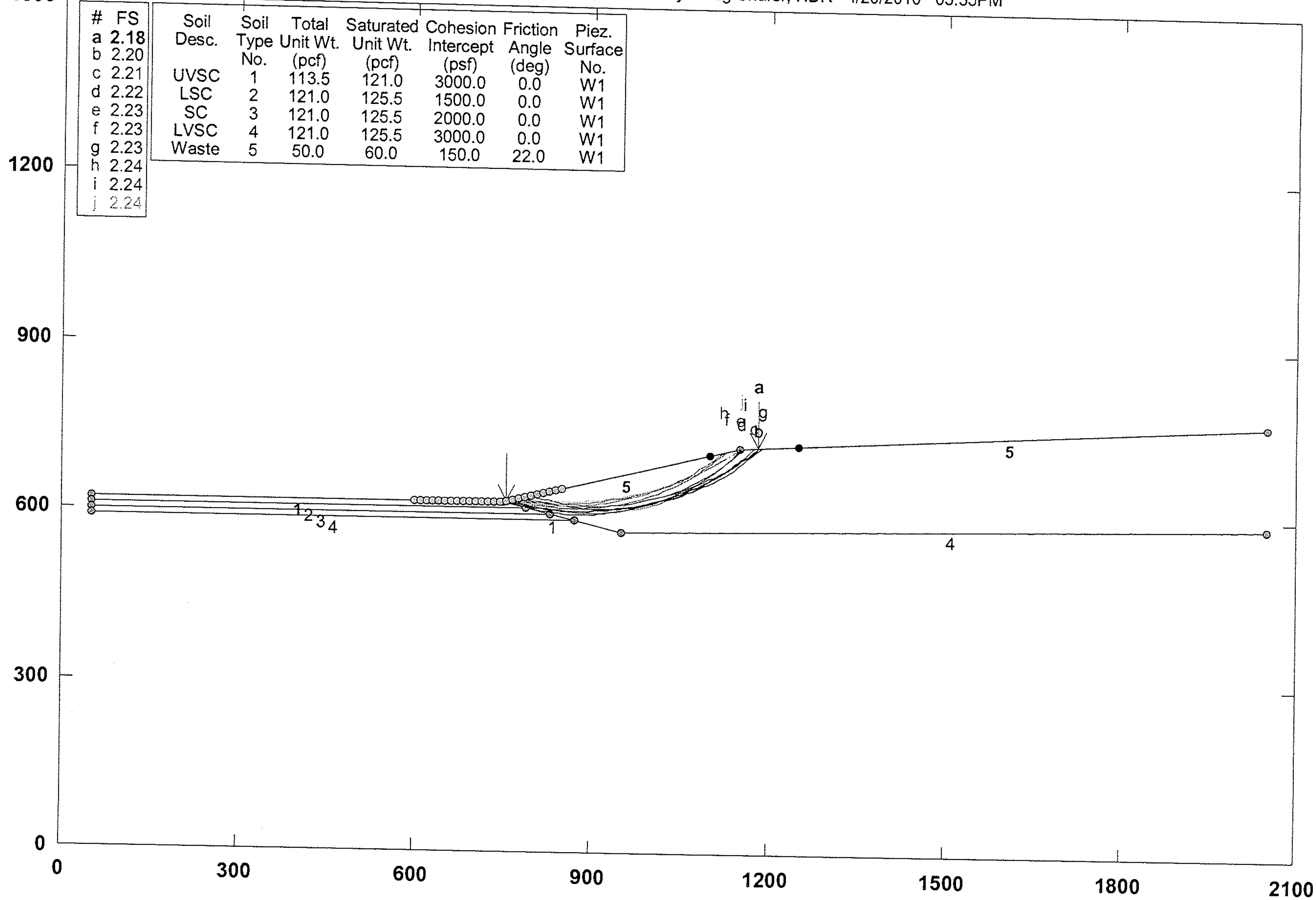
$\frac{a_y}{a_{max}} = \frac{0.28}{0.28} = 1.0$ @ $M = 7.0$

See Attachment 2B (Reference A)

$u_{max} = 0.05$ cm $<$ 30 cm (allowable) OK

Intermountain 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 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 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 No.	X-Surf (ft)	Y-Surf (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	686.78
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

*** 2.184 ***

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

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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

Circle Center At X = 885.9 ; Y = 1073.9 and Radius, 460.2
*** 2.200 ***
Failure Surface Specified By 46 Coordinate Points

Point 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

Circle Center At X = 893.9 ; Y = 993.7 and Radius, 390.8
*** 2.214 ***
Failure Surface Specified By 45 Coordinate Points

Point 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

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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

Circle Center At X = 842.5 ; Y = 1139.0 and Radius, 520.3

*** 2.227 ***

Failure Surface Specified By 40 Coordinate Points

Point 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

Circle Center At X = 867.7 ; Y = 986.0 and Radius, 375.6

*** 2.233 ***

Failure Surface Specified By 45 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	787.50	629.38
2	797.06	626.45
3	806.69	623.75

4	816.39	621.30
5	826.14	619.09
6	835.95	617.13
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	1056.99	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 No.	X-Surf (ft)	Y-Surf (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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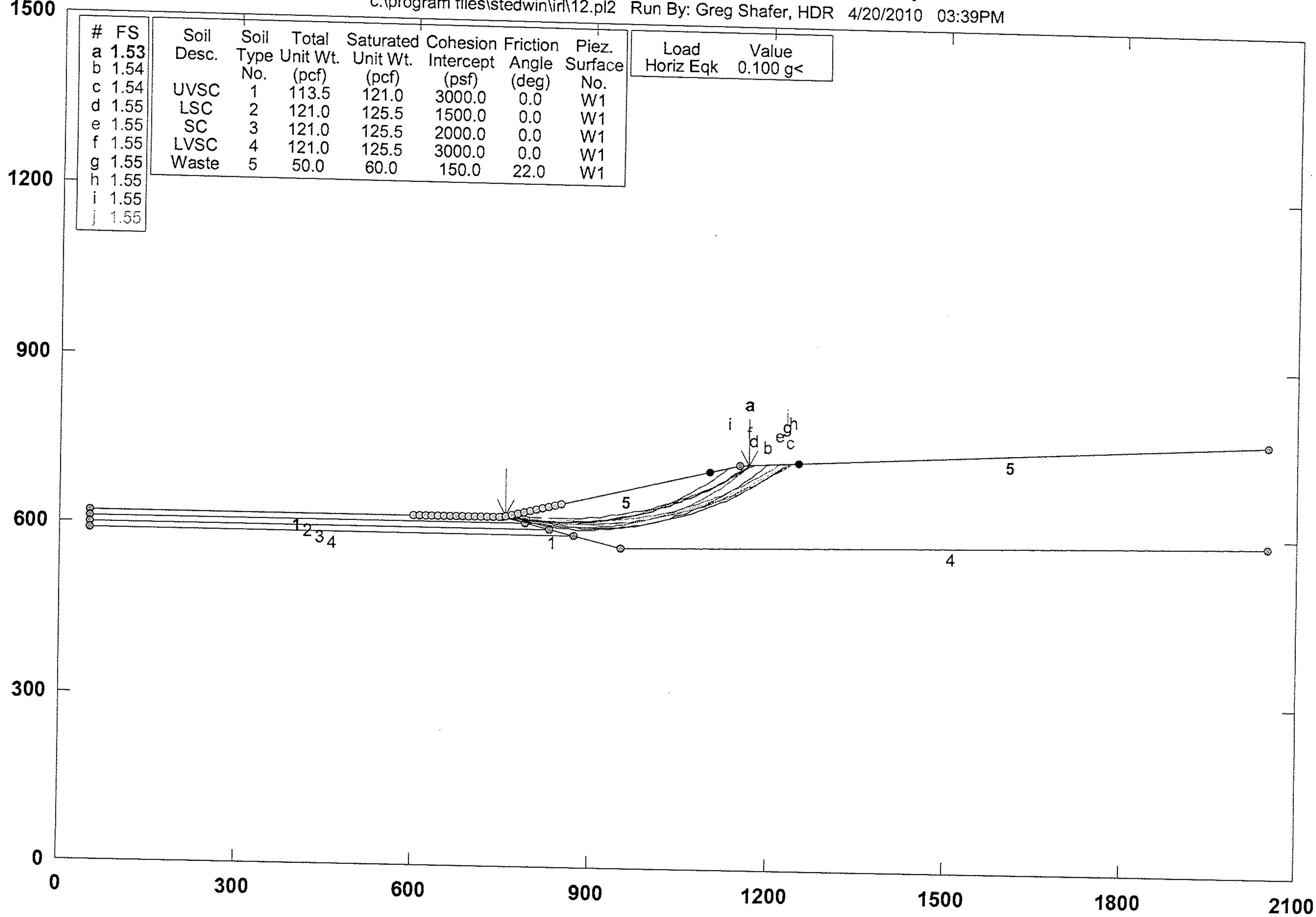
No.	(ft)	(ft)
1	777.08	626.77
2	787.00	625.49
3	796.94	624.40
4	806.90	623.50
5	816.88	622.80
6	826.86	622.29
7	836.86	621.97
8	846.86	621.84
9	856.86	621.90
10	866.85	622.16
11	876.84	622.61
12	886.82	623.26
13	896.79	624.09
14	906.74	625.12
15	916.66	626.34
16	926.56	627.75
17	936.43	629.35
18	946.27	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 ***

Intermountain Regional Landfill Fill Slope 1

c:\program files\stedwin\irl\12.pl2 Run By: Greg Shafer, HDR 4/20/2010 03:39PM



PCSTABL7 FSmin=1.53
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: 03:39PM
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	657.59
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	1086.99	646.34
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	620.30
6	816.46	619.76
7	826.45	619.39
8	836.45	619.20
9	846.45	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	1015.22	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

33	1076.53	653.54
34	1085.23	658.46
35	1093.81	663.60
36	1102.26	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
8	835.84	613.73
9	845.81	612.90
10	855.79	612.25
11	865.78	611.76
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	709.16
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

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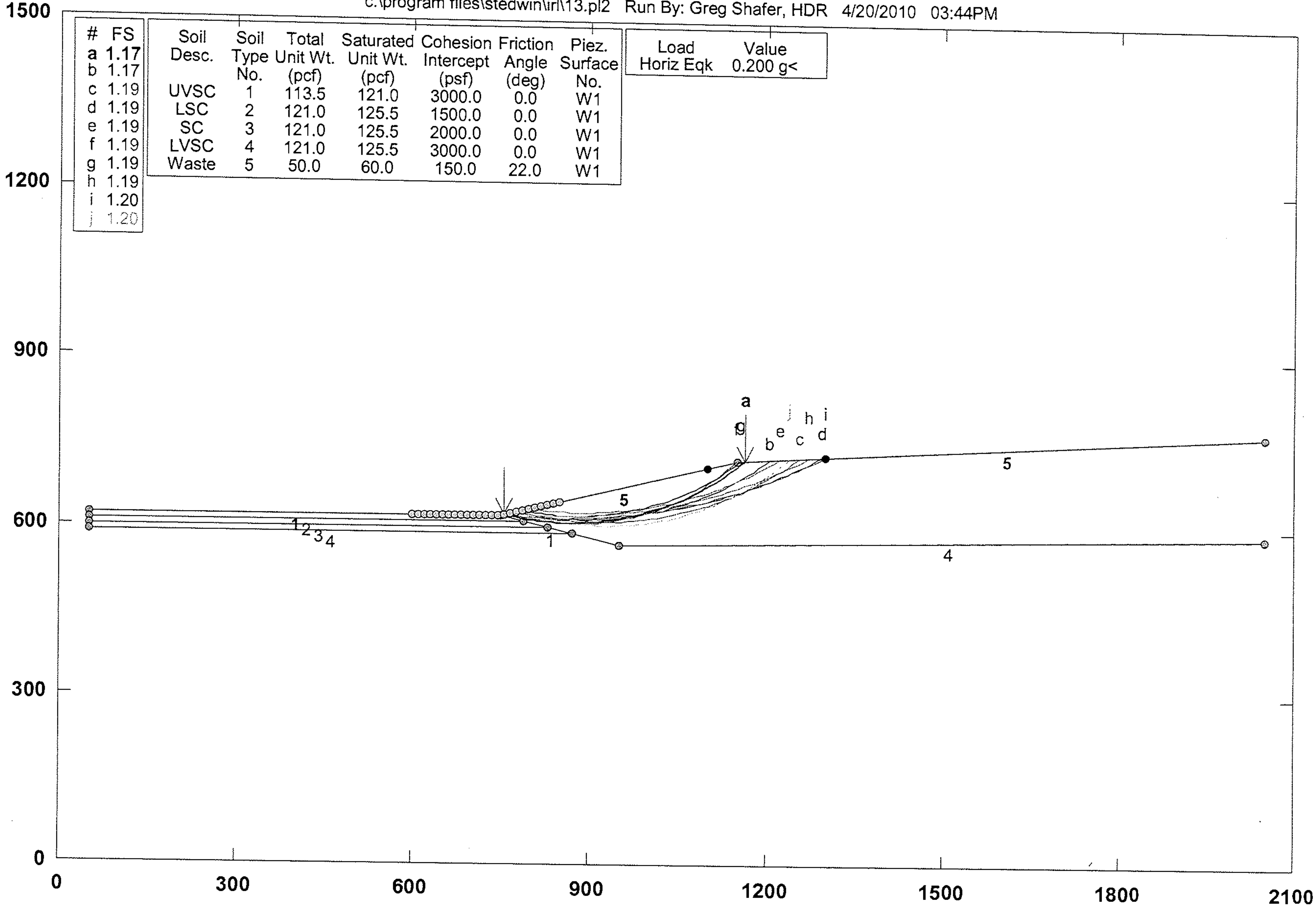
27	1034.84	633.42
28	1044.51	635.97
29	1054.13	638.69
30	1063.71	641.58
31	1073.23	644.62
32	1082.70	647.83
33	1092.12	651.21
34	1101.47	654.74
35	1110.76	658.44
36	1119.99	662.29
37	1129.15	666.30
38	1138.24	670.47
39	1147.26	674.80
40	1156.20	679.28
41	1165.06	683.91
42	1173.84	688.69
43	1182.54	693.63
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



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

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
36	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

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
*** 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	618.46
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
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

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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
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

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 ***

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

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
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

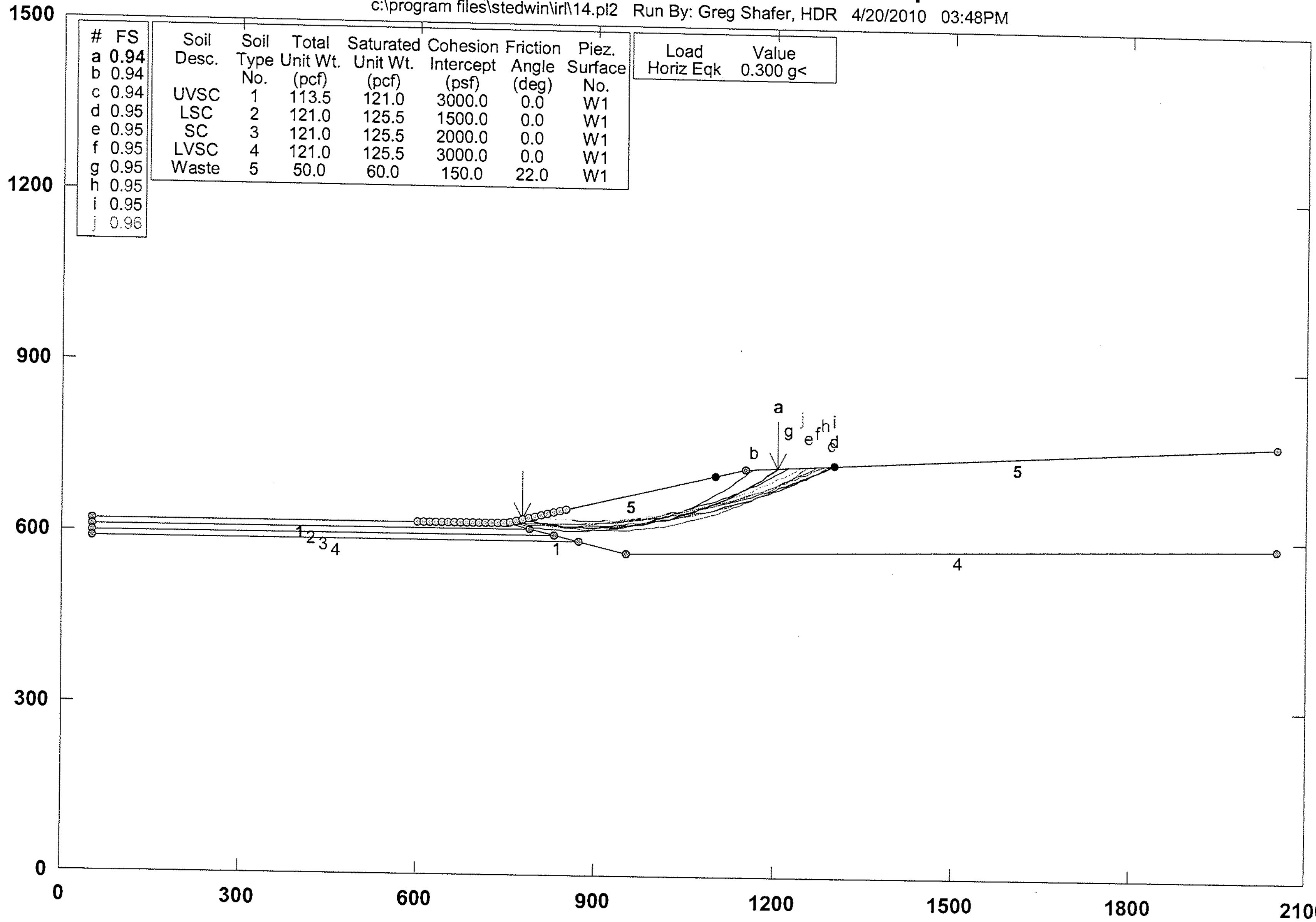
Point No.	X-Surf (ft)	Y-Surf (ft)
1	777.08	626.77
2	786.61	623.73
3	796.20	620.90
4	805.85	618.28
5	815.55	615.86
6	825.31	613.65
7	835.10	611.64
8	844.94	609.85
9	854.82	608.27
10	864.72	606.90
11	874.66	605.74

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



PCSTABL7 FSmin=0.94

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: 03:48PM
Run By: Greg Shafer, HDR
Input Data Filename: C:14.in
Output Filename: C:14.OUT
Unit: ENGLISH
Plotted Output Filename: C:14.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
Of0.300 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 = 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 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
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

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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
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
*** 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

Circle Center At X = 853.5 ; Y = 1490.5 and Radius, 870.7

*** 0.947 ***

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	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

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

*** 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	1073.68	650.49
34	1083.37	652.95
35	1093.04	655.51

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: 4-26-10
	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. Verify that positive drainage towards the sumps is maintained after placement of the waste.
   b. Verify maximum strains along the leachate do not exceed the maximum allowed.

3.2 References:

A. Earthtec Testing & Engineering, P.C. (2006) Geotechnical Study Intermountain Regional Landfill
B. Das, B.; (1990) Principles of Foundation Engineering, 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 (prior to filling with waste), P2
e0 = initial void ratio after excavation
Pc = Preconsolidation pressure, Ref A and attached = 2.4 KSF
Hc = 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.

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

HDR | ONE COMPANY *Many Solutions*®

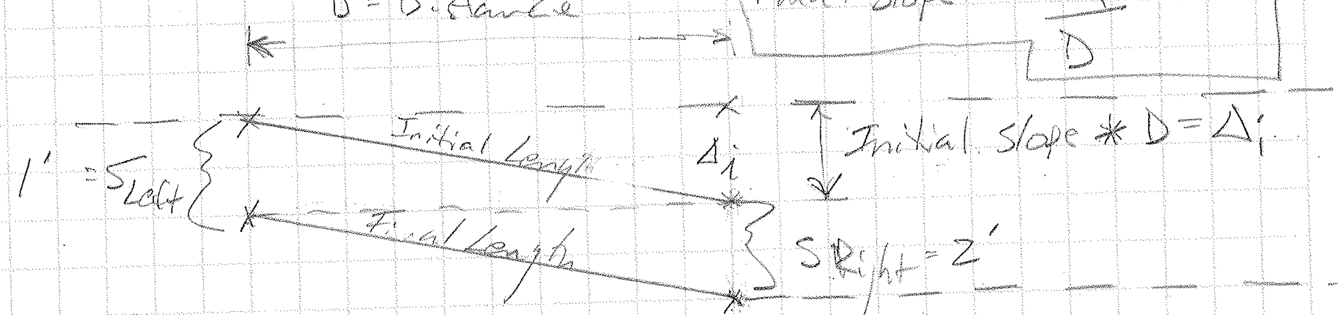
Project: IRL		Computed: GMS	Date: 3/2010
Subject: Settlement		Checked: PHP	Date: 4-26-10
Task: Verify LCRS slope		Page: 1	of: 8
Job #: 125184 Dept. 143		No:	

Calculations Approach

Initial slope $\frac{\Delta_i}{D}$

$\Delta_f = \Delta_i + S_R - S_L$

Final Slope = $\frac{\Delta_f}{D}$



$$\text{Initial length} = \sqrt{D^2 + [(\text{Initial slope}) * D]^2}$$

Final length =

Δ_i = Initial Diff = $D * (\text{Initial slope}) = \Delta_i$

$\Delta_f = \Delta_i + (S_R - S_L)$

Point #	Depth to Center	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 = (Depth to center) * (Moist unit wt. of soil)

$P_2 = P_1$ − [(Thickness of Ex.)(Moist unit wt. of soil)]

$P_3 = P_2$ + [(Thickness of Waste Fill)(Moist unit wt. of Waste)]

Consolidation settlement

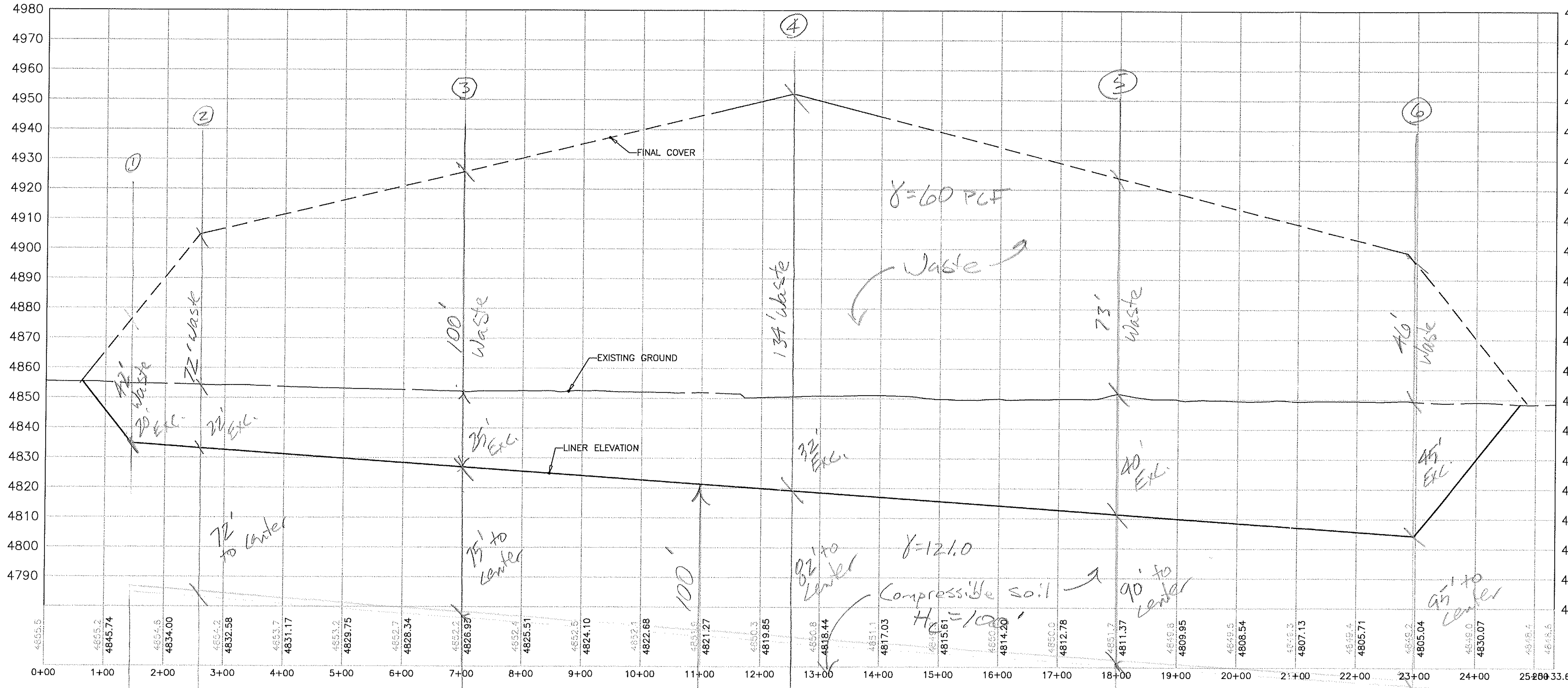
$$S_c = \cancel{\frac{C_s H_c}{1+e_0} \log \frac{P_c}{P_0}} \rightarrow 0 + \frac{C_c H_c}{1+e_0} \log \frac{P_0 + \Delta P}{P_c} \quad Pas$$

$P_0 > P_c$

$P_c = 2.4$ 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)



CROSS SECTION EAST–WEST
ALL CELLS

120' 440' 550' 550' 500'

$\Delta = 120(0.015) = 1.8'$

$22'' - 19'' = 3'' = 0.25'$

$1.8 + 0.25 = 2.05'$

$\Delta_t \ \frac{2.05'}{120'} = 1.7\%$ OK

$\Delta = (440)(0.015) = 6.6'$
$24'' - 22'' = 2'' = 0.17'$
$6.6 + 0.17' = 6.8'$
$\Delta_t = \frac{6.8}{440} = 1.5\%$ OK

$\Delta = (550)(0.015) = 8.25'$
$26'' - 24'' = 2'' = 0.17'$
$\Delta_t = \frac{8.42}{550} = 1.5\%$ OK

$\Delta = 550(0.015) = 8.25'$
$22 - 26 = -4'' = -0.33'$
$8.25 - 0.33 = 7.92$
$\Delta_t = \frac{7.92}{550} = 1.44\%$ OK

$500(0.015) = 7.5'$
$19'' - 22'' = -3'' = -0.25'$
$\Delta = 7.5 - 0.25 = 7.25$
$\Delta_t = \frac{7.25}{500'} = 1.45\%$ OK

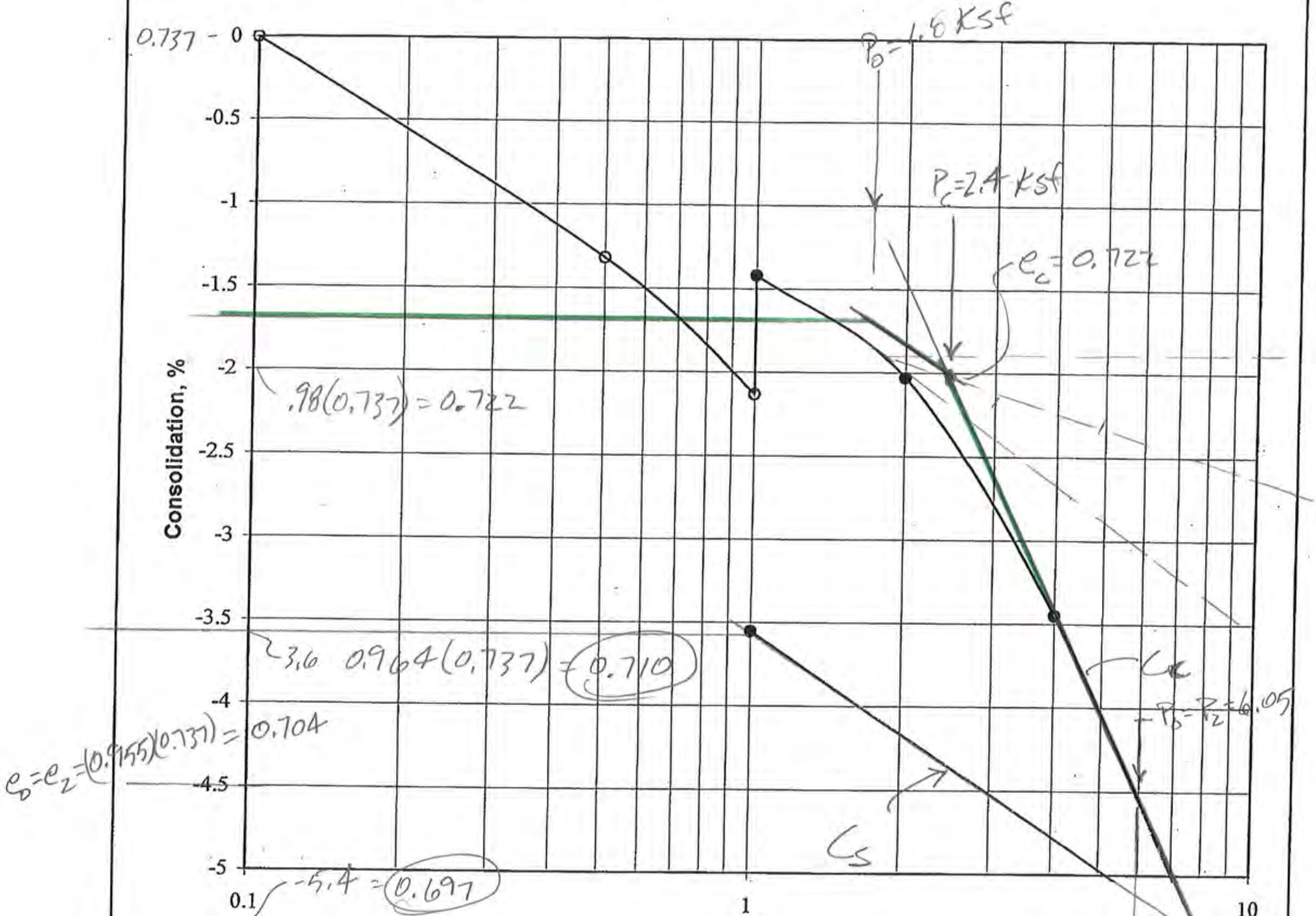
19" 22" 24" 26" 22" 19"

si 1" = 20"

1" = 40' V
1" = 200' H
Sheet 7 of 12

C:\PWworking\PH\Xd0164095\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

$$P_0 = \frac{15.5(1.21)(97)}{1000 \text{ psf}} \left| \frac{1 \text{ tsf}}{} \right. = 1.8 \text{ tsf}$$

