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**UTAH DIVISION OF  
SOLID & HAZARDOUS WASTE**

**APPLICATION TO RENEW A PERMIT TO  
OPERATE A CLASS I LANDFILL**

Prepared for:

**BOX ELDER COUNTY SOLID WASTE (BECSW)**

**Little Mountain Landfill**

**Box Elder County, Utah**

Prepared by

**IGES, INC.**

4153 Commerce Drive

Salt Lake City, Utah 84107

**December 22, 2006**

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## INTRODUCTION

This document presents an application to renew a permit to operate solid waste disposal facilities at the Box Elder County Landfill (Little Mountain Landfill), which is owned by Box Elder County and operated by Box Elder County Solid Waste (BECSW). The Little Mountain Landfill is currently operated under permit number 9609R1 issued by the Utah Solid and Hazardous Waste Control Board. This permit became effective on April 15, 2002 and expires at midnight on April 14, 2007.

In the four and one half years that have passed since the current permit was issued for the Little Mountain Landfill, very few changes have taken place other than the annual volume of wastes. An area of the Little Mountain site has been developed for the eventual construction of a Public Convenience Center (PCC). The PCC is a facility to be utilized by the residential waste haulers to process waste and recyclable products away from the working face. The timing of the PCC is not known at this point; however, the Operations Plan will include provisions for it.

This permit application contains conceptual level engineering sufficient for permitting purposes. This permit application does not represent a lateral expansion to the currently permitted landfill cells. It does, however, contain several small modifications in engineering and operational issues at the landfill.

The following items, which have been previously permitted and are part of the operating record of the landfill, will not be discussed in great detail in this permit application:

- Alternate Liner – an alternate liner consisting of the low-permeability site soils has been approved for use as a landfill liner at the Little Mountain Landfill. All future landfill cells will be constructed using the previously approved alternate liner.
- Leachate collection and removal system Exemption – due to unique site conditions, Little Mountain Landfill has been exempted from the incorporation of a leachate collection and

removal system. All future landfill cells will be constructed without leachate collection and removal systems.

- Groundwater Monitoring Exemption – due to the extreme depth of ground water, Little Mountain Landfill has been exempted from the UDEQ groundwater monitoring requirements. BECSW plans to continue to operate the landfill consistent with current operations.
  
- Alternate Daily Cover – an alternative daily cover has also been approved for use at the landfill. BECSW plans to continue to utilize the approved alternate daily cover in their landfilling operations.
  
- Alternate Final Cover – due to the approval of an alternative landfill liner, an alternative final cover has also been approved. BECSW plans to construct the final cover using the previously approved alternative cover.

Appendix G includes copies of previously issued letters from the Utah Division of Solid and Hazardous Waste with respect to previously approved landfill exemptions.

The application has been organized to follow the general outline of R315-302 and R315-310. This organization results in some duplication and repetition of information, but it is intended to simplify the review and approval of the permit application. Part I of this document duplicates the standard form outlining general data pertaining to the site. Part II is a general report that includes a facility description, landfill operations plan, and closure and post-closure care plans and financial assurance. Part III is the Professional Engineering Report and includes details on the design and geohydrology of the site.

**APPLICATION TO RENEW A PERMIT TO  
OPERATE A CLASS I LANDFILL**

**Little Mountain Landfill**

**PART I - GENERAL DATA**

## Utah Class I and V Landfill Permit Application Form

<b>Part I General Information</b>				APPLICANT: PLEASE COMPLETE ALL SECTIONS.			
<b>Landfill Type</b>	<input checked="" type="checkbox"/>	Class I	<b>II. Application Type</b>	<input type="checkbox"/>	New Application	<input type="checkbox"/>	Modification
	<input type="checkbox"/>	Class V		<input checked="" type="checkbox"/>	Renewal Application	<input type="checkbox"/>	Change of Ownership
For Renewal Applications, Changes of Ownership, and Modifications Enter Current Permit Number						9609	
<b>III. Facility Name and Location</b>							
Legal Name of Facility Box Elder County Landfill (Little Mountain Landfill)							
Site Address (street or directions to site) 9595 West 6800 North						County Box Elder	
City West of Brigham City			State UT	Zip Code 84302		Telephone (435) 744-2275	
Township 10 N	Range 3 W	Section(s) 18		Quarter/Quarter Section		Quarter Section	
Main Gate Latitude degrees 41 minutes 13 seconds 9			Longitude degrees 112 minutes 13 seconds 46				
<b>IV. Facility Owner(s) Information</b>							
Legal Name of Facility Owner Box Elder County Municipal Building Authority							
Address (mailing)							
City Brigham City			State UT	Zip Code 84302		Telephone	
<b>V. Facility Operator(s) Information</b>							
Legal Name of Facility Operator Box Elder County Solid Waste							
Address (mailing) 01 South Main Street							
Brigham City			State UT	Zip Code 84302		Telephone (435) 744-2275	
<b>VI. Property Owner(s) Information</b>							
Legal Name of Property Owner Box Elder County Municipal Building Authority							
Address (mailing)							
City Brigham City			State UT	Zip Code 84302		Telephone	
<b>VII. Contact Information</b>							
Owner Contact Ms. Gina Allen				Title Director			
Address (mailing) 01 South Main Street							
City Brigham City			State UT	Zip Code 84302		Telephone (435) 744-2275	
Email Address gallen@boxeldercounty.com				Alternative Telephone (cell or other)		(435) 730-3153	
Operator Contact Ms. Gina Allen				Title Director			
Address (mailing) 01 South Main Street							
City Brigham City			State UT	Zip Code 84302		Telephone (435) 744-2275	
Email Address gallen@boxeldercounty.com				Alternative Telephone (cell or other)		730-3153	
Property Owner Contact Ms. Gina Allen				Title Director			
Address (mailing)							
			State	Zip Code		Telephone	
Email Address				Alternative Telephone (cell or other)			

## Utah Class I and V Landfill Permit Application Form

<b>Part I General Information (Continued)</b>																																														
<b>III. Waste Types</b> (check all that apply) All non-hazardous solid waste (see R315-315-7(3) for PCB special requirements) OR the following specific waste types: <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left; border-bottom: 1px solid black;">Waste Type</th> <th style="text-align: center; border-bottom: 1px solid black;">Combined Disposal Unit</th> <th style="text-align: center; border-bottom: 1px solid black;">Monofill Unit</th> </tr> <tr> <td><input checked="" type="checkbox"/> Municipal Waste</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td><input checked="" type="checkbox"/> Construction &amp; Demolition</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td><input checked="" type="checkbox"/> Industrial</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/> Incinerator Ash</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td><input checked="" type="checkbox"/> Animals</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/> Asbestos</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/> PCB's (R315-315-7(3) only)</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/> Other _____</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </table>	Waste Type	Combined Disposal Unit	Monofill Unit	<input checked="" type="checkbox"/> Municipal Waste	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> Construction & Demolition	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> Industrial	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Incinerator Ash	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> Animals	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> Asbestos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> PCB's (R315-315-7(3) only)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Other _____	<input type="checkbox"/>	<input type="checkbox"/>	<b>IX. Facility Area</b> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="border-bottom: 1px solid black;">Facility Area.....</td> <td style="text-align: right; border-bottom: 1px solid black;"><u>111</u></td> <td style="text-align: right; border-bottom: 1px solid black;">acres</td> </tr> <tr> <td style="border-bottom: 1px solid black;">Disposal Area.....</td> <td style="text-align: right; border-bottom: 1px solid black;"><u>25</u></td> <td style="text-align: right; border-bottom: 1px solid black;">acres</td> </tr> <tr> <td style="border-bottom: 1px solid black;">Design Capacity</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px; border-bottom: 1px solid black;">Years.....</td> <td style="text-align: right; border-bottom: 1px solid black;"><u>48</u></td> <td></td> </tr> <tr> <td style="border-bottom: 1px solid black;">Cubic Yards.....</td> <td style="text-align: right; border-bottom: 1px solid black;"><u>4456000</u></td> <td></td> </tr> <tr> <td style="border-bottom: 1px solid black;">Tons.....</td> <td style="text-align: right; border-bottom: 1px solid black;"><u>2634000</u></td> <td></td> </tr> </table>	Facility Area.....	<u>111</u>	acres	Disposal Area.....	<u>25</u>	acres	Design Capacity			Years.....	<u>48</u>		Cubic Yards.....	<u>4456000</u>		Tons.....	<u>2634000</u>	
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Indicate Documents Attached To This Application <input checked="" type="checkbox"/> Facility Map or Maps <input checked="" type="checkbox"/> Facility Legal Description <input checked="" type="checkbox"/> Plan of Operation <input checked="" type="checkbox"/> Waste Description <input checked="" type="checkbox"/> Ground Water Report <input checked="" type="checkbox"/> Closure Design <input checked="" type="checkbox"/> Cost Estimates <input checked="" type="checkbox"/> Financial Assurance	<input type="checkbox"/> Application Fee: Amount \$	Class V Special Requirements <input type="checkbox"/> Documents required by UCA 19-6-108(9) and (10)																																												
<b>I HEREBY CERTIFY THAT THIS INFORMATION AND ALL ATTACHED PAGES ARE CORRECT AND COMPLETE.</b>																																														
Signature of Authorized Owner Representative  _____ Name typed or printed	Title _____ Address _____	Date _____																																												
Signature of Authorized Land Owner Representative (if applicable)  _____ Name typed or printed	Title _____ Address _____	Date _____																																												
Signature of Authorized Operator Representative (if applicable)  _____ Name typed or printed	Title _____ Address _____	Date _____																																												

**APPLICATION TO RENEW A PERMIT TO  
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**Little Mountain Landfill**

**PART II - GENERAL REPORT**

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## 1.0 - FACILITY DESCRIPTION

The Box Elder County Landfill (Little Mountain Landfill) is owned by Box Elder County and operated by Box Elder County Solid Waste (BECSW). The Little Mountain Landfill is located approximately 21 miles west of Brigham City in a basin approximately 800 feet above the valley floor. The facility is surrounded by ridges on all sides within a small canyon running northwest to the valley floor. The landfill is currently operating under Utah State Department of Environmental Quality Permit Number 9609 as a Class I Landfill. This permit expires April 15, 2007. The physical address for the site is 9595 West 6800 North. The road to the site has been paved for all-weather access. The facility is entirely fenced, with public access through the locking gate at the main entrance. There are two locked utility maintenance/fire control gates in the fence; one in the southeast corner overlooking the Great Salt Lake, and one located in the south corner of the fence line. The site is approximately five miles northwest of Corrine, Utah, and 60 miles north of Salt Lake City. A location map is included on Drawing 1. All permit drawings are included in Appendix A.

### 1.1 AREA SERVED

Little Mountain Landfill serves all of Box Elder County, with the exception of two Class III landfills; one operated by ATK (Thiokol), in Promontory, Utah and one operated by Nucor, in Plymouth, Utah. Waste streams are not growing at the previously anticipated 3%. The waste stream holding constant and has the potential of decreasing due to the diversion of municipal solid waste (MSW) out of the county. For the calculation of landfill life; a waste growth rate of 1.1% was utilized. The 1.1% waste increase rate mirrors the most recent census population projections for Box Elder County.

### 1.2 WASTE TYPES

The Little Mountain Landfill's waste stream averages approximately 115 tons per day of which approximately 60% is MSW. Commercial and Industrial waste make up approximately 25% while Construction and Demolition (C&D) comprises 15% of total intake. Approximately 400 tons of green waste is diverted annually to a compost facility operated by a private

contractor. The compost facility is located on property near the landfill. The remainder of the waste received is special waste, which includes dead animals, and non-hazardous wastewater generated by AUTOLIV a.s.p. Inc. (located in Promontory, Utah).

BECSW is currently recycling tires, white goods, scrap metal, and collecting green waste to be diverted to the compost facility. The feasibility of recycling carpet pad and other materials are being evaluated. Annually; approximately 200 tons of material is being diverted from the landfill to be recycled.

The Little Mountain Landfill was the temporary disposal location for MSW from Weber County for a period of time during 2004 and 2005. The increase in MSW from Weber County was a one-time event resulting in the consumption of approximately 110,000 cubic yards of airspace.

### **1.3 FACILITY HOURS**

The operating hours for the facility are 7:30 a.m. to 5:30 p.m. The Facility is open Monday thru Saturday with the following holidays being observed:

New Years Day

Memorial Day

July 4<sup>th</sup>

Labor Day

Thanksgiving Day

Christmas Day

The following facility information is posted at the gate:

Landfill Owner

Days of Landfill Operation

Hours of Landfill Operation

Instructional Signs (no scavenging, no hazardous materials, dump in designated areas, etc.)

Emergency Telephone Numbers

#### 1.4 LANDFILL EQUIPMENT

The following equipment is on site and used in landfill operations:

- Compactor(s)
- Scraper(s)
- Front End Loader
- IT – 28
- Trackhoe
- Motor Grader
- Track Dozer
- Roll-off Truck
- (6) roll-off bins
- (1) water tank bed
- ADC Application Machine

#### 1.5 LANDFILL PERSONNEL

The following persons are responsible for on-site landfill operations at the Little Mountain Landfill:

**Director of Solid Waste Management** - The Director is responsible for all matters relating to the Solid Waste Program for Box Elder County; including landfill operations, transfer stations, and all recycling functions. The Director is responsible that the landfill operations meet all DSHW permit requirements. The Director conducts regular facility inspections and monitors all landfill activities. The Director is responsible for all operational documentation including the annual reports to DSHW. The Director is responsible for all persons on the site including visitors.

This position requires a B.S. degree from an accredited university in Public Health, Business Management, or Civil Engineering plus 5 years of progressive experience in landfill operations management. Manager of Landfill Operations (MOLO) certification is required within 6 months of hire.

**Equipment Operator(s)** - The equipment operators are responsible for all day-to-day activities at the landfill. These responsibilities include, waste acceptance and placement, traffic control, safe operation and maintenance of all equipment, visual inspection of incoming waste, random waste screening operations, and general construction as it pertains to landfill operations.

This position requires at least 2 years experience in the operation and maintenance of heavy equipment. Landfill Operators must possess a Class A Commercial Drivers License.

**Scale Operator/Office Assistant** - The scale operator are responsible for the initial screening of all incoming waste. With the assistance of the in-house computer program he/she will track all incoming waste and update records as required. The scale operator is also responsible for all transactions at the scalehouse, and the receipt of all monies. Additionally, the scale operator assists the Director in the preparation of the annual landfill reports.

This position requires a good working knowledge of computers with a minimum of 1-year experience in office management.

A minimum of (1) equipment operator and (1) scale operator are required on site during business hours. During the course of normal operations there are typically one scale operator and two equipment operators on site.

## 2.0 - LEGAL DESCRIPTION

The legal description of the property Box Elder County owns for development of a landfill is as follows:

Parcel: 04-003-0010

Beginning at a point 525.7 feet north of the southwest corner of Section 18, Township 10 North, Range 3 West, Salt Lake Baseline and Meridian, running north 2,021.4 feet, thence south 89 degrees 30 minutes east 2,037.6 feet, thence south 7 degrees 35 minutes west 92.4 feet, thence south 9 degrees 2 minutes west 547.2 feet, thence South 84 degrees 37 minutes West 1,307 feet, thence North 84 degrees 36 minutes West 563 feet, thence North 88 degrees 38 minutes West 662 feet to the point of beginning, containing 111.72 acres.

The entire property will be developed as a landfill, except for a 25-foot buffer zone around the inside perimeter fence.

A copy of the legal description is included as Appendix B.

### **3.0 - OPERATIONS PLAN**

This Operations Plan has been written to address the requirements of UAC R315-302-2 and briefly describes the operations of the Box Elder County (Little Mountain) Class I Landfill.

A more extensive document titled Box Elder County Landfill Operator's Manual contains detailed information regarding specific operating procedures. The purpose of the manual is to provide the Box Elder County Solid Waste Management Supervisor and Operating Personnel with standard procedures for day-to-day operation of the landfill. A copy of this manual is kept on file at the Landfill. Forms used by BECSW are included in Appendix C.

#### **3.1 SCHEDULE OF CONSTRUCTION**

The development of the Little Mountain Landfill was broken into four Phases; the first two Phases of the development are complete. Phase I consisted of constructing a soil berm along the south, west, and north perimeter of the initial landfill area, Phase II has consisted of filling the existing active area of the landfill while the first cell of Phase III was excavated. Phase III consists of the excavation of the landfill expansion (Cells 1-4) area and Phase IV will consist of filling and covering the expansion area (Cells 1-4). The landfill construction was presented in these Phases to facilitate the evaluation of: 1) life of landfill remaining, 2) time and volume of soil to be excavated in the landfill expansion area, and 3) calculation of airspace and required cover soil. The development of the landfill is onto previously permitted land and does not constitute a lateral expansion.

BECSW has fully completed Phase I construction and Phase II is still being utilized as the active landfill area to promote a positive drainage of the working face. Phase II was originally scheduled to be in operation for approximately 2 years; however, Phase II has been modified (and the waste stream has been less than projected) so that it will be the active portion of the landfill throughout 2007. The first cell (Cell 1) of Phase III has been excavated and will be

placed in service once the Phase II area is complete. Final cover construction will be an incremental process commencing after a portion of the landfill reaches final elevation.

During the construction of the balance of Phase III (Cells 2, 3, and 4), soil will be stockpiled for use as daily, intermediate and final cover. BECSW will selectively stockpile soil (if variable soils are encountered) to utilize the lowest permeability soils in the final cover construction.

As each portion of the landfill reaches the final elevation, intermediate cover will be placed. Prior to the construction of any final cover; BECSW will prepare a QA/QC Plan (including drawings) to govern the construction of the final cover. The QA/QC Plan will detail the type of testing (if required) and general construction documentation required to demonstrate that the construction practices are consistent with this permit. Water management structures will be constructed on the final cover as the final cover is placed. Construction of the final cover will take place in 3-5 separate construction projects. The construction will take place as large areas of the landfill are completed to the final design elevations. The final cover construction will be conducted in 3-5 stages to minimize the amount of soils to be stockpiled and the amount of financial assurance required.

## **3.2 DESCRIPTION OF HANDLING PROCEDURES**

### **3.2.1 General**

A waste control program designed to detect and deter attempts to dispose of hazardous and other unacceptable wastes will continue to be implemented at Little Mountain Landfill. The program is designed to protect the health and safety of employees, customers, and the general public, as well as to protect against the contamination of the environment.

The landfill is open for public and private disposal. Signs posted near the landfill entrance clearly indicate (1) the types of wastes that are accepted; (2) the types of wastes not accepted at the site; and (3) the penalty for illegal disposal.

All vehicles delivering wastes to the site must stop at the scalehouse. Scalehouse personnel inquire as to the contents of each incoming load to screen for unacceptable materials. Any vehicle suspected of carrying unacceptable materials (liquid waste, sludges, or hazardous waste) are prevented from entering the disposal site unless the driver can provide evidence that the waste is acceptable for disposal at the site. Little Mountain Landfill reserves the right to refuse service to any suspect load. Vehicles carrying unacceptable materials are required to exit the site without discharging their loads. If a load is suspected of containing unacceptable materials, the following information is recorded: date, time, name of the hauler, driver, telephone number of hauler, vehicle license plate, and source of the waste. The scalehouse then notifies the working face operator that a load is suspect and that load is further inspected at the landfill tipping area before final disposal is allowed.

After a vehicle leaves the scalehouse, the vehicle is routed to the appropriate discharge location. Loads are regularly surveyed at the tipping area. If a discharged load contains inappropriate or unacceptable material, the discharger is required to reload the material and remove it from the landfill site. If the discharger is not immediately identified, the area where the unacceptable material was discharged is cordoned off. Unacceptable material is moved to a designated area for identification and preparation for proper disposal.

Currently all traffic is directed to the working face at the landfill. A Public Convenience Center (PCC) has been designed (but not yet constructed) for residential MSW and recycling use. The PCC is not currently scheduled for construction in the 2007 year but may be constructed before the next landfill permit renewal. The construction and operation of the PCC will enable the BECSW personnel to largely separate the commercial traffic from the residential haulers. The commercial traffic will bypass the PCC and haul directly to the landfill operating face.

### **3.2.2 Waste Acceptance**

BECSW uses a solid waste software package entitled "Waste Works". With this program BECSW is able to track all incoming waste as well as bill and receive payment from all customers. When a vehicle with waste stops on the scale; the scale operator identifies the load as to whether it is a commercial hauler, general public, or private individual with an account. The

proper codes are entered into the computer identifying the origin, hauler, and account number. All loads larger than a pickup are weighed and charged accordingly. This information is printed on a two-part ticket; the customer receives one copy and one copy is forwarded to the County Auditor's Office for storage. Information regarding all transactions is stored on the in house computer at the landfill. All records are backed up on a nightly basis to a county computer located at the Box Elder County Court House. The information stored on the computer serves as the daily log. A monthly summary of all landfill transactions is created and kept on file at the landfill. Any or all transactions may be retrieved as necessary. After each load has been recorded, the driver is directed where to take the load. All loads with the exception of green waste, dead animals, and non-hazardous wastewater (AUTOLIV only) are directed to the working face where the waste is deposited for disposal.

Each load is visually inspected. Waste screening is done as needed or scheduled according to the procedures outlined in Section 3.3 Waste Inspection. No open burning is allowed. No smoking is allowed near the work face.

### **3.2.3 Waste Disposal**

Wastes are dumped at the toe of the work face when possible and spread up the slope in one to two foot lifts, keeping the slope at a maximum of three to one (horizontal to vertical) configuration.

Work face dimensions are kept narrow enough to minimize blowing litter and reduce the amount of material needed for daily cover. Typically, the width of the working face is two and one-half times the width of the dozer blade (40 feet). This facilitates complete compaction of the waste and keeps the width narrow enough to minimize amount of daily cover required.

Typically the compactor is operated with the blade facing uphill. Equipment operations across the slope are avoided to minimize the potential of equipment tipping over. In addition to safety concerns, a toe of slope to crest of slope working orientation provides the following benefits:

- Minimizes blowing litter problems.

Increases equipment compactive effectiveness.

Increased visibility for waste placement and compaction.

More uniform waste distribution.