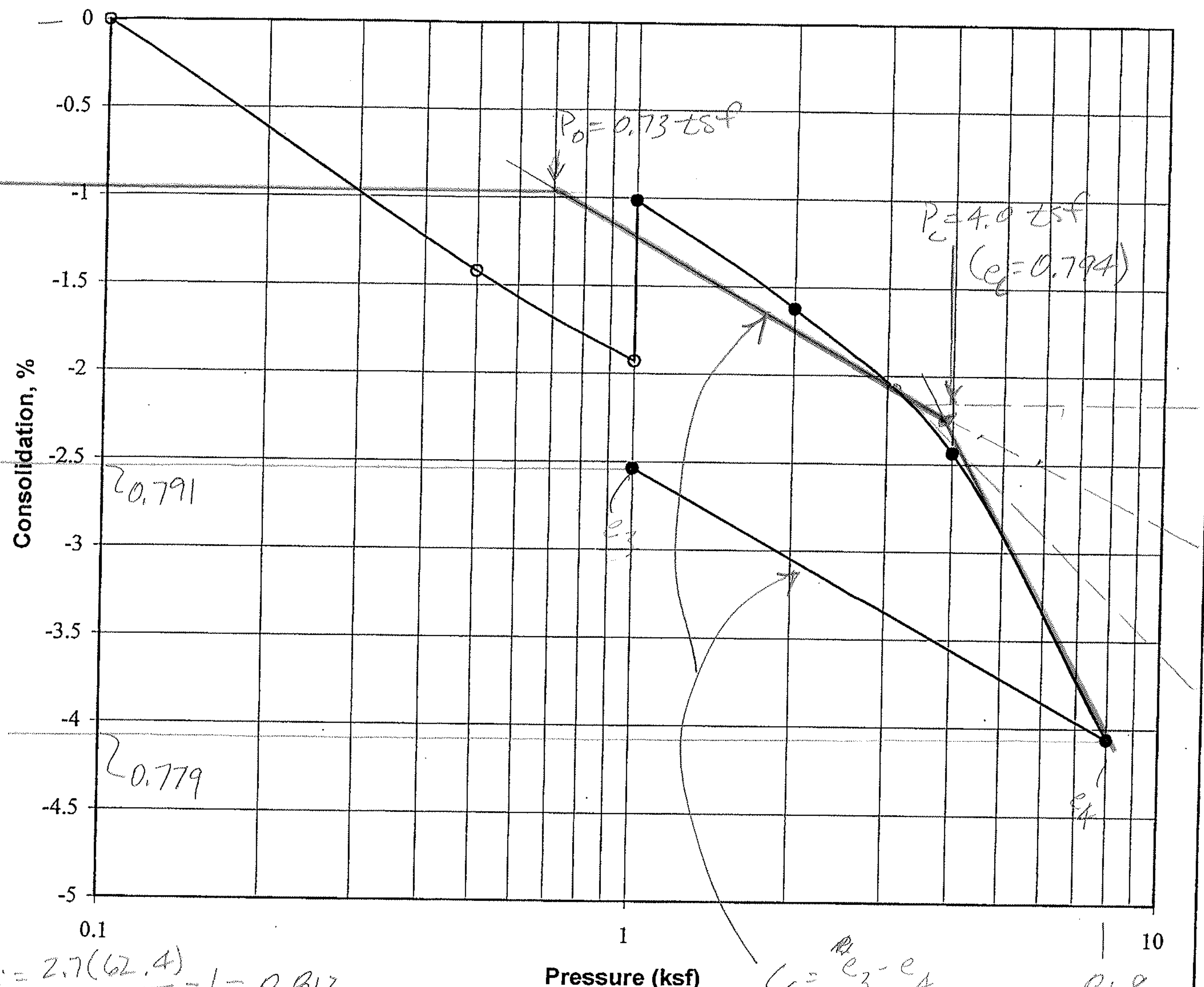
$$C_c = \frac{0.722 - 0.697}{\log \frac{8}{2.4}} = 0.048$$

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

5/8

CONSOLIDATION - SWELL TEST

0.812



-2.6 (0.974)

-4.1 (0.959)

$e_i = \frac{2.7(62.4)}{93} - 1 = 0.812$

$C_s = \frac{e_3 - e_4}{\log \frac{P_4}{P_3}} = \frac{0.791 - 0.779}{\log\left(\frac{8}{1}\right)} = 0.013$

8 ksf

$C_c = \frac{(0.794 - 0.779)}{\log\left(\frac{8}{4}\right)} = 0.05$

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

$P_0 = \frac{(6.5)(1.20)(93.0)}{1000 \text{ psf}} \Big| \frac{1 \text{ tsf}}{}$

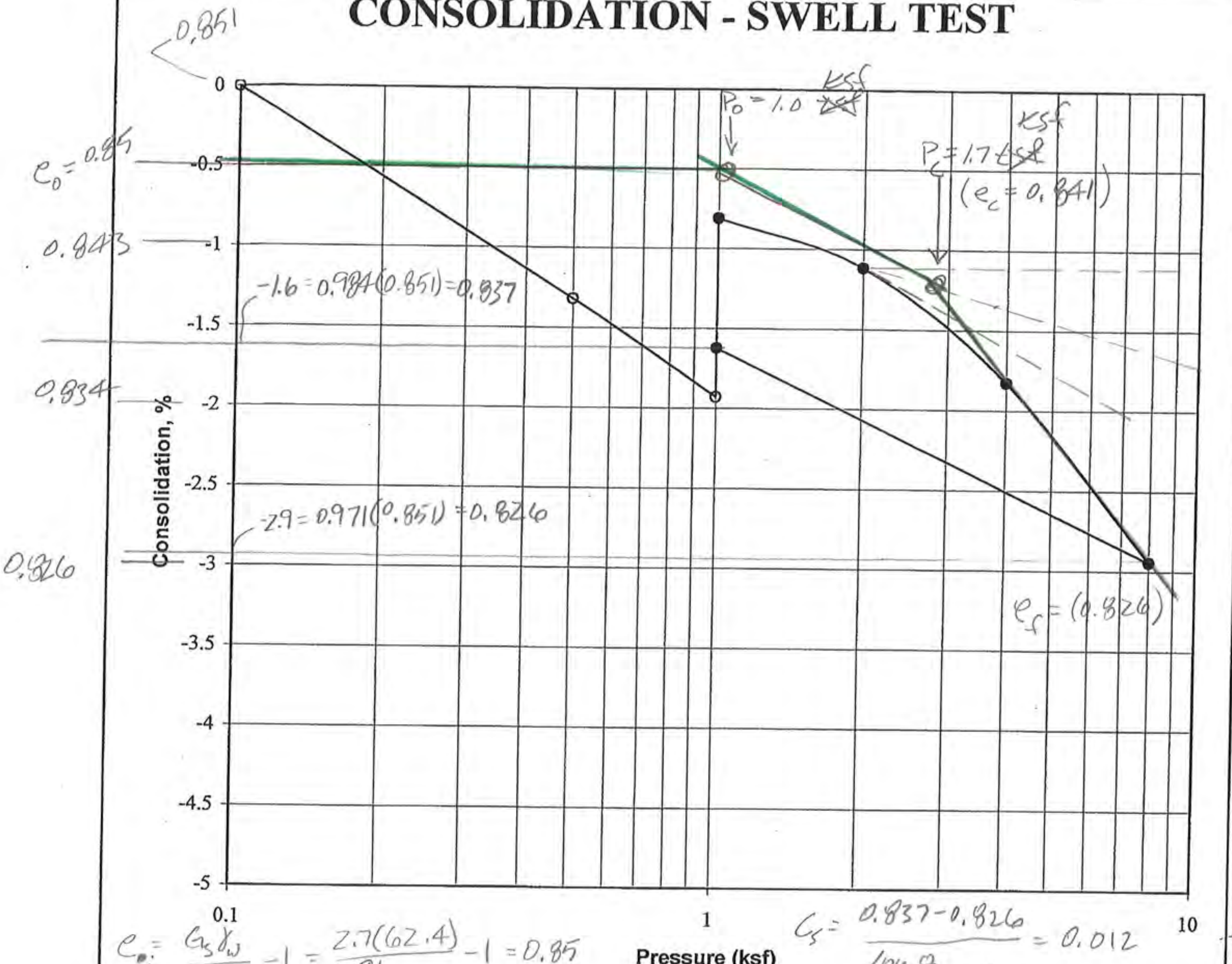
$= 0.73$ tsf

$OCR = \frac{4.0 \text{ tsf}}{0.73 \text{ tsf}} = 5.5$

$LL = 71$ $\quad 0.0463\left(\frac{71}{100}\right)2.7 = 0.09$

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

CONSOLIDATION - SWELL TEST



$$C_s = \frac{0.837 - 0.826}{\log 8} = 0.012$$

$$e_{i} = \frac{G_s \gamma_w}{\gamma_d} - 1 = \frac{2.7(62.4)}{91} - 1 = 0.85$$

(100 ft)(60 pcf) waste

$$\frac{(50')(110)}{1000} = 5.5 \text{ ksf}$$

$$50(110) = 1\ \text{kip} \,/\, 1000 \text{ LBS}$$

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

$$P_o = \frac{(9\text{ ft})(91)(1.26)}{1000\ \cancel{\#}} \Big| \frac{1\ \text{Kips}}{} = 1.03 \text{ tsf}$$

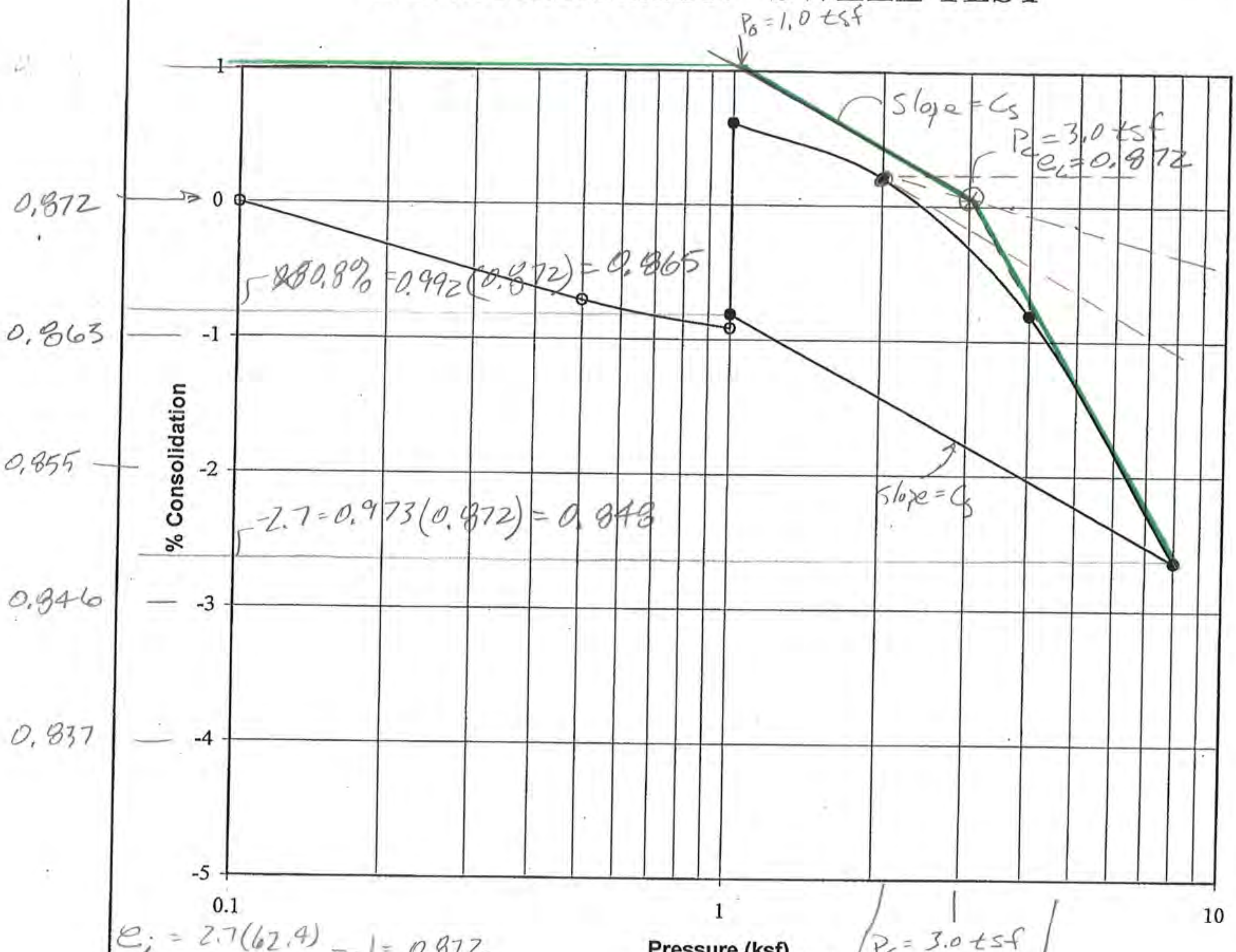
100

$$C_c = \frac{0.841 - 0.826}{\log\left(\frac{8}{1.7}\right)} = 0.022$$

$$OCR = \frac{1.7 \text{ tsf}}{1.0 \text{ tsf}} = 1.7$$

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

CONSOLIDATION - SWELL TEST



$e_i = \frac{2.7(62.4)}{90} - 1 = 0.872$

$C_s = \frac{0.865 - 0.848}{\log 8} = 0.019$

$C_c = \frac{0.872 - 0.848}{\log(8/3.0)} = 0.056$

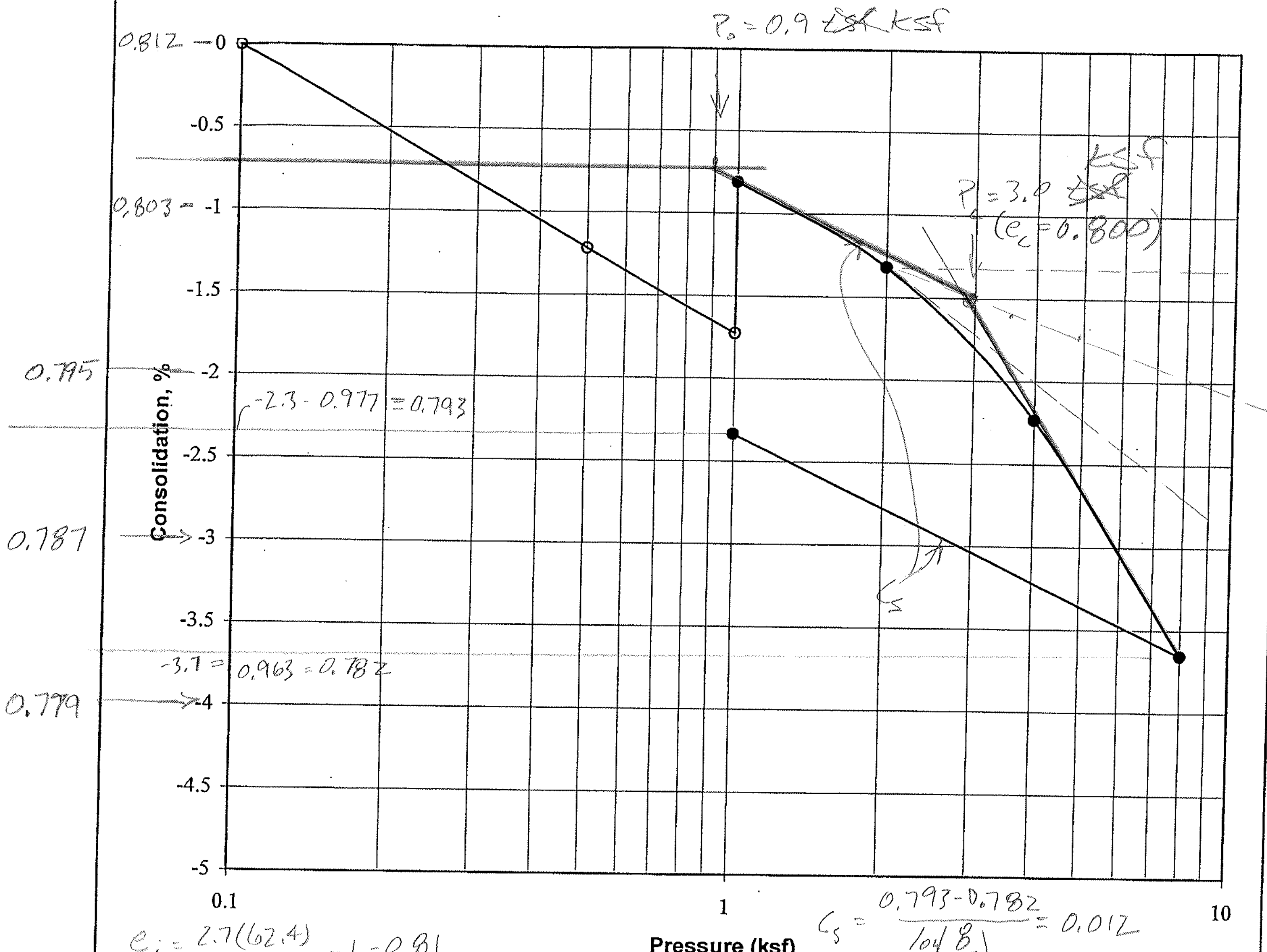
Project:	Intermountain Regional Landfill
Location:	TP-7
Sample Depth:	9
Description:	Block
Soil Type:	FAT CLAY (CH)
Dry Density, pcf:	90
Natural Moisture, %:	23
Liquid Limit:	70
Plasticity Index:	37
Water Added at:	1 ksf
Percent Swell:	1.5

$P_o = \frac{9.25'(1.23)(90.0 \text{ PCF})}{1000} = 1.02$ 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



$e_i = \frac{2.7(62.4)}{93} - 1 = 0.81$

$C_s = \frac{0.793 - 0.782}{\log\left(\frac{8}{1}\right)} = 0.012$

30'(1

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

$P_o = \frac{(8)(93)(1.19)}{1000}$ ~~tsf~~ k

$P_o = 0.9$ ~~tsf~~ ksf

$C_c = \frac{0.800 - 0.782}{\log \frac{8}{3}} = 0.042$

$OCR = \frac{3.0\ tsf}{0.9\ tsf} = 3.3$

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

APPENDIX G:

GROUNDWATER MONITORING PLAN

APPENDIX G

GROUNDWATER MONITORING PLAN

FOR

INTERMOUNTAIN REGIONAL LANDFILL

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Submitted
August 2010

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1.0 INTRODUCTION

This Groundwater Monitoring Plan (GMP) addresses the groundwater monitoring and sampling program at Intermountain Regional Landfill in Fairfield, Utah. The GMP is required by the Utah Department of Environmental Quality (UDEQ) Municipal Solid Waste Regulations (R315-308-2) and will meet the requirements of the federal U.S. Environmental Protection Agency (EPA) regulations under Subtitle D of the Resource Conservation and Recovery Act (RCRA).

1.1 Groundwater Monitoring System

The groundwater monitoring system for the site consists of four monitoring wells (DMW), DMW-1 through DMW-4. Well DMW-1 serves as the upgradient or background well for the landfill. DMW-2 serves as the downgradient or compliance well for the leachate pond, and DMW-3 and DMW-4 serve as the compliance wells for Cell 1. Construction of Cell 2 will begin on the east side of the cell, and DMW-5, which will be installed at a later date, will serve as the compliance well for the cell. Monitoring well location are shown on Figure G-1 in Attachment 3.

Additional monitoring wells will be added to the system as information becomes available to indicate that they are necessary to meet the requirements of the regulations. New wells might also be added to the system as new cells or leachate basins are designed and constructed.

1.2 Well Construction

Groundwater monitoring wells will be constructed of 2-inch or 2.5-inch-diameter polyvinyl chloride (PVC) pipe with a 20-foot screen interval and a 1-foot silt sump. Figure G-2 in Attachment 3 shows a typical design of a groundwater monitoring well.

2.0 GROUNDWATER ELEVATION MONITORING

2.1 Well Inspections

During each monitoring event, the wells will be inspected for damage to the well casing, protective cover, lock, well cap, and concrete pad. In addition, the ground surface around the well pads will be inspected for erosion. If any problems are discovered, the problem elements will be repaired or replaced as soon as practicable.

2.2 Monitoring Procedures

Groundwater-level measurements will be collected using an electric well sounder with measurements recorded to the nearest 0.5-inch (0.04-foot) increment. For each monitoring event, the total well depth will be measured to evaluate whether the casing has silted up. Water levels in the monitor wells will be measured before purging or sampling to minimize the potential effects of these activities on the water levels. The groundwater-level measurement will be recorded to the nearest 0.04 foot from the top of the monitor well casing. Water-level measurements will always be referenced to the survey mark on the well casing. When a measurement is collected, the measuring device will be raised and lowered several times to ensure that the correct measurement is obtained. Water-level measurements collected for each monitoring event will be converted to elevations (nearest 0.04 foot) and submitted with the groundwater sampling report. The survey data for each monitoring well will be referenced to the benchmark established for the landfill.

2.3 Protocol for Water-Level Measurements and Instrumentation

During each monitoring event, the current water-level readings will be compared to the readings from the previous monitoring event in order to avoid discrepancies. If an obvious discrepancy is noticed, the water level will be measured again to ensure that the measurement was recorded correctly.

Before collecting water-level measurements, the measuring device will be checked for damage, including bends or kinks in the tape. To maintain consistency and precision, and to the degree possible, the same measuring device will be used during each monitoring event.

Before conducting the well-purging activities, the pH and conductivity meters will be calibrated. The instruments will be calibrated according to the manufacturer's procedures for each instrument. At a minimum, the pH meter will be calibrated using standard calibration solutions as recommended by the manufacturer. The conductivity meter will be calibrated using standard solutions as recommended or supplied by the manufacturer. The same instruments will be used for each monitoring event.

3.0 DECONTAMINATION PROCEDURES

Before beginning each sampling event and between wells, all non-dedicated equipment including the water-level measuring device will be decontaminated thoroughly to minimize the potential for cross-contamination. The decontamination procedures will consist of thoroughly flushing the equipment with potable water three times followed by a final rinse with deionized water. Purge and decontamination water will be discharged on the ground. If contamination is found in compliance monitoring events, subsequent purge and decontamination water will be stored in containers until analytical results are provided. Purge water will be discharged to the leachate detention basin if contaminated or to the ground if uncontaminated.

4.0 GROUNDWATER SAMPLE COLLECTION

4.1 Well-Purging Procedures

Before each sampling event, the groundwater level in each well and the total well depth will be measured as described in Section 2.2, Monitoring Procedures. During the purging activities, the sampling team will wear disposable latex gloves and will change them between wells. To purge a well, a disposable bailer will be lowered into the monitoring well. The bailer will be raised to the surface and water evacuated. Three well volumes will be removed from the well before a sample is collected. If a well dewaters before achieving the stable water quality parameters, it will be allowed to recharge before sampling. During the purging operations, the sampling team will record the climatic conditions, condition of the wells and surrounding ground surface, field collected water quality, color, odors, water level, depth of well, and purge rate. The information will be recorded in indelible ink, will be stored either on site at the landfill office, and will become part of the site operating record for the landfill.

4.2 Groundwater Collection and Handling Procedures

Before collecting a groundwater sample, the monitor wells will be purged of groundwater as described in Section 4.1, Well-Purging Procedures. Purge water will be handled as discussed in Section 4.5, Purge Water Handling Procedures. The monitor wells will be sampled in the same order as they are purged. Samples will be collected within 24 hours following purging. If sufficient recharge does not occur within 7 days following purging, then the well will be considered dry and a sample will not be collected. The Intermountain Regional Landfill's operators will follow the laboratory's quality assurance/quality control (QA/QC) protocols regarding sampling containers, preservation, and holding times.

The samples will be collected directly from the bailer. The sample containers will be held as close to the bailer as possible without touching it to minimize the loss of volatile organic compounds (VOCs). The containers for the VOCs will be tilted slightly to allow the water to gently run down the inside wall of the container.

After each sample container is filled, it will be labeled with the well number, date and time collected, preservatives used, analyses to be run, and the sampler's initials. The 40-mL (milliliter) vials will be placed in zip-locked plastic bags. The sample containers for each well will include, at a minimum, two 40-mL volatile organic analysis (VOA) glass vials with Teflon® septa screw caps for VOCs and other bottles provided by the laboratory. Sample containers for VOCs will be completely filled and sealed carefully to prevent air bubbles. If an air bubble is present, then the sample will be discarded and the sample will be collected again. All other sample containers will be filled as completely as possible.

Once the samples have been properly sealed and labeled as described above, they will be recorded on a Chain-of-Custody (COC) form that is signed and dated by the sampling technician(s). An example of a typical COC is presented in Attachment 2. The COC will accompany the samples to the laboratory.

The samples will be placed in a plastic ice chest (similar to an Igloo ice chest) with ice or a refreezable product to maintain a temperature as close to 4 degrees Celsius as possible until the analyses are performed. **Dry ice is not permitted because it could freeze the samples and break the containers.** Precautions will be taken to secure the samples in the ice chest to prevent them from breaking during transport.

The samples will be delivered to the laboratory within 24 hours after collection, so it will not be necessary to preserve the samples in the field, except samples collected for dissolved constituent analyses. Any samples, other than the samples collected for dissolved constituent analyses, that require preservatives will be collected in pre-preserved containers supplied by the laboratory.

4.2.1 Sampling Frequency of Detection Monitoring

The sampling schedule for detection monitoring consists of collecting samples from each monitor well for the detection monitoring constituents on a semi-annual basis after background data have been established. Any changes to the frequency and/or number and type of constituents for detection monitoring must be approved by the Executive Secretary of the Division of Solid And Hazardous Waste before implementing the change. The schedule for establishing background data is discussed in Section 5.5, Establishing Background Data.

4.3 Quality Assurance and Quality Control Samples

To screen field procedures, additional samples will be collected. Periodically, trip blank samples will be prepared by the laboratory and will accompany the empty sample containers and collected samples to and from the laboratory. The trip blank will consist of four 40-mL VOA vials, two with deionized water and two with laboratory-grade water. The purpose of the trip blank is to assess whether any of the sample containers or collected samples has been contaminated before or during sampling and during transport to the laboratory. At least one trip blank will be prepared for each day of sampling or for every container transported to the laboratory. The QA/QC samples will be collected and handled in a similar fashion as the other samples and will be analyzed for VOCs.

At the discretion of the owner or at the direction of UDEQ, blind field duplicate samples will be collected to assess the precision of the sampling and laboratory methods. The blind duplicate samples will be collected from well(s) with typically the highest concentrations of contaminants. When a blind sample is collected, it will be handled in a similar fashion as the other samples but will be labeled so that the laboratory does not know it is a duplicate sample for QA/QC purposes.

4.4 Health and Safety Protocol

Sampling of the monitor wells will not be permitted during inclement weather, including thunderstorms. To the extent possible, monitor wells will not be sampled when the temperature is below freezing. Caution should be taken when the temperature exceeds 100 degrees Fahrenheit. If contamination is detected, the Intermountain Regional Landfill owner will develop a health and safety plan for future groundwater monitoring.

4.5 Purge Water Handling Procedures

If contamination is found in prior samples, purge and decontamination water will be collected in closable drums and stored on-site for subsequent disposal. The analytical data will be reviewed to determine the proper disposal procedures. If needed, UDEQ will be consulted to help determine proper disposal procedures.

5.0 ANALYTICAL TESTING

5.1 Laboratory Performing the Analyses

The analytical laboratory selected to perform the required analyses will be licensed and certified by the State of Utah. At a minimum, the selected laboratory will apply quality-control procedures in accordance with EPA SW-846, Test Methods for Evaluating Solid Waste, Third Edition, as revised February 2007.

5.2 Laboratory Procedures

The laboratory will follow appropriate QA/QC protocols developed as part of its licensing and certification. At a minimum, on receipt of the samples by the laboratory, the sample lot will be verified with the information on the COC (see Attachment 2). If there is a discrepancy with the samples, the responsible party that collected the samples will be notified, and the problem will be resolved before the analyses are performed. The COC will be signed and dated by the designated receiving personnel at the laboratory. The COC will remain with the laboratory until the analyses are completed and then will be attached to the completed laboratory report.

For samples that require overnight transport to the laboratory, the COC will be signed, and the date and time when the samples were received by the transporter will be recorded. The COC will be attached to the sample container(s) and delivered to the laboratory, and a copy of the bill of lading will be supplied by the transporter. After the analysis is completed and the laboratory report is finalized, the complete COC with the bill of lading (or receipt if sent by certified mail) will be attached to the laboratory report.

The laboratory will keep a copy of the COC and laboratory results for at least 3 years.

5.3 Laboratory Quality Assurance and Quality Control Samples

The laboratory will follow its QA/QC plan developed as part of its licensing and certification. If practical, the laboratory will be required to achieve detection limits (DLs) that are at least one order of magnitude below the maximum contaminant levels (MCLs) for a constituent for which an MCL has been established.

5.4 Constituents To Be Analyzed and Test Methods

As specified in the UDEQ (R315-308-2) and Subtitle D (40 Code of Federal Regulations [CFR] 258.53) regulations, the groundwater monitoring program at all municipal solid waste landfill facilities shall consist of detection monitoring that includes specific constituents. The constituents to be tested for during the detection-monitoring program are listed in Table 1 below. Approved testing methods as described in Section 5.1, Laboratory Performing the Analyses, will be used for all constituents. The laboratory DLs will be below the MCLs for each of the constituents, if practical. If a change in the analytical method is needed, then the Executive Secretary will be notified in writing. The Executive Secretary shall approve of the change before the change is implemented. All samples will be analyzed within the required holding times for the particular analyses. The laboratory will report the Chemical Abstracts Service (CAS) number for each constituent analyzed.