Grade stakes are used when necessary to control cell height and top surface grade. The top of the interim surfaces typically range from 2 to 5 percent to promote runoff with the cell heights ranging from 8 to 10 feet.

Wastes are compacted by making three to five passes up and down the slope. Compaction reduces litter, differential settlement, and the quantities of cover soil needed. Compaction also extends the life of the site, reduces unit costs, and leaves fewer voids to help reduce vector problems. Care is taken that no holes are left in the compacted waste. Voids are filled with additional waste as they develop.

The Little Mountain facility is approved to use a biodegradable plastic as an alternative daily cover (ADC). When the ADC is utilized; it is used for seven days, at which time the waste is covered with six inches of soil for a daily cover that encapsulates a section of waste for fire protection. The ADC is placed only on the sloping work face. The top of the lift is covered with soil on a daily basis. Shredded tires have also been approved as an ADC if the need arises.

Intermediate cover is applied to all areas of the active cell which will not receive additional waste within 30 days. Intermediate cover consists of an additional 12 inches of soil being placed over the 6 inches of daily cover soil.

### **3.2.4 Special Wastes**

#### ***3.2.4.1 Used Oil and Batteries***

Little Mountain Landfill is a "Used Oil Recycle Center". When a customer has used oil to dispose of they fill out the form "UTAH DIYer USED OIL LOG" provided by UDEQ. A report generated from this form is turned in quarterly stating the amount of oil deposited and the customer's names. A waste oil furnace is used in the machine shop to dispose of the used oil

while providing heat for the shop. Batteries are not accepted at the working face. BECSW Provides a pallet near the office where incoming batteries are stored until a sufficient number is generated to facilitate delivery to a recycler.

#### ***3.2.4.2 Bulky Wastes***

White goods are accepted at the landfill and are separated for recycling. All appliances containing refrigerants are segregated in a separate area. Refrigerant is removed and the appliances are loaded into the metal bin for recycling. Used cars are not accepted at the Little Mountain landfill. Persons seeking to dispose of used car bodies are directed to take the car to Western Metals located near Plymouth, Utah.

#### ***3.2.4.3 Tires***

Little Mountain Landfill accepts small quantities of tires from the general public. Commercial haulers are prohibited from disposing of tires. A total of four passenger tires are accepted from the public with each load. A fee is assessed for each additional tire over four and for every tire larger than typical passenger size (16" rim). All tires are stored in a designated tire storage area. When sufficient quantities of tires are collected, a tire hauler is called and the tires are removed from the facility for recycling.

#### ***3.2.4.4 Dead Animals***

Dead animals are accepted at the landfill. A designated trench is prepared for the acceptance of these animals. They are collected in the trench and a minimum of 6" of cover is placed over the animals at the end of each day. In the event the trench is inaccessible, the dead animals are incorporated into the face of the landfill. The incorporation of the carcasses into the landfill is accomplished by pushing up the toe of the face and depositing the animal in the bottom of the toe; waste is then pushed over the top of the animal.

#### ***3.2.4.5 Asbestos Waste***

Asbestos waste is not accepted at the Little Mountain facility.

#### ***3.2.4.6 Non-Hazardous Waste Water (AUTOLIV only)***

Non-hazardous wastewater is accepted at the landfill for volume reduction. This is accomplished by two methods. The first method is a solidification process, which is done by mixing the water with on site soils to a consistency that will pass the paint filter test. These soils are then used as daily cover on the working face. The second method is to deposit the wastewater in the evaporation ponds. These ponds were constructed to handle the water during the winter months and when weather conditions will not allow the solidification process to be performed. A complete description of how these materials are handled is recorded in the Landfill Operators Manual.

#### ***3.2.4.7 Grease Pit and Animal Waste By-Products***

Waste from restaurant grease traps and slaughterhouse by-products are accepted at the landfill. These wastes require 24 to 48 hour notice before disposal. If the waste passes the paint filter test, it is deposited in the dead animal trench and covered daily. If excess liquid is present in the waste, the waste is unloaded on a specially prepared drying pad. The waste remains on the drying pad until the moisture has been sufficiently reduced to pass the paint filter test. Once the waste passes the paint filter test, the waste is deposited either in the dead animal trench or at the toe of the working face where it is immediately covered.

#### ***3.2.4.8 Non-Hazardous Containerized Waste (AUTOLIV only)***

Non-hazardous containerized waste from AUTOLIV is accepted at the landfill as a "special handle waste". Prior authorization of 24 to 48 hours is required, at which time a shipping manifest is created. As the waste arrives at the landfill, the scale operator verifies the amounts received against the shipping manifest. The scale operator informs the machine operator at the working face, and the toe of the face is opened up sufficiently to accommodate the material being delivered. The containers are immediately covered and secured in the landfill.

### **3.3 WASTE INSPECTION**

#### **3.3.1 Landfill Spotting**

Learning to identify and exclude prohibited and hazardous waste is necessary for the safe operation of the Landfill. The Equipment Operators are required to receive initial and periodic hazardous waste inspection training. Operators are required to obtain the initial 40-hour HAZWOPER Training and attend yearly refresher courses. Certificates of training are kept in the personnel files.

Hazardous wastes have either physical or chemical characteristics that could harm human health or the environment. A waste is considered hazardous if it falls into either of two categories: 1) a listed waste, or 2) a characteristic waste. Hazardous wastes are not accepted at the Little Mountain Landfill.

Small quantity generators (<100 kg/mo) and household quantities are exempt from hazardous waste regulations. However, hazardous wastes are most likely to enter the Landfill mixed in with common household waste. Public education and periodic waste screening are the tools used to minimize the amount of inadvertent hazardous waste entering the landfill.

A detailed description of the waste-screening program can be found in the Landfill Operator's Manual.

#### **3.3.2 Random Waste Screening**

Random inspections of incoming loads are conducted according to the schedule established by the Director. One commercial waste hauler per week is selected randomly according to the schedule. If frequent violations are detected, additional random checks are scheduled at the discretion of the Director.

If a suspicious or unknown waste is encountered, the Equipment Operator proceeds with the waste screening as follows:

The driver of the vehicle containing the suspect material is directed to the waste screening area.

The waste screening form is completed.

Protective gear is worn (leather gloves, steel-toed boots, goggles, coveralls, and hard hat).

The suspect material is spread out with the dozer or hand tools and visually examined. Suspicious marking or materials, like the ones listed below, are investigated further:

Containers labeled hazardous

Material with unusual amounts of moisture

Biomedical (red bag) waste

Unidentified powders, smoke, or vapors

Liquids, sludges, pastes, or slurries

Asbestos or asbestos contaminated materials

Batteries

Other wastes not accepted by the Landfill

The Landfill Director is called if unstable wastes that cannot be handled safely or radioactive wastes are discovered or suspected.

### **3.3.3 Removal of Hazardous or Prohibited Waste**

Should hazardous or prohibited wastes be discovered during random waste screening or during tipping, the waste is removed from the Landfill as follows:

The waste is loaded back on the hauler's vehicle. The hauler is then informed of the proper disposal options. If the hauler or generator is no longer on the premises and is known, they are asked to retrieve the waste and informed of the proper disposal options. The Landfill Director arranges to have the waste transported to the proper disposal site and then bill the original hauler or generator.

A record of the removal of all hazardous or prohibited wastes is kept in the site operational records.

### 3.3.4 Hazardous or Prohibited Waste Discovered After the Fact

If Hazardous or prohibited wastes are discovered in the landfill, the following procedure is used to remove them:

Access to the area is restricted.

The Landfill Director is immediately notified.

The Equipment Operator removes the waste from the working face if it is safe to do so.

The waste is isolated in a secure area of the landfill and the area cordoned off.

The Fire Marshall's Hazardous Materials Response Team is notified.

The DSHW, the hauler (if known), and the generator (if known) are notified within 24 hours of the discovery. The generator (if known) is responsible for the proper cleanup, transportation, and disposal of the waste.

### 3.3.5 Notification Procedures

The following agencies and people are contacted if any hazardous materials are discovered at the Landfill:

Gina Allen, Landfill Director .....	(435) 744-2275
Bear River Health Department .....	(435) 734-0845
Director, DSHW .....	(801) 538-6170
Box Elder Co. Fire Marshall .....	(435) 734-9441

A record of conversation is completed as each of the entities is contacted. The record of conversation is kept in the site operational records.

## **3.4 FACILITY MONITORING AND INSPECTION**

### **3.4.1 Groundwater**

Little Mountain Landfill does not plan to monitor groundwater. Tahoma Companies, Inc. (Tahoma) completed an exploratory boring extending 300 feet below the landfill bottom and did not encounter groundwater. Based on the minimum depth to groundwater being 300 feet and the low permeability site soils, initial groundwater modeling performed by Tahoma estimated the leachate travel time to be 14,174 years. These calculations were submitted to the DSHW and the landfill has been exempted from leachate collection and liner requirements. As a result groundwater monitoring is not performed as part of the regular monitoring program.

### **3.4.2 Surface Water**

The Little Mountain Landfill Permit Drawings illustrate the locations and details of the surface water drainage control systems for both run-on and run-off. In general, surface water is prevented from running into the active landfill area by berms. Each cell will have a storm water basin sized to collect the run-off from the excavated cell and any sloping MSW from adjacent cells. Drawing 3 indicates the location of the storm water basins. Calculations of the anticipated run-off volumes are shown in Appendix D. Run-off from the final cover will be managed by a combination of berms and ditches. The berms will be placed to divert the water around the active area to culverts and a settling pond. Landfill staff will inspect the drainage system monthly. Temporary repairs will be made to any observed deficiencies until permanent repairs can be scheduled. BECSW or a licensed general contractor will repair drainage facilities as required.

### **3.4.3 Leachate Collection**

A leachate collection system will not be installed due to the current liner exemption issued by the DSHW. In general, the threat of groundwater contamination from leachate is very small because of the great distance between the landfill and groundwater, the relatively low permeability of the soils beneath the landfill, and the low precipitation. Should the landfill have a demonstrated need for a leachate collection system, one will be designed and installed.

Any storm water contacting the MSW in the active cell remains in the active cell due to the highly irregular surface of the landfill. (See Part III, Section 1.3.2).

#### **3.4.4 Landfill Gas**

This facility is monitored for methane gas on a quarterly basis. Concentrations of methane gas are measured with a hand-held gas monitor.

Gas readings are recorded at each end of the active cell, the office and shop, the fuel tanks, and other places at random. Readings are recorded on the "Gas Log" sheet and kept on file in the scale house office.

If methane releases are detected in excess of 25 percent of the LEL, in the landfill building or more than 100 percent of LEL at the property boundary, the procedure outlined in the "Explosive Gases" section is followed.

#### **3.4.5 Evaporation Pond Monitoring**

The water in the evaporation ponds is sampled semi-annually to ensure that concentrations of the constituents present in the wastewater are not hazardous. TCLP criteria are used as the basis to determine if the liquid in the ponds are hazardous. Liquid levels in the ponds are observed as each load of liquid is delivered. The evaporation ponds are fenced and access to the ponds is through a locked gate.

#### **3.4.6 General Inspections**

Routine inspections are necessary to prevent malfunctions and deterioration, operator errors, and discharges that may cause or lead to release of wastes to the environment or a threat to human health. Equipment Operators are responsible for conducting and recording routine inspections of the landfill facilities according to the following schedule:

Equipment Operators perform pre-operational inspections of all equipment daily. A post-operational inspection is performed at the end of each shift while equipment is cooling down.

All equipment is on a regular maintenance schedule. The on-site mechanic performs all oil changes and a complete inspection of each piece of equipment at this time. A logbook is maintained on each piece of equipment and any repairs and comments concerning the inspection are contained in the log. Oil samples are pulled when each machine is serviced and results are recorded in the machine log.

Facility inspections are completed on a quarterly basis. Any needed corrective action items are recorded and the Landfill Equipment Operators complete needed repairs. If a problem is of an urgent nature, the problem is corrected immediately.

Scale maintenance is performed annually at a minimum. If specific problems arise before scheduled maintenance, scale maintenance is done as required. The scale is certified on an annual basis.

### **3.5 CONTINGENCY AND CORRECTIVE ACTION PLANS**

The following sections outline procedures to be followed in case of fire, explosion, groundwater contamination, release of explosive gases, or failure of the storm water management system.

The County Fire Marshal's Hazardous Materials Response Team is contacted in all cases where hazardous materials or materials contaminated with PCB's are suspected to be involved.

#### **3.5.1 Fire**

The potential for fire is a concern in all landfills. Little Mountain Landfill staff follows a waste handling procedure to minimize the potential for a landfill fire. If any load comes to the landfill on fire, the driver of the vehicle is directed to a pre-designated area away from the working face. The burning waste is unloaded, spread out, and immediately covered with sufficient amounts of soil to smother the fire. Once the burning waste cools and is deemed safe, the material is then incorporated into the working face. Some loads coming to the landfill may be on fire but not detected until after being unloaded at the working face. If a load of waste that is on fire is

unloaded at the working face, the load of waste is immediately removed from the working face, spread out, and covered with soil.

The Box Elder County Fire Department is called if it appears that landfill personnel and equipment cannot contain any fire at the landfill. The Box Elder Fire Department is also called if a fire is burning below the landfill surface or is difficult to reach or isolate.

In case of fire, the Director is notified immediately. A written report detailing the event is placed in the operating record within seven days, including any corrective action taken.

### **3.5.2 Release of Explosive Gases**

Methane gas generation and concentration is not anticipated to be a problem at the Little Mountain Landfill. However, due to the production of methane in all landfills, landfill gas levels are monitored quarterly. If a concentration of methane is detected in excess of 25 percent of LEL in a landfill building, 100 percent LEL at the property boundary, or over 100 parts per million in an off-site building, the following procedure is followed:

Landfill operations cease immediately. The landfill is evacuated if personnel or buildings may be threatened.

If gas is detected in a building, the doors and windows are opened to allow the gas to escape.

If off-site buildings or structures appear to be threatened, the Box Elder County Fire Department is called, the property evacuated, and the property owners notified.

The Director is called. The release is monitored and a temporary corrective action implemented as soon as possible. Permanent corrective action is completed as soon as practicable.

The DSHW is notified immediately and a written report submitted within 14 days of detecting the release. The gas levels detected and a description of the steps taken to protect human health are placed in the operating record within seven days of detection. A remediation plan for the methane

gas release is placed in the operating record within 60 days of detection and the Executive Secretary is notified that the plan has been implemented.

### **3.5.3 Explosion**

If an explosion occurs or seems eminent, all personnel and customers are accounted for and the Landfill is evacuated. Corrective action is immediately evaluated and implemented as soon as practicable.

The Director is notified immediately and the Box Elder County Fire Department is called. The Executive Secretary is notified immediately.

If the explosion is the result of methane gas, the gas levels detected and a description of the steps taken to protect human health is placed in the operating record within seven days of detection. A remediation plan for the methane gas release is placed in the operating record within 60 days of detection and the Executive Secretary is notified that the plan has been implemented.

### **3.5.4 Failure of Run-On/Run-Off Containment**

The purpose of the run-on/run-off control systems is to manage the stormwater falling in or near the landfill. Water is diverted away from the landfill using a series of ditches, berms, and roads. These structures are inspected on a regular basis and repaired as needed. Most of the water falling on the working face is unable to flow out of the working area due to surface depressions left by the compactor. All stormwaters falling or flowing near the active landfill cell are prevented from flowing into the active area by diversion berms and ditches.

If the run-on system fails, temporary measures such as temporary berms, ditches, or other methods are used to divert water from the active landfill cell.

If a run-off ditch or berm fails, temporary berms or ditches are constructed until a permanent run-off structure can be constructed.

Any temporary berms or other structures are checked at least every 2 hours. Permanent improvements or repairs are made as soon as practicable.

The Director is notified immediately if a failure of either of the run-on or run-off systems is discovered. The event is fully documented in the operating record, including corrective action within 14 days.

### **3.5.5 Groundwater Contamination**

If groundwater contamination is ever suspected, studies to confirm contamination will be conducted and the extent of contamination documented. This program may include the installation of groundwater monitoring wells. A groundwater monitoring program would be developed and corrective action taken as deemed necessary, with the approval of the Executive Secretary.

## **3.6 CONTINGENCY PLAN FOR ALTERNATIVE WASTE HANDLING**

The most probable reason for a disruption in the waste handling procedures at the Little Mountain Landfill will be weather related. The Landfill may close during periods of inclement weather such as high winds, heavy rain, snow, flooding, or any other weather-related condition that would make travel or operations dangerous. The Little Mountain Landfill may also close for other reasons like fire, natural disaster, etc. In general, the Little Mountain Landfill minimizes the possibility of disruption of waste disposal services from an operational standpoint.

In case of equipment failure, the Box Elder County Road Department will provide the necessary equipment to continue operations while repairs are being made. If the Landfill is not operational for any unforeseen reasons, the commercial haulers serving Box Elder County is notified as follows:

Waste Management of Northern Utah .....	(801) 731-5542
Brigham City Solid Waste .....	(435) 734-2001
Rupp Trucking .....	(435) 257-7333
Quality Recycling .....	(435) 257-5588

Green Disposal.....	(801) 392-4950
Waste Connections.....	(800) 772-0273
Autoliv .....	(435) 471-3017

BECSW has a reciprocal agreement with Logan City to provide an alternative site for temporary disposal of municipal solid waste should the need arise.

### **3.7 MAINTENANCE PLAN**

#### **3.7.1 Groundwater Monitoring System**

The Little Mountain Landfill is currently exempt from the State of Utah DSHW default design requirements for leachate collection, landfill liner, and groundwater monitoring because of the depth to groundwater and the native soils present under the landfill. As a result, no groundwater monitoring system is planned.

#### **3.7.2 Leachate Collection and Recovery System**

The Little Mountain Landfill is currently exempt from the State of Utah DSHW default design requirements for leachate collection, landfill liner, and groundwater monitoring because of the depth to groundwater and the native soils present under the landfill. As a result, no leachate collection and recovery system is planned.

#### **3.7.3 Gas Monitoring System**

The Little Mountain Landfill and proposed expansion is not expected to produce and concentrate significant amounts of landfill gas. No gas collection system is planned. Quarterly gas monitoring is conducted using a hand held meter.

### **3.8 DISEASE AND VECTOR CONTROL**

The vectors encountered at the Little Mountain Landfill are flies, birds, mosquitoes, rodents, skunks, and snakes. Due to the rural location of the landfill, stray house pets are occasionally encountered at the landfill. The program for controlling these vectors is as follows:

### **3.8.1 Insects**

Eliminating breeding areas is essential in the control of insects. Little Mountain Landfill minimizes the breeding areas by covering the waste daily and maintaining surfaces to reduce ponded water. The mosquito abatement district personnel assist the landfill as necessary.

### **3.8.2 Rodents**

Reducing potential food sources minimizes rodent populations at the landfill. To date, no significant numbers of mice or rats have been observed. The potential food sources are minimized by properly applying daily cover.

In the event of a significant increase in the number of rodents at the landfill, a professional exterminator will be contacted. The exterminator would then establish an appropriate protocol for pest control in accordance with all county, state and federal regulations.

### **3.8.3 Birds**

The Little Mountain Landfill has had minimal problems with birds (seagulls). Good landfilling practices of waste compaction, daily covering of active working face, and the minimization of ponded water has to date alleviated most of the bird problems. When the occasional need arises, the birds are encouraged to leave by using cracker and whistler shells.

### **3.8.4 Household Pets**

Because of the landfills location, some stray cats and dogs have wandered onto landfill property. When stray animals are encountered (and can be caught), they are turned over to the animal shelter in Brigham City. If we are unable to apprehend the animals, they are chased off the property. If the animals return and cannot be caught, lethal methods may be used to eliminate the problem.

### **3.8.5 Wildlife**

Little Mountain Landfill has a variety of wildlife located on or near the landfill property. Wildlife includes deer, snakes, foxes, skunks, and coyotes. The only operational problems with

wildlife to date have been with an occasional skunk or snake. When problem skunks or snakes are encountered, they are exterminated. If other site wildlife becomes a problem, the landfill will coordinate with the Division of Wildlife Resources to provide methods and means to eliminate the problem.

In the event that any of these vectors become an unmanageable problem, the services of a professional exterminator will be employed.

### **3.8.6 Fugitive Dust**

The roads leading to the landfill are paved with site access provided via a maintained gravel access road. Some construction activities and daily traffic produce a certain amount of dust. Landfill activities compounded by the occasional high wind present a periodic fugitive dust problem. If the dust problem elevates above the "minimum avoidable dust level", the landfill applies water to problem areas.

The landfill has a water tank that is pulled up on the hook-lift truck and is used to suppress the dust. Water is applied to the gravel roads leading from the landfill office to the tipping face and at the tipping face. The water is applied as often as needed to control the dust.

The landfill has a limited volume of water available at the site. During the dry summer months; Little Mountain Landfill personnel may augment the dust control water supplies by detaining stormwater run-off with the water held in the lined evaporation ponds. Run-off water from the Phase III excavation will be detained within the perimeter access road. In addition to the water detained within the access road; a stormwater run-on detention basin located to the northwest of the active landfill may be utilized as a source of dust control water.

Because of the limited water, Little Mountain Landfill is in the process of evaluating alternate water sources to be used for dust control. If other sources of dust control water become available, a request will be prepared for DSHW approval. Once approved for use by DSHW, the landfill will expand its current dust control practices.

### **3.8.7 Litter Control**

Due to the nature of landfilling operations, litter control is an ongoing problem. Landfill personnel perform routine litter cleanup to keep the landfill and surrounding properties clear of windblown debris.

Whenever possible, the working face is placed down wind so that blowing litter is worked into the landfill face. During windy conditions, landfill personnel minimize the spreading of the waste to reduce the amount of windblown debris.

### **3.9 RECYCLING**

Currently, recycling activities at the landfill consists of storage areas and bins to recycle white goods and scrap metal. Little Mountain diverts all green waste to the composting facility near the bottom of the hill north of the landfill entrance. Due in part to the recycling market conditions, the BECSW does not plan to expand the on-site recycling program (until or when the PCC is constructed). The public does have the opportunity to participate in composting programs through Mow'n Ranger, and Brigham City and Tremonton Waste Treatment Facilities.