Table 1. Background/Detection Monitoring Constituents

Inorganic Constituents	Heavy Metals
Ammonia (7664-41-7) Carbonate/bicarbonate Calcium Chemical oxygen demand (COD) Chlorides Iron (7439-89-6) Magnesium Manganese (7439-96-5) Nitrate (as N) pH Potassium Sodium Sulfate Total dissolved solids (TDS) Total organic carbon (TOC)	Antimony (7440-36-0) Arsenic (7440-38-2) Barium (7440-39-3) Beryllium (7440-41-7) Cadmium (7440-43-9) Chromium Cobalt (7440-48-4) Copper (7440-50-8) Lead Mercury (7439-97-6 Nickel (7440-02-0) Selenium (7782-49-2) Silver (7440-22-4) Thallium Vanadium (7440-62-2) Zinc (7440-66-6)
VOCs	
Acetone (67-64-1) Acrylonitrile (107-13-1) Benzene (71-43-2) Bromochloromethane (74-97-5) Bromodichloromethane (75-27-4) Bromoform (75-25-2) Carbon disulfide (75-15-0) Carbon tetrachloride (56-23-5) Chlorobenzene (108-90-7) Chloroethane (75-00-3) Chloroform (67-66-3) Dibromochloromethane (124-48-1) 1,2-Dibromo-3-chloropropane (96-12-8) 1,2-Dibromoethane (106-93-4) 1,2-Dichlorobenzene, ortho (95-50-1) 1,4-Dichlorobenzene, para (106-46-7) trans-1,4-Dichloro-2-butene (110-57-6) 1,1-Dichloroethane (75-34-3) 1,2-Dichloroethane (107-06-2) 1,1-Dichloroethylene (75-35-4) cis-1,2-Dichloroethylene (156-59-2) trans-1,2-Dichloroethylene (156-60-5) 1,2-Dichloropropane (78-87-5)	is-1,3-Dichloropropene (100061-01-5) trans-1,3-Dichloropropene (10061-02-6) Ethylbenzene (100-41-4) 2-Hexanone (591-78-6) Methyl bromide (74-83-9) Methyl chloride (74-87-3) Methylene bromide (74-95-3) Methylene chloride (75-09-2) Methyl ethyl ketone; MEK (78-93-3) Methyl iodide (74-88-4) 4-Methyl-2-pentanone (108-10-1) Styrene (100-42-5) 1,1,1,2-Tetrachloroethane (630-20-6) 1,1,2,2-Tetrachloroethane (79-34-5) Tetrachloroethylene (127-18-4) Toluene (108-88-3) 1,1,1-Trichloroethane (71-55-6) 1,1,2-Trichloroethane (79-00-5) Trichloroethylene (79-01-6) Trichlorofluoromethane; CFC-11 (75-69-4) 1,2,3-Trichloropropane (96-18-4) Vinyl acetate (108-05-4) Vinyl chloride (75-01-4) Xylenes (1330-20-7)

Note: The CAS Number (if appropriate) is listed in parentheses. These parameters were taken from UAC R315-308-4 and should be verified at least annually.

5.5 Establishing Background Data

Monitoring wells will be installed as landfill cells are developed. As specified in the UDEQ regulations (R315-308-2(4)(a)) and Subtitle D (40 CFR 258.53) regulations, background data for the detection monitoring constituents will be established on all monitoring wells as they are constructed. Background data will be generated by sampling the monitoring wells on a monthly basis after construction. To provide an acceptable level of confidence in the data, eight samples will be collected to establish background concentrations.

6.0 STATISTICAL METHOD TO EVALUATE ANALYTICAL DATA

After each sampling event, the groundwater monitoring data will be evaluated to determine if statistically significant changes from background values have occurred for each constituent listed in Table 1 above. The statistical analyses will be performed in accordance with R315-308-2(7). The anticipated statistical method selected for this landfill will be an intra-well comparison with a control chart such as a Shewert-CUSUM control chart. This procedure is the preferred method because it is relatively easy to implement and because it is especially applicable to sites without groundwater contamination. The analytical data may also be analyzed using prediction limits (PL), with the PLs determined based on the background data collected. The background data, once obtained, will be reviewed to determine the most appropriate statistical method to evaluate statistically significant changes during the detection-monitoring period.

7.0 REPORTING REQUIREMENTS

After each detection monitoring sampling event, the analytical data will be summarized in a report. The report will be submitted with the landfill's annual report unless immediate notification is required. Any statistically significant change observed from the background data will be reported in writing to UDEQ within 60 days after a sampling event. Only statistically significant changes (SSC) detected in the compliance wells (downgradient wells) will be reported to UDEQ.

When an SSC has been determined, the owner/operator within 14 days of receiving the statistical analysis results will enter this information into the operating record and notify the Executive Secretary of the finding in writing. The notification must indicate the constituents that have shown SSC. In addition, the owner/operator will immediately resample all monitoring wells for the constituents listed in Table 1. If an SSC is still present after resampling, the owner/operator must notify the Executive Secretary in writing within 7 days of receiving the sample results. However, if the SSC from the background data is believed to be caused by a source other than the landfill, then the owner/operator can prepare a report that explains the cause of the SSC. This report must be prepared and certified by a qualified groundwater scientist and submitted to the Executive Secretary for approval within 90 days after the sampling event. If the Executive Secretary approves the report, then the landfill can return to detection monitoring. If the Executive Secretary believes that a satisfactory explanation is not given, the assessment monitoring program will be implemented at the direction of the Executive Secretary. The assessment monitoring program shall be implemented in accordance with R315-308-2(11).

ATTACHMENT 1

FIELD DATA FORM

GROUNDWATER MONITORING PROGRAM
FIELD DATA REPORTING FORM
INTERMOUNTAIN REGIONAL LANDFILL

Date:
Sampled By:
Recorded By:
Weather:

Well Number	Depth of Well	Depth of Water	Temp C__ F__	pH	Conductivity	Comments

ATTACHMENT 2

TYPICAL CHAIN-OF-CUSTODY FORM

Phone: 801-964-2511
Fax: 801-964-2721
www.enviroprolabs.com

ENVIROPRO LABORATORIES

2712 South 3600 West, Suite E
West Valley City, UT 84119

Chain of Custody Record

Date: ____________ Page: _____ of _____

Contact Name | Phone Number | Fax Number

Company Name

Street Address

City, State, Zip

Project Name | Site Location

Sample ID	Date Collected	Time Collected	Matrix	Lab ID	Preservation Code	Number of Containers	Rush	Container Size	Analysis Request							Comments

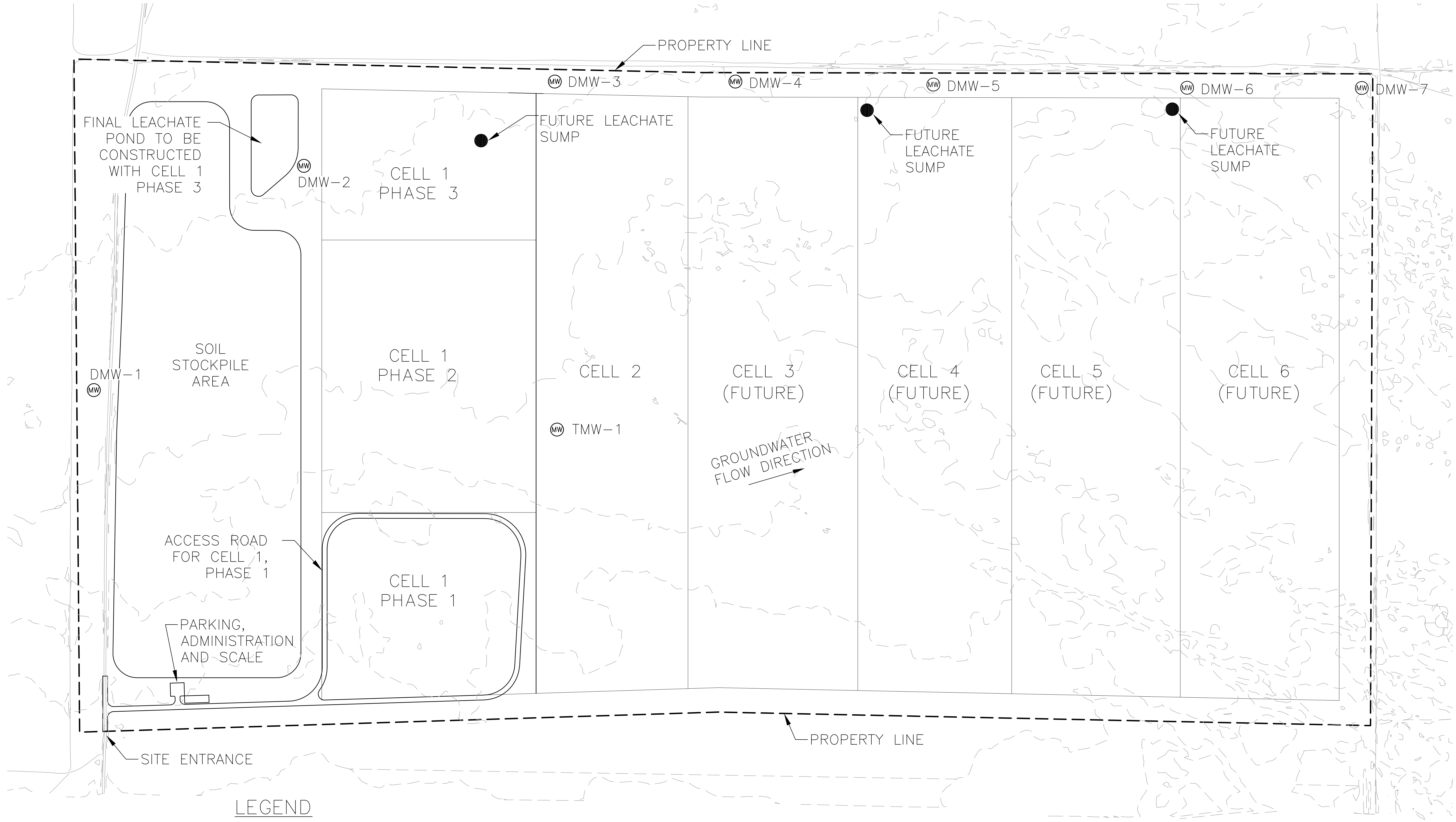
Preservation Code

1 = 4°C
2 = HNO_3
3 = HCl
4 = H_2SO_4
5 = NaOH
6 = Other

Special Instructions / Comments	(1) Relinquished By	(2) Relinquished By	Sampler Initials:
	(1) Date / Time	(2) Date / Time	Method of Shipment
	(1) Company	(2) Company	HAND CARRY USPS FEDX UPS
	(1) Received By	(2) Received By	CoC
Route Results Through:	(1) Date / Time	(2) Date / Time	Seal Intact?
Email address:	(1) Company	(2) Company	Yes No

APPENDIX 3

FIGURES



LEGEND

MW	MONITORING WELL
DMW-X	DEEP MONITORING WELL
TMW-X	TEMPORARY MONITORING WELL

N

0 400 800
SCALE IN FEET

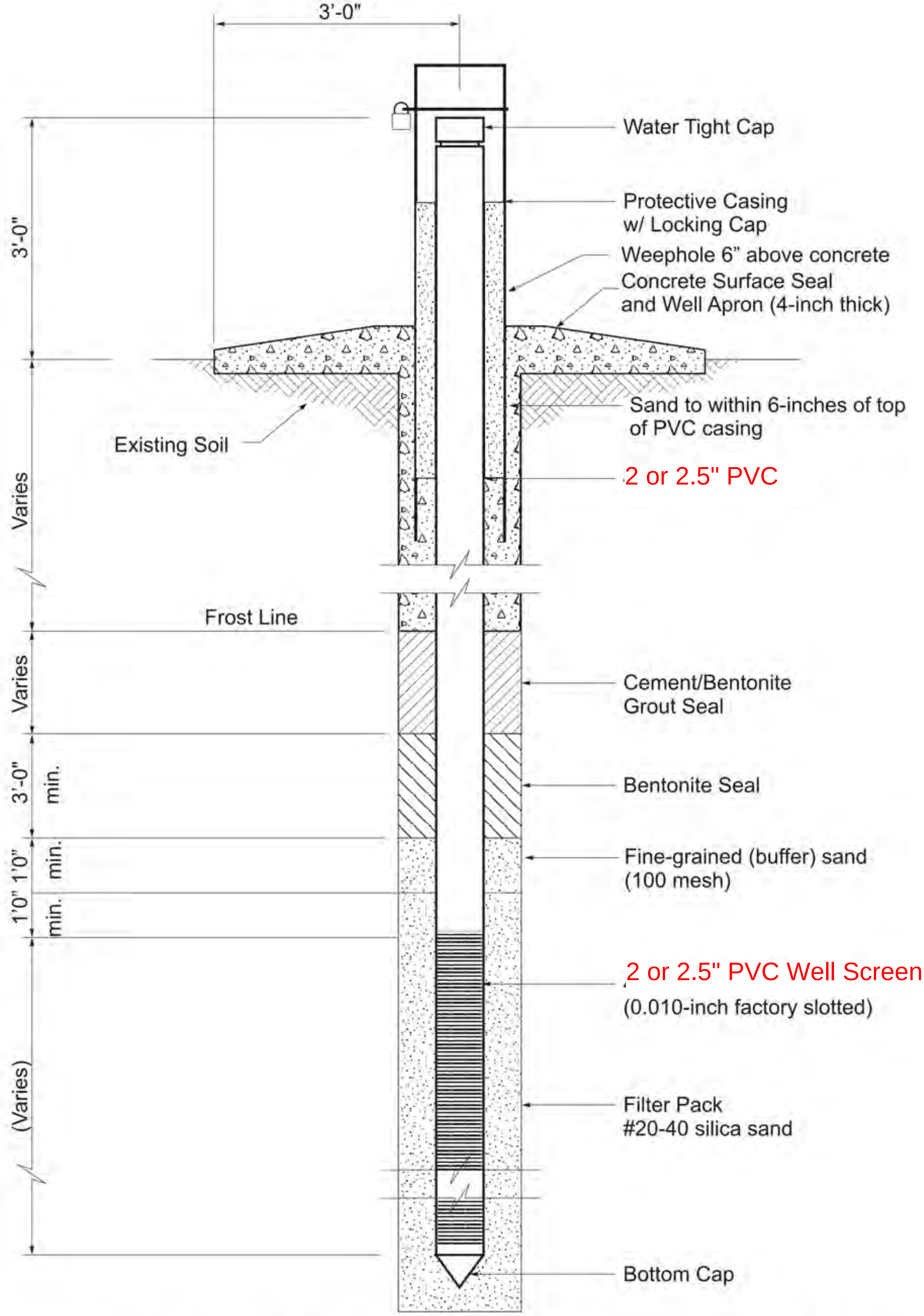
NOTE:
LOCATIONS OF MONITORING WELLS ARE APPROXIMATE. THIS FIGURE IS INTENDED TO PRESENT THE GENERAL LOCATION RELATIVE TO THE LANDFILL CELLS.

HDR Engineering, Inc.

INTERMOUNTAIN REGIONAL LANDFILL
MONITORING WELL LOCATIONS

DATE
AUGUST 2010

FIGURE
G-1



HDR

HDR Engineering, Inc.

Typical Monitoring Well

Date
April 2010

Figure
G-2

Piezometer.cdr
R:/Hatchco/Figures
10/22/2001

APPENDIX H:

LEACHATE GENERATION CALCULATIONS

APPENDIX H

LEACHATE GENERATION CALCULATIONS

Intermountain Regional Landfill
Class V Landfill Permit Application

Submitted August 2010

Prepared By:

HDR ENGINEERING, INC.

HELP Model Introduction and Parameters

The Hydrologic Evaluation of Landfill Performance (HELP) model was used to determine the amount of leachate generated at Intermountain Regional Landfill for two scenarios:

- Scenario 1: Cell Area of one acre with an initial lift of 10 feet and 6" of daily cover for 1 year
  - Layer 1: 6 inches of daily cover (layer type 1, texture 6)
  - Layer 2: 10 feet of waste (layer type 1, texture 18)
  - Layer 3: 2 feet of a drainage layer (layer type 2, texture 6)
  - Layer 4: 60 mil HDPE Liner (layer type 4, texture 35)
  - Layer 5: 0.25" Bentonite Mat (layer type 3, texture 17)

- Scenario 2: Cell area of 1 acre with 100 feet of waste and 12" of intermediate cover (prior to final cap)
  - Layer 1: 12 inches of intermediate cover (layer type 1, texture 6)
  - Layer 2: 100 feet of waste (layer type 1, texture 18)
  - Layer 3: 2 feet of a drainage layer (layer type 2, texture 6)
  - Layer 4: 60 mil HDPE Liner (layer type 4, texture 35)
  - Layer 5: 0.25" Bentonite Mat (layer type 3, texture 17)

It is noted that an area of 1 acre was used for the calculations because the calculations can then be applied to any area to determine leachate generation.

The texture types shown above are defined in the HELP program as shown in attachment 1. The layer types shown above are defined in the HELP program as follows:

- Layer type 1: Vertical drainage layer
- Layer type 2: Lateral drainage layer
- Layer type 3: Flexible membrane liner
- Layer type 4: Barrier soil layer

To be conservative, the intermediate cover, daily cover, lateral drainage layer and the barrier soil layer were assumed to be saturated at the beginning of the simulation for both conditions. The initial moisture content of the waste was assumed to be 11%.

For the 60 mil HDPE flexible membrane liner, the following properties were used:

- Pinhole density: 2 holes per acre
- Installed defects: 4 holes per acre
- Placement quality: Good

The maximum drainage path used for the analysis is 2,500 feet with an average drainage slope of 1.6%.

The synthetic rainfall generator (SRG) from the HELP model was used for Salt Lake City, Utah for 20 years. The SRG was then adjusted using monthly temperature and precipitation data for Fairfield, Utah from the Western Regional Climate Center (see attachment 2).

Leachate Generation and Maximum Head

Leachate generation calculations for Scenarios 1 and 2 are attached, and show that no leachate is generated in either scenario (see attachment 3). Because no leachate is generated, the head on the liner is negligible and is therefore less than the 12" maximum head specified in R-315.

Leachate Collection and Management

As stated previously, the HELP Model results show that no leachate is generated. However, an 8" leachate collection pipe will be installed at a 1.4% slope to collect any leachate that may be generated. The capacity of the pipe is 1.88 cfs (see attachment 4).

Stormwater that comes into contact with solid waste or daily cover is typically allowed to infiltrate into the waste to be managed by the leachate system. Contaminated stormwater will be minimized by keeping the active face as small as possible and by placing soil cover on all waste filled areas not currently being utilized for disposal.

The following is a list of attachments:

Attachment 1: HELP Program Texture Types

Attachment 2: Western Regional Climate Center data

Attachment 3: HELP Program Output

Attachment 4: Leachate Collection Pipe Capacity Calculation

References

The Hydrologic Evaluation of Landfill Performance (HELP) Model Engineering Documentation for Version 3. http://el.erdc.usace.army.mil/elmodels/pdf/help3doc.pdf Site visited May 3, 2010.

Western Regional Climate Center website. http://www.wrcc.dri.edu/   Site visited May 20, 2010.

APPENDIX H

ATTACHMENT 1:

HELP Program Texture Types

TABLE 4. DEFAULT SOIL, WASTE, AND GEOSYNTHETIC CHARACTERISTICS

Classification			Total Porosity	Field Capacity	Wilting Point	Saturated Hydraulic Conductivity
HELP	USDA	USCS	vol/vol	vol/vol	vol/vol	cm/sec
1	CoS	SP	0.417	0.045	0.018	$1.0x10^{-2}$
2	S	SW	0.437	0.062	0.024	$5.8x10^{-3}$
3	FS	SW	0.457	0.083	0.033	$3.1x10^{-3}$
4	LS	SM	0.437	0.105	0.047	$1.7x10^{-3}$
5	LFS	SM	0.457	0.131	0.058	$1.0x10^{-3}$
6	SL	SM	0.453	0.190	0.085	$7.2x10^{-4}$
7	FSL	SM	0.473	0.222	0.104	$5.2x10^{-4}$
8	L	ML	0.463	0.232	0.116	$3.7x10^{-4}$
9	SiL	ML	0.501	0.284	0.135	$1.9x10^{-4}$
10	SCL	SC	0.398	0.244	0.136	$1.2x10^{-4}$
11	CL	CL	0.464	0.310	0.187	$6.4x10^{-5}$
12	SiCL	CL	0.471	0.342	0.210	$4.2x10^{-5}$
13	SC	SC	0.430	0.321	0.221	$3.3x10^{-5}$
14	SiC	CH	0.479	0.371	0.251	$2.5x10^{-5}$
15	C	CH	0.475	0.378	0.265	$1.7x10^{-5}$
16	Barrier Soil		0.427	0.418	0.367	$1.0x10^{-7}$
17	Bentonite Mat (0.6 cm)		0.750	0.747	0.400	$3.0x10^{-9}$
18	Municipal Waste (900 lb/yd^3 or 312 kg/m^3)		0.671	0.292	0.077	$1.0x10^{-3}$
19	Municipal Waste (channeling and dead zones)		0.168	0.073	0.019	$1.0x10^{-3}$
20	Drainage Net (0.5 cm)		0.850	0.010	0.005	$1.0x10^{+1}$
21	Gravel		0.397	0.032	0.013	$3.0x10^{-1}$
22	L*	ML	0.419	0.307	0.180	$1.9x10^{-5}$
23	SiL*	ML	0.461	0.360	0.203	$9.0x10^{-6}$
24	SCL*	SC	0.365	0.305	0.202	$2.7x10^{-6}$
25	CL*	CL	0.437	0.373	0.266	$3.6x10^{-6}$
26	SiCL*	CL	0.445	0.393	0.277	$1.9x10^{-6}$
27	SC*	SC	0.400	0.366	0.288	$7.8x10^{-7}$
28	SiC*	CH	0.452	0.411	0.311	$1.2x10^{-6}$
29	C*	CH	0.451	0.419	0.332	$6.8x10^{-7}$
30	Coal-Burning Electric Plant Fly Ash*		0.541	0.187	0.047	$5.0x10^{-5}$
31	Coal-Burning Electric Plant Bottom Ash*		0.578	0.076	0.025	$4.1x10^{-3}$
32	Municipal Incinerator Fly Ash*		0.450	0.116	0.049	$1.0x10^{-2}$
33	Fine Copper Slag*		0.375	0.055	0.020	$4.1x10^{-2}$
34	Drainage Net (0.6 cm)		0.850	0.010	0.005	$3.3x10^{+1}$

* Moderately Compacted

(Continued)

TABLE 4 (continued). DEFAULT SOIL, WASTE, AND GEOSYNTHETIC CHARACTERISTICS

Classification		Total Porosity	Field Capacity	Wilting Point	Saturated Hydraulic Conductivity
HELP	Geomembrane Material	vol/vol	vol/vol	vol/vol	cm/sec
35	High Density Polyethylene (HDPE)				2.0×10^{-13}
36	Low Density Polyethylene (LDPE)				4.0×10^{-13}
37	Polyvinyl Chloride (PVC)				2.0×10^{-11}
38	Butyl Rubber				1.0×10^{-12}
39	Chlorinated Polyethylene (CPE)				4.0×10^{-12}
40	Hypalon or Chlorosulfonated Polyethylene (CSPE)				3.0×10^{-12}
41	Ethylene-Propylene Diene Monomer (EPDM)				2.0×10^{-12}
42	Neoprene				3.0×10^{-12}

(concluded)

user-defined soil option accepts non-default soil characteristics for layers assigned soil type numbers greater than 42. This is especially convenient for specifying characteristics of waste layers. User-specified soil characteristics can be assigned any soil type number greater than 42.

When a default soil type is used to describe the top soil layer, the program adjusts the saturated hydraulic conductivities of the soils in the top half of the evaporative zone for the effects of root channels. The saturated hydraulic conductivity value is multiplied by an empirical factor that is computed as a function of the user-specified maximum leaf area index. Example values of this factor are 1.0 for a maximum LAI of 0 (bare ground), 1.8 for a maximum LAI of 1 (poor stand of grass), 3.0 for a maximum LAI of 2 (fair stand of grass), 4.2 for a maximum LAI of 3.3 (good stand of grass) and 5.0 for a maximum LAI of 5 (excellent stand of grass).

The manual option requires values for porosity, field capacity, wilting point, and saturated hydraulic conductivity. These and related soil properties are defined below.

Soil Water Storage (Volumetric Content): the ratio of the volume of water in a soil to the total volume occupied by the soil, water and voids.

Total Porosity: the soil water storage/volumetric content at saturation (fraction of total volume).

APPENDIX H

ATTACHMENT 2:

WESTERN REGIONAL CLIMATE CENTER DATA

Source: Western Regional Climate Center,
http://www.wrcc.dri.edu/cgi-bin/cliRECtM.pl?ut2696

FAIRFIELD, UTAH (422696)

Period of Record Monthly Climate Summary

Period of Record : 1/ 1/1911 to 12/31/2009

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	38.3	43.6	53.1	62.3	71.9	81.7	89.4	87.7	79.2	66.5	50.9	39.4	63.7
Average Min. Temperature (F)	11.8	16.8	23.9	29.5	36.8	43.8	50.8	49.4	39.6	28.9	20.2	12.9	30.4
Average Total Precipitation (in.)	1.09	1.00	1.09	1.02	1.17	0.74	0.92	0.94	0.92	1.10	0.89	0.98	11.87
Average Total SnowFall (in.)	9.1	6.7	4.5	1.8	0.3	0.0	0.0	0.0	0.0	0.9	4.0	8.4	35.7
Average Snow Depth (in.)	3	3	0	0	0	0	0	0	0	0	0	2	1

Percent of possible observations for period of record.
Max. Temp.: 91% Min. Temp.: 91.2% Precipitation: 93.3% Snowfall: 91.1% Snow Depth: 88.8%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

Source: Western Regional Climate Center,
http://www.wrcc.dri.edu/htmlfiles/ut/ut.avg.html

UTAH

MONTHLY AVERAGE TEMPERATURES (F)