### **3.10 TRAINING PROGRAM**

As part of the initial training of new employees, the Landfill Operator's Manual is required reading. All personnel are required to review the approved permit annually.

All personnel associated with the operation of the landfill receive training annually. The "Sanitary Landfill Operator Training Course" offered by the Solid Waste Association of North America (SWANA) is required by all employees within 1 year of hire date. Certificates of completion are kept in personnel files. Regular safety and equipment maintenance training sessions are held to ensure that employees are aware of the latest technologies and that good safety practices are used at all times.

### **3.11 RECORDKEEPING**

An operating record is maintained as part of a permanent record on the following items:

Vehicle weights, number of vehicles entering the landfill and types of wastes received on a monthly basis. Daily logs are stored on the computer.

Deviations from the approved Plan of Operation.

Personnel training and notification procedures.

Landfill gas-monitoring results.

Waste water test results.

Random load inspection log.

### **3.12 SUBMITTAL OF ANNUAL REPORT**

BECSW will submit a copy of its annual report to the Executive Secretary by March 1 of each year for the most recent calendar or fiscal year of facility operation. The annual report will include facility activities during the previous year and will include, at a minimum, the following:

Name and address of facility.

Calendar or fiscal year covered by the annual report.

Annual quantity, in tons or volume, in cubic yards, and estimated in-place density in pounds per cubic yard of solid waste handled for each type of treatment, storage, or disposal facility, including applicable recycling facilities.

Annual update of required financial assurances mechanism pursuant to Utah Administrative Code R315-309.

Results of gas monitoring.

Training programs completed.

### **3.13 INSPECTIONS**

The Director, or his/her designee, inspects the facility to minimize malfunctions and deterioration, operator errors, and discharges that may cause or lead to the release of wastes to the environment or to a threat to human health. These inspections are conducted on a quarterly basis, at a minimum.

An inspection log is kept as part of the operating record. This log includes at least the date and time of inspection, the printed name and handwritten signature of the inspector, a notation of observations made, and the date and nature of any repairs or corrective actions. Inspection records are available to the Executive Secretary or an authorized representative upon request.

### **3.14 RECORDING WITH COUNTY RECORDER**

Plats and other data, as required by the County Recorder, will be recorded with the Box Elder County Recorder as part of the record of title no later than 60 days after certification of closure.

### **3.15 STATE AND LOCAL REQUIREMENTS**

The Little Mountain Landfill maintains and will continue to maintain compliance with all applicable state and local requirements including zoning, fire protection, water pollution prevention, air pollution prevention, and nuisance control.

### **3.16 SAFETY**

Landfill personnel are required to participate in an ongoing safety program. This program complies with the Occupational Safety and Health Administration (OSHA), and the National Institute of Occupational Safety and Health (NIOSH) regulations as applicable. This program is designed to make the site and equipment as secure as possible and to educate landfill personnel about safe work practices.

The Box Elder County Sheriff's Department, registered under the Utah Emergency Medical Training Council, trains all of the landfill employees in First Aid and CPR annually. The name of each person to have a first aid certificate is posted beside the telephone numbers. It is preferable to have one first aid certified personnel on site during all normal operating hours.

### **3.17 EMERGENCY PROCEDURES**

In the event of an accident or any other emergency situation, the Equipment Operator notifies the Scale Attendant who immediately contacts the Landfill Director and proceeds as directed. If the

Landfill Director is not available, the Scale Attendant calls the appropriate emergency number posted by the telephone. The emergency telephone numbers are:

Box Elder County Central Dispatch .....	911
Fire Department .....	(435) 723-5227
Sheriff's Office .....	(435) 734-9441
Highway Patrol .....	(800) 284-6950
County Fire Marshal .....	(435) 734-9441
Brigham City Community Hospital .....	(435) 734-9471
Gina Allen, Landfill Director .....	(435) 730-3153

#### **4.0 - CLOSURE PLAN**

This section describes the final cover construction, site capacity, schedule of closure implementation, estimated costs for closure, and final inspection procedures for the expansion of the Little Mountain Landfill.

##### **4.1 CLOSURE STRATEGY**

As the Little Mountain Landfill slowly fills, daily and intermediate cover is systematically placed as required as part of the daily landfill operations. Prior to construction of any final cover; BECSW personnel will submit a QA/QC Plan to the DSHW for review and approval. The QA/QC Plan will detail the testing and construction documentation necessary during the construction of the final cover.

As portions of the landfill reach the final cover elevation the final lift of daily then intermediate cover is placed. During each summer, the areas of the landfill that have reached final design elevation and that have been covered with both daily and intermediate cover will receive the final cover soils. The landfill is divided into 4 Cells to help to illustrate the direction of landfilling operations. The establishment of the 4 cells is somewhat arbitrary since the landfill will be developed, landfilled, and covered in an incremental fashion.

The projected date of the final closure of the entire landfill, based upon current waste streams is in 2049. It is projected that approximately 2.6 millions tons of waste (5.5 million cubic yards of waste and cover soils) will be placed in the landfill at the time of closure.

The Executive Secretary will be notified in writing at least 60 days prior to the anticipated last receipt of waste in accordance with R315-302-3(4)(a). Implementation of the closure plan will begin within 30 days after the last receipt of waste. Closure will be completed within 180 days of implementation of closure activities, unless an extension has been granted by the Executive Secretary.

## **4.2 FINAL COVER DESIGN AND INSTALLATION**

The design of the final cover system for the Little Mountain Landfill has been completed and is included in the Permit Drawings. The final cover design described herein is in accordance with current State of Utah regulations criteria. The final cover system is designed to control the emission of landfill gas, promote the establishment of vegetative cover, minimize infiltration, and percolation of water into the waste, and prevent erosion of the waste throughout the post-closure care period and beyond.

### **4.2.1 Seed, Fertilizer and Mulch**

The top 6-inches of the cover will be seeded with a mixture of grasses suitable for fast growth in the region, fertilized and mulched. A local, experienced agronomist will be retained to develop an appropriate seed mixture for the seeding of the Landfill.

### **4.2.2 Contouring**

The landfill's final grades will be inspected and maintained in order to ensure the covers integrity and conformity with the final cover grades and elevations.

## **4.3 CERTIFICATION OF CLOSURE AND RECORDKEEPING**

A civil engineer registered in the State of Utah will document the final closure construction activities of the Landfill. The registered engineer will be employed by BECSW, or will be a

BECSW hired contractor and will document the landfill was closed according to the QA/QC Plan. Any amendment or deviation to the QA/QC Plan will be approved by the Executive Secretary and any associated permit modifications will be made. As part of the final cover construction process, the engineer shall also provide closure as-built drawings to the Executive Secretary within 90 days following completion of the closure activities.

Additionally, the final plats and the amount and location of waste will be recorded on the site title. BECSW will file the notarized plat with the Box Elder County Recorder within 60 days following certification of closure.

## **5.0 - POST-CLOSURE PLAN**

Post closure activities will begin when the final closure is approved is approved by the Executive Secretary. The following presents the post-closure plan for the Little Mountain Landfill.

### **5.1 MONITORING PROGRAM**

The following subsections offer a description of the post-closure monitoring program.

#### **5.1.1 Groundwater Unlined and Lined Landfill**

Under the current permit, groundwater is not monitored at the Little Mountain Landfill. No groundwater monitoring is planned for the post-closure care period.

#### **5.1.2 Surface Water - Existing and Proposed Landfill Expansion**

Although no surface water sampling activities are scheduled under the current landfill permit, BECSW staff will inspect the surface water management system no less than quarterly. Temporary repairs to any observed structures will be made until permanent repairs can be scheduled. BECSW or a licensed general contractor will replace surface water management structures, as required.

#### **5.1.3 Leachate Collection and Treatment**

Under the current permit, leachate collection and treatment is not required. No leachate collection or treatment facility maintenance is planned for the post-closure care period.

#### **5.1.4 Landfill Gas**

During the first 30 years of the post-closure care period, BECSW personnel will be responsible for the monitoring of all methane gas monitoring stations, and facility structures. Gas monitoring will occur no less often than quarterly and will be conducted more often if the need arises. In the event that a sample exceeds the regulatory level, BECSW personnel will notify the DSHW immediately and undertake appropriate corrective actions.

The proposed Little Mountain Landfill is not expected to produce significant amounts of landfill gas and no gas collection system has been designed. Should the landfill have a demonstrated need for a gas collection system, one will be designed and installed. Gas monitoring will be conducted for 30 years after closure. If gas emissions during the post-closure period are shown to be negligible, Box Elder County may request that the Executive Secretary amend the 30-year post closure period for gas monitoring. The cost for gas monitoring is included in the budget for quarterly inspection.

## **5.2 MAINTENANCE PROGRAM**

The following subsections offer a description of the maintenance of installed structures.

### **5.2.1 Monitoring Systems**

#### ***5.2.1.1 Groundwater***

No groundwater monitoring will be performed; therefore there will be no ancillary system to maintain.

#### ***5.2.1.2 Surface Water***

Drainage control problems can result in accelerated erosion of a particular area within the landfill. Differential settlement of drainage control structures can limit their usefulness and may result in a failure to properly direct storm water off-site.

Implementation of a post-closure maintenance program will maintain the integrity of the final drainage system throughout the post-closure maintenance period. The final surface water drainage system will be evaluated and inspected, no less than quarterly, for ponded water and blockage of and damage to drainage structures and swales. Where erosion problems are noted or drainage control structures need repairs, proper maintenance procedures will be implemented as soon as site conditions permit so that further damage is minimized. Damaged drainage pipes and broken ditch linings will be removed and replaced.

BECSW staff will inspect the drainage system no less than quarterly. Temporary repairs will be made until permanent repairs can be scheduled. BECSW personnel or a licensed general contractor will repair or replace drainage facilities as required.

#### ***5.2.1.3 Leachate Collection and Treatment***

No leachate collection and treatment system is currently in use at the Landfill; therefore there is not a system to maintain.

#### ***5.2.1.4 Landfill Gas Collection System***

No landfill gas collection system is currently in use at the Landfill; therefore there is not a system to maintain.

### **5.3 SCHEDULE OF POST-CLOSURE ACTIVITIES**

Post-closure activities, consisting of monitoring and maintaining the final cover and permanent drainage facilities, will be implemented immediately following approval of the final closure.

### **5.4 CHANGES TO RECORD OF TITLE, LAND USE, AND ZONING**

The BECSW will notify the Box Elder County Recorder's Office at any such time when there is a change to the Record of Title, land use plan, or zoning restrictions. In addition, The BECSW will notify the Recorder at that time when the post-closure care period has expired and when a final site use has been accepted by the State DSHW.

## 6.0 – FINANCIAL ASSURANCE PLAN

### 6.1 CLOSURE COST ESTIMATES

Cost estimates for closure are based upon a third party performing closure activities. The closure cost estimate is for the cost to close the largest area of the landfill requiring final cover. Based upon the existing landfilling operations and the future incrementally nature of the final cover, the more expensive of the following two closure scenarios will govern the amount of financial assurance required:

Immediate closing of the landfill – Closing the existing landfill in the near term would require that the existing footprint be covered with an additional 4 ½ feet of cover soils. The existing footprint of the landfill is approximately 9 acres. The unit cost for soil placement over the existing landfill is very low due to the proximity (located immediately northwest of the existing landfill, no excavation or hauling required) of the cover soils.

ITEM	UNIT	QUANTITY	COST/UNIT	TOTAL COST
Soil Placement	Yds <sup>3</sup>	65,000	\$2.00	\$130,000
QA-QC Plan / Testing	Yds <sup>3</sup>	65,000	\$0.50	\$32,500
Grading and Drainage	Yds <sup>3</sup>	65,000	\$0.50	\$32,500
Revegetation	Acres	9	\$2,500.00	\$22,500
<b>Subtotal</b>				<b>\$217,500</b>
Engineering/Construction Doc				\$11,000
Contingency				\$22,000
<b>Total</b>				<b>\$250,500</b>

Future closing of the landfill – Due to the incremental closing of the landfill (placement of final cover soils in several construction phases – four to five) closing the landfill at any point in the future will require placing final cover over a relatively small working area. The small annual waste stream will result in a relatively small operational area. Based upon the 45 plus years of landfill life, the largest area anticipated to be open without final cover will be roughly 20% of the total area of the final cover. 20% of the final cover area is approximately 440,000 sq. ft. The volume of soil to cover 440,000 sq. ft. with the remaining 3.3 feet of final cover soils over the in-place daily and intermediate soil cover is approximately 54,000 cubic yards. The unit costs for cover soil is relatively low due to the proximity of the soil borrow area. Since the future soil stockpile locations and volumes are unknown; final cover soil costs are anticipated to be excavated and hauled from the area surrounding the landfill.

ITEM	UNIT	QUANTITY	COST/UNIT	TOTAL COST
Soil Placement	Yds <sup>3</sup>	54,000	\$3.00	\$162,000
QA-QC / Testing	Yds <sup>3</sup>	54,000	\$0.50	\$27,000
Grading and Drainage	Yds <sup>3</sup>	54,000	\$0.50	\$27,000
Revegetation	Acre	10	\$2,500.00	\$25,000
<b>Subtotal</b>				<b>\$241,000</b>
Engineering/Construction Doc				\$12,000
Contingency				\$24,000
<b>Total</b>				<b>\$277,000</b>

The unit costs presented above represent costs obtained by IGES for landfill liner and cover projects completed within the last 12 months along the Wasatch Front.

## 6.2 POST-CLOSURE COST ESTIMATES

Cost estimates for post-closure are based upon a third party performing post-closure inspection activities. Post-closure activities will be quarterly site inspections and annual summer maintenance. The following activities will be performed for a period of 30-years consistent with existing landfill regulations:

ITEM	UNIT	QUANTITY	COST/UNIT	TOTAL COST
Quarterly Inspection	Hours	360	\$50	\$18,000
Annual Maintenance	Days	60	\$300	\$24,000
<b>Subtotal</b>				<b>\$42,000</b>
Supplemental Engineering				\$2,800
Contingency				\$4,200
<b>Total</b>				<b>\$49,000</b>

## 6.3 FINANCIAL ASSURANCE MECHANISM

The Box Elder County Commissioners have, consistent with a resolution previously passed, established a dedicated account (trust fund) for the financial assurance of the Little Mountain Landfill. The trust fund is with the Utah Public Treasurer's Investment Fund; monthly statements can be obtained through the State Treasurer's office. Based upon previous estimates for closure and post-closure, Box Elder County has placed approximately \$260,000 into the financial assurance account.

Based upon the more conservative estimated costs for closure and the anticipated costs for post-closure care totaling approximately \$326,000, the amount of financial assurance monies set aside appears to be slightly less the anticipated future costs.

Money deposited in the trust fund will be used exclusively for closure, post-closure care, and corrective action (if required).

The financial assurance requirements for the Little Mountain Landfill will be evaluated annually as part of the required annual report.

**APPLICATION TO RENEW A PERMIT TO  
OPERATE A CLASS I LANDFILL**

**Little Mountain Landfill**

**PART III - TECHNICAL AND ENGINEERING REPORT**

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## 1.0 – GENERAL LANDFILL INFORMATION

### 1.1 PHASE DESIGN - PROPOSED LANDFILL EXPANSION

This permit application includes provisions for the full development of the existing Landfilling operation utilizing the land immediately adjacent to the currently operating Box Elder County Landfill (Little Mountain Landfill). The landfill development is on land that is within existing permit boundaries and does not represent a lateral expansion. The future development is estimated to extend the operating life of the Little Mountain Landfill until the year 2054.

#### 1.1.1 Estimated Life

The Little Mountain Landfill development has been broken into four major tasks or phases. The Permit Drawings show the four Phases of the Little Mountain development. The landfill Phases that have been completed have been included to understand historic modification of the landfill operation. The four Phases of the landfill expansion are as follows:

##### *1.1.1.1 Phase I (Landfill Berm Construction) – Completed.*

Phase I of the landfill development consisted of grading out the mound of soil that was located to the northwest of the active landfill. The regraded stockpile of soil was created when the existing landfill was excavated. Phase I established a somewhat uniform soil berm around the south, west, and north sides of the existing landfill. The construction of the soil berm required that approximately 17,400 cubic yards of soil be cut from the existing stockpile and an additional 53,500 cubic yards of soil was imported as fill. The creation of the soil berm allowed for the construction of a site perimeter access road while providing a western boundary for the MSW of Phase II.

##### *1.1.1.2 Phase II (Filling Existing Footprint) – Ongoing*

Phase II is the continuation of landfilling in the historic operational area. Phase II of the landfill development has provided the operational time required to excavate Cell 1 and approximately ½ of Cell 2 in Phase III. The Phase II operation was modified to keep the landfill operation more compact and provide for positive drainage of the working areas. The Phase II area will be operational until approximately 2008 utilizing the existing landfilling methods.

### ***1.1.1.3 Phase III (Excavation of Landfill Expansion) – Ongoing***

Phase III of the landfill expansion is the soil excavation for Cells 1 through 4. The development of the landfill Cells is shown in the Drawings. The division of Phase III into four Cells is arbitrary since the development of the expansion will be done in an incremental fashion. The division of Phase III into Cells is for illustrative purposes only. A secondary reason for the division into Cells is to estimate the amount of soil to be removed (and the time to remove the soil) to develop an adequate working area.

Phase III excavation will generate approximately 1.2 million cubic yards of soil. The net soil available for use as daily, intermediate and final cover is slightly less than 1.2 million cubic yards. As Phase III proceeds, the lowest permeability soils (visual assessment) will be stockpiled separately (if operationally feasible) for use as the “infiltration minimization layer” of the final cover.

Daily and intermediate cover is being excavated from the Phase III area.

### ***1.1.1.4 Phase IV (Filling/Covering Landfill Expansion) – Future***

Phase IV will consist of the incremental infilling and covering of the expansion area. Phase IV will provide approximately 48 years of landfill capacity. The landfill capacity is based upon 115 tons/day waste stream, 307 operational days/year, 1200 lbs/yd<sup>3</sup> wastes density, and a waste to soil ratio of 4:1. If any of these parameters change, the landfill life will vary accordingly. The waste stream at the Little Mountain Landfill has not escalated due to the waste reduction and diversion.

Box Elder County Solid Waste (BECSW) has excavated Cell 1 of Phase III to final design elevation. BECSW personnel are delaying moving the landfill operation into Cell 1 to determine if the area might need to be lined if the Little Mountain facility is to accommodate waste from out of the County.

The design airspace for Phase IV is approximately 5.5 million cubic yards. The 5.5 million cubic yards of design airspace will include 1.1 million cubic yards of soil. The size of Little Mountain Landfill was limited to 5.5 million cubic yards of total capacity to keep under the State of Utah air quality regulations. Appendix E contains the calculations for landfill life and demonstrates compliance with State of Utah Department of Air Quality regulations.

### **1.1.2 Liner**

Due to the great distance to groundwater and slow permeability of the site soils, semi-arid climate, and high evaporation rate, the Little Mountain Landfill has been exempted from synthetic liner requirements. With the continued approval of the Executive Secretary, the proposed landfill expansion will not construct a synthetic liner system. IGES has excavated and logged additional test pits at the Little Mountain Landfill. Lab test data confirms previous near surface exploration work at the site performed by Tahoma Inc. IGES test pit logs and lab data is presented in Appendix F.

### **1.1.3 Leachate Collection and Treatment System**

For reasons described in Section 1.1.2 the existing landfill has also been exempted from the leachate collection and treatment system requirements. With the continued approval of the Executive Secretary, the proposed landfill expansion will not construct a leachate collection and treatment system.

### **1.1.4 Fill Method**

Wastes are dumped at the toe of the work face and spread up the slope in one to two foot layers, keeping the working slope at a maximum three to one (horizontal to vertical).

Work face dimensions are kept narrow enough to minimize blowing litter and reduce the amount of soil needed for daily cover. However, dimensions should be wide enough to accommodate vehicles bringing garbage into the landfill safely. BECSW has found that the width of the work face should be no less than two and a half times the width of the compactor blade for the best operational efficiencies.

Typically the compactor is operated with the blade facing uphill. Equipment operations across the slope are avoided to minimize the potential of equipment tipping over. In addition to safety concerns, a toe of slope to crest of slope working orientation provides the following benefits:

- Minimizes blowing litter problems.
- Increases equipment compactive effectiveness.
- Increased visibility for waste placement and compaction.
- More uniform waste distribution.

Grade stakes are used when necessary to control cell height and top surface grade. The top of the surface grade ranges from 2 to 5 percent, and the cell height ranges from 8 to 10 feet.

Wastes are compacted by making three to five passes up and down the slope. Compaction reduces litter, differential settlement, and the quantities of cover soil needed. Compaction also extends the life of the site, reduces unit costs, and leaves fewer voids to help reduce vector problems. Care is taken that no holes are left in the compacted waste. Voids are filled with additional waste as they develop.

### **1.1.5 Daily and Final Cover**

#### ***1.1.5.1 Daily and Intermediate Cover***

A biodegradable flexible cover material has been approved for use as alternate daily cover at the Little Mountain Landfill. This material is currently being used as daily cover on the active areas of landfilling. In less active areas the waste is covered with a daily cover consisting of the on-site soils.

Where soil daily cover is used in these areas of less activity, the material is placed approximately six inches thick. The material is used to retard infiltration of surface water and discourage vectors.

Intermediate cover is required to be placed when portions of a Class I unit are idle for more than 30 days. The intermediate cover is to minimize the potential for water infiltration, blowing waste and vector problems. Intermediate cover will consist of an additional 12 inches of low permeability site soils.

Compacted intermediate cover will remain exposed to atmospheric conditions for no more than 30 days before being covered with additional waste or final cover soils. Any areas of the landfill with intermediate cover that may be exposed to the atmosphere for more than 30 days will receive an additional 40 inches of cover soils, for a minimum of 58 inches of soil cover. Damaged areas of the intermediate cover will be regraded and recompactd when necessary to restore the intermediate cover.

Sufficient surplus excavated soil or material from borrow areas will be available from on site to serve as a source for intermediate cover.