	PERIOD OF RECORD	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
ALLEN'S RANCH	1962-2001	24.9	30.1	37.3	45.5	54.9	63.6	71.0	68.5	59.4	47.9	35.5	26.2	47.1
ALPINE	1948-2007	29.0	33.0	41.2	48.8	56.9	65.7	73.4	71.5	62.6	51.0	38.6	30.3	50.2
ALTA	1948-2007	21.6	22.8	25.9	32.6	42.5	52.3	60.4	59.2	50.5	39.8	28.1	22.8	38.2
ALTAMONT	1953-2007	19.4	24.3	34.0	43.1	52.3	60.8	68.0	66.0	57.3	46.0	32.3	21.7	43.8
ALTON	1928-2007	27.3	29.8	34.8	42.8	51.0	59.4	66.2	64.7	57.8	48.0	36.5	29.3	45.6
ANETH PLANT	1959-2007	29.8	38.6	47.0	54.5	64.3	73.6	79.9	78.6	68.9	55.9	42.7	32.1	55.5
ANGLE	1981-2007	23.9	29.5	36.7	43.0	51.8	59.6	66.1	64.6	56.1	45.5	33.9	25.2	44.7
ANTELOPE ISLAND	1952-1972	28.6	33.8	40.8	48.8	59.2	68.3	78.4	76.3	64.9	53.1	39.4	30.0	51.8
ARCHES NATL PARK HQ	1980-2007	31.9	38.8	48.7	56.5	66.5	76.7	83.2	80.9	71.0	57.5	43.5	33.2	57.4
BEAR RIVER BAY	1969-1996	26.1	31.3	41.7	50.0	59.6	70.2	77.3	75.4	64.4	52.4	38.7	29.1	51.3
BEAR RIVER REFUGE	1948-1984	24.4	29.5	39.7	49.3	59.2	67.7	75.5	73.3	63.9	52.0	38.8	28.7	50.2
BEAVER	1889-1990	27.5	31.6	37.7	45.4	53.5	62.0	69.1	67.4	59.2	48.5	37.0	29.3	47.4
BEAVER CANYON P H	1948-2007	29.1	30.3	36.4	42.3	53.2	61.4	68.2	65.7	58.5	47.6	37.4	28.2	46.5
BIG WATER	1986-2007	35.4	41.4	50.0	58.5	67.4	77.2	82.9	80.3	71.6	59.4	45.3	35.0	58.7
BINGHAM CANYON	1948-1974	27.6	30.6	35.8	44.0	54.5	63.2	72.0	70.0	61.7	50.3	37.4	29.3	48.0
BINGHAM CANYON 2 NE	1974-1985	27.0	31.9	37.5	45.9	54.9	66.0	74.9	72.6	64.4	50.8	38.0	30.6	49.6
BIRDSEYE	1948-1992	20.4	25.7	34.0	41.7	50.5	58.5	65.6	63.9	54.7	45.4	33.6	21.9	43.0
BLACK ROCK	1951-2007	27.9	33.6	41.1	48.5	57.0	65.6	73.2	71.2	61.8	50.2	37.6	28.7	49.7
BLANDING	1904-2007	28.2	33.6	40.3	48.3	57.3	67.1	73.3	71.2	63.2	52.0	39.1	30.2	50.3
BLOWHARD MTN RADAR	1964-2006	20.8	21.1	24.5	29.7	38.8	49.1	55.8	54.1	47.2	37.9	27.1	21.4	35.6
BLUFF	1928-2007	30.5	37.8	45.9	54.5	63.6	72.5	79.1	76.9	67.9	54.9	41.0	31.7	54.7
BONANZA	1948-1993	18.8	25.3	37.5	48.6	57.9	67.8	74.6	72.2	63.8	51.0	35.9	23.7	48.1
BOUNTIFUL-VAL VERDA	1981-2007	29.6	33.3	42.7	49.8	58.8	68.1	76.6	75.0	64.4	52.6	39.6	30.8	51.8
BOULDER	1954-2007	28.4	32.5	39.0	46.2	55.4	65.1	71.6	69.2	61.7	51.1	38.0	29.9	49.0
BRIAN HEAD	1991-2007	19.6	21.0	25.8	31.4	40.2	50.0	56.0	55.1	46.9	35.8	25.1	19.1	35.5
BRIGHAM CITY	1948-1974	27.4	32.8	40.0	49.2	59.6	67.9	77.4	74.9	64.5	52.8	39.8	29.9	51.3
BRIGHAM CITY WASTE PLT	1974-2007	26.6	31.6	41.6	49.0	57.5	66.3	73.8	71.9	62.8	50.8	37.7	28.5	49.8
BRYCE CANYON FAA AIRPOR	1948-1983	19.6	23.2	28.8	37.4	46.2	54.8	62.0	60.0	52.8	42.9	30.4	22.0	40.0
BRYCE CANYON NAT'L PRK	1971-1978	19.0	22.8	29.6	35.6	45.2	55.2	61.0	58.3	50.9	40.5	29.2	20.8	39.0
BRYCE CANYON NAT'L PRK	1948-1959	21.2	23.7	29.3	38.9	46.5	55.9	62.8	60.8	54.3	43.3	31.0	24.5	41.0
BRYCE CANYON NATL PK HD	1959-2007	22.6	25.2	31.0	38.3	47.4	56.5	63.1	60.9	53.0	43.0	31.1	23.6	41.3
BULLFROG BASIN	1967-2007	35.5	41.3	49.7	57.4	68.3	78.6	85.2	82.3	73.2	60.2	46.7	36.6	59.6
CALLAO	1948-2007	27.1	32.9	41.5	48.8	57.6	66.1	73.9	72.1	61.9	49.9	37.5	28.0	49.8
CALLISTER RANCH	1967-1984	27.6	33.7	40.7	47.1	57.0	67.2	75.3	74.2	63.7	50.4	38.4	29.4	50.4
CANYONLANDS THE NECK	1965-2007	28.9	34.8	42.9	50.7	61.2	72.0	78.2	75.7	66.6	53.8	39.9	29.8	52.9
CANYONLANDS THE NEEDLE	1965-2007	28.9	35.9	44.5	52.0	62.2	72.2	78.7	76.5	66.8	53.9	40.6	30.2	53.5
CAPITOL REEF NATL PARK	1967-2007	30.1	36.2	45.0	52.4	62.1	72.0	78.0	75.5	67.3	55.2	40.8	31.3	53.8
CASTLE DALE	1928-2007	21.8	28.9	38.5	46.7	55.9	64.9	71.2	68.9	60.2	48.9	35.1	25.1	47.2
CASTLE VALLEY INST	1978-2007	30.1	36.5	45.7	54.0	63.3	73.4	79.2	76.5	67.3	55.2	41.3	31.1	54.5
CEDAR CITY 5 E	1983-2006	30.8	33.4	39.8	47.0	55.5	64.1	70.3	69.0	61.6	51.3	39.2	30.4	49.4
CEDAR CITY FAA AIRPORT	1948-2007	29.7	34.1	40.2	47.6	56.6	66.5	73.9	72.0	63.4	51.5	38.9	30.6	50.4
CEDAR CITY POWERHOUSE	1928-1961	28.8	33.0	40.0	48.7	57.0	66.5	73.5	71.7	64.1	52.2	38.9	32.2	50.5
CEDAR CITY STEAM PLANT	1961-1983	31.1	35.6	39.2	46.6	56.5	66.7	74.3	72.0	64.3	53.3	41.1	32.6	51.1
CEDAR POINT	1957-2007	26.1	29.8	36.3	44.4	54.0	64.0	70.2	67.9	59.8	48.7	36.1	27.8	47.1
CHURCH WELLS	1975-1986	32.5	38.3	46.1	54.7	63.1	74.7	80.9	78.4	68.2	56.7	43.0	34.1	55.9
CIRCLEVILLE	1948-2006	28.0	32.1	38.1	44.9	54.3	63.4	70.4	68.1	59.6	48.6	36.9	28.8	47.8
CISCO	1952-1967	23.0	31.7	40.1	51.1	61.9	71.8	79.7	76.3	66.4	53.9	38.0	26.4	51.7
CITY CREEK WATER PLANT	1955-2007	28.4	31.0	40.0	47.7	56.4	64.8	74.2	70.9	61.3	50.1	37.3	29.7	49.3
CLEAR CREEK	1948-1967	18.9	21.1	25.5	34.8	43.0	52.1	59.3	57.4	50.3	41.7	29.3	21.6	37.9
CLEAR LAKE REFUGE	1963-1984	25.8	32.6	39.6	46.9	57.1	66.9	75.6	73.0	62.8	50.3	37.7	27.3	49.6
COALVILLE	1948-2007	24.6	28.2	36.7	44.1	52.4	59.8	66.4	64.8	56.6	46.9	34.8	26.2	45.1
COALVILLE 13 E	1974-2007	22.8	24.4	31.9	40.6	48.6	56.5	64.0	62.0	53.9	43.8	31.5	24.1	42.0
CORINNE	1871-2006	24.6	30.1	39.0	48.2	57.0	65.8	74.1	72.4	62.1	50.2	37.2	27.6	49.0
COTTONWOOD WEIR	1948-2007	30.7	35.8	43.1	50.9	60.4	70.0	79.0	77.3	67.6	55.1	41.1	32.0	53.6
COVE FORT	1948-1980	27.4	30.7	35.9	43.8	53.8	63.1	72.1	70.0	61.3	49.5	36.9	28.9	47.8
CUTLER DAM UTAH P&L CO	1980-2007	25.6	29.7	41.5	50.3	58.7	67.4	75.8	74.3	63.7	51.6	38.1	26.9	50.3
DEER CREEK DAM	1948-2007	20.9	24.3	33.6	42.8	51.3	59.2	66.8	65.2	56.6	46.2	34.3	25.0	43.8
DELTA	1938-2007	25.9	32.3	40.4	48.6	58.0	67.1	75.7	73.6	63.5	51.1	37.0	27.8	50.1
DESERET	1891-2007	25.8	32.1	40.5	48.3	57.1	66.0	74.0	72.0	62.0	50.0	37.1	27.3	49.4
DESERT EXP RANGE	1950-1984	26.6	32.9	38.6	46.4	55.8	65.7	73.7	71.3	62.2	50.2	37.0	28.1	49.0
DEWEY	1967-2004	26.9	35.2	45.8	53.8	63.4	73.0	79.7	77.6	67.3	54.0	40.0	29.9	53.9
DINOSAUR NM QUARRY AREA	1958-2007	17.9	25.5	39.0	49.1	59.0	68.2	75.2	72.7	62.8	49.8	35.4	22.6	48.1
DRAPER POINT OF THE MTN	1985-2007	32.0	36.2	45.5	52.2	61.4	71.2	78.2	76.8	67.0	54.7	41.4	31.8	54.0
DUCHESNE	1906-2007	17.9	24.6	36.4	46.2	55.0	63.1	69.8	67.8	58.9	47.3	33.1	21.4	45.1
DUGWAY	1950-2007	27.2	33.8	41.3	49.4	59.0	69.1	78.0	75.6	64.5	51.5	38.1	28.7	51.3
ECHO DAM	1948-2007	22.8	26.7	35.4	43.9	52.5	60.5	68.3	66.8	57.8	47.2	34.2	25.0	45.1
ELBERTA	1928-1992	26.4	32.2	40.2	49.1	57.5	66.9	75.1	73.2	63.8	51.6	38.0	29.1	50.3
ELECTRIC LAKE U P & L	1980-2007	13.9	16.2	23.1	31.0	41.7	50.7	57.2	55.5	47.2	36.5	24.4	14.9	34.4
EMERY	1901-1978	24.1	29.1	36.4	44.6	53.3	61.5	67.9	66.0	58.2	47.9	35.9	26.6	46.0
EMERY 15 SW	1979-1986	23.1	23.1	28.9	36.7	45.8	55.9	62.3	60.7	53.2	40.0	28.6	23.3	40.1
ENTERPRISE BERYL JCT	1948-2006	27.8	32.9	39.2	45.7	54.9	63.2	70.3	68.7	59.8	49.0	36.5	28.1	48.0
EPHRAIM SORENSENS FLD	1949-2007	24.7	30.1	38.0	45.6	54.6	64.1	71.8	69.7	60.6	49.5	36.5	26.2	47.6
ESCALANTE	1901-2007	27.4	33.0	40.4	48.0	56.5	65.5	71.5	69.2	61.4	51.0	38.5	29.1	49.3
ESKDALE	1966-2007	28.3	34.0	42.3	49.1	58.4	67.7	75.2	73.1	62.9	51.0	38.2	28.7	50.8
EUREKA	1948-1984	26.5	30.4	35.6	42.8	52.3	61.2	70.1	68.1	59.1	48.1	36.5	27.7	46.5
FAIRFIELD	1950-2007	25.3	30.2	38.6	45.9	54.4	62.8	70.1	68.5	59.4	47.8	35.4	26.4	47.1
FARMINGTON	1948-1965	28.5	34.0	40.5	50.3	59.2	67.5	75.7	74.5	65.5	54.0	39.8	31.2	51.7
FARMINGTON USU FLD STN	1948-2007	29.6	34.2	42.6	50.1	59.0	68.1	76.5	74.5	64.7	52.4	39.9	30.4	51.8
FERRON	1948-2007	23.9	29.6	38.5	47.3	56.9	66.3	73.0	70.4	62.1	50.5	36.4	26.2	48.4

APPENDIX H

ATTACHMENT 3:

HELP PROGRAM OUTPUT

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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:\HELP\IRL\s1\DATA4.D4
TEMPERATURE DATA FILE:      C:\HELP\IRL\s1\DATA7.D7
SOLAR RADIATION DATA FILE:  C:\HELP\IRL\s1\DATA13.D13
EVAPOTRANSPIRATION DATA:    C:\HELP\IRL\s1\DATA11.D11
SOIL AND DESIGN DATA FILE:  C:\HELP\IRL\s1\DATA10.D10
OUTPUT DATA FILE:           C:\HELP\IRL\s1\out.OUT


TIME:  15:18     DATE:   5/21/2010


******************************************************************************

     TITLE:  Intermountain Regional Landfill Scenario 1

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
              WERE SPECIFIED BY THE USER.


                                   LAYER  1
                                   --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   6
           THICKNESS                    =      6.00   INCHES
           POROSITY                     =      0.4530 VOL/VOL
           FIELD CAPACITY               =      0.1900 VOL/VOL
           WILTING POINT                =      0.0850 VOL/VOL
           INITIAL SOIL WATER CONTENT   =      0.1900 VOL/VOL
           EFFECTIVE SAT. HYD. COND.    =  0.720000011000E-03 CM/SEC
         NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  2.49
                  FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.


                                   LAYER  2
                                   --------

                     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   =      0.1100 VOL/VOL
           EFFECTIVE SAT. HYD. COND.    =  0.100000005000E-02 CM/SEC
```

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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:\HELP\IRL\s2\DATA4.D4
TEMPERATURE DATA FILE:      C:\HELP\IRL\s2\DATA7.D7
SOLAR RADIATION DATA FILE:  C:\HELP\IRL\s2\DATA13.D13
EVAPOTRANSPIRATION DATA:    C:\HELP\IRL\s2\DATA11.D11
SOIL AND DESIGN DATA FILE:  C:\HELP\IRL\s2\DATA10.D10
OUTPUT DATA FILE:           C:\HELP\IRL\s2\out.OUT


TIME:  15:19     DATE:   5/21/2010


******************************************************************************

     TITLE:  Intermountain Regional Landfill Scenario 2

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
              WERE SPECIFIED BY THE USER.


                                   LAYER  1
                                   --------

                    TYPE 1 - VERTICAL PERCOLATION LAYER
                        MATERIAL TEXTURE NUMBER   6
           THICKNESS                    =     12.00   INCHES
           POROSITY                     =      0.4530 VOL/VOL
           FIELD CAPACITY               =      0.1900 VOL/VOL
           WILTING POINT                =      0.0850 VOL/VOL
           INITIAL SOIL WATER CONTENT   =      0.1900 VOL/VOL
           EFFECTIVE SAT. HYD. COND.    =  0.720000011000E-03 CM/SEC
         NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  2.49
                  FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.


                                   LAYER  2
                                   --------

                    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   =      0.1100 VOL/VOL
           EFFECTIVE SAT. HYD. COND.    =  0.100000005000E-02 CM/SEC
```

LAYER 3

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 6

THICKNESS	=	24.00	INCHES
POROSITY	=	0.4530	VOL/VOL
FIELD CAPACITY	=	0.1900	VOL/VOL
WILTING POINT	=	0.0850	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1900	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.720000011000E-03	CM/SEC
SLOPE	=	1.60	PERCENT
DRAINAGE LENGTH	=	2500.0	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	=	2.00	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 USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	77.00	
FRACTION OF AREA ALLOWING RUNOFF	=	0.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	16.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	2.720	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	8.120	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	1.328	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	139.027	INCHES
TOTAL INITIAL WATER	=	139.027	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	=	1.60
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
1.09	1.00	1.09	1.02	1.17	0.74
0.92	0.94	0.92	1.10	0.89	0.98

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
25.30	30.20	38.60	45.90	54.40	62.80
70.10	68.50	59.40	47.80	35.40	26.40

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR SALT LAKE CITY UTAH
AND STATION LATITUDE = 40.76 DEGREES

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ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	9.97	36191.109	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	10.184	36968.621	102.15
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		

CHANGE IN WATER STORAGE	-0.214	-777.513	-2.15
SOIL WATER AT START OF YEAR	139.027	504669.687	
SOIL WATER AT END OF YEAR	138.698	503474.125	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.115	418.067	1.16
ANNUAL WATER BUDGET BALANCE	0.0000	0.002	0.00

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ANNUAL TOTALS FOR YEAR 2

	INCHES	CU. FEET	PERCENT
PRECIPITATION	12.61	45774.297	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	12.503	45387.187	99.15
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	0.107	387.129	0.85
SOIL WATER AT START OF YEAR	138.698	503474.125	
SOIL WATER AT END OF YEAR	138.920	504279.312	
SNOW WATER AT START OF YEAR	0.115	418.067	0.91
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.022	0.00

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ANNUAL TOTALS FOR YEAR 3

	INCHES	CU. FEET	PERCENT
PRECIPITATION	7.95	28858.504	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	7.906	28697.498	99.44
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		

CHANGE IN WATER STORAGE	0.044	161.027	0.56
SOIL WATER AT START OF YEAR	138.920	504279.312	
SOIL WATER AT END OF YEAR	138.304	502043.969	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.660	2396.377	8.30
ANNUAL WATER BUDGET BALANCE	0.0000	-0.021	0.00

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ANNUAL TOTALS FOR YEAR 4

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.95	50638.508	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	12.358	44860.863	88.59
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	1.592	5777.574	11.41
SOIL WATER AT START OF YEAR	138.304	502043.969	
SOIL WATER AT END OF YEAR	140.328	509390.156	
SNOW WATER AT START OF YEAR	0.660	2396.377	4.73
SNOW WATER AT END OF YEAR	0.228	827.766	1.63
ANNUAL WATER BUDGET BALANCE	0.0000	0.067	0.00

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ANNUAL TOTALS FOR YEAR 5

	INCHES	CU. FEET	PERCENT
PRECIPITATION	9.43	34230.898	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	9.326	33854.625	98.90
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	0.104	376.289	1.10

SOIL WATER AT START OF YEAR	140.328	509390.156	
SOIL WATER AT END OF YEAR	140.552	510203.531	
SNOW WATER AT START OF YEAR	0.228	827.766	2.42
SNOW WATER AT END OF YEAR	0.108	390.661	1.14
ANNUAL WATER BUDGET BALANCE	0.0000	-0.014	0.00

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ANNUAL TOTALS FOR YEAR 6

	INCHES	CU. FEET	PERCENT
PRECIPITATION	14.03	50928.906	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	12.918	46893.496	92.08
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	1.112	4035.456	7.92
SOIL WATER AT START OF YEAR	140.552	510203.531	
SOIL WATER AT END OF YEAR	141.185	512500.719	
SNOW WATER AT START OF YEAR	0.108	390.661	0.77
SNOW WATER AT END OF YEAR	0.586	2128.952	4.18
ANNUAL WATER BUDGET BALANCE	0.0000	-0.047	0.00

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ANNUAL TOTALS FOR YEAR 7

	INCHES	CU. FEET	PERCENT
PRECIPITATION	11.69	42434.707	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	12.584	45681.336	107.65
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	-0.894	-3246.695	-7.65

SOIL WATER AT START OF YEAR	141.185	512500.719	
SOIL WATER AT END OF YEAR	140.496	510000.719	
SNOW WATER AT START OF YEAR	0.586	2128.952	5.02
SNOW WATER AT END OF YEAR	0.381	1382.258	3.26
ANNUAL WATER BUDGET BALANCE	0.0000	0.066	0.00

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ANNUAL TOTALS FOR YEAR 8

	INCHES	CU. FEET	PERCENT
PRECIPITATION	8.61	31254.299	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	8.556	31060.027	99.38
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	0.054	194.333	0.62
SOIL WATER AT START OF YEAR	140.496	510000.719	
SOIL WATER AT END OF YEAR	140.816	511163.281	
SNOW WATER AT START OF YEAR	0.381	1382.258	4.42
SNOW WATER AT END OF YEAR	0.114	414.023	1.32
ANNUAL WATER BUDGET BALANCE	0.0000	-0.062	0.00

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ANNUAL TOTALS FOR YEAR 9

	INCHES	CU. FEET	PERCENT
PRECIPITATION	12.75	46282.500	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	12.099	43918.012	94.89
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	0.651	2364.476	5.11
SOIL WATER AT START OF YEAR	140.816	511163.281	

SOIL WATER AT END OF YEAR	141.582	513941.781	
SNOW WATER AT START OF YEAR	0.114	414.023	0.89
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.011	0.00

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ANNUAL TOTALS FOR YEAR 10

	INCHES	CU. FEET	PERCENT
PRECIPITATION	11.38	41309.402	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	11.192	40626.805	98.35
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	0.188	682.588	1.65
SOIL WATER AT START OF YEAR	141.582	513941.781	
SOIL WATER AT END OF YEAR	141.497	513632.750	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.273	991.606	2.40
ANNUAL WATER BUDGET BALANCE	0.0000	0.010	0.00

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ANNUAL TOTALS FOR YEAR 11

	INCHES	CU. FEET	PERCENT
PRECIPITATION	12.56	45592.812	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	11.902	43204.625	94.76
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	0.658	2388.200	5.24
SOIL WATER AT START OF YEAR	141.497	513632.750	

SOIL WATER AT END OF YEAR	142.428	517012.562	
SNOW WATER AT START OF YEAR	0.273	991.606	2.17
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.013	0.00

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ANNUAL TOTALS FOR YEAR 12

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.21	37062.305	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	10.317	37452.348	101.05
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	-0.107	-390.066	-1.05
SOIL WATER AT START OF YEAR	142.428	517012.562	
SOIL WATER AT END OF YEAR	142.185	516131.531	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.135	490.958	1.32
ANNUAL WATER BUDGET BALANCE	0.0000	0.020	0.00

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ANNUAL TOTALS FOR YEAR 13

	INCHES	CU. FEET	PERCENT
PRECIPITATION	9.17	33287.113	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	8.294	30108.729	90.45
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	0.876	3178.381	9.55
SOIL WATER AT START OF YEAR	142.185	516131.531	
SOIL WATER AT END OF YEAR	143.103	519465.312	

SNOW WATER AT START OF YEAR	0.135	490.958	1.47
SNOW WATER AT END OF YEAR	0.092	335.562	1.01
ANNUAL WATER BUDGET BALANCE	0.0000	0.005	0.00

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ANNUAL TOTALS FOR YEAR 14

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.57	38369.113	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	9.409	34154.027	89.01
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	1.161	4215.101	10.99
SOIL WATER AT START OF YEAR	143.103	519465.312	
SOIL WATER AT END OF YEAR	143.759	521844.562	
SNOW WATER AT START OF YEAR	0.092	335.562	0.87
SNOW WATER AT END OF YEAR	0.598	2171.410	5.66
ANNUAL WATER BUDGET BALANCE	0.0000	-0.015	0.00

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ANNUAL TOTALS FOR YEAR 15

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.35	37570.500	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	9.314	33809.922	89.99
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	1.036	3760.573	10.01
SOIL WATER AT START OF YEAR	143.759	521844.562	
SOIL WATER AT END OF YEAR	145.393	527776.562	

SNOW WATER AT START OF YEAR	0.598	2171.410	5.78
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.007	0.00

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ANNUAL TOTALS FOR YEAR 16

	INCHES	CU. FEET	PERCENT
PRECIPITATION	11.13	40401.906	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	11.001	39934.230	98.84
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	0.129	467.708	1.16
SOIL WATER AT START OF YEAR	145.393	527776.562	
SOIL WATER AT END OF YEAR	145.522	528244.250	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.031	0.00

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ANNUAL TOTALS FOR YEAR 17

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.60	38478.008	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	9.377	34037.777	88.46
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	1.223	4440.155	11.54
SOIL WATER AT START OF YEAR	145.522	528244.250	
SOIL WATER AT END OF YEAR	146.362	531294.375	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00

SNOW WATER AT END OF YEAR	0.383	1390.027	3.61
ANNUAL WATER BUDGET BALANCE	0.0000	0.074	0.00

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ANNUAL TOTALS FOR YEAR 18

	INCHES	CU. FEET	PERCENT
PRECIPITATION	11.99	43523.711	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	11.302	41027.914	94.27
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	0.688	2495.821	5.73
SOIL WATER AT START OF YEAR	146.362	531294.375	
SOIL WATER AT END OF YEAR	147.391	535030.375	
SNOW WATER AT START OF YEAR	0.383	1390.027	3.19
SNOW WATER AT END OF YEAR	0.041	149.833	0.34
ANNUAL WATER BUDGET BALANCE	0.0000	-0.027	0.00

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ANNUAL TOTALS FOR YEAR 19

	INCHES	CU. FEET	PERCENT
PRECIPITATION	6.95	25228.502	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	6.331	22981.078	91.09
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	0.619	2247.439	8.91
SOIL WATER AT START OF YEAR	147.391	535030.375	
SOIL WATER AT END OF YEAR	147.602	535794.437	
SNOW WATER AT START OF YEAR	0.041	149.833	0.59

SNOW WATER AT END OF YEAR	0.450	1633.231	6.47
ANNUAL WATER BUDGET BALANCE	0.0000	-0.016	0.00

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ANNUAL TOTALS FOR YEAR 20

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.72	49803.602	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	12.057	43768.371	87.88
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	1.663	6035.281	12.12
SOIL WATER AT START OF YEAR	147.602	535794.437	
SOIL WATER AT END OF YEAR	149.239	541738.625	
SNOW WATER AT START OF YEAR	0.450	1633.231	3.28
SNOW WATER AT END OF YEAR	0.475	1724.343	3.46
ANNUAL WATER BUDGET BALANCE	0.0000	-0.052	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 20

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.94	0.86	1.22	0.96	1.01	0.75
	0.81	0.89	0.83	0.87	0.80	1.04
STD. DEVIATIONS	0.50	0.46	0.50	0.44	0.56	0.52
	0.57	0.89	0.70	0.61	0.38	0.46
RUNOFF						
TOTALS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION						

TOTALS	0.517	0.560	1.465	1.544	1.165	1.125
	0.825	0.857	0.714	0.505	0.597	0.573
STD. DEVIATIONS	0.205	0.175	0.380	0.619	0.568	0.575
	0.569	0.897	0.626	0.398	0.222	0.163

LATERAL DRAINAGE COLLECTED FROM LAYER 3

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

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	0.0000	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

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 20

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.98 (1.982)	39861.0	100.00
RUNOFF	0.000 (0.0000)	0.00	0.000
EVAPOTRANSPIRATION	10.447 (1.8360)	37921.37	95.134
LATERAL DRAINAGE COLLECTED FROM LAYER 3	0.00000 (0.00000)	0.000	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.00000 (0.00000)	0.000	0.00000
AVERAGE HEAD ON TOP OF LAYER 4	0.000 (0.000)		
CHANGE IN WATER STORAGE	0.534 (0.6552)	1939.66	4.866

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 20

	(INCHES)	(CU. FT.)
PRECIPITATION	1.27	4610.100
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 3	0.00000	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 4	0.000	
MAXIMUM HEAD ON TOP OF LAYER 4	0.000	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	1.55	5618.2544

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.3003

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.0830

*** 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 20

LAYER	(INCHES)	(VOL/VOL)
1	3.0539	0.2545
2	141.4379	0.1179
3	4.5600	0.1900
4	0.0000	0.0000
5	0.1875	0.7500
SNOW WATER	0.475	

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LAYER 3

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 6

THICKNESS	=	24.00 INCHES
POROSITY	=	0.4530 VOL/VOL
FIELD CAPACITY	=	0.1900 VOL/VOL
WILTING POINT	=	0.0850 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1900 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.720000011000E-03 CM/SEC
SLOPE	=	1.60 PERCENT
DRAINAGE LENGTH	=	2500.0 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	=	2.00 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 USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	77.00
FRACTION OF AREA ALLOWING RUNOFF	=	0.0 PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000 ACRES
EVAPORATIVE ZONE DEPTH	=	16.0 INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	2.240 INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	9.428 INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	1.280 INCHES
INITIAL SNOW WATER	=	0.000 INCHES
INITIAL WATER IN LAYER MATERIALS	=	19.087 INCHES
TOTAL INITIAL WATER	=	19.087 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	=	1.60
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
1.09	1.00	1.09	1.02	1.17	0.74
0.92	0.94	0.92	1.10	0.89	0.98

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
25.30	30.20	38.60	45.90	54.40	62.80
70.10	68.50	59.40	47.80	35.40	26.40

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR SALT LAKE CITY UTAH
AND STATION LATITUDE = 40.76 DEGREES

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ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	9.97	36191.109	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	9.791	35540.309	98.20
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		

CHANGE IN WATER STORAGE	0.179	650.786	1.80
SOIL WATER AT START OF YEAR	19.087	69287.547	
SOIL WATER AT END OF YEAR	19.152	69520.266	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.115	418.067	1.16
ANNUAL WATER BUDGET BALANCE	0.0000	0.012	0.00

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ANNUAL TOTALS FOR YEAR 2

	INCHES	CU. FEET	PERCENT
PRECIPITATION	12.61	45774.297	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	12.751	46284.473	101.11
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	-0.141	-510.152	-1.11
SOIL WATER AT START OF YEAR	19.152	69520.266	
SOIL WATER AT END OF YEAR	19.126	69428.180	
SNOW WATER AT START OF YEAR	0.115	418.067	0.91
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.026	0.00

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ANNUAL TOTALS FOR YEAR 3

	INCHES	CU. FEET	PERCENT
PRECIPITATION	7.95	28858.504	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	7.865	28548.961	98.93
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		

CHANGE IN WATER STORAGE	0.085	309.526	1.07
SOIL WATER AT START OF YEAR	19.126	69428.180	
SOIL WATER AT END OF YEAR	18.551	67341.328	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.660	2396.377	8.30
ANNUAL WATER BUDGET BALANCE	0.0000	0.018	0.00

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ANNUAL TOTALS FOR YEAR 4

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.95	50638.508	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	12.516	45431.453	89.72
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	1.434	5207.050	10.28
SOIL WATER AT START OF YEAR	18.551	67341.328	
SOIL WATER AT END OF YEAR	20.418	74116.992	
SNOW WATER AT START OF YEAR	0.660	2396.377	4.73
SNOW WATER AT END OF YEAR	0.228	827.766	1.63
ANNUAL WATER BUDGET BALANCE	0.0000	0.004	0.00

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ANNUAL TOTALS FOR YEAR 5

	INCHES	CU. FEET	PERCENT
PRECIPITATION	9.43	34230.898	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	9.718	35274.770	103.05
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	-0.288	-1043.868	-3.05

SOIL WATER AT START OF YEAR	20.418	74116.992	
SOIL WATER AT END OF YEAR	20.251	73510.227	
SNOW WATER AT START OF YEAR	0.228	827.766	2.42
SNOW WATER AT END OF YEAR	0.108	390.661	1.14
ANNUAL WATER BUDGET BALANCE	0.0000	-0.004	0.00

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ANNUAL TOTALS FOR YEAR 6

	INCHES	CU. FEET	PERCENT
PRECIPITATION	14.03	50928.906	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	12.938	46964.297	92.22
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	1.092	3964.634	7.78
SOIL WATER AT START OF YEAR	20.251	73510.227	
SOIL WATER AT END OF YEAR	20.864	75736.570	
SNOW WATER AT START OF YEAR	0.108	390.661	0.77
SNOW WATER AT END OF YEAR	0.586	2128.952	4.18
ANNUAL WATER BUDGET BALANCE	0.0000	-0.026	0.00

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ANNUAL TOTALS FOR YEAR 7

	INCHES	CU. FEET	PERCENT
PRECIPITATION	11.69	42434.707	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	12.570	45629.660	107.53
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	-0.880	-3194.955	-7.53

SOIL WATER AT START OF YEAR	20.864	75736.570	
SOIL WATER AT END OF YEAR	20.190	73288.312	
SNOW WATER AT START OF YEAR	0.586	2128.952	5.02
SNOW WATER AT END OF YEAR	0.381	1382.258	3.26
ANNUAL WATER BUDGET BALANCE	0.0000	0.000	0.00

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ANNUAL TOTALS FOR YEAR 8

	INCHES	CU. FEET	PERCENT
PRECIPITATION	8.61	31254.299	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	8.182	29700.090	95.03
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	0.428	1554.205	4.97
SOIL WATER AT START OF YEAR	20.190	73288.312	
SOIL WATER AT END OF YEAR	20.885	75810.750	
SNOW WATER AT START OF YEAR	0.381	1382.258	4.42
SNOW WATER AT END OF YEAR	0.114	414.023	1.32
ANNUAL WATER BUDGET BALANCE	0.0000	0.004	0.00

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ANNUAL TOTALS FOR YEAR 9

	INCHES	CU. FEET	PERCENT
PRECIPITATION	12.75	46282.500	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	12.497	45364.285	98.02
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	0.253	918.217	1.98
SOIL WATER AT START OF YEAR	20.885	75810.750	

SOIL WATER AT END OF YEAR	21.252	77142.992	
SNOW WATER AT START OF YEAR	0.114	414.023	0.89
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.003	0.00

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ANNUAL TOTALS FOR YEAR 10

	INCHES	CU. FEET	PERCENT
PRECIPITATION	11.38	41309.402	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	11.454	41579.582	100.65
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	-0.074	-270.179	-0.65
SOIL WATER AT START OF YEAR	21.252	77142.992	
SOIL WATER AT END OF YEAR	20.904	75881.203	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.273	991.606	2.40
ANNUAL WATER BUDGET BALANCE	0.0000	0.000	0.00

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ANNUAL TOTALS FOR YEAR 11

	INCHES	CU. FEET	PERCENT
PRECIPITATION	12.56	45592.812	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	11.805	42850.980	93.99
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	0.755	2741.820	6.01
SOIL WATER AT START OF YEAR	20.904	75881.203	

SOIL WATER AT END OF YEAR	21.932	79614.633	
SNOW WATER AT START OF YEAR	0.273	991.606	2.17
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.011	0.00

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ANNUAL TOTALS FOR YEAR 12

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.21	37062.305	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	10.571	38373.039	103.54
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	-0.361	-1310.734	-3.54
SOIL WATER AT START OF YEAR	21.932	79614.633	
SOIL WATER AT END OF YEAR	21.436	77812.937	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.135	490.958	1.32
ANNUAL WATER BUDGET BALANCE	0.0000	0.000	0.00

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ANNUAL TOTALS FOR YEAR 13

	INCHES	CU. FEET	PERCENT
PRECIPITATION	9.17	33287.113	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	7.927	28774.422	86.44
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	1.243	4512.684	13.56
SOIL WATER AT START OF YEAR	21.436	77812.937	
SOIL WATER AT END OF YEAR	22.722	82481.023	

SNOW WATER AT START OF YEAR	0.135	490.958	1.47
SNOW WATER AT END OF YEAR	0.092	335.562	1.01
ANNUAL WATER BUDGET BALANCE	0.0000	0.009	0.00

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ANNUAL TOTALS FOR YEAR 14

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.57	38369.113	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	9.781	35505.859	92.54
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	0.789	2863.267	7.46
SOIL WATER AT START OF YEAR	22.722	82481.023	
SOIL WATER AT END OF YEAR	23.005	83508.437	
SNOW WATER AT START OF YEAR	0.092	335.562	0.87
SNOW WATER AT END OF YEAR	0.598	2171.410	5.66
ANNUAL WATER BUDGET BALANCE	0.0000	-0.012	0.00

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ANNUAL TOTALS FOR YEAR 15

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.35	37570.500	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	9.131	33147.066	88.23
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	1.219	4423.439	11.77
SOIL WATER AT START OF YEAR	23.005	83508.437	
SOIL WATER AT END OF YEAR	24.822	90103.289	

SNOW WATER AT START OF YEAR	0.598	2171.410	5.78
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.003	0.00

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ANNUAL TOTALS FOR YEAR 16

	INCHES	CU. FEET	PERCENT
PRECIPITATION	11.13	40401.906	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	11.440	41527.703	102.79
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	-0.310	-1125.803	-2.79
SOIL WATER AT START OF YEAR	24.822	90103.289	
SOIL WATER AT END OF YEAR	24.512	88977.484	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.007	0.00

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ANNUAL TOTALS FOR YEAR 17

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.60	38478.008	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	9.838	35713.051	92.81
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	0.762	2764.944	7.19
SOIL WATER AT START OF YEAR	24.512	88977.484	
SOIL WATER AT END OF YEAR	24.890	90352.398	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00

SNOW WATER AT END OF YEAR	0.383	1390.027	3.61
ANNUAL WATER BUDGET BALANCE	0.0000	0.012	0.00

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ANNUAL TOTALS FOR YEAR 18

	INCHES	CU. FEET	PERCENT
PRECIPITATION	11.99	43523.711	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	11.623	42190.238	96.94
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	0.367	1333.475	3.06
SOIL WATER AT START OF YEAR	24.890	90352.398	
SOIL WATER AT END OF YEAR	25.599	92926.070	
SNOW WATER AT START OF YEAR	0.383	1390.027	3.19
SNOW WATER AT END OF YEAR	0.041	149.833	0.34
ANNUAL WATER BUDGET BALANCE	0.0000	-0.002	0.00

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ANNUAL TOTALS FOR YEAR 19

	INCHES	CU. FEET	PERCENT
PRECIPITATION	6.95	25228.502	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	6.739	24463.023	96.97
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	0.211	765.475	3.03
SOIL WATER AT START OF YEAR	25.599	92926.070	
SOIL WATER AT END OF YEAR	25.402	92208.148	
SNOW WATER AT START OF YEAR	0.041	149.833	0.59

SNOW WATER AT END OF YEAR	0.450	1633.231	6.47
ANNUAL WATER BUDGET BALANCE	0.0000	0.003	0.00

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ANNUAL TOTALS FOR YEAR 20

	INCHES	CU. FEET	PERCENT
PRECIPITATION	13.72	49803.602	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	12.102	43931.852	88.21
DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 5	0.000000	0.000	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0000		
CHANGE IN WATER STORAGE	1.618	5871.737	11.79
SOIL WATER AT START OF YEAR	25.402	92208.148	
SOIL WATER AT END OF YEAR	26.994	97988.773	
SNOW WATER AT START OF YEAR	0.450	1633.231	3.28
SNOW WATER AT END OF YEAR	0.475	1724.343	3.46
ANNUAL WATER BUDGET BALANCE	0.0000	0.014	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 20

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	0.94	0.86	1.22	0.96	1.01	0.75
	0.81	0.89	0.83	0.87	0.80	1.04
STD. DEVIATIONS	0.50	0.46	0.50	0.44	0.56	0.52
	0.57	0.89	0.70	0.61	0.38	0.46
RUNOFF						
TOTALS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

EVAPOTRANSPIRATION

TOTALS	0.518	0.560	1.446	1.594	1.245	1.245
	0.818	0.820	0.744	0.474	0.525	0.572
STD. DEVIATIONS	0.205	0.173	0.381	0.636	0.552	0.538
	0.558	0.885	0.625	0.342	0.164	0.163

LATERAL DRAINAGE COLLECTED FROM LAYER 3

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

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	0.0000	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

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 20

	INCHES	CU. FEET	PERCENT
PRECIPITATION	10.98 (1.982)	39861.0	100.00
RUNOFF	0.000 (0.0000)	0.00	0.000
EVAPOTRANSPIRATION	10.562 (1.8866)	38339.75	96.184
LATERAL DRAINAGE COLLECTED FROM LAYER 3	0.00000 (0.00000)	0.000	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.00000 (0.00000)	0.000	0.00000
AVERAGE HEAD ON TOP OF LAYER 4	0.000 (0.000)		
CHANGE IN WATER STORAGE	0.419 (0.6780)	1521.28	3.816

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 20

	(INCHES)	(CU. FT.)
PRECIPITATION	1.27	4610.100
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 3	0.00000	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 4	0.000	
MAXIMUM HEAD ON TOP OF LAYER 4	0.000	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	1.55	5618.2544
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3100	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0800	

*** 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 20

LAYER	(INCHES)	(VOL/VOL)
1	1.8406	0.3068
2	20.4060	0.1701
3	4.5600	0.1900
4	0.0000	0.0000
5	0.1875	0.7500
SNOW WATER	0.475	

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APPENDIX H

ATTACHMENT 4:

LEACHATE COLLECTION PIPE CAPACITY CALCULATION

Worksheet for IRL 8" Leachate Collection Pipe

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01400	ft/ft
Normal Depth	0.67	ft
Diameter	0.67	ft
Discharge	1.45	ft³/s

Results

Discharge	1.45	ft³/s
Normal Depth	0.67	ft
Flow Area	0.35	ft²
Wetted Perimeter	2.10	ft
Top Width	0.00	ft
Critical Depth	0.56	ft
Percent Full	100.0	%
Critical Slope	0.01337	ft/ft
Velocity	4.11	ft/s
Velocity Head	0.26	ft
Specific Energy	0.93	ft
Froude Number	0.00	
Maximum Discharge	1.56	ft³/s
Discharge Full	1.45	ft³/s
Slope Full	0.01400	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%

Worksheet for IRL 8" Leachate Collection Pipe

GVF Output Data

Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.67	ft
Critical Depth	0.56	ft
Channel Slope	0.01400	ft/ft
Critical Slope	0.01337	ft/ft

APPENDIX I:

LEACHATE POND CALCULATIONS

ONE COMPANY
Many Solutions SM

Project:	Intermountain Regional Landfill	Computed:	RLR	Date:	3/1/2010
Subject:	Hydrologic Analysis	Checked:	TW	Date:	6/10/2010
Task:	Leachate Pond Volume Calculations				
Job #:					

The required volume of the intermediate leachate pond was calculated using the area of Cell 1 Phase 1. The design storm for the leachate pond is the 25-year, 24-hour storm. The pond was designed to hold the entire 25-year, 24-hour storm.

25-yr, 24-hr Precip. = 1.74 inches

From NOAA Altas 14 Point Precipitation Frequency Estimates (See attached)

Volume Required

Cell Name	Area (Ac), A	25-yr, 24-hr Precip. (in.)	Volume Required[1] (ac-ft)	Volume Required (ft^3)
Cell 1, Stage 1	8.0	1.74	1.16	50,530

<u>Volume Provided</u>

Bottom Elevation= 4824.00

Top Elevation= 4826.00

Volume Provided= 66,635 ft^3 (Volume determined using AutoCAD Civil 3D 2008)

Summary

Volume Provided	66,635	ft^3
Volume Required	50,530	ft^3
Balance	16,105	ft^3

Volume Provided > Volume Required

(1) Vrequired = $(P_{25,24}*A)/12$

POINT PRECIPITATION FREQUENCY ESTIMATES FROM NOAA ATLAS 14

Utah 40.210671 N 112.077606 W 4845 feet

from "Precipitation-Frequency Atlas of the United States" NOAA Atlas 14, Volume 1, Version 4
G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley
NOAA, National Weather Service, Silver Spring, Maryland, 2006
Extracted: Mon Mar 1 2010

Confidence Limits | Seasonality | Location Maps | Other Info. | GIS data | Maps | Docs | Return to State Map

Precipitation Frequency Estimates (inches)

ARI* (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.11	0.17	0.21	0.29	0.36	0.44	0.49	0.62	0.76	0.90	1.00	1.19	1.39	1.57	2.04	2.41	2.99	3.51
2	0.14	0.22	0.27	0.37	0.45	0.55	0.61	0.76	0.93	1.11	1.23	1.46	1.71	1.92	2.50	2.95	3.66	4.29
5	0.20	0.31	0.38	0.51	0.63	0.72	0.78	0.94	1.13	1.32	1.47	1.75	2.04	2.29	2.97	3.50	4.31	5.05
10	0.25	0.38	0.47	0.64	0.79	0.89	0.93	1.09	1.29	1.50	1.67	2.00	2.32	2.59	3.33	3.94	4.81	5.62
25	0.33	0.50	0.62	0.84	1.03	1.14	1.17	1.31	1.52	1.74	1.94	2.34	2.70	2.98	3.80	4.51	5.45	6.34
50	0.40	0.61	0.76	1.02	1.26	1.36	1.39	1.50	1.69	1.92	2.14	2.62	2.99	3.28	4.13	4.93	5.91	6.86
100	0.48	0.73	0.91	1.23	1.52	1.63	1.64	1.74	1.88	2.10	2.35	2.90	3.28	3.58	4.46	5.35	6.34	7.34
200	0.58	0.88	1.09	1.47	1.82	1.93	1.95	2.02	2.15	2.28	2.56	3.19	3.57	3.87	4.77	5.75	6.74	7.79
500	0.73	1.10	1.37	1.84	2.28	2.41	2.42	2.50	2.57	2.60	2.85	3.58	3.96	4.24	5.15	6.27	7.22	8.31
1000	0.86	1.31	1.62	2.18	2.70	2.84	2.84	2.91	2.92	2.95	3.06	3.89	4.25	4.51	5.42	6.64	7.55	8.66

* These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval.
Please refer to NOAA Atlas 14 Document for more information. NOTE: Formatting forces estimates near zero to appear as zero.

*** Upper bound of the 90% confidence interval**
Precipitation Frequency Estimates (inches)

ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.14	0.20	0.25	0.34	0.42	0.50	0.55	0.69	0.83	0.98	1.09	1.30	1.52	1.71	2.21	2.60	3.23	3.75
2	0.17	0.26	0.32	0.44	0.54	0.64	0.69	0.84	1.03	1.20	1.33	1.59	1.86	2.08	2.72	3.19	3.95	4.59
5	0.24	0.37	0.45	0.61	0.76	0.84	0.89	1.04	1.24	1.43	1.59	1.92	2.23	2.48	3.22	3.78	4.64	5.39
10	0.30	0.46	0.57	0.77	0.95	1.03	1.06	1.21	1.43	1.62	1.81	2.19	2.53	2.80	3.61	4.24	5.17	5.99
25	0.40	0.60	0.75	1.01	1.25	1.32	1.34	1.46	1.68	1.88	2.09	2.56	2.93	3.22	4.11	4.86	5.85	6.75
50	0.48	0.74	0.92	1.23	1.53	1.60	1.61	1.68	1.88	2.07	2.31	2.86	3.24	3.54	4.46	5.32	6.35	7.30
100	0.59	0.89	1.11	1.49	1.84	1.92	1.94	1.96	2.11	2.27	2.55	3.17	3.56	3.87	4.83	5.78	6.81	7.81
200	0.71	1.08	1.34	1.81	2.24	2.31	2.34	2.36	2.43	2.46	2.78	3.49	3.88	4.18	5.17	6.22	7.24	8.29
500	0.91	1.38	1.71	2.31	2.86	2.93	2.96	2.99	3.02	3.05	3.10	3.94	4.31	4.60	5.60	6.80	7.76	8.86
1000	1.09	1.65	2.05	2.76	3.41	3.52	3.55	3.59	3.62	3.66	3.69	4.30	4.64	4.92	5.91	7.21	8.12	9.24

* The upper bound of the confidence interval at 90% confidence level is the value which 5% of the simulated quantile values for a given frequency are greater than.
** These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval.

Please refer to NOAA Atlas 14 Document for more information. NOTE: Formatting prevents estimates near zero to appear as zero.

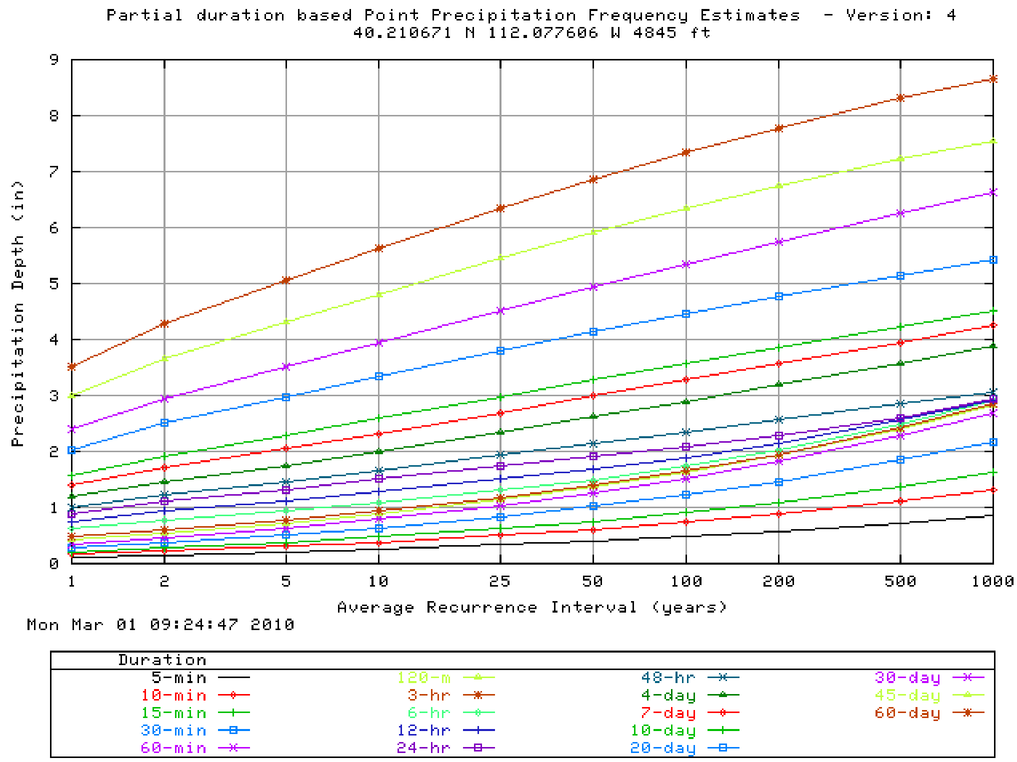
*** Lower bound of the 90% confidence interval**
Precipitation Frequency Estimates (inches)

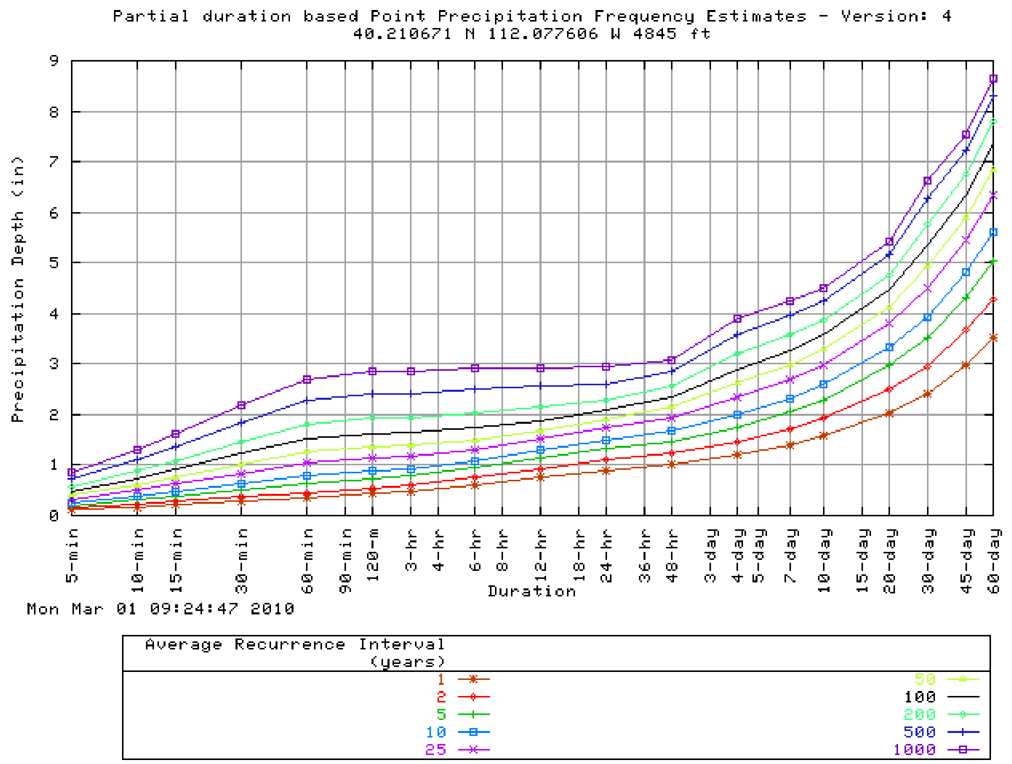
ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.10	0.15	0.18	0.24	0.30	0.39	0.44	0.57	0.70	0.83	0.93	1.09	1.28	1.45	1.88	2.22	2.78	3.27
2	0.12	0.19	0.23	0.32	0.39	0.48	0.54	0.70	0.85	1.02	1.14	1.34	1.57	1.77	2.31	2.73	3.40	4.00
5	0.17	0.26	0.32	0.44	0.54	0.63	0.69	0.85	1.03	1.22	1.36	1.61	1.88	2.11	2.75	3.24	4.01	4.70
10	0.21	0.32	0.40	0.54	0.67	0.77	0.82	0.99	1.18	1.38	1.54	1.83	2.13	2.39	3.08	3.64	4.47	5.24
25	0.27	0.41	0.51	0.69	0.85	0.96	1.02	1.17	1.38	1.59	1.78	2.14	2.47	2.74	3.51	4.17	5.07	5.90
50	0.32	0.49	0.61	0.82	1.02	1.13	1.18	1.32	1.52	1.75	1.97	2.38	2.73	3.01	3.82	4.54	5.49	6.38
100	0.38	0.58	0.72	0.96	1.19	1.32	1.37	1.50	1.67	1.91	2.16	2.63	2.98	3.27	4.11	4.92	5.88	6.81
200	0.44	0.67	0.83	1.12	1.39	1.51	1.58	1.72	1.87	2.06	2.33	2.87	3.24	3.52	4.38	5.26	6.25	7.21
500	0.53	0.81	1.00	1.35	1.67	1.81	1.88	2.06	2.19	2.26	2.57	3.20	3.56	3.84	4.72	5.71	6.68	7.68
1000	0.60	0.92	1.14	1.53	1.90	2.05	2.13	2.34	2.44	2.47	2.75	3.44	3.80	4.07	4.95	6.02	6.96	7.99

* The lower bound of the confidence interval at 90% confidence level is the value which 5% of the simulated quantile values for a given frequency are less than.

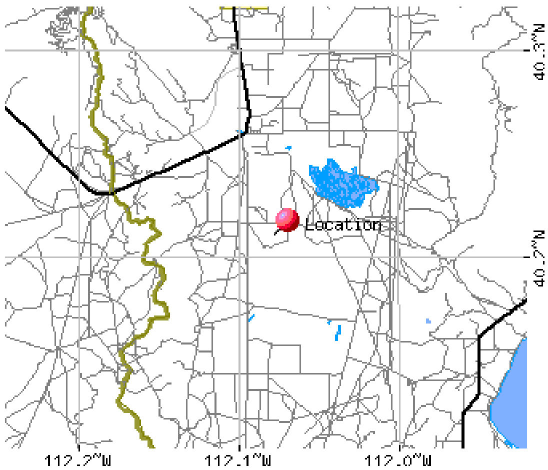
** These precipitation frequency estimates are based on a partial duration maxima series. ARI is the Average Recurrence Interval.
Please refer to NOAA Atlas 14 Document for more information. NOTE: Formatting prevents estimates near zero to appear as zero.

Text version of tables





Maps -



These maps were produced using a direct map request from the U.S. Census Bureau Mapping and Cartographic Resources Tiger Map Server.

Please read disclaimer for more information.

LEGEND

State
County
Indian Resv
Lake/Pond/Ocean
Street
Expressway
Highway
Connector
Stream
Military Area
National Park
Other Park
City
County

Scale 1:228583
0 2 4 6 8 mi
0 2 4 6 8 10 km
*average--true scale depends on monitor resolution

Other Maps/Photographs -

View USGS digital orthophoto quadrangle (DOQ) covering this location from TerraServer; **USGS Aerial Photograph** may also be available from this site. A DOQ is a computer-generated image of an aerial photograph in which image displacement caused by terrain relief and camera tilts has been removed. It combines the image characteristics of a photograph with the geometric qualities of a map. Visit the USGS for more information.

Watershed/Stream Flow Information -

Find the Watershed for this location using the U.S. Environmental Protection Agency's site.

Climate Data Sources -

Precipitation frequency results are based on data from a variety of sources, but largely NCDC. The following links provide general information about observing sites in the area, regardless of if their data was used in this study. For detailed information about the stations used in this study, please refer to NOAA Atlas 14 Document.

Using the **National Climatic Data Center's (NCDC)** station search engine, locate other climate stations within:

+/-30 minutes ...OR... +/-1 degree of this location (40.210671/-112.077606). Digital ASCII data can be obtained directly from **NCDC**.

Find Natural Resources Conservation Service (NRCS) SNOTEL (SNOwpack TELemetry) stations by visiting the **Western Regional Climate Center's state-specific SNOTEL station maps**.

Hydrometeorological Design Studies Center
DOC/NOAA/National Weather Service
1325 East-West Highway
Silver Spring, MD 20910
(301) 713-1669
Questions?: HDSC.Questions@noaa.gov

Disclaimer

APPENDIX J:

RUN-ON AND RUN-OFF CALCULATIONS

Project:	Intermountain Regional Landfill	Computed:	RLR	Date:	8/13/2010
Subject:	Run-off calculations	Checked:	trw	Date:	7/12/2010
Task:	Determine Flow Rates using Rational Method				
Job #:					

HDR ONE COMPANY *Many Solutions*℠

DA-1: Cell 1 North - Diversion Ditch around Cell 1

Rational Equation Parameters

Drainage Area (A) = 19.37 ac

Time of Concentration

$$t_c = \sum_{i=1}^{k} T_{ti} = \sum_{i=1}^{k} \left(\frac{L_i}{60V_i} \right)$$

Eq. 7.11 from UDOT Manual: Roadway Drainage, Hydrology (See Attached)

$$V = kS^{0.5}$$

Eq. 7.12 from UDOT Manual: Roadway Drainage, Hydrology (See Attached)

where:
- tc= Time of concentration (min); V= Velocity (ft/s)
- L= Length of segment (ft); S= Slope (%)
- k= Intercept coefficient from Table 7-10 from UDOT Manual: Roadway Drainage, Hydrology (See Attached)

Segment 1:
L= 310 ft
S= 25.0%
k= 1.61 (Assume shallow, concentrated flow)
V= 8.1 ft/s
Therefore, tc= 0.64 min

Segment 2:
L= 3300 ft
S= 2.0%
k= 1.61 (Assume shallow, concentrated flow)
V= 2.3 ft/s
Therefore, tc= 24.16 min

Total tc= 24.80 min

Rainfall intensity (i) for 25-year storm

For tc= 24.80 min
i_{25}= 2.48 in/hr (From IDF curves from NOAA Atlas 14 (See attached))

Rainfall Runoff Coefficient

C= 0.30 (C value for unimproved area from Table 7-24 from UDOT Manual of Instruction (See attached))

Frequency Factor for Rational Formula

C_f = 1.1 (Frequency Factor for 25-year recurrence internval, from Table 7-21 from UDOT Manual of Instruction)

Discharge Calculation

$Q=C*C_f*I*A$

Q_{25}=	16	cfs

Project:	Intermountain Regional Landfill	Computed:	RLR	Date:	8/13/2010
Subject:	Run-off calculations	Checked:	trw	Date:	7/12/2010
Task:	Determine Flow Rates using Rational Method				
Job #:					

HDR ONE COMPANY *Many Solutions* SM

DA-1: Cell 1 South - Diversion Ditch around Cell 1

Rational Equation Parameters

Drainage Area (A) = 25.20 ac

Time of Concentration

$$t_c = \sum_{i=1}^{k} T_{ti} = \sum_{i=1}^{k} \left(\frac{L_i}{60 V_i} \right)$$

Eq. 7.11 from UDOT Manual: Roadway Drainage, Hydrology (See Attached)

$$V = kS^{0.5}$$

Eq. 7.12 from UDOT Manual: Roadway Drainage, Hydrology (See Attached)

where:
tc= Time of concentration (min) V= Velocity (ft/s)
L= Length of segment (ft) S= Slope (%)
k= Intercept coefficient from Table 7-10 from UDOT Manual: Roadway Drainage, Hydrology (See Attached)

Segment 1:
L= 310 ft
S= 25.0%
k= 1.61 (Assume shallow, concentrated flow)
V= 8.1 ft/s
Therefore, tc= 0.64 min

Segment 2:
L= 2540 ft
S= 2.0%
k= 1.61 (Assume shallow, concentrated flow)
V= 2.3 ft/s
Therefore, tc= 18.59 min

Total tc= 19.23 min

Rainfall intensity (i) for 25-year storm

For tc= 19.23 min
i_{25}= 2.48 in/hr (From IDF curves from NOAA Atlas 14 (See attached))

Rainfall Runoff Coefficient

C= 0.30 (C value for unimproved area from Table 7-24 from UDOT Manual of Instruction (See attached))

Frequency Factor for Rational Formula

C_f = 1.1 (Frequency Factor for 25-year recurrence internval, from Table 7-21 from UDOT Manual of Instruction (See attached))

Discharge Calculation

$Q=C*C_f*I*A$

Q_{25}=	21	cfs

Worksheet for IRL Triangular Channel for Run-off (16 CFS)

Project Description

Friction Method	Manning Formula	
Solve For	Normal Depth	

Input Data

Roughness Coefficient	0.027	
Channel Slope	0.01000	ft/ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Discharge	16.00	ft³/s

Results

Normal Depth	1.06	ft
Flow Area	4.52	ft²
Wetted Perimeter	8.77	ft
Top Width	8.50	ft
Critical Depth	1.00	ft
Critical Slope	0.01394	ft/ft
Velocity	3.54	ft/s
Velocity Head	0.19	ft
Specific Energy	1.26	ft
Froude Number	0.86	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.06	ft
Critical Depth	1.00	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.01394	ft/ft

Worksheet for IRL Triangular Channel for Run-off (21 CFS)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.027	
Channel Slope	0.01000	ft/ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Discharge	21.00	ft³/s

Results

Normal Depth	1.18	ft
Flow Area	5.54	ft²
Wetted Perimeter	9.71	ft
Top Width	9.42	ft
Critical Depth	1.11	ft
Critical Slope	0.01344	ft/ft
Velocity	3.79	ft/s
Velocity Head	0.22	ft
Specific Energy	1.40	ft
Froude Number	0.87	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.18	ft
Critical Depth	1.11	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.01344	ft/ft

Worksheet for North Channel

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.020	
Channel Slope	0.00200	ft/ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Bottom Width	10.00	ft
Discharge	142.00	ft³/s

Results

Normal Depth	1.97	ft
Flow Area	35.15	ft²
Wetted Perimeter	26.22	ft
Top Width	25.74	ft
Critical Depth	1.50	ft
Critical Slope	0.00579	ft/ft
Velocity	4.04	ft/s
Velocity Head	0.25	ft
Specific Energy	2.22	ft
Froude Number	0.61	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.97	ft
Critical Depth	1.50	ft
Channel Slope	0.00200	ft/ft
Critical Slope	0.00579	ft/ft

Worksheet for West Channel

Project Description

Friction Method	Manning Formula	
Solve For	Normal Depth	

Input Data

Roughness Coefficient	0.020	
Channel Slope	0.00080	ft/ft
Left Side Slope	6.67	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Bottom Width	10.00	ft
Discharge	142.00	ft³/s

Results

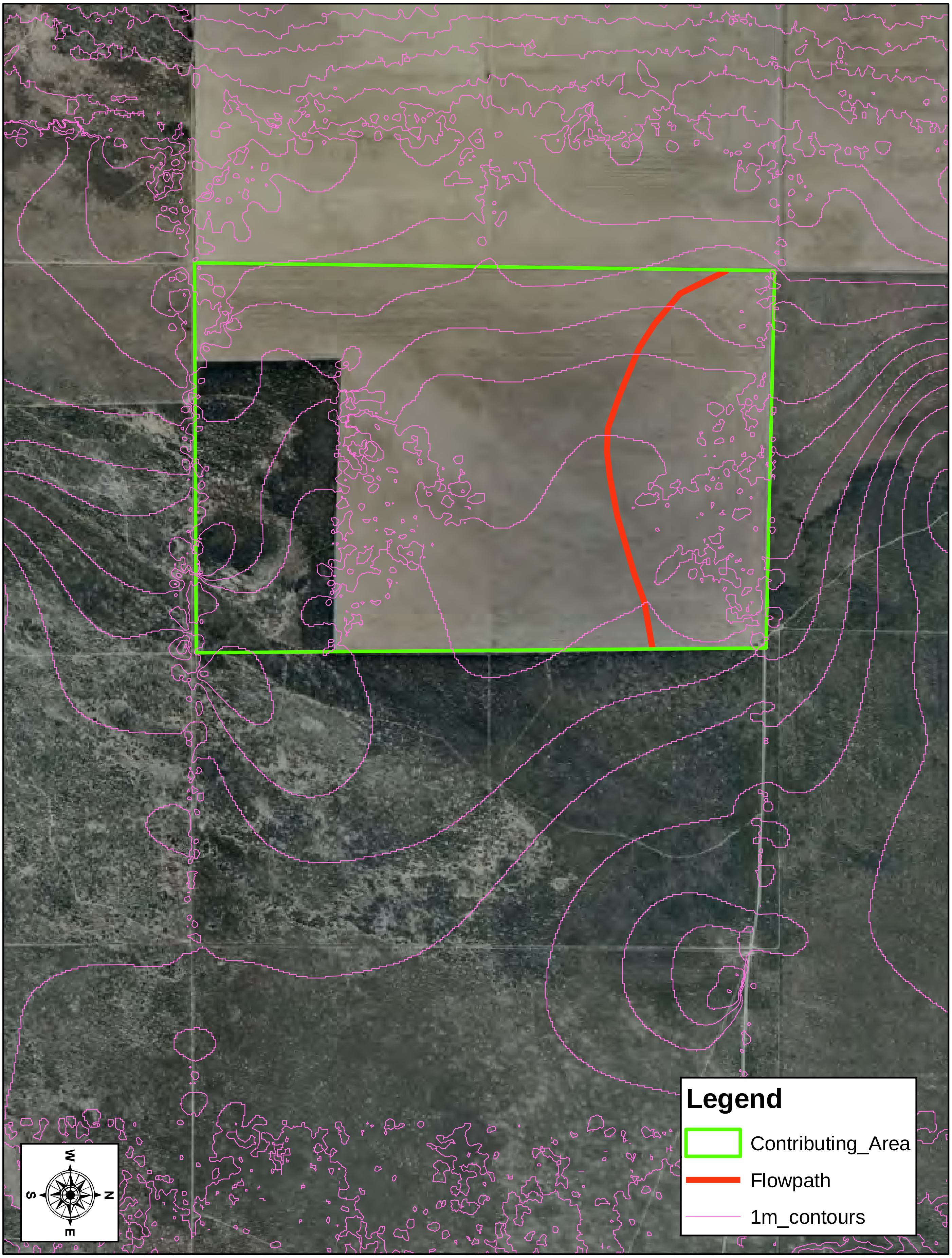
Normal Depth	2.33	ft
Flow Area	52.10	ft²
Wetted Perimeter	35.27	ft
Top Width	34.81	ft
Critical Depth	1.43	ft
Critical Slope	0.00592	ft/ft
Velocity	2.73	ft/s
Velocity Head	0.12	ft
Specific Energy	2.44	ft
Froude Number	0.39	
Flow Type	Subcritical	