#### ***1.1.5.2 Final Cover***

BECSW proposes to use the previously approved alternate cover for all areas of the proposed expansion. The lowermost portion of a standard final cover system is an “infiltration minimization layer” constructed of a minimum of 18 inches thick of earthen material with a permeability no greater than that of the floor of the landfill unit. Soil samples from test pits at the landfill site have measured permeabilities of  $4.18 \times 10^{-6}$  cm/sec and  $3.09 \times 10^{-6}$  cm/sec. (Tahoma 1996). Therefore the infiltration layer of the final cover system will be constructed of on site soils with permeability no greater than  $3.09 \times 10^{-6}$  cm/sec. The lowest permeability site soils will be selectively stockpiled during the excavation of Phase III for use in the “infiltration minimization layer”.

The infiltration layer will then be covered with an “erosion layer” consisting of a minimum of 40 inches of earthen material, the top 6 of which can sustain plant growth.

#### **1.1.6 Elevations of Bottom Liner and Final Cover**

As illustrated on the Permit Drawings that are included with this permit application, Phase III development is not currently designed to be constructed with a synthetic liner. The slope of the bottom of the landfill expansion will be a minimum of 2%. The lowest elevation of the landfill expansion is to be constructed at 4860 feet above mean sea level. The existing landfill permit planned for the bottom of the landfill to be dropped approximately 3 feet to generate the additional soil required during the life of the landfill; alternate daily cover and borrow sources outside the perimeter of the site access road will generate the additional cover required.

The maximum planned elevation for the final cover is 4980 feet above mean sea level. The final cover slopes at approximately 5%.

## **1.2 MONITORING SYSTEM DESIGN - EXISTING AND PROPOSED LANDFILL EXPANSION**

### **1.2.1 Groundwater**

Little Mountain Landfill does not plan to monitor groundwater. Tahoma Companies, Inc. (Tahoma) completed an exploratory boring extending 300 feet below the landfill bottom and did not encounter groundwater. Based on the minimum depth to groundwater being 300 feet and the low permeability site soils, modeling performed by Tahoma estimated the leachate travel time to be 14,174 years. These calculations were submitted to the Utah Division of Solid and Hazardous Waste (DSHW) and the landfill has been exempted from leachate collection and synthetic liner requirements. As a result groundwater monitoring will not be performed as part of the regular monitoring program.

### **1.2.2 Surface Water**

The Little Mountain Landfill Permit Drawings illustrate the locations and details of the surface water drainage control systems for both run-on and run-off. In general, surface water will be prevented from running into the active landfill area by berms. Very little runoff from any active area is anticipated due to the irregular surface left by the teeth of the compactor; a water retention ditch is located to the east of the active area if any runoff is generated. The water retention ditch does not drain outside the perimeter access road; it currently stores all storm water generated within the access road. Runoff from the final cover will be managed by a combination of berms and ditches.

As the development of Phase III progresses; the construction of the settling pond and a culvert connecting the water retention ditch will be constructed. The berms will be placed to divert the water around the active area to culverts and the settling pond. Landfill staff will inspect the drainage system quarterly. Temporary repairs will be made to observed deficiencies until permanent repairs can be scheduled. BECSW or a licensed general contractor will repair drainage facilities as required.

Runoff from the excavated area will be collected in a detention basin to the northwest of the current landfill. The collected runoff will be used for dust control.

### **1.2.3 Leachate Collection**

A leachate collection system will not be installed due to the current synthetic liner exemption issued by the DSHW. In general, the threat of groundwater contamination from leachate is very small because of the great distance between the landfill and groundwater, the relatively low permeability of the soils beneath the landfill, and the low precipitation. Should the landfill have a demonstrated need for a leachate collection system, one will be designed and installed.

Any storm water contacting the MSW in the active cell will remain in the active cell area due to the highly irregular surface of the landfill (and the existing water retention ditch).

### **1.2.4 Landfill Gas**

This facility is monitored for methane gas on a quarterly basis. Concentrations of methane gas are measured with a hand-held gas monitor.

Gas readings will be recorded at each end of the active cell, the office and shop, the fuel tanks, and other places at random. Readings will be recorded on the "Gas Log" sheet and kept on file in the scale house office.

## **1.3 DESIGN AND LOCATION OF RUN-ON/RUN-OFF CONTROL SYSTEMS**

### **1.3.1 Run-On from a 24-Hour, 25-Year Storm**

The design for the proposed landfill expansion of the Little Mountain Landfill incorporates a run-on control system that is capable of directing the flow away from the active portion of the landfill during the peak discharge of a 24-hour, 25-year storm (2.38 inches, National Oceanic and Atmospheric Association). The purpose of the run-on control is to minimize the amount of surface water entering the landfill facility. Run-on controls prevent: (1) erosion, which may damage the physical structure of the landfill; (2) surface discharge of wastes in solution or suspension; and (3) downward percolation of run-on through wastes, creating leachate. Ditches and berms (perimeter access road) are constructed around the perimeter of the landfill site. Water draining toward the landfill site from the surrounding ridges and slopes are collected in the perimeter ditches and routed into natural drainages outside the Landfill.

The proposed locations and typical cross sections of all run-on structures are shown on the Drawings. During the 25-year 24-hour storm event, run-off from surrounding areas that naturally runs toward the landfill from the north, east and south will generate flows of 19.8, 15.2 and 22.0 cfs, respectively. Adjacent to the elevated road berms which intercept surface run-on, the depth of projected flows will not exceed 1.4 feet; as such perimeter berms are constructed to a minimum height of 2 feet. Appendix D presents the analysis of the run-on potential from land adjacent to the landfill expansion.

### **1.3.2 Run-Off from a 24-Hour, 25-Year Storm (Active Cell)**

Based on stormwater calculations for the proposed landfill, dimples created by compacting the waste and cover soils will create sufficient surface detention space to retain all potential run-off from a 24-hour, 25-year storm. Appendix D presents the analysis of the stormwater run-off potential from the active area of the landfill. The construction of the water retention ditch is an added measure of stormwater retention capacity.

### **1.3.3 Run-Off from a 24-Hour, 25-Year Storm (Area within the Perimeter Access Road)**

Stormwater falling within the perimeter access road will flow northwest down the 2% cell bottom slope. As the stormwater nears the existing active area it will be diverted southwest along a run-on control berm that separates the Phase III development and the "existing landfill operation". Currently all stormwater generated within the site access road are stored in the water retention ditch.

As the existing landfill operation is moved into Cell 1; a stormwater detention basin will be constructed as indicated in the Drawings. The stormwater detention basin will be at least 100 ft. x 100 ft. x 4 ft., providing approximately 300,000 gallons of dust control water when full. The water retention ditch will be hydraulically connected to the stormwater detention basin by a gated culvert leading to a drainage ditch. Water will be selectively released from the water retention ditch to fill the stormwater detention basin. As the detention basin fills it will be monitored to prevent an accidental overflow. Water will be stored in the stormwater detention basin until used for dust control within the access road or evaporated. Appendix D presents the analysis of the stormwater run-off from the area within the perimeter access road.

#### **1.3.4 Run-Off from a 24-Hour, 25-Year Storm (Final Landfill Cover)**

Stormwater from the final cover will be managed with a series of berms directing water into perimeter ditches. The perimeter ditches will then direct the water to drop structures that will convey the stormwater into the existing stormwater run-on ditches. The Drawings show the location of pertinent drainage structures. Appendix D presents the analysis of the stormwater run-off from the final cover.

## 2.0 - GEOHYDROLOGICAL ASSESSMENT

### 2.1 GEOLOGY AND HYDROLOGY

#### 2.1.1 Regional Geology

Box Elder County is in the northwestern corner of Utah, bordering Idaho on the north, Nevada on the west, Tooele and Weber Counties on the south, and Cache County on the east. It has a land area of 5,594 square miles, and an additional 800 square miles is submerged under the Great Salt Lake.

Elevations in Box Elder County range from 4,210 feet at the Great Salt Lake to 9,892 feet in the Raft River Mountains near the Idaho border. Three contrasting land form types occur in the County: 1) Low mudflats and shorelines of Great Salt Lake and the Great Salt Lake Desert, 2) Mountain ranges, and 3) Broad slopes intermediate between the mountain ranges and the lowlands.

Nearly flat lowlands of eastern Box Elder County are underlain by fine-grained, soft soils (silt and clay) with a very shallow (generally less than 10 feet BGL) water table. The soils and water are highly saline, except in portions of the Bear River Valley north of the Great Salt Lake.

Mountainous lands consist of hard, fractured bedrock with a thin veneer of coarse, mechanically weathered and eroded soils. Typical rock types are limestone, dolomite, quartzite and igneous rock. Most of the mountain ranges trend north to south. The Raft River Mountains are an exception; they trend nearly east-west along the northern edge of the County.

Broad slopes intermediate between the mountains and the lowlands consist of coarse granular soils (sand, gravel, cobbles and boulders) eroded off the mountains. These soils have been moved about by rivers, streams and lakes to form alluvial fans, lake terraces and other depositional features. From a distance the slopes appear smooth, but are cut locally by minor drainages and washes.

#### 2.1.2 Local Geology

The proposed Little Mountain Landfill expansion is on an isolated mountain rising 1,350 feet above the Bear River Valley in the east-central portion of Box Elder County.

The rocks that form Little Mountain are mostly limestones of Mississippian and Pennsylvanian to Permian age (Doelling, 1980). Similar rocks are exposed in mountains located west, north and

east of Bear River Valley. Sediments of the Great Salt Lake cover bedrock to the south of Little Mountain.

At least five bedrock formations are exposed on Little Mountain. The bedrock formations listed from oldest to youngest, are the Jefferson, Lodgepole, Humbug, Great Blue and Oquirrh.

## **2.2 HYDROGEOLOGY**

### **2.2.1 Groundwater**

Little Mountain is an isolated structural and topographic highland surrounded by the lowlands of the Bear River Valley and the Great Salt Lake Desert. Rocks that are present in the mountain are mostly brittle, fractured limestone. Precipitation that falls on the Little Mountain either runs off the steep hillsides, or infiltrates through soils into the fractured limestone.

Water that infiltrates into fractured limestones travels downward under the influence of gravity until it reaches a zone of saturation. The only known zone of saturation near Little Mountain occurs 700 feet below the proposed landfill site in the soils of the surrounding lowlands.

Groundwater could occur in a saturated zone of fractured limestone within Little Mountain, but above the surrounding lowland surface. If present, a water table would have a convex upward surface, roughly similar to the topography of Little Mountain, but with much lower relief. If the top of the water table in the fractured limestone bedrock were significantly higher than groundwater elevation under the surrounding lowlands, pressure from the weight of the water would force fresh groundwater through the fractured limestone and out the sides of Little Mountain in a line of springs. This postulated line of fresh water springs would occur around the perimeter of Little Mountain wherever the top of the groundwater intersected the hillside.

No line of fresh water springs is present at or near the base of Little Mountain. Therefore, it is unlikely that a significant bedrock aquifer occurs within the mountain.

### **2.2.2 Surface Water**

No surface water is present at the proposed Little Mountain Landfill site. Minor intermittent drainages cross the site from southeast to northwest. All up gradient surface water will be diverted around the site by appropriately sized berms or ditches.

## **2.3 WATER RIGHTS**

Records of the Utah Division of Water Rights have been reviewed to obtain information on points of diversion, water use classifications and depths of wells near Little Mountain. No water rights have been claimed atop the mountain, and no water wells have been drilled there. Eight water use claims are valid in the lowlands east and south of Little Mountain. Seven of these are underground drains used for stock watering.