GVF Input Data

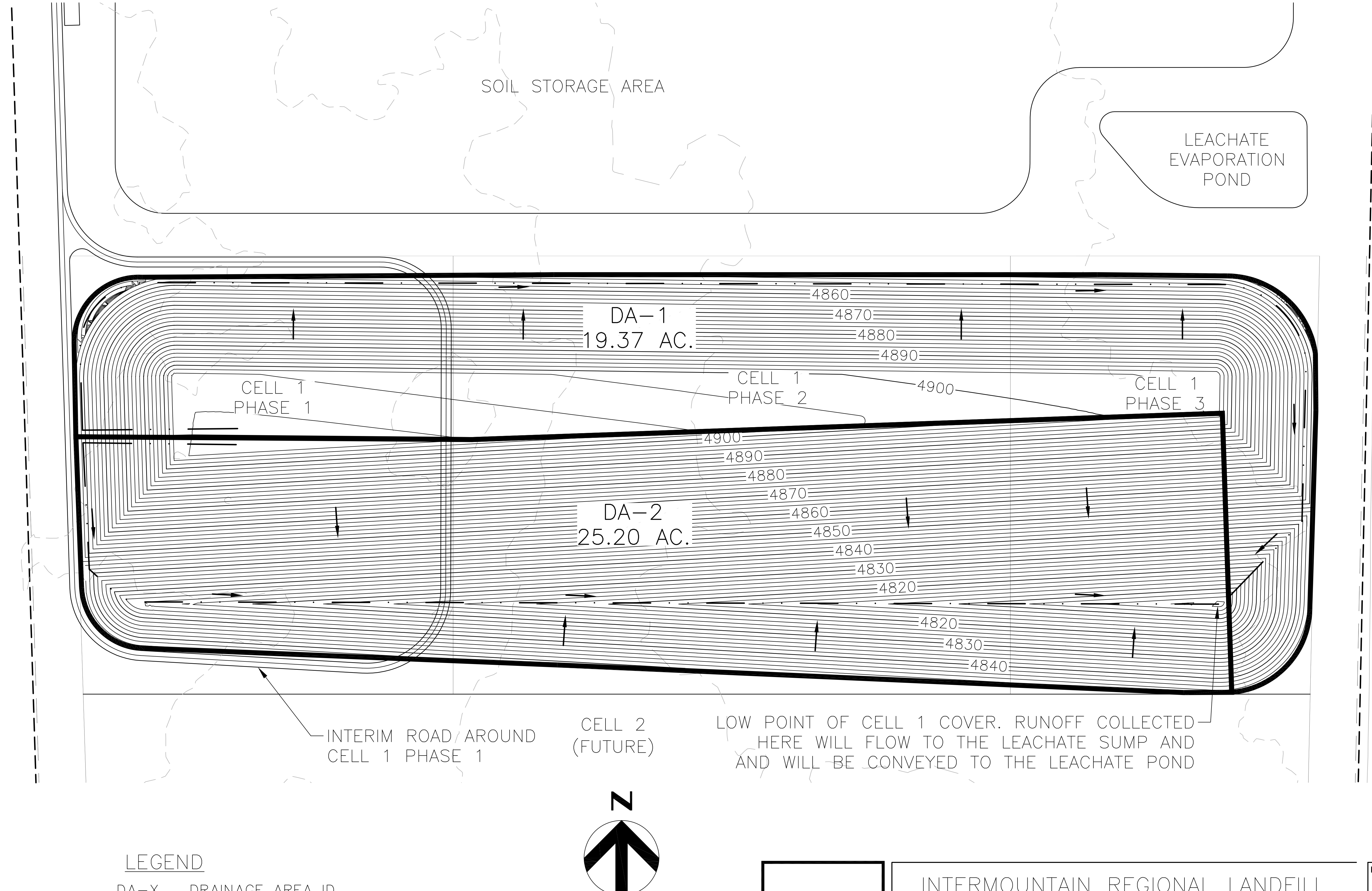
Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.33	ft
Critical Depth	1.43	ft
Channel Slope	0.00080	ft/ft
Critical Slope	0.00592	ft/ft



Fairfield Municipal Landfill Run-on Contributing Area



LEGEND

DA-X	DRAINAGE AREA ID
(heavy line)	DRAINAGE AREA BOUNDARY
— · · —	FLOW PATH

HDR Engineering, Inc.

INTERMOUNTAIN REGIONAL LANDFILL
RUN-OFF DRAINAGE AREAS
CELL 1

DATE
JUNE 2010

FIGURE
J-1

APPENDIX K:

WATER RIGHTS DATA

Utah Division of Water Rights

Select Related Information

(WARNING: Water Rights makes NO claims as to the accuracy of this data.) RUN DATE: 12/15/2009

WATER RIGHT: **54-493** APPLICATION/CLAIM NO.: **A52843** CERT. NO.:

OWNERSHIP

NAME: Douglas Young
ADDR: 4770 South 900 East
Murray UT 84107

DATES, ETC.

LAND OWNED BY APPLICANT? No COUNTY TAX ID#:
FILED: 03/30/1979|PRIORITY: 03/30/1979|PUB BEGAN: |PUB ENDED: |NEWSPAPER:
ProtestEnd: |PROTESTED: [No]|HEARNG HLD: |SE ACTION: [ ]|ActionDate:09/06/1979|PROOF DUE:
EXTENSION: |ELEC/PROOF:[ ]|ELEC/PROOF: |CERT/WUC: |LAP, ETC: 01/18/1982|LAPS LETTER:
RUSH LETTR: |RENOVATE: |RECON REQ: |TYPE: [ ]
PD BOOK: [54-]|MAP: [ ]|PUB DATE:
Type of Right: Application to Appropriate Source of Info: Application to Appropriate **Status: Lapsed**

LOCATION OF WATER RIGHT***(Points of Diversion: Click on Location to access PLAT Program.)*********** MAP VIEWER

FLOW: 0.015 cfs SOURCE: Underground Water Well
COUNTY: Utah COMMON DESCRIPTION: APPROX 3.5 MI S/E OF FAIRFIELD

POINT OF DIVERSION -- UNDERGROUND: (Click Well ID# link for more well data.)
(1) S 500 ft E 1050 ft from N4 cor, Sec 16, T 7S, R 2W, SLBM
DIAMETER OF WELL: 6 ins. DEPTH: 100 to 500 ft. YEAR DRILLED: WELL LOG? NO WELL ID#:
Comment:

USES OF WATER RIGHT******** *ELU -- Equivalent Livestock Unit (cow, horse, etc.)* ******** *EDU -- Equivalent Domestic Unit or 1 Family*

SUPPLEMENTAL GROUP NO. 400461.

IRRIGATION: 0.25 acres Div Limit: 0.0 acft. PERIOD OF USE: 04/01 TO 10/31

STOCKWATER: 10.0000 Stock Units Div Limit: PERIOD OF USE: 01/01 TO 12/31

DOMESTIC: 1.0000 EDUs Div Limit: PERIOD OF USE: 01/01 TO 12/31

###PLACE OF USE:

	NORTH WEST QUARTER				NORTH EAST QUARTER				SOUTH WEST QUARTER				SOUTH EAST QUARTER				Section Totals
	NW	NE	SW	SE	NW	NE	SW	SE	NW	NE	SW	SE	NW	NE	SW	SE	
Sec 16 T 7S R 2W SLBM					0.2500												0.2500

GROUP ACREAGE TOTAL: 0.2500

PLACE OF USE for STOCKWATERING

	NORTH-WEST¼				NORTH-EAST¼				SOUTH-WEST¼				SOUTH-EAST¼			
	NW	NE	SW	SE	NW	NE	SW	SE	NW	NE	SW	SE	NW	NE	SW	SE
Sec 16 T 7S R 2W SLBM					X											

DIVERSION & DEPLETION ESTIMATES

(All values in acre-feet, Growing Season in days)

	IRRIGATION	STOCK	DOMESTIC	MUNICIPAL	MINING	POWER	OTHER	MANUALLY EVALUATED	ACRE-FEET EXPORTED	DIVERSION DUTY	DEPLETION DUTY	GROWING SEASON	WATER-USE REPORTING
DIV:								Yes					
DEP:													

OTHER COMMENTS

APPLICANT BUYING LAND ON CONTRACT

E N D O F D A T A

(WARNING: Water Rights makes NO claims as to the accuracy of this data.) RUN DATE: 12/15/2009

WATER RIGHT: **53-1437** APPLICATION/CLAIM NO.: **D6916** CERT. NO.:
CHANGES: a22976 Withdrawn
a22946 Withdrawn

OWNERSHIP

NAME: Evan Johnson
ADDR: 327 North 200 East #2
American Fork UT 84003

DATES, ETC.

```
LAND OWNED BY APPLICANT?                    COUNTY TAX ID#:
FILED:     01/13/1999|PRIORITY:    /  /1900|PUB BEGAN:          |PUB ENDED:          |NEWSPAPER:
ProtestEnd:          |PROTESTED: [No      ]|HEARNG HLD:         |SE ACTION: [       ]|ActionDate:          |PROOF DUE:
EXTENSION:           |ELEC/PROOF:[        ]|ELEC/PROOF:         |CERT/WUC:           |LAP, ETC:            |LAPS LETTER:
RUSH LETTR:          |RENOVATE:            |RECON REQ:          |TYPE: [             ]
PD BOOK: [  53-     ]|MAP:  [             ]|PUB DATE:
Type of Right: Diligence Claim               Source of Info: Ownership Segregation         Status:
```

LOCATION OF WATER RIGHT***(Points of Diversion: Click on Location to access PLAT Program.)***MAP VIEWER***

FLOW: 129.2 acre-feet SOURCE: Warm Springs
COUNTY: Utah COMMON DESCRIPTION:

POINT OF DIVERSION -- SURFACE:
(1) N 2010 ft W 1040 ft from S4 cor, Sec 08, T 10S, R 1E, SLBM
Diverting Works: Concrete Lined Canal Source: Warm Springs

Stream Alt Required?: No

USES OF WATER RIGHT

*ELU -- Equivalent Livestock Unit (cow, horse, etc.) ******** EDU -- Equivalent Domestic Unit or 1 Family*

SUPPLEMENTAL GROUP NO. 233875.

IRRIGATION: 32.3 acres Div Limit: 0.0 acft. PERIOD OF USE: 04/01 TO 10/31

###PLACE OF USE:

	NORTH WEST QUARTER				NORTH EAST QUARTER				SOUTH WEST QUARTER				SOUTH EAST QUARTER				Section
	NW	NE	SW	SE	NW	NE	SW	SE	NW	NE	SW	SE	NW	NE	SW	SE	Totals
Sec 32 T 9S R 1E SLBM									X								0.0000
Sec 05 T 10S R 1E SLBM	X		X						X		X						0.0000
Sec 06 T 10S R 1E SLBM						X											0.0000
GROUP ACREAGE TOTAL:																	0.0000

SEGREGATION HISTORY

This Right was Segregated from 53-1433 , with Appl#: D6916, Approval Date: / / under which Proof is to be submitted.
This Right as originally filed:

FLOW IN CFS	QUANTITY IN ACRE-FEET	IRRIGATED	STOCK	DOMESTIC	MUNICIPAL	MINING	POWER	OTHER

```
                                  ACREAGE      (ELUs)   (FAMILIES)(*-----------------ACRE-FEET------------------*)
                         129.2        32.3000
          See Change Application a22946
*****************************************************************************************************************************************
******************************************************E N D   O F   D A T A*********************************************************
*****************************************************************************************************************************************
```

Online Services | Agency List | Business
Search

Utah Division of Water Rights

Select Related Information

```
    (WARNING: Water Rights makes NO claims as to the accuracy of this data.) RUN DATE: 12/15/2009    Page 1
CHANGE: a22976          WATER RIGHT: 53-1437  CERT. NO.:       COUNTY TAX ID#:
BASE WATER RIGHTS: 53-1437
RIGHT EVIDENCED BY: 53-1437
CHANGES: Point of Diversion [X], Place of Use [X], Nature of Use [X], Reservoir Storage [ ].
*-----------------------------------------------------------------------------------------------------------------------------------*

NAME: Evan Johnson
ADDR: 327 North 200 East #2
      American Fork UT 84003
                     REMARKS:
*-----------------------------------------------------------------------------------------------------------------------------------*
FILED:     02/12/1999|PRIORITY:  02/12/1999|ADV BEGAN: 03/03/1999|ADV ENDED: 03/10/1999|NEWSPAPER:  Lehi Free Press
ProtestEnd:03/31/1999|PROTESTED: [No Heari]|HEARNG HLD:          |SE ACTION: [        ]|ActionDate:          |PROOF DUE:
EXTENSION:           |ELEC/PROOF:[        ]|ELEC/PROOF:          |CERT/WUC:             |LAP, ETC:  03/17/2001|LAPS LETTER:
RUSH LETTR:          |RENOVATE:            |RECON REQ:           |TYPE: [              ]
Status: Withdrawn
*****************************************************************  *****************************************************************
**********************H E R E T O F O R E************************  ***********************H E R E A F T E R***********************
*****************************************************************  *****************************************************************

|FLOW:   129.2 acre-feet                                         ||FLOW:   128.746 acre-feet                                         |
|----------------------------------------------------------------||----------------------------------------------------------------|
|SOURCE: Warm Springs                                            ||SOURCE: Underground Well                                        |
|COUNTY: Utah                                                    ||COUNTY: Utah       COM DESC: Cedar Valley                       |

|POINT(S) OF DIVERSION ------> MAP VIEWER                        ||CHANGED AS FOLLOWS: (Click Location link for WRPLAT)            |
|----------------------------------------------------------------||----------------------------------------------------------------|
|Point Surface:                                                  ||                                                                |
|(1)  N 2010 ft W 1040 ft from S4 cor, Sec 08, T 10S, R  1E, SLBM||                                                                |
| Dvrting Wks: Concrete Lined Canal                              ||                                                                |
| Source:      Warm Springs                                      ||                                                                |
|----------------------------------------------------------------||----------------------------------------------------------------|
|Point Underground:                                              ||UNDERGROUND: (Click Link for PLAT data, Well ID# link for data.)|
|                                                                ||(1)  N  660 ft W  660 ft from W4 cor, Sec 20, T  7S, R  2W, SLBM|
|                                                                ||  Diameter:    2 ins.  Depth:  100 to 1000 ft.  WELL ID#:        |
|                                                                ||    COMMENT: 2` to 16` Diameter                                 |
|                                                                ||(2)  S 1370 ft W   50 ft from NE cor, Sec 20, T  7S, R  2W, SLBM|
|                                                                ||  Diameter:    2 ins.  Depth:  100 to 1000 ft.  WELL ID#:        |
|                                                                ||    COMMENT: 2` TO 16` Diameter                                 |
|                                                                ||(3)  S   50 ft W   50 ft from E4 cor, Sec 20, T  7S, R  2W, SLBM|
|                                                                ||  Diameter:    2 ins.  Depth:  100 to 1000 ft.  WELL ID#:        |
|                                                                ||    COMMENT: 2` to 16` Diameter                                 |
|----------------------------------------------------------------||----------------------------------------------------------------|

|PLACE OF USE ------>                                            ||CHANGED as follows:                                              |
|----------------------------------------------------------------||----------------------------------------------------------------|
|                             --NW¼--  --NE¼--  --SW¼--  --SE¼-- ||                             --NW¼--  --NE¼--  --SW¼--  --SE¼-- |
|                            |N N S S||N N S S||N N S S||N N S S|||                            |N N S S||N N S S||N N S S||N N S S||
|                            |W E W E||W E W E||W E W E||W E W E|||                            |W E W E||W E W E||W E W E||W E W E||
|Sec 32 T  9S R  1E SLBM     * : : : ** : : : **X: : : ** : : : *||Sec 19 T  7S R  3W SLBM     * : : : ** : : :X** : : : ** : : : *|
|Sec 05 T 10S R  1E SLBM     *X: :X: ** : : : **X: :X: ** : : : *||Sec 20 T  7S R  3W SLBM     * : :X:X** : : : ** : : : ** : : : *|
|Sec 06 T 10S R  1E SLBM     * : : : ** :X: : ** : : : ** : : : *||                                                                |

|NATURE OF USE ------>                                           ||CHANGED as follows:                                              |
|----------------------------------------------------------------||----------------------------------------------------------------|
|SUPPLEMENTAL to Other Water Rights: No                          ||SUPPLEMENTAL to Other Water Rights: No                          |
|----------------------------------------------------------------||----------------------------------------------------------------|
```

```
|IRR:     32.3000 acs Sol/Sup:             acs USED 04/01 - 10/31||IRR:     30.0000 acs Sol/Sup:             acs USED 04/01 - 10/31|
|...............................................................||...............................................................|
|                                                               ||STK: 7.0000 Cattle or Equivalent           USED 01/01 - 12/31|
|...............................................................||...............................................................|
|                                                               ||DOM: 19.0000 Equivalent Domestic Units       USED 01/01 - 12/31|
*-----------------------------------------------------------------------------------------------------------------------------------*
*-----------------------------------------------------------------------------------------------------------------------------------*
PROTESTANTS*************************************************************************************************************************
*-----------------------------------------------------------------------------------------------------------------------------------*

NAME: Provo River Water User's Association                        NAME:  Provo River Water User`s Association
ADDR: 1788 North State Street                                     ADDR: c/o Scott H. Martin (PO Box 45000)
      Orem UT 84057                                                     10 Exchange Place, 11th Floor
                                                                        Salt Lake City UT 84145-5000
------------------------------------------------------------------------------------------------------------------------------------
************************************************************************************************************************************
*******************************************************E N D   O F   D A T A*******************************************************
************************************************************************************************************************************
```

(WARNING: Water Rights makes NO claims as to the accuracy of this data.) RUN DATE: 12/15/2009

```
WATER RIGHT: 53-1510     APPLICATION/CLAIM NO.: A2136     CERT. NO.: 1970     SHARES OF STOCK: 30.0
CHANGES: a26638     Withdrawn
         a28617     Withdrawn
=======================================================================================================================
OWNERSHIP**************************************************************************************************************
=======================================================================================================================

NAME: Utah Lake Distributing Company
ADDR: 1156 South State Street #201
      Orem, UT 84097
INTEREST: 100%       REMARKS:

NAME: WW Ranches L.C.
ADDR: c/o William N White
      4195 Summermeadow Dr
      Bountiful, UT 84010
=======================================================================================================================
DATES, ETC.************************************************************************************************************
=======================================================================================================================
LAND OWNED BY APPLICANT?                 COUNTY TAX ID#:
FILED:     10/27/1908|PRIORITY:  10/27/1908|PUB BEGAN:          |PUB ENDED:          |NEWSPAPER:
ProtestEnd:          |PROTESTED: [No      ]|HEARNG HLD:         |SE ACTION: [Approved]|ActionDate:03/19/1910|PROOF DUE:
EXTENSION:           |ELEC/PROOF:[        ]|ELEC/PROOF:         |CERT/WUC:  01/27/1931|LAP, ETC:            |LAPS LETTER:
RUSH LETTR:          |RENOVATE:            |RECON REQ:          |TYPE: [             ]
PD BOOK: [  53-     ]|MAP:  [             ]|PUB DATE:
Type of Right: Application to Appropriate     Source of Info: Ownership Segregation        Status: Certificate
=======================================================================================================================
LOCATION OF WATER RIGHT***(Points of Diversion: Click on Location to access PLAT Program.)***********MAP VIEWER*****************
=======================================================================================================================
FLOW: 153.3 acre-feet                          SOURCE: Utah Lake and Jordan River
COUNTY: Utah         COMMON DESCRIPTION: Jordan Narrows

POINT OF DIVERSION -- SURFACE:
(1) S 1282 ft W   17 ft from N4 cor, Sec 25, T  5S, R  1W, SLBM
      Diverting Works:  Utah Lake Dam                                      Source:  Utah Lake

Stream Alt Required?: No

POINT OF REDIVERSION:
(1) S  395 ft E 2438 ft from W4 cor, Sec 26, T  4S, R  1W, SLBM
      Diverting Works:  USBR/MWDSLC Pump Station                           Source:  Jordan River
=======================================================================================================================
USES OF WATER RIGHT******** ELU -- Equivalent Livestock Unit (cow, horse, etc.) ******** EDU -- Equivalent Domestic Unit or 1 Family
=======================================================================================================================
SUPPLEMENTAL GROUP NO. 233948.
.......................................................................................................................
  IRRIGATION: Sole Supply: UNEVALUATED acres     Group Total: 30.66        Div Limit: 0.0 acft.      PERIOD OF USE: 04/01 TO 10/31
.......................................................................................................................
  ###PLACE OF USE:      *-------NORTH WEST QUARTER------*-------NORTH EAST QUARTER------*-------SOUTH WEST QUARTER------*-------SOUTH EAST QUARTER------*   Section
                        *  NW   |  NE   |  SW   |  SE   *  NW   |  NE   |  SW   |  SE   *  NW   |  NE   |  SW   |  SE   *  NW   |  NE   |  SW   |  SE   *   Totals
 Sec 08 T  2S R  1W SLBM *_______|_______|_______|X      *_______|_______|_______|_______*_______|X      |X      |_______*X      |X      |X      |X      *     0.0000
```

Sec 16 T 2S R 1W SLBM	X	X	X	X													0.0000
Sec 17 T 2S R 1W SLBM					X	X											0.0000
Sec 20 T 2S R 1W SLBM	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	0.0000
Sec 21 T 2S R 1W SLBM	X	X	X	X					X	X	X						0.0000
Sec 28 T 2S R 1W SLBM	X		X						X		X						0.0000
Sec 29 T 2S R 1W SLBM						X	X	X	X	X	X	X	X	X	X	X	0.0000
Sec 32 T 2S R 1W SLBM	X	X		X	X	X	X	X		X		X	X		X		0.0000
Sec 33 T 2S R 1W SLBM	X		X														0.0000
Sec 04 T 3S R 1W SLBM	X	X	X	X			X		X	X	X	X	X	X	X	X	0.0000
Sec 05 T 3S R 1W SLBM		X			X	X		X						X		X	0.0000
Sec 08 T 3S R 1W SLBM						X											0.0000
Sec 09 T 3S R 1W SLBM	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	0.0000
Sec 10 T 3S R 1W SLBM			X						X	X							0.0000
Sec 15 T 3S R 1W SLBM		X	X	X					X								0.0000
Sec 16 T 3S R 1W SLBM				X	X	X	X	X		X		X	X	X	X	X	0.0000
Sec 20 T 3S R 1W SLBM																X	0.0000
Sec 21 T 3S R 1W SLBM	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0.0000
Sec 28 T 3S R 1W SLBM	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	0.0000
Sec 29 T 3S R 1W SLBM						X		X						X		X	0.0000
Sec 32 T 3S R 1W SLBM						X		X						X		X	0.0000
Sec 33 T 3S R 1W SLBM	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0.0000
Sec 04 T 4S R 1W SLBM	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	0.0000
Sec 05 T 4S R 1W SLBM						X		X						X		X	0.0000
Sec 09 T 4S R 1W SLBM	X	X	X	X	X	X	X	X		X			X	X	X	X	0.0000
Sec 10 T 4S R 1W SLBM	X		X						X		X	X					0.0000
Sec 15 T 4S R 1W SLBM	X	X		X													0.0000
Sec 35 T 4S R 1W SLBM							X						X	X	X	X	0.0000
Sec 36 T 4S R 1W SLBM											X	X					0.0000
Sec 01 T 5S R 1W SLBM	X	X	X	X	X		X		X	X	X	X	X				0.0000
Sec 02 T 5S R 1W SLBM		X		X	X	X	X	X					X	X	X	X	0.0000
Sec 11 T 5S R 1W SLBM		X		X	X	X	X	X		X		X	X	X	X	X	0.0000
Sec 12 T 5S R 1W SLBM	X	X	X	X					X	X	X	X	X				0.0000
Sec 13 T 5S R 1W SLBM	X		X														0.0000
Sec 14 T 5S R 1W SLBM	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0.0000
Sec 15 T 5S R 1W SLBM								X						X	X	X	0.0000
Sec 22 T 5S R 1W SLBM					X	X	X	X					X	X	X	X	0.0000
Sec 23 T 5S R 1W SLBM	X	X	X	X	X	X	X	X		X		X	X	X	X	X	0.0000
Sec 24 T 5S R 1W SLBM			X								X						0.0000
Sec 25 T 5S R 1W SLBM	X	X	X	X					X		X						0.0000
Sec 26 T 5S R 1W SLBM	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0.0000
Sec 27 T 5S R 1W SLBM					X	X	X	X		X		X	X	X		X	0.0000
Sec 34 T 5S R 1W SLBM						X		X									0.0000
Sec 35 T 5S R 1W SLBM	X	X	X	X	X	X	X		X	X		X	X		X	X	0.0000
Sec 01 T 6S R 1W SLBM			X	X					X	X	X	X			X		0.0000
Sec 02 T 6S R 1W SLBM					X	X											0.0000
Sec 12 T 6S R 1W SLBM					X	X											0.0000
																GROUP ACREAGE TOTAL:	0.0000

==

SEGREGATION HISTORY

==

This Right was Segregated from 59-13, with Appl#: A2136, Approval Date: / / under which Proof is to be submitted.
This Right as originally filed:

FLOW IN CFS	QUANTITY IN ACRE-FEET	IRRIGATED ACREAGE	STOCK (ELUs)	DOMESTIC (FAMILIES)	MUNICIPAL	MINING	POWER	OTHER
	153.3	30.6600						

(WATER USES; MUNICIPAL, MINING, POWER, OTHER in ACRE-FEET)

Based on 30 shares of stock; see Change Application a26638

****

***E N D O F D A T A**

****

utah.gov | Online Services | Agency List | Business | Search

Utah Division of Water Rights

Select Related Information

(WARNING: Water Rights makes NO claims as to the accuracy of this data.) RUN DATE: 12/15/2009 Page 1

```
CHANGE: a26638          WATER RIGHT: 53-1510   CERT. NO.:        COUNTY TAX ID#:     AMENDATORY? No
BASE WATER RIGHTS: 53-1510
RIGHT EVIDENCED BY: 53-1510, a portion of 59-13 (A2136)  (Cert. No. 1970).  Based on 30 shares of
                    Utah Lake Distributing Company stock.
CHANGES: Point of Diversion [X], Place of Use [X], Nature of Use [X], Reservoir Storage [ ].
*------------------------------------------------------------------------------------------------------------------------------------*

NAME: Utah Lake Distributing Company
ADDR: 1156 South State Street #201
      Orem, UT 84097
INTEREST: 100%       REMARKS:

NAME: WW Ranches L.C.
ADDR: c/o William N White
      4195 Summermeadow Dr
      Bountiful, UT 84010
                     REMARKS:
*------------------------------------------------------------------------------------------------------------------------------------*
FILED:     05/02/2002|PRIORITY:  05/02/2002|ADV BEGAN: 05/29/2002|ADV ENDED: 06/05/2002|NEWSPAPER:  The Payson Chronicle
ProtestEnd:06/25/2002|PROTESTED: [No Heari]|HEARNG HLD:          |SE ACTION: [Approved]|ActionDate:07/30/2003|PROOF DUE:  07/31/2006
EXTENSION:           |ELEC/PROOF:[        ]|ELEC/PROOF:          |CERT/WUC:            |LAP, ETC:  03/20/2006|LAPS LETTER:
PUSH LETTR:          |RENOVATE:            |RECON REQ:           |TYPE: [             ]
Status: Withdrawn
*****************************************************************  *****************************************************************
**********************H E R E T O F O R E**********************  **********************H E R E A F T E R**********************
*****************************************************************  *****************************************************************

|FLOW:   153.3 acre-feet                                        ||FLOW:   153.3 acre-feet                                        |
|---------------------------------------------------------------||---------------------------------------------------------------|
|SOURCE: Utah Lake and Jordan River                             ||SOURCE: Underground Water Wells (33)                           |
|---------------------------------------------------------------||---------------------------------------------------------------|
|COUNTY: Salt Lake                                              ||COUNTY: Utah       COM DESC: West Mountain                     |
|---------------------------------------------------------------||---------------------------------------------------------------|
|                                                               ||     All uses and any combination thereof                      |
|                                                               ||     combined together shall not exceed 153.3                  |
|                                                               ||     acre-feet.  This change application is                    |
|                                                               ||     being filed pursuant to the attached                      |
|                                                               ||     agreement between Utah Lake Distributing C                |
|                                                               ||     ompany and J L.C.  If either party                        |
|                                                               ||     to the agreement determines the change                    |
|                                                               ||     application is inconsistent with the                      |
|                                                               ||     attached agreement, or that there is a                    |
|                                                               ||     breach of the agreement, either party                     |
|                                                               ||     to the agreement may unilaterally                         |
|                                                               ||     withdraw this change application.                         |
|---------------------------------------------------------------||---------------------------------------------------------------|

|POINT(S) OF DIVERSION ------> MAP VIEWER                       ||CHANGED AS FOLLOWS: (Click Location link for WRPLAT)           |
|---------------------------------------------------------------||---------------------------------------------------------------|
|Point Surface:                                                 ||Point Surface:                                                 |
|(1)  S 1282 ft W   17 ft from N4 cor, Sec 25, T  5S, R  1W, SLBM||(1)  N 1517 ft W  364 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM|
| Dvrting Wks: Utah Lake Dam                                    || Dvrting Wks: Pump                                             |
| Source:      Utah Lake                                        || Source:      Utah Lake                                        |
|                                                               ||                                                               |
|                                                               ||Stream Alt?: No                                                |
|---------------------------------------------------------------||---------------------------------------------------------------|
|Point Underground:                                             ||UNDERGROUND: (Click Link for PLAT data, Well ID# link for data.)|
|                                                               ||(1)  S 1980 ft W  325 ft from N4 cor, Sec 19, T  7S, R  2W, SLBM|
|                                                               ||  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:       |
```

```
COMMENT:
(2)  N   50 ft W   50 ft from SE cor, Sec 20, T  7S, R  2W, SLBM
  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:
    COMMENT:
(3)  S 1980 ft W 1980 ft from N4 cor, Sec 20, T  7S, R  2W, SLBM
  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:
    COMMENT:
(4)  S 1370 ft W   50 ft from NE cor, Sec 20, T  7S, R  2W, SLBM
  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:
    COMMENT:
(5)  N 1000 ft E  600 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM
  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:
    COMMENT:
(6)  S  600 ft E  600 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM
  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:
    COMMENT:
(7)  S  600 ft E  800 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM
  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:
    COMMENT:
(8)  S  400 ft E 1000 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM
  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:
    COMMENT:
(9)  S  200 ft E 1000 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM
  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:
    COMMENT:
(10) S    0 ft E    0 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM
  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:
    COMMENT:
(11) S    0 ft E 1200 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM
  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:
    COMMENT:
(12) N  200 ft W  600 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM
  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:
    COMMENT:
(13) N  200 ft E  400 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM
  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:
    COMMENT:
(14) N  200 ft E 1200 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM
  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:
    COMMENT:
(15) N  400 ft E  200 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM
  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:
    COMMENT:
(16) N  600 ft W  200 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM
  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:
    COMMENT:
(17) N  600 ft E 1200 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM
  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:
    COMMENT:
(18) N  800 ft W  200 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM
  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:
    COMMENT:
(19) N  800 ft E 1200 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM
  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:
    COMMENT:
(20) N 1000 ft E  200 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM
  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:
    COMMENT:
(21) N 1000 ft E 1000 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM
  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:
    COMMENT:
(22) N 1000 ft E 1200 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM
  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:
    COMMENT:
(23) N 1200 ft E  800 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM
  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:
    COMMENT:
(24) N 1200 ft E 1200 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM
  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:
    COMMENT:
(25) N 1400 ft E  800 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM
  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:
    COMMENT:
(26) N 1400 ft W 1000 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM
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|                                                                ||  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:         |
|                                                                ||    COMMENT:                                                     |
|                                                                ||(27) N  400 ft E 1200 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM|
|                                                                ||  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:         |
|                                                                ||    COMMENT:                                                     |
|                                                                ||(28) N  800 ft W  800 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM|
|                                                                ||  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:         |
|                                                                ||    COMMENT:                                                     |
|                                                                ||(29) N 1000 ft W  600 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM|
|                                                                ||  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:         |
|                                                                ||    COMMENT:                                                     |
|                                                                ||(30) N 1200 ft E 1200 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM|
|                                                                ||  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:         |
|                                                                ||    COMMENT:                                                     |
|                                                                ||(31) N  600 ft E 1200 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM|
|                                                                ||  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:         |
|                                                                ||    COMMENT:                                                     |
|                                                                ||(32) N 1600 ft E  600 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM|
|                                                                ||  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:         |
|                                                                ||    COMMENT:                                                     |
|                                                                ||(33) S  200 ft E 1000 ft from N4 cor, Sec 16, T  8S, R  1E, SLBM|
|                                                                ||  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:         |
|                                                                ||    COMMENT:                                                     |
|----------------------------------------------------------------||-----------------------------------------------------------------|
|Point Rediversion:                                              ||                                                                 |
|(1)  S  395 ft E 2438 ft from W4 cor, Sec 26, T  4S, R  1W, SLBM||
| Dvrting Wks: USBR/MWDSLC Pump Station                          ||                                                                 |
| Source:      Jordan River                                      ||                                                                 |
|----------------------------------------------------------------||-----------------------------------------------------------------|

|PLACE OF USE ------>                                            ||CHANGED as follows:                                              |
|----------------------------------------------------------------||-----------------------------------------------------------------|
|                              --NW¼--  --NE¼--  --SW¼--  --SE¼-- ||                                --NW¼--  --NE¼--  --SW¼--  --SE¼-- |
|                             |N N S S||N N S S||N N S S||N N S S|||                               |N N S S||N N S S||N N S S||N N S S||
|                             |W E W E||W E W E||W E W E||W E W E|||                               |W E W E||W E W E||W E W E||W E W E||
|Sec 16 T  2S R  1W SLBM     * :X: : ** : : : ** : : : ** : : : *||Sec 19 T  7S R  2W SLBM     * : : : ** : : :X** : : : ** : : : *|
|                                                                ||Sec 20 T  7S R  2W SLBM     * : :X:X** : : : ** : : : ** : : : *|
|                                                                ||Sec 09 T  8S R  1E SLBM     * : : : ** : : : ** :X:X:X**X: :X: *|
|                                                                ||Sec 16 T  8S R  1E SLBM     *X:X: : ** : : :X** : : : ** : : : *|

|NATURE OF USE ------>                                           ||CHANGED as follows:                                              |
|----------------------------------------------------------------||-----------------------------------------------------------------|
|SUPPLEMENTAL to Other Water Rights: No                          ||SUPPLEMENTAL to Other Water Rights: No                           |
|----------------------------------------------------------------||-----------------------------------------------------------------|
|IRR:     30.6600 acs Sol/Sup:             acs USED 04/01 - 10/31||IRR:     30.0000 acs Sol/Sup:             acs USED 04/01 - 10/31|
|................................................................||.................................................................|
|                                                                ||STK: 30.0000 Cattle or Equivalent             USED 01/01 - 12/31|
|................................................................||.................................................................|
|                                                                ||DOM: 90.0000 Equivalent Domestic Units        USED 01/01 - 12/31|
|................................................................||.................................................................|
|                                                                ||OTH: FIRE PROTECTION:                         USED 01/01 - 12/31|
|                                                                ||                                                                 |
|................................................................||.................................................................|
|                                                                ||OTH: COMMERCIAL:                              USED 01/01 - 12/31|
|                                                                ||                                                                 |
|................................................................||.................................................................|
|                                                                ||OTH: INDUSTRIAL:                              USED 01/01 - 12/31|
|                                                                ||                                                                 |
|----------------------------------------------------------------||-----------------------------------------------------------------|

*---------------------------------------------------------------------------------------------------------------------------------*
*---------------------------------------------------------------------------------------------------------------------------------*
PROTESTANTS************************************************************************************************************************
*---------------------------------------------------------------------------------------------------------------------------------*

NAME: Bureau of Reclamation                                        NAME:  Jordan Valley Water Conservancy District
ADDR: Jonathan B. Jones                                            ADDR: c/o Richard P. Bay
      302 East 1860 South                                                P. O. Box 70
      Provo UT 84606-7317                                                West Jordan UT 84088-0070
-----------------------------------------------------------------------------------------------------------------------------------
NAME: Western Water LLC                                            NAME:
ADDR: Harvey L. Hutchinson                                         ADDR:
```

194 E. Paradise Ln.
Alpine UT 84004

E N D O F D A T A

(WARNING: Water Rights makes NO claims as to the accuracy of this data.) RUN DATE: 12/15/2009 Page 1

```
CHANGE: a28617          WATER RIGHT: 53-1510  CERT. NO.:       COUNTY TAX ID#:     AMENDATORY? No
BASE WATER RIGHTS: 53-1510
                   53-1543
RIGHT EVIDENCED BY: a26638(53-1510), 53-1543(A2136) both segregated portions of 59-13; based on 36 shares Utah Lake Dist
CHANGES: Point of Diversion [ ], Place of Use [ ], Nature of Use [X], Reservoir Storage [ ].
*------------------------------------------------------------------------------------------------------------------*

NAME: State of Utah Board of Water Resources
ADDR: Held for Utah Lake Distributing Company
      1594 West North Temple, Ste 310
      Salt Lake City UT 84114-6201
INTEREST: 100%       REMARKS:

NAME: Utah Lake Distributing Company
ADDR: 1156 South State Street #201
      Orem, UT 84097
                     REMARKS: Held by State of Utah Board of Water Resources

NAME: WW Ranches L.C.
ADDR: c/o William N White
      4195 Summermeadow Dr
      Bountiful, UT 84010
                     REMARKS:
*------------------------------------------------------------------------------------------------------------------*
FILED:     01/29/2004|PRIORITY:  01/29/2004|ADV BEGAN: 02/11/2004|ADV ENDED: 02/18/2004|NEWSPAPER:  The Payson Chronicle
ProtestEnd:03/09/2004|PROTESTED: [No Heari]|HEARNG HLD:          |SE ACTION: [        ]|ActionDate:          |PROOF DUE:
EXTENSION:           |ELEC/PROOF:[        ]|ELEC/PROOF:          |CERT/WUC:             |LAP, ETC:  09/14/2006|LAPS LETTER:
RUSH LETTR:          |RENOVATE:            |RECON REQ:           |TYPE: [             ]
Status: Withdrawn
*****************************************************************  *****************************************************************
**********************H E R E T O F O R E**********************  **********************H E R E A F T E R***********************
*****************************************************************  *****************************************************************

|FLOW:   183.96 acre-feet                                        ||FLOW:   183.96 acre-feet                                        |
|----------------------------------------------------------------||----------------------------------------------------------------|
|SOURCE: Underground Water Wells (31) (existing)                 ||SOURCE: 31 Existing - approved under a26638                     |
|----------------------------------------------------------------||----------------------------------------------------------------|
|COUNTY: Utah                                                    ||COUNTY: Utah       COM DESC: West Mountain                       |
|----------------------------------------------------------------||----------------------------------------------------------------|
|     All uses and any combination thereof                       ||                                                                |
|     combined together shall not exceed 183.96                  ||                                                                |
|     acre-feet.  This change application is                     ||                                                                |
|     being filed pursuant to the attached                       ||                                                                |
|     agreement between Utah Lake Distributing C                 ||                                                                |
|     ompany and J L.C.  If either party                         ||                                                                |
|     to the agreement determines the change                     ||                                                                |
|     application is inconsistent with the                       ||                                                                |
|     attached agreement, or that there is a                     ||                                                                |
|     breach of the agreement, either party                      ||                                                                |
|     to the agreement may unilaterally                          ||                                                                |
|     withdraw this change application.                          ||                                                                |
|----------------------------------------------------------------||----------------------------------------------------------------|

|POINT(S) OF DIVERSION ------> MAP VIEWER                        ||SAME AS HERETOFORE                                              |
|----------------------------------------------------------------||----------------------------------------------------------------|
|Point Surface:                                                  ||                                                                |
|(1)  N 1517 ft W  364 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM||
| Dvrting Wks: Pump                                              ||                                                                |
| Source:      Utah Lake                                         ||                                                                |
```

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|--------------------------------------------------------------||--------------------------------------------------------------|
|Point Underground:                                            ||                                                              |
|(1)  S 1980 ft W  325 ft from N4 cor, Sec 19, T  7S, R  2W, SLBM||                                                              |
|  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#: 000000 ||                                                              |
|    COMMENT:                                                  ||                                                              |
|(2)  N   50 ft W   50 ft from SE cor, Sec 20, T  7S, R  2W, SLBM||                                                              |
|  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#: 000000 ||                                                              |
|    COMMENT:                                                  ||                                                              |
|(3)  S 1370 ft W   50 ft from NE cor, Sec 20, T  7S, R  2W, SLBM||                                                              |
|  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#: 000000 ||                                                              |
|    COMMENT:                                                  ||                                                              |
|(4)  S 1980 ft W 1980 ft from N4 cor, Sec 20, T  7S, R  2W, SLBM||                                                              |
|  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#: 000000 ||                                                              |
|    COMMENT:                                                  ||                                                              |
|(5)  N 1000 ft E  600 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM||                                                              |
|  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#: 000000 ||                                                              |
|    COMMENT:                                                  ||                                                              |
|(6)  S  600 ft E  800 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM||                                                              |
|  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#: 000000 ||                                                              |
|    COMMENT:                                                  ||                                                              |
|(7)  S  200 ft E 1000 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM||                                                              |
|  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#: 000000 ||                                                              |
|    COMMENT:                                                  ||                                                              |
|(8)  S    0 ft E 1200 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM||                                                              |
|  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#: 000000 ||                                                              |
|    COMMENT:                                                  ||                                                              |
|(9)  S  600 ft E  600 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM||                                                              |
|  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#: 000000 ||                                                              |
|    COMMENT:                                                  ||                                                              |
|(10) S  400 ft E 1000 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM||                                                              |
|  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#: 000000 ||                                                              |
|    COMMENT:                                                  ||                                                              |
|(11) S    0 ft E    0 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM||                                                              |
|  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#: 000000 ||                                                              |
|    COMMENT:                                                  ||                                                              |
|(12) N  200 ft W  600 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM||                                                              |
|  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#: 000000 ||                                                              |
|    COMMENT:                                                  ||                                                              |
|(13) N  200 ft E  400 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM||                                                              |
|  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#: 000000 ||                                                              |
|    COMMENT:                                                  ||                                                              |
|(14) N  200 ft E 1200 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM||                                                              |
|  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#: 000000 ||                                                              |
|    COMMENT:                                                  ||                                                              |
|(15) N  400 ft E  200 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM||                                                              |
|  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#: 000000 ||                                                              |
|    COMMENT:                                                  ||                                                              |
|(16) N  600 ft W  200 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM||                                                              |
|  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#: 000000 ||                                                              |
|    COMMENT:                                                  ||                                                              |
|(17) N  600 ft E 1200 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM||                                                              |
|  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#: 000000 ||                                                              |
|    COMMENT:                                                  ||                                                              |
|(18) N  800 ft W  200 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM||                                                              |
|  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#: 000000 ||                                                              |
|    COMMENT:                                                  ||                                                              |
|(19) N  800 ft E 1200 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM||                                                              |
|  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#: 000000 ||                                                              |
|    COMMENT:                                                  ||                                                              |
|(20) N 1000 ft E  200 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM||                                                              |
|  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#: 000000 ||                                                              |
|    COMMENT:                                                  ||                                                              |
|(21) N 1000 ft E 1000 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM||                                                              |
|  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#: 000000 ||                                                              |
|    COMMENT:                                                  ||                                                              |
|(22) N 1000 ft E 1200 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM||                                                              |
|  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#: 000000 ||                                                              |
|    COMMENT:                                                  ||                                                              |
|(23) N 1200 ft E  800 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM||                                                              |
|  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#: 000000 ||                                                              |
|    COMMENT:                                                  ||                                                              |
|(24) N 1200 ft E 1200 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM||                                                              |
|  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#: 000000 ||                                                              |
|    COMMENT:                                                  ||                                                              |
```

```
|(25) N 1400 ft E  800 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM||
|  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#: 000000 ||                                                                 |
|    COMMENT:                                                    ||                                                                 |
|(26) N 1400 ft W 1000 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM||
|  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#: 000000 ||                                                                 |
|    COMMENT:                                                    ||                                                                 |
|(27) N  400 ft E 1200 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM||
|  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#: 000000 ||                                                                 |
|    COMMENT:                                                    ||                                                                 |
|(28) N  800 ft W  800 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM||
|  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#: 000000 ||                                                                 |
|    COMMENT:                                                    ||                                                                 |
|(29) N 1000 ft W  600 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM||
|  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#: 000000 ||                                                                 |
|    COMMENT:                                                    ||                                                                 |
|(30) N 1600 ft E  600 ft from S4 cor, Sec 09, T  8S, R  1E, SLBM||
|  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#: 000000 ||                                                                 |
|    COMMENT:                                                    ||                                                                 |
|(31) S  200 ft E 1000 ft from N4 cor, Sec 16, T  8S, R  1E, SLBM||
|  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#: 000000 ||                                                                 |
|    COMMENT:                                                    ||                                                                 |
|----------------------------------------------------------------||-----------------------------------------------------------------|
|Point Rediversion:                                              ||                                                                 |
|(1)  S  395 ft E 2438 ft from W4 cor, Sec 26, T  4S, R  1W, SLBM||
| Dvrting Wks: USBR/MWDSLC Pump Station                          ||                                                                 |
| Source:      Jordan River                                      ||                                                                 |
|----------------------------------------------------------------||-----------------------------------------------------------------|

|PLACE OF USE ------>                                            ||SAME AS HERETOFORE                                               |
|----------------------------------------------------------------||-----------------------------------------------------------------|
|                             --NW¼--  --NE¼--  --SW¼--  --SE¼-- ||                                                                 |
|                            |N N S S||N N S S||N N S S||N N S S||                                                                 |
|                            |W E W E||W E W E||W E W E||W E W E||                                                                 |
|Sec 19 T  7S R  2W SLBM     * : : : ** : : :X** : : : ** : : : *||                                                                 |
|Sec 20 T  7S R  2W SLBM     * : :X:X** : : : ** : : : ** : : : *||                                                                 |
|Sec 09 T  8S R  1E SLBM     * : : : ** : : : ** :X:X:X**X: :X: *||                                                                 |
|Sec 16 T  8S R  1E SLBM     *X:X: : ** : : :X** : : : ** : : : *||                                                                 |

|NATURE OF USE ------>                                           ||CHANGED as follows:                                              |
|----------------------------------------------------------------||-----------------------------------------------------------------|
|SUPPLEMENTAL to Other Water Rights: No                          ||SUPPLEMENTAL to Other Water Rights: No                           |
|----------------------------------------------------------------||-----------------------------------------------------------------|
|IRR:     36.7920 acs Sol/Sup:             acs USED 04/01 - 10/31||                                                                 |
|................................................................||.................................................................|
|STK: 30.0000 Cattle or Equivalent             USED 01/01 - 12/31||                                                                 |
|................................................................||.................................................................|
|................................................................||.................................................................|
|DOM: 90.0000 Equivalent Domestic Units        USED 01/01 - 12/31||DOM: 408.0000 Equivalent Domestic Units       USED 01/01 - 12/31|
|................................................................||.................................................................|
|OTH: COMMERCIAL:                              USED 01/01 - 12/31||                                                                 |
|                                                                ||                                                                 |
|................................................................||.................................................................|
|OTH: INDUSTRIAL:                              USED 01/01 - 12/31||                                                                 |
|                                                                ||                                                                 |
|................................................................||.................................................................|
|OTH: FIRE PROTECTION:                         USED 01/01 - 12/31||                                                                 |
|                                                                ||                                                                 |
|----------------------------------------------------------------||-----------------------------------------------------------------|

*-----------------------------------------------------------------------------------------------------------------------------------*
*-----------------------------------------------------------------------------------------------------------------------------------*
PROTESTANTS*************************************************************************************************************************
*-----------------------------------------------------------------------------------------------------------------------------------*

NAME: USA Bureau of Reclamation                                   NAME:  Provo River Water Users Association
ADDR: c/o Jonathan B. Jones                                       ADDR: c/o Warren H. Peterson
      302 East 1860 South                                               362 West Main Street
      Provo, UT  84606-7317                                             Delta, UT  84624
------------------------------------------------------------------------------------------------------------------------------------
************************************************************************************************************************************
******************************************************E N D   O F   D A T A*********************************************************
************************************************************************************************************************************
```

Utah Division of Water Rights

Select Related Information

(WARNING: Water Rights makes NO claims as to the accuracy of this data.) RUN DATE: 12/15/2009

WATER RIGHT: **54-1045** APPLICATION/CLAIM NO.: CERT. NO.:

CHANGES: a24306 Withdrawn
a28091 Rejected
a29374 Approved

OWNERSHIP

NAME: East Jordan Irrigation Company
ADDR: 13849 Lookout Peak Drive
Riverton, UT 84096-6441

NAME: Scott McLachlan
ADDR: P.O. Box 37
Lehi, UT 84043
REMARKS: 65.34 acft, 13.068 acres

DATES, ETC.

LAND OWNED BY APPLICANT? COUNTY TAX ID#:
FILED: |PRIORITY: / /1877|PUB BEGAN: |PUB ENDED: |NEWSPAPER:
ProtestEnd: |PROTESTED: [No]|HEARNG HLD: |SE ACTION: [ ]|ActionDate: |PROOF DUE:
EXTENSION: |ELEC/PROOF:[ ]|ELEC/PROOF: |CERT/WUC: 06/16/1969|LAP, ETC: |LAPS LETTER:
RUSH LETTR: |RENOVATE: |RECON REQ: |TYPE: [ ]
PD BOOK: [54-]|MAP: [ ]|PUB DATE:
Type of Right: Decree Source of Info: Ownership Segregation Status:

LOCATION OF WATER RIGHT***(Points of Diversion: Click on Location to access PLAT Program.)***********MAP VIEWER

FLOW: 64.34 acre-feet SOURCE: Utah Lake and Jordan River
COUNTY: Utah COMMON DESCRIPTION: Jordan Narrows

POINTS OF DIVERSION -- SURFACE:
(1) N 180 ft E 1880 ft from W4 cor, Sec 26, T 4S, R 1W, SLBM
Diverting Works: Turner Dam Source: Jordan River
(2) S 1000 ft W 40 ft from N4 cor, Sec 25, T 5S, R 1W, SLBM
Diverting Works: Utah Lake Pumping Plant Source: Utah Lake

Stream Alt Required?: No

USES OF WATER RIGHT******** *ELU -- Equivalent Livestock Unit (cow, horse, etc.)* ******** *EDU -- Equivalent Domestic Unit or 1 Family*

SUPPLEMENTAL GROUP NO. 400052. Water Rights Appurtenant to the following use(s):
54-1045(DEC),1232(DEC)

IRRIGATION: Sole Supply: 12.818 acres of the Group Total of 13.068 Div Limit: 0.0 acft. PERIOD OF USE: 04/01 TO 10/31

###PLACE OF USE:

	NORTH WEST QUARTER				NORTH EAST QUARTER				SOUTH WEST QUARTER				SOUTH EAST QUARTER				Section
	NW	NE	SW	SE	NW	NE	SW	SE	NW	NE	SW	SE	NW	NE	SW	SE	Totals
Sec 07 T 2S R 1E SLBM											X						0.0000

Sec 18 T 2S R 1E SLBM	X	X	X	X			X	X	X	X	X	X	X	X	X	X	0.0000
Sec 19 T 2S R 1E SLBM	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0.0000
Sec 20 T 2S R 1E SLBM			X						X	X	X	X			X		0.0000
Sec 29 T 2S R 1E SLBM	X	X	X		X	X			X		X						0.0000
Sec 30 T 2S R 1E SLBM	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0.0000
Sec 31 T 2S R 1E SLBM	X	X	X	X	X	X	X		X	X	X	X					0.0000
Sec 11 T 2S R 1W SLBM							X	X		X		X	X	X	X	X	0.0000
Sec 12 T 2S R 1W SLBM	X	X	X	X			X		X	X	X	X	X		X	X	0.0000
Sec 13 T 2S R 1W SLBM	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	0.0000
Sec 14 T 2S R 1W SLBM	X	X	X	X	X	X	X	X		X		X	X	X	X	X	0.0000
Sec 23 T 2S R 1W SLBM		X		X	X	X	X	X		X			X	X			0.0000
Sec 24 T 2S R 1W SLBM	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0.0000
Sec 25 T 2S R 1W SLBM	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0.0000
Sec 36 T 2S R 1W SLBM	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0.0000
Sec 06 T 3S R 1E SLBM	X	X	X						X		X						0.0000
Sec 07 T 3S R 1E SLBM			X						X	X	X						0.0000
Sec 18 T 3S R 1E SLBM	X	X	X	X					X	X	X	X					0.0000
Sec 19 T 3S R 1E SLBM	X		X						X		X	X					0.0000
Sec 29 T 3S R 1E SLBM									X								0.0000
Sec 30 T 3S R 1E SLBM	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0.0000
Sec 31 T 3S R 1E SLBM	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0.0000
Sec 32 T 3S R 1E SLBM									X		X						0.0000
Sec 01 T 3S R 1W SLBM	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0.0000
Sec 02 T 3S R 1W SLBM																X	0.0000
Sec 11 T 3S R 1W SLBM					X	X	X	X						X			0.0000
Sec 12 T 3S R 1W SLBM	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0.0000
Sec 13 T 3S R 1W SLBM	X	X	X	X	X	X	X	X		X		X	X	X	X	X	0.0000
Sec 24 T 3S R 1W SLBM		X		X	X	X	X	X	X	X	X	X	X	X	X	X	0.0000
Sec 25 T 3S R 1W SLBM	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0.0000
Sec 26 T 3S R 1W SLBM				X			X	X		X			X	X			0.0000
Sec 35 T 3S R 1W SLBM						X								X		X	0.0000
Sec 36 T 3S R 1W SLBM	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	0.0000
Sec 05 T 4S R 1E SLBM	X																0.0000
Sec 06 T 4S R 1E SLBM	X	X	X	X	X	X	X	X	X	X	X	X	X				0.0000
Sec 01 T 4S R 1W SLBM	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0.0000
Sec 02 T 4S R 1W SLBM						X		X					X	X	X	X	0.0000
Sec 11 T 4S R 1W SLBM		X		X	X	X	X	X	X	X	X		X	X			0.0000
Sec 12 T 4S R 1W SLBM	X	X		X	X	X	X										0.0000
Sec 14 T 4S R 1W SLBM	X	X	X	X					X	X							0.0000
GROUP ACREAGE TOTAL:																	0.0000

SEGREGATION HISTORY

This Right was Segregated from 57-7637 , with Appl#: , Approval Date: / / under which Proof is to be submitted.

This Right as originally filed:

FLOW IN CFS	QUANTITY IN ACRE-FEET	IRRIGATED ACREAGE	STOCK (ELUS)	DOMESTIC (FAMILIES)	MUNICIPAL	MINING	POWER	OTHER
	130.68	26.1360						

WATER USES; MUNICIPAL, MINING, POWER, OTHER in ACRE-FEET.

based on 27 shares of stock; see Change Application

The following Water Rights have been Segregated from 54-1045:

(1) WRNUM: 54-1102 65.34 13.0680
APPL#:
NAME: East Jordan Irrigation Company, et al.
FILED: 05/08/2003 STATUS:
APPR:

(2) WRNUM: 54-1232 1.0 0.2500
APPL#:
NAME: East Jordan Irrigation Company, et al.
FILED: 10/01/2007 STATUS:
APPR:

```
========================================================================================================================================
                         CFS         ACRE-FEET   IRRIGATED     STOCK     DOMESTIC  MUNICIPAL    MINING      POWER       OTHER
                                                  ACREAGE      (ELUs)   (FAMILIES)(*-----------------ACRE-FEET------------------*)
54-1045 currently has:                  64.34        12.8180
****************************************************************************************************************************************
*******************************************************E N D   O F   D A T A***********************************************************
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Utah Division of Water Rights

Select Related Information

(WARNING: Water Rights makes NO claims as to the accuracy of this data.) RUN DATE: 12/15/2009 Page 1

```
CHANGE: a24306          WATER RIGHT: 54-1045  CERT. NO.:        COUNTY TAX ID#:      AMENDATORY? No
BASE WATER RIGHTS: 54-1045
RIGHT EVIDENCED BY: 54-1045, which is a portion of 57-7637.  (Based on 27 shares of East Jordan
                    Irrigation Company stock.)
CHANGES: Point of Diversion [X], Place of Use [X], Nature of Use [X], Reservoir Storage [ ].
*------------------------------------------------------------------------------------------------------------------------------*

NAME: East Jordan Irrigation Company
ADDR: 13849 Lookout Peak Drive
      Riverton, UT 84096-6441
                     REMARKS:

NAME: Scott McLachlan
ADDR: 9300 North 10400 West
      Lehi UT 84043
                     REMARKS: 64.13 acft, 71 families, 8.0425 acres
*------------------------------------------------------------------------------------------------------------------------------*
FILED:     03/27/2000|PRIORITY:  03/27/2000|ADV BEGAN: 04/12/2000|ADV ENDED: 04/19/2000|NEWSPAPER:  Lehi Free Press
ProtestEnd:05/09/2000|PROTESTED: [No Heari]|HEARNG HLD:          |SE ACTION: [Approved]|ActionDate:07/07/2000|PROOF DUE:
EXTENSION:           |ELEC/PROOF:[        ]|ELEC/PROOF:          |CERT/WUC:            |LAP, ETC:            |LAPS LETTER:
RUSH LETTR:          |RENOVATE:            |RECON REQ:           |TYPE: [             ]
Status: Withdrawn
*****************************************************************   ****************************************************************
**********************H E R E T O F O R E***********************   ***********************H E R E A F T E R**********************
*****************************************************************   ****************************************************************

|FLOW:   65.34 acre-feet                                          ||FLOW:   65.34 acre-feet                                          |
|-----------------------------------------------------------------||-----------------------------------------------------------------|
|SOURCE: Utah Lake and Jordan River                               ||SOURCE: Underground Water Wells (4)                              |
|COUNTY: Salt Lake                                                ||COUNTY: Utah       COM DESC: 4.5 miles South of Fairfield        |

|POINT(S) OF DIVERSION ------> MAP VIEWER                         ||CHANGED AS FOLLOWS: (Click Location link for WRPLAT)             |
|-----------------------------------------------------------------||-----------------------------------------------------------------|
|Point Surface:                                                   ||                                                                 |
|(1)  N  180 ft E 1880 ft from W4 cor, Sec 26, T  4S, R  1W, SLBM ||                                                                 |
| Dvrting Wks: Turner Dam                                         ||                                                                 |
| Source:      Jordan River                                       ||                                                                 |
|(2)  S 1000 ft W   40 ft from N4 cor, Sec 25, T  5S, R  1W, SLBM ||                                                                 |
| Dvrting Wks: Utah Lake Pumping Plant                            ||                                                                 |
| Source:      Utah Lake                                          ||                                                                 |
|-----------------------------------------------------------------||-----------------------------------------------------------------|
|Point Underground:                                               ||UNDERGROUND: (Click Link for PLAT data, Well ID# link for data.)|
|                                                                 ||(1)  S 1350 ft W  325 ft from NE cor, Sec 19, T  7S, R  2W, SLBM|
|                                                                 ||  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:        |
|                                                                 ||    COMMENT:                                                     |
|                                                                 ||(2)  S 1980 ft W 1980 ft from N4 cor, Sec 20, T  7S, R  2W, SLBM|
|                                                                 ||  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:        |
|                                                                 ||    COMMENT:                                                     |
|                                                                 ||(3)  S 1370 ft W   50 ft from NE cor, Sec 20, T  7S, R  2W, SLBM|
|                                                                 ||  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:        |
|                                                                 ||    COMMENT:                                                     |
|                                                                 ||(4)  N   50 ft W   50 ft from SE cor, Sec 20, T  7S, R  2W, SLBM|
|                                                                 ||  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:        |
|                                                                 ||    COMMENT:                                                     |
|-----------------------------------------------------------------||-----------------------------------------------------------------|

|PLACE OF USE ------>                                             ||CHANGED as follows:                                              |
|-----------------------------------------------------------------||-----------------------------------------------------------------|
```

```
|                             --NW¼--  --NE¼--  --SW¼--  --SE¼-- ||                             --NW¼--  --NE¼--  --SW¼--  --SE¼-- |
|                            |N N S S||N N S S||N N S S||N N S S|||                            |N N S S||N N S S||N N S S||N N S S||
|                            |W E W E||W E W E||W E W E||W E W E|||                            |W E W E||W E W E||W E W E||W E W E||
|Sec 07 T  2S R  1E SLBM     * : : : ** : : : ** : :X: ** : : : *||Sec 19 T  7S R  2W SLBM     * : : : ** : : :X** : : : ** : : : *|
|Sec 18 T  2S R  1E SLBM     *X:X:X:X** : :X:X**X:X:X:X**X:X:X:X*||Sec 20 T  7S R  2W SLBM     * : :X:X** : : : ** : : : ** : : : *|
|Sec 19 T  2S R  1E SLBM     *X:X:X:X**X:X:X:X**X:X:X:X**X:X:X:X*||                                                                 |
|Sec 20 T  2S R  1E SLBM     * : :X: ** : : : **X:X:X:X** : :X: *||                                                                 |
|Sec 29 T  2S R  1E SLBM     *X:X:X: **X:X: : **X: :X: ** : : : *||                                                                 |
|Sec 30 T  2S R  1E SLBM     *X:X:X:X**X:X:X:X**X:X:X:X**X:X:X:X*||                                                                 |
|Sec 31 T  2S R  1E SLBM     *X:X:X:X**X:X:X: **X:X:X:X** : : : *||                                                                 |
|Sec 11 T  2S R  1W SLBM     * : : : ** : :X:X** :X: :X**X:X:X:X*||                                                                 |
|Sec 12 T  2S R  1W SLBM     *X:X:X:X** : :X: **X:X:X:X**X: :X:X*||                                                                 |
|Sec 13 T  2S R  1W SLBM     *X:X:X:X**X:X: :X**X:X:X:X**X:X:X:X*||                                                                 |
|Sec 14 T  2S R  1W SLBM     *X:X:X:X**X:X:X:X** :X: :X**X:X:X:X*||                                                                 |
|Sec 23 T  2S R  1W SLBM     * :X: :X**X:X:X:X** :X: : **X:X: : *||                                                                 |
|Sec 24 T  2S R  1W SLBM     *X:X:X:X**X:X:X:X**X:X:X:X**X:X:X:X*||                                                                 |
|Sec 25 T  2S R  1W SLBM     *X:X:X:X**X:X:X:X**X:X:X:X**X:X:X:X*||                                                                 |
|Sec 36 T  2S R  1W SLBM     *X:X:X:X**X:X:X:X**X:X:X:X**X:X:X:X*||                                                                 |
|Sec 06 T  3S R  1E SLBM     *X:X:X: ** : : : **X: :X: ** : : : *||                                                                 |
|Sec 07 T  3S R  1E SLBM     * : :X: ** : : : **X:X:X: ** : : : *||                                                                 |
|Sec 18 T  3S R  1E SLBM     *X:X:X:X** : : : **X:X:X:X** : : : *||                                                                 |
|Sec 19 T  3S R  1E SLBM     *X: :X: ** : : : **X: :X:X** : : : *||                                                                 |
|Sec 29 T  3S R  1E SLBM     * : : : ** : : : **X: : : ** : : : *||                                                                 |
|Sec 30 T  3S R  1E SLBM     *X:X:X:X**X:X:X:X**X:X:X:X**X:X:X:X*||                                                                 |
|Sec 31 T  3S R  1E SLBM     *X:X:X:X**X:X:X:X**X:X:X:X**X:X:X:X*||                                                                 |
|Sec 32 T  3S R  1E SLBM     * : : : ** : : : **X: :X: ** : : : *||                                                                 |
|Sec 01 T  3S R  1W SLBM     *X:X:X:X**X:X:X:X**X:X:X:X**X:X:X:X*||                                                                 |
|Sec 02 T  3S R  1W SLBM     * : : : ** : : : ** : : : ** : : :X*||                                                                 |
|Sec 11 T  3S R  1W SLBM     * : : : **X:X:X:X** : : : ** :X: : *||                                                                 |
|Sec 12 T  3S R  1W SLBM     *X:X:X:X**X:X:X:X**X:X:X:X**X:X:X:X*||                                                                 |
|Sec 13 T  3S R  1W SLBM     *X:X:X:X**X:X:X:X** :X: :X**X:X:X:X*||                                                                 |
|Sec 24 T  3S R  1W SLBM     * :X: :X**X:X:X:X**X:X:X:X**X:X:X:X*||                                                                 |
|Sec 25 T  3S R  1W SLBM     *X:X:X:X**X:X:X:X**X:X:X:X**X:X:X:X*||                                                                 |
|Sec 26 T  3S R  1W SLBM     * : : :X** : :X:X** :X: : **X:X: : *||                                                                 |
|Sec 35 T  3S R  1W SLBM     * : : : ** :X: : ** : : : ** :X: :X*||                                                                 |
|Sec 36 T  3S R  1W SLBM     *X:X:X:X**X:X:X:X**X:X: :X**X:X:X:X*||                                                                 |
|Sec 05 T  4S R  1E SLBM     *X: : : ** : : : ** : : : ** : : : *||                                                                 |
|Sec 06 T  4S R  1E SLBM     *X:X:X:X**X:X:X:X**X:X:X:X**X: : : *||                                                                 |
|Sec 01 T  4S R  1W SLBM     *X:X:X:X**X:X:X:X**X:X:X:X**X:X:X:X*||                                                                 |
|Sec 02 T  4S R  1W SLBM     * : : : ** :X: :X** : : : **X:X:X:X*||                                                                 |
|Sec 11 T  4S R  1W SLBM     * :X: :X**X:X:X:X**X:X:X: **X:X: : *||                                                                 |
|Sec 12 T  4S R  1W SLBM     *X:X: :X**X:X:X: ** : : : ** : : : *||                                                                 |
|Sec 14 T  4S R  1W SLBM     *X:X:X:X** : : : **X:X: : ** : : : *||                                                                 |

|NATURE OF USE ------>                                          ||CHANGED as follows:                                            |
|---------------------------------------------------------------||---------------------------------------------------------------|
|SUPPLEMENTAL to Other Water Rights: No                         ||SUPPLEMENTAL to Other Water Rights: No                         |
|---------------------------------------------------------------||---------------------------------------------------------------|
|IRR:     13.0680 acs Sol/Sup:            acs USED 04/01 - 10/31||IRR:      8.1225 acs Sol/Sup:            acs USED 04/01 - 10/31|
|...............................................................||...............................................................|
|                                                               ||DOM: 73.0000 Equivalent Domestic Units        USED 01/01 - 12/31|

*------------------------------------------------------------------------------------------------------------------------------*
SEGREGATION HISTORY*************************************************************************************************************
*------------------------------------------------------------------------------------------------------------------------------*
This Change as originally filed:
                                                                        FLOW IN      QUANTITY IN    *---------W A T E R   U S E S---------*
                                                                          CFS         ACRE-FEET     IRRIGATED       STOCK         DOMESTIC
                                                                                                     ACREAGE        (ELUs)       (FAMILIES)
                                                                                         130.68      16.2450         .0000       146.0000
*------------------------------------------------------------------------------------------------------------------------------*
*------------------------------------------------------------------------------------------------------------------------------*
The following Changes have been Segregated from a24306:
(   1)  CHANGE: a24306a      WRNUM:  54-1102                                             65.34        8.1225         .0000        73.0000
        NAME:  East Jordan Irrigation Company etal
        FILED: 05/08/2003  STATUS: AMEN  APPR/REJ:
*------------------------------------------------------------------------------------------------------------------------------*
*------------------------------------------------------------------------------------------------------------------------------*
                                                                          CFS         ACRE-FEET     IRRIGATED       STOCK         DOMESTIC
                                                                                                     ACREAGE        (ELUs)       (FAMILIES)
a24306 currently has: -------------------------------->                                  65.34        8.1225         .0000        73.0000
*------------------------------------------------------------------------------------------------------------------------------*
*------------------------------------------------------------------------------------------------------------------------------*
```

```
PROTESTANTS*******************************************************************************************************************
*----------------------------------------------------------------------------------------------------------------------------*

NAME: PacifiCorp                                                  NAME:  PacifiCorp.
ADDR: c/o Jody L. Williams                                        ADDR: c/o Claudia Conder
      299 South Main St., Ste. 1800                                     1407 West North Temple #320
      Salt Lake City UT 84111                                           Salt Lake City UT 84116
------------------------------------------------------------------------------------------------------------------------------
NAME: USA Bureau of Reclamation                                   NAME:
ADDR: ATTN: Jonathan Jones                                        ADDR:
      302 East 1860 South
      Provo UT 84606-7317
------------------------------------------------------------------------------------------------------------------------------
*----------------------------------------------------------------------------------------------------------------------------*
EXTENSIONS OF TIME WITHIN WHICH TO FILE PROOF*********************************************************************************
*----------------------------------------------------------------------------------------------------------------------------*
FILED:     07/25/2003|PUB BEGAN:           |PUB ENDED:           |NEWSPAPER: No Adv Required
ProtestEnd:          |PROTESTED: [No Hear ]|HEARNG HLD:          |SE ACTION: [Approved]|ActionDate:04/15/2004|PROOF DUE:  07/31/2008
------------------------------------------------------------------------------------------------------------------------------
******************************************************************************************************************************
*******************************************************E N D   O F   D A T A**************************************************
******************************************************************************************************************************
```

Utah Division of Water Rights

Select Related Information

(WARNING: Water Rights makes NO claims as to the accuracy of this data.) RUN DATE: 12/15/2009

WATER RIGHT: **54-1102** APPLICATION/CLAIM NO.: CERT. NO.:

CHANGES: a24306a Amended by Subsequent Change
a29375 Approved
a28090 Amended by Subsequent Change

OWNERSHIP

NAME: East Jordan Irrigation Company
ADDR: 13849 Lookout Peak Drive
Riverton, UT 84096-6441

NAME: Keith Jonsson
ADDR: 9250 West 8170 North
Lehi UT 84043
REMARKS: 65.34 acft, 13.068 acres

DATES, ETC.

```
LAND OWNED BY APPLICANT?                   COUNTY TAX ID#:
FILED:              |PRIORITY:  00/00/1877|PUB BEGAN:           |PUB ENDED:           |NEWSPAPER:
ProtestEnd:         |PROTESTED: [No      ]|HEARNG HLD:          |SE ACTION: [        ]|ActionDate:          |PROOF DUE:
EXTENSION:          |ELEC/PROOF:[        ]|ELEC/PROOF:          |CERT/WUC:  06/16/1969|LAP, ETC:            |LAPS LETTER:
RUSH LETTR:         |RENOVATE:            |RECON REQ:           |TYPE: [              ]
PD BOOK: [  54-     ]|MAP:  [             ]|PUB DATE:
Type of Right: Decree                        Source of Info: Ownership Segregation        Status:
```

LOCATION OF WATER RIGHT***(Points of Diversion: Click on Location to access PLAT Program.)*********** MAP VIEWER

FLOW: 65.34 acre-feet SOURCE: Utah Lake and Jordan River
COUNTY: BAD-COUNTY COMMON DESCRIPTION: Jordan Narrows

POINTS OF DIVERSION -- SURFACE:
(1) N 180 ft E 1880 ft from W4 cor, Sec 26, T 4S, R 1W, SLBM
Diverting Works: Turner Dam Source: Jordan River
(2) S 1000 ft W 40 ft from N4 cor, Sec 25, T 5S, R 1W, SLBM
Diverting Works: Utah Lake Pumping Plant Source: Utah Lake

Stream Alt Required?: No

USES OF WATER RIGHT******** *ELU -- Equivalent Livestock Unit (cow, horse, etc.)* ******** *EDU -- Equivalent Domestic Unit or 1 Family*

SUPPLEMENTAL GROUP NO. 400111.

IRRIGATION: Sole Supply: UNEVALUATED acres Group Total: 13.068 Div Limit: 0.0 acft. PERIOD OF USE: 04/01 TO 10/31

###PLACE OF USE:	NORTH WEST QUARTER				NORTH EAST QUARTER				SOUTH WEST QUARTER				SOUTH EAST QUARTER				Section Totals
	NW	NE	SW	SE	NW	NE	SW	SE	NW	NE	SW	SE	NW	NE	SW	SE	
Sec 07 T 2S R 1E SLBM											X						0.0000
Sec 18 T 2S R 1E SLBM	X	X	X	X			X	X	X	X	X	X	X	X	X	X	0.0000
Sec 19 T 2S R 1E SLBM	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0.0000

Sec 20 T 2S R 1E SLBM			X						X	X	X	X			X		0.0000
Sec 29 T 2S R 1E SLBM	X	X	X		X	X			X		X						0.0000
Sec 30 T 2S R 1E SLBM	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0.0000
Sec 31 T 2S R 1E SLBM	X	X	X	X	X	X	X		X	X	X	X					0.0000
Sec 11 T 2S R 1W SLBM							X	X		X		X	X	X	X	X	0.0000
Sec 12 T 2S R 1W SLBM	X	X	X	X			X		X	X	X	X	X		X	X	0.0000
Sec 13 T 2S R 1W SLBM	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	0.0000
Sec 14 T 2S R 1W SLBM	X	X	X	X	X	X	X	X		X		X	X	X	X	X	0.0000
Sec 23 T 2S R 1W SLBM		X		X	X	X	X	X		X			X	X			0.0000
Sec 24 T 2S R 1W SLBM	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0.0000
Sec 25 T 2S R 1W SLBM	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0.0000
Sec 36 T 2S R 1W SLBM	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0.0000
Sec 06 T 3S R 1E SLBM	X	X	X						X		X						0.0000
Sec 07 T 3S R 1E SLBM			X						X	X	X						0.0000
Sec 18 T 3S R 1E SLBM	X	X	X	X					X	X	X	X					0.0000
Sec 19 T 3S R 1E SLBM	X		X						X		X	X					0.0000
Sec 29 T 3S R 1E SLBM									X								0.0000
Sec 30 T 3S R 1E SLBM	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0.0000
Sec 31 T 3S R 1E SLBM	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0.0000
Sec 32 T 3S R 1E SLBM									X		X						0.0000
Sec 01 T 3S R 1W SLBM	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0.0000
Sec 02 T 3S R 1W SLBM																X	0.0000
Sec 11 T 3S R 1W SLBM					X	X	X	X						X			0.0000
Sec 12 T 3S R 1W SLBM	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0.0000
Sec 13 T 3S R 1W SLBM	X	X	X	X	X	X	X	X		X		X	X	X	X	X	0.0000
Sec 24 T 3S R 1W SLBM		X		X	X	X	X	X	X	X	X	X	X	X	X	X	0.0000
Sec 25 T 3S R 1W SLBM	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0.0000
Sec 26 T 3S R 1W SLBM				X			X	X		X			X	X			0.0000
Sec 35 T 3S R 1W SLBM						X								X		X	0.0000
Sec 36 T 3S R 1W SLBM	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	0.0000
Sec 05 T 4S R 1E SLBM	X																0.0000
Sec 06 T 4S R 1E SLBM	X	X	X	X	X	X	X	X	X	X	X	X	X				0.0000
Sec 01 T 4S R 1W SLBM	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0.0000
Sec 02 T 4S R 1W SLBM						X		X					X	X	X	X	0.0000
Sec 11 T 4S R 1W SLBM		X		X	X	X	X	X	X	X	X		X	X			0.0000
Sec 12 T 4S R 1W SLBM	X	X		X	X	X	X										0.0000
Sec 14 T 4S R 1W SLBM	X	X	X	X					X	X							0.0000
																GROUP ACREAGE TOTAL:	0.0000

SEGREGATION HISTORY

This Right was Segregated from 54-1045 , with Appl#: , Approval Date: / / under which Proof is to be submitted.

This Right as originally filed:

FLOW IN CFS	QUANTITY IN ACRE-FEET	IRRIGATED ACREAGE	STOCK (ELUs)	DOMESTIC (FAMILIES)	MUNICIPAL	MINING	POWER	OTHER
	65.34	13.0680						

(MUNICIPAL, MINING, POWER, OTHER: ACRE-FEET)

E N D O F D A T A

Utah Division of Water Rights

Select Related Information

(WARNING: Water Rights makes NO claims as to the accuracy of this data.) RUN DATE: 12/15/2009 Page 1

```
CHANGE: a24306a          WATER RIGHT: 54-1102   CERT. NO.:        COUNTY TAX ID#:     AMENDATORY? No
BASE WATER RIGHTS: 54-1102
RIGHT EVIDENCED BY: 54-1102 is a seg portion 54-1045, which is a portion of 57-7637.  (Based on 27 shares of East Jordan
                    Irrigation Company stock.)
CHANGES: Point of Diversion [X], Place of Use [X], Nature of Use [X], Reservoir Storage [ ].
*------------------------------------------------------------------------------------------------------------------------------------*

NAME: East Jordan Irrigation Company
ADDR: 13849 Lookout Peak Drive
      Riverton, UT 84096-6441
                     REMARKS:

NAME: Keith Jonsson
ADDR: 9250 West 8170 North
      Lehi UT 84003
                     REMARKS:
*------------------------------------------------------------------------------------------------------------------------------------*
FILED:     05/08/2003|PRIORITY:  05/08/2003|ADV BEGAN: 04/12/2000|ADV ENDED: 04/19/2000|NEWSPAPER:  Lehi Free Press
ProtestEnd:05/09/2000|PROTESTED: [No Heari]|HEARNG HLD:          |SE ACTION: [Approved]|ActionDate:07/07/2000|PROOF DUE:  07/31/2008
EXTENSION:           |ELEC/PROOF:[        ]|ELEC/PROOF:          |CERT/WUC:             |LAP, ETC:            |LAPS LETTER:
RUSH LETTR:          |RENOVATE:            |RECON REQ:           |TYPE: [              ]
Status: Amended by Subsequent Change
*****************************************************************  *****************************************************************
**********************H E R E T O F O R E***********************  ***********************H E R E A F T E R************************
*****************************************************************  *****************************************************************

|FLOW:   65.34 acre-feet                                         ||FLOW:   65.34 acre-feet                                          |
|----------------------------------------------------------------||-----------------------------------------------------------------|
|SOURCE: Utah Lake and Jordan River                              ||SOURCE: Underground Water Wells (4)                              |
|COUNTY: Salt Lake                                               ||COUNTY: Utah       COM DESC: 4.5 miles South of Fairfield       |

|POINT(S) OF DIVERSION ------> MAP VIEWER                        ||CHANGED AS FOLLOWS: (Click Location link for WRPLAT)            |
|----------------------------------------------------------------||-----------------------------------------------------------------|
|Point Surface:                                                  ||                                                                 |
|(1)  N  180 ft E 1880 ft from W4 cor, Sec 26, T  4S, R  1W, SLBM||                                                                 |
| Dvrting Wks: Turner Dam                                        ||                                                                 |
| Source:      Jordan River                                      ||                                                                 |
|(2)  S 1000 ft W   40 ft from N4 cor, Sec 25, T  5S, R  1W, SLBM||                                                                 |
| Dvrting Wks: Utah Lake Pumping Plant                           ||                                                                 |
| Source:      Utah Lake                                         ||                                                                 |
|----------------------------------------------------------------||-----------------------------------------------------------------|
|Point Underground:                                              ||UNDERGROUND: (Click Link for PLAT data, Well ID# link for data.)|
|                                                                ||(1)  S 1350 ft W  325 ft from NE cor, Sec 19, T  7S, R  2W, SLBM|
|                                                                ||  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:         |
|                                                                ||    COMMENT:                                                     |
|                                                                ||(2)  S 1980 ft W 1980 ft from N4 cor, Sec 20, T  7S, R  2W, SLBM|
|                                                                ||  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:         |
|                                                                ||    COMMENT:                                                     |
|                                                                ||(3)  S 1370 ft W   50 ft from NE cor, Sec 20, T  7S, R  2W, SLBM|
|                                                                ||  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:         |
|                                                                ||    COMMENT:                                                     |
|                                                                ||(4)  N   50 ft W   50 ft from SE cor, Sec 20, T  7S, R  2W, SLBM|
|                                                                ||  Diameter:  16 ins.  Depth:  100 to 1000 ft.  WELL ID#:         |
|                                                                ||    COMMENT:                                                     |
|----------------------------------------------------------------||-----------------------------------------------------------------|

|PLACE OF USE ------>                                            ||CHANGED as follows:                                              |
|----------------------------------------------------------------||-----------------------------------------------------------------|
```

```
|                             --NW¼--  --NE¼--  --SW¼--  --SE¼-- ||                                --NW¼--  --NE¼--  --SW¼--  --SE¼-- |
|                            |N N S S||N N S S||N N S S||N N S S|||                               |N N S S||N N S S||N N S S||N N S S||
|                            |W E W E||W E W E||W E W E||W E W E|||                               |W E W E||W E W E||W E W E||W E W E||
|Sec 07 T  2S R  1E SLBM     * : : : ** : : : ** : :X: ** : : : *||Sec 19 T  7S R  2W SLBM     * : : : ** : : :X** : : : ** : : : *|
|Sec 18 T  2S R  1E SLBM     *X:X:X:X** : :X:X**X:X:X:X**X:X:X:X*||Sec 20 T  7S R  2W SLBM     * : :X:X** : : : ** : : : ** : : : *|
|Sec 19 T  2S R  1E SLBM     *X:X:X:X**X:X:X:X**X:X:X:X**X:X:X:X*||                                                                 |
|Sec 20 T  2S R  1E SLBM     * : :X: ** : : : **X:X:X:X** : :X: *||                                                                 |
|Sec 29 T  2S R  1E SLBM     *X:X:X: **X:X: : **X: :X: ** : : : *||                                                                 |
|Sec 30 T  2S R  1E SLBM     *X:X:X:X**X:X:X:X**X:X:X:X**X:X:X:X*||                                                                 |
|Sec 31 T  2S R  1E SLBM     *X:X:X:X**X:X:X: **X:X:X:X** : : : *||                                                                 |
|Sec 11 T  2S R  1W SLBM     * : : : ** : :X:X** :X: :X**X:X:X:X*||                                                                 |
|Sec 12 T  2S R  1W SLBM     *X:X:X:X** : :X: **X:X:X:X**X: :X:X*||                                                                 |
|Sec 13 T  2S R  1W SLBM     *X:X:X:X**X:X: :X**X:X:X:X**X:X:X:X*||                                                                 |
|Sec 14 T  2S R  1W SLBM     *X:X:X:X**X:X:X:X** :X: :X**X:X:X:X*||                                                                 |
|Sec 23 T  2S R  1W SLBM     * :X: :X**X:X:X:X** :X: : **X:X: : *||                                                                 |
|Sec 24 T  2S R  1W SLBM     *X:X:X:X**X:X:X:X**X:X:X:X**X:X:X:X*||                                                                 |
|Sec 25 T  2S R  1W SLBM     *X:X:X:X**X:X:X:X**X:X:X:X**X:X:X:X*||                                                                 |
|Sec 36 T  2S R  1W SLBM     *X:X:X:X**X:X:X:X**X:X:X:X**X:X:X:X*||                                                                 |
|Sec 06 T  3S R  1E SLBM     *X:X:X: ** : : : **X: :X: ** : : : *||                                                                 |
|Sec 07 T  3S R  1E SLBM     * : :X: ** : : : **X:X:X: ** : : : *||                                                                 |
|Sec 18 T  3S R  1E SLBM     *X:X:X:X** : : : **X:X:X:X** : : : *||                                                                 |
|Sec 19 T  3S R  1E SLBM     *X: :X: ** : : : **X: :X:X** : : : *||                                                                 |
|Sec 29 T  3S R  1E SLBM     * : : : ** : : : **X: : : ** : : : *||                                                                 |
|Sec 30 T  3S R  1E SLBM     *X:X:X:X**X:X:X:X**X:X:X:X**X:X:X:X*||                                                                 |
|Sec 31 T  3S R  1E SLBM     *X:X:X:X**X:X:X:X**X:X:X:X**X:X:X:X*||                                                                 |
|Sec 32 T  3S R  1E SLBM     * : : : ** : : : **X: :X: ** : : : *||                                                                 |
|Sec 01 T  3S R  1W SLBM     *X:X:X:X**X:X:X:X**X:X:X:X**X:X:X:X*||                                                                 |
|Sec 02 T  3S R  1W SLBM     * : : : ** : : : ** : : : ** : : :X*||                                                                 |
|Sec 11 T  3S R  1W SLBM     * : : : **X:X:X:X** : : : ** :X: : *||                                                                 |
|Sec 12 T  3S R  1W SLBM     *X:X:X:X**X:X:X:X**X:X:X:X**X:X:X:X*||                                                                 |
|Sec 13 T  3S R  1W SLBM     *X:X:X:X**X:X:X:X** :X: :X**X:X:X:X*||                                                                 |
|Sec 24 T  3S R  1W SLBM     * :X: :X**X:X:X:X**X:X:X:X**X:X:X:X*||                                                                 |
|Sec 25 T  3S R  1W SLBM     *X:X:X:X**X:X:X:X**X:X:X:X**X:X:X:X*||                                                                 |
|Sec 26 T  3S R  1W SLBM     * : : :X** : :X:X** :X: : **X:X: : *||                                                                 |
|Sec 35 T  3S R  1W SLBM     * : : : ** :X: : ** : : : ** :X: :X*||                                                                 |
|Sec 36 T  3S R  1W SLBM     *X:X:X:X**X:X:X:X**X:X: :X**X:X:X:X*||                                                                 |
|Sec 05 T  4S R  1E SLBM     *X: : : ** : : : ** : : : ** : : : *||                                                                 |
|Sec 06 T  4S R  1E SLBM     *X:X:X:X**X:X:X:X**X:X:X:X**X: : : *||                                                                 |
|Sec 01 T  4S R  1W SLBM     *X:X:X:X**X:X:X:X**X:X:X:X**X:X:X:X*||                                                                 |
|Sec 02 T  4S R  1W SLBM     * : : : ** :X: :X** : : : **X:X:X:X*||                                                                 |
|Sec 11 T  4S R  1W SLBM     * :X: :X**X:X:X:X**X:X:X: **X:X: : *||                                                                 |
|Sec 12 T  4S R  1W SLBM     *X:X: :X**X:X:X: ** : : : ** : : : *||                                                                 |
|Sec 14 T  4S R  1W SLBM     *X:X:X:X** : : : **X:X: : ** : : : *||                                                                 |
 _______________________________________________________________   _________________________________________________________________
 _______________________________________________________________   _________________________________________________________________
|NATURE OF USE ------>                                           ||CHANGED as follows:                                              |
|----------------------------------------------------------------||-----------------------------------------------------------------|
|SUPPLEMENTAL to Other Water Rights: No                          ||SUPPLEMENTAL to Other Water Rights: No                           |
|----------------------------------------------------------------||-----------------------------------------------------------------|
|IRR:     13.0680 acs Sol/Sup:             acs USED 04/01 - 10/31||IRR:      8.1225 acs Sol/Sup:              acs USED 04/01 - 10/31|
|................................................................||.................................................................|
|                                                                ||DOM: 73.0000 Equivalent Domestic Units        USED 01/01 - 12/31|
 _______________________________________________________________   _________________________________________________________________
*---------------------------------------------------------------------------------------------------------------------------------*
SEGREGATION HISTORY***************************************************************************************************************
*---------------------------------------------------------------------------------------------------------------------------------*
This Change as originally filed:
                                                           FLOW IN      QUANTITY IN    *---------W A T E R   U S E S---------*
                                                             CFS        ACRE-FEET      IRRIGATED        STOCK          DOMESTIC
                                                                                        ACREAGE         (ELUs)        (FAMILIES)
                                                                           130.68       16.2450          .0000        146.0000
*---------------------------------------------------------------------------------------------------------------------------------*
*---------------------------------------------------------------------------------------------------------------------------------*
The following Changes have been Segregated from a24306a:
(   1)  CHANGE: a24306a       WRNUM:  54-1102                               65.34        8.1225          .0000         73.0000
        NAME:  East Jordan Irrigation Company etal
        FILED: 05/08/2003  STATUS: AMEN  APPR/REJ:
*---------------------------------------------------------------------------------------------------------------------------------*
*---------------------------------------------------------------------------------------------------------------------------------*
                                                             CFS        ACRE-FEET      IRRIGATED        STOCK          DOMESTIC
                                                                                        ACREAGE         (ELUs)        (FAMILIES)
a24306a currently has: ---------------------------------->                 65.34        8.1225          .0000         73.0000
*---------------------------------------------------------------------------------------------------------------------------------*
*---------------------------------------------------------------------------------------------------------------------------------*
```

```
PROTESTANTS*****************************************************************************************************************************
*------------------------------------------------------------------------------------------------------------------------------------*

NAME: PacifiCorp                                                   NAME:  PacifiCorp/Claudia
ADDR: c/o Jody L. Williams                                         ADDR: c/o Claudia Conder
      299 South Main St., Ste. 1800                                      1407 West North Temple #320
      Salt Lake City UT 84111                                            Salt Lake City UT 84116
--------------------------------------------------------------------------------------------------------------------------------------
NAME: USA Bureau of Reclamation                                    NAME:
ADDR: ATTN: Jonathan Jones                                         ADDR:
      302 East 1860 South
      Provo UT 84606-7317
--------------------------------------------------------------------------------------------------------------------------------------
*------------------------------------------------------------------------------------------------------------------------------------*
EXTENSIONS OF TIME WITHIN WHICH TO FILE PROOF*******************************************************************************************
*------------------------------------------------------------------------------------------------------------------------------------*
FILED:     07/23/2003|PUB BEGAN:           |PUB ENDED:           |NEWSPAPER: No Adv Required
ProtestEnd:          |PROTESTED: [No Hear ]|HEARNG HLD:          |SE ACTION: [Approved]|ActionDate:01/08/2004|PROOF DUE:  07/31/2008
--------------------------------------------------------------------------------------------------------------------------------------
**************************************************************************************************************************************
*******************************************************E N D   O F   D A T A**********************************************************
**************************************************************************************************************************************
```