One point of diversion is a four-inch diameter well drilled to a total depth of 22 feet BGL. The well was drilled near the base of Little Mountain, 1.1 miles northeast of the proposed landfill site, near the southwest corner of Section 8, T. 10 N., R. 3 W. The location is at the break in slope between the mountain and adjacent lowlands. Surface elevation of the well is at approximately 4,275 feet, placing the water level elevation (near the bottom of the well) at 4,253 feet. That is about 700 feet below the elevation of the proposed landfill site.

## **2.4 GROUNDWATER QUALITY**

### **2.4.1 Groundwater Data**

No fresh groundwater has been found at the landfill site. The nearest water analyses available are of natural hot and warm springs at the base of Little Mountain (Klauck and Budding, 1984). They reported that thermal waters in Box Elder County are found at the faulted boundaries between mountains and lowlands where bedrock is at or near the ground surface.

Two hot springs, with groundwater temperatures more than 20° Centigrade, occur along the southern border of Little Mountain. They are Stinking Hot Springs and Little Mountain Warm Spring.

Water at Stinking Hot Springs is highly saline. Older published measurements of Total Dissolved Solids (TDS) range from 29,000 to 30,400 milligrams per liter (mg/L). Klauck and Budding reported a TDS of 31,080 mg/L. Most of the dissolved chemicals are sodium and chloride, with unusually high concentrations of lithium, bromide and iodide ions. The high concentrations of chemicals are derived from 1) saline minerals in the surface soils south of Little Mountain, and 2) deeply buried subsurface materials through which the water moves before reaching the surface.

Water from Little Mountain Warm Spring has similar chemical composition to water from Stinking Hot Springs. TDS are 36,110 mg/L, with sodium and chloride as the predominant constituents. Reported concentrations dissolved ions ( $\text{HCO}_3$ , lithium, strontium, potassium, calcium, and boron—among others) are very similar to analyses from Stinking Hot Springs. Water from Little Mountain Warm Spring and Stinking Hot Springs may travel along the same geological structures and carry dissolved chemicals from the same buried sources.

Kaluk and Budding reported three warm springs one to two miles northwest of Little Mountain. Water from each of those springs is less saline (4,352, 9,444 and 9,762 mg/L TDS) than at either Stinking Hot Springs or Little Mountain Warm Spring. The water temperatures are also lower ( $19^\circ$ ,  $16^\circ$  and  $16^\circ$  C) at the three measuring points.

Water analyses, temperatures and orientation of the faults along the west side of Little Mountain suggest that the three warm springs are part of the same groundwater system that feeds the two hot springs. Water in the three warm springs is diluted by cooler and fresher surface water from Salt Creek and shallow groundwater.

#### **2.4.2 Statistical Analysis**

BECSW does not plan to monitor groundwater at the proposed landfill site. The hydrogeological assessments for the 1996 landfill permit (Tahoma Inc.) was the first hydrological site evaluation of the Little Mountain Landfill site. The hydrogeological assessment was incorporated in Tahoma's *Request for Exemption from Liner, Leachate Control and Ground Water Monitoring*. This document was submitted to the DSHW on November 29, 1995. State of Utah DSHW correspondence is included as Appendix G.

The basis for obtaining a waiver from groundwater monitoring is found in UAC R315-308. The rule states that the requirements "may be suspended by the Executive Secretary if the owner or operator of a solid waste disposal facility can demonstrate that there is no potential for migration of hazardous constituents from the facility to the groundwater during the active life of the facility and the post closure period.

Drilling at the landfill site proved that groundwater is not present from the surface to a depth of at least 300 feet BGL, which is the total depth explored through drilling. The HELP3 model showed that the average percolation rate of leachate through the bottom of the Landfill would be 0.06011 inches per year. Travel time calculations shown in the *Request for Exemption*

demonstrate that the travel time for leachate to reach 300 feet (the maximum depth of the test boring, and therefore, the minimum proven depth to groundwater) would be 14,174 years. This greatly exceeds the length of time for the active life of the facility plus the post-closure care period.

### 3.0 - ENGINEERING REPORT

#### 3.1 LOCATION STANDARDS - EXISTING AND PROPOSED LANDFILL EXPANSION

In addition to the Subtitle D criteria, DSHW has adopted specific location standards. The Utah location standards for Municipal Solid Waste Landfills (MSWLFs), as presented in the Solid Waste Permitting and Management Rules (R315-302), are outlined below.

- Land Use Compatibility (UAC R315-302-1(2)a)
  - Not to be located within 1000 feet of parks and protected areas
  - Not to be located in an ecologically and scientifically significant area
  - Not to be located on prime or unique farmland
  - Not to be located within ¼ mile of existing dwellings, incompatible or historical structures, unless allowed by local land use planning or zoning
  - Not to be located within 5,000 feet of airport runways
  - Not to be located on archeological sites
  
- Geology (UAC R315-302-1(2)b)
  - Proximity to a Holocene Fault
  - Considerations for constructing in a seismic impact zone
  - Consideration given to unstable areas
  
- Surface Water (UAC R315-302-1(2)c)
  - Will not affect public water system
  - Will not affect existing lakes, reservoirs and ponds
  - Cannot be located in a floodplain unless certain criteria are met
  
- Wetlands (UAC R315-302-1(2)d) Not allowed unless:
  - Alternative location has been denied previously
  - Will not violate state water quality standard or Clean Water Act
  - Will not jeopardize threatened or endangered species
  - Will not cause or contribute to significant degradation of the wetlands

- Groundwater (UAC R315-302-1(2)e)
  - Groundwater/landfill cell separation
  - Sole source aquifer
  - Groundwater quality
  - Source protection areas

The following sections present the Utah MSWLF location standards and discuss the status of Little Mountain Landfill's compliance with those requirements.

### **3.1.1 Land Use Compatibility Requirements**

The proposed landfill meets all criteria outlined in UAC R315-302-1(2)(a) as shown below. Documentation of the items listed below is found in Appendix H.

#### ***3.1.1.1 Little Mountain Landfill Land Use Compatibility***

- The facility is not within 1,000 feet of a national, state or county park, monument or recreation area; designated wilderness or wilderness study area; or wild and scenic river area.

*Source: Bauman, Susan, U.S. Bureau of Land Management, Public Room, Salt Lake City, Utah. See letter dated August 25, 1995.*

- The facility is not within an ecologically and scientifically significant natural area, including wildlife management areas and habitat for threatened or endangered species as designated pursuant to the Endangered Species Act of 1982.

*Source: Williams, Robert D., U.S. Fish and Wildlife Service; Salt Lake City, Utah. See letter dated September 22, 1995.*

- The facility is not located on farmland classified as "prime" or "unique." Thirteen acres of land in two parcels on the northwest and southeast peripheries of the site have been classified as farmland of "statewide importance" by the U.S. Department of Agriculture Soil Conservation Service under the Prime Farmland Protection Act. About six acres of this land will be used for storage of surplus soil as part of the Landfill, while the remainder will not be developed under this permit.

*Source: Domeier, Mike, Utah Department of Agriculture, Salt Lake City, Utah. See letters dated November 9, 1995 and December 29, 1995.*

*Source: Jay Hardy, Box Elder County Commissioner. See letter dated January 18, 1996.*

*Source: Bohn, Ralph T., Utah Department of Solid and Hazardous Waste, Salt Lake City, Utah. See letter dated January 29, 1996.*

- The facility is not within one-fourth mile of:
  - a) Existing permanent dwellings, residential areas and other incompatible structures such as schools or churches.

*Source: Field investigation by Gary F. Player, Principal Geologist, Tahoma Companies, Inc., July 26, 1995. See memorandum of that date.*

- b) Historic structures or properties listed or eligible to be listed in the State of National Register of Historic Places.

*Source: Dykmann, James L., State of Utah, Utah State Historical Society. See letter dated September 6, 1995.*

- The facility is not within 10,000 feet of any airport runway end used by turbojet aircraft or within 5,000 feet of any airport runway used by any piston-type aircraft.

*Source: Fredrickson, Scott, U.S. Federal Aviation Agency, Denver, CO. See letter to him dated October 12, 1995.*

- The facility is not within an archaeological site that would violate Section 9-8-204.

*Source: Dykmann, James L., State of Utah, Utah State Historical Society. See letter dated September 6, 1995.*

- The facility is not within an area that is at a variance with the Box Elder County land use plan or zoning requirements.

*Source: Beecher, Denton, Zoning Administrator and County Surveyor. See letter to him dated October 13, 1995.*

### **3.1.2 Geology**

#### **3.1.2.1 Geologic Hazards**

The Utah State Regulations indicate “No new facility or lateral expansion of an existing facility shall be located in a subsidence area, a dam failure flood area, above an underground mine, above a salt dome, above a salt bed, or on or adjacent to geologic features which could compromise the structural integrity of the facility”.

The Little Mountain Landfill is not adjacent to geologic features that could compromise the structural integrity of the facility. The Little Mountain Landfill is not in a subsidence area, a dam failure flood area, an underground a salt dome, a salt bed or mine.

#### **3.1.2.2 Fault Areas**

A new landfill may not be located within 200 feet of an active (Holocene) fault. Suzanne Hecker (1993) completed an inventory of active faults in Utah for the Utah Geological Survey. Her map shows that the closest active faults to Little Mountain occur at the western edge of the Wasatch Mountains, east of Brigham City and approximately 10 miles from Little Mountain.

The expected maximum ground acceleration from a large earthquake at this site with a two (2) percent probability of exceedance in 50 years is 0.42g (United States Geologic Survey’s (USGS) Earthquake Hazards Program - National Seismic Hazard Mapping Project). These values are estimated ground surface accelerations for a “firm rock” site, which is identified as having a shear-wave velocity of 760 m/sec in the top 30 meters. Sites with different soil types may experience amplification or de-amplification of these values. The site is situated within the International Building Code (IBC) Region 2. Based on our field investigation, it is our opinion the soils at this site are representative of a “stiff soil” profile having an average shear wave velocity  $600 \leq \bar{V}_s \leq 1,200$  (ft/sec) in the top 100 feet, best represented by IBC Site Class D having Site Coefficients of  $F_a = 1.13$  and  $F_v = 1.71$ . A summary of the anticipated horizontal acceleration and site coefficients are contained in the following table.

Spectral Period	Mapped Spectral Acceleration, $S_s$ and $S_1$ (g)	Site Coefficient, $F_a$ and $F_v$	Mapped Spectral Acceleration x Site Coefficient (g)
0.2 sec (short)	1.372	1.0	1.372
1.0 sec (long)	0.560	1.3	0.728
IBC 1615.1.3 recommends scaling the MCE value by 2/3 to obtain the design spectral response acceleration values.			

### 3.1.2.3 *Seismic Impact Zone*

The EPA and the DSHW define a seismic impact zone as any location with a 10% or greater probability that the maximum horizontal acceleration (MHA) in lithified earth material, expressed as a percentage of the earth's gravitational pull, will exceed 0.10g in 250 years. Tahoma Companies, Inc. conducted a seismic study in 1995 and indicated there was a 10 percent chance in 250 years that the area could experience horizontal accelerations of 0.60g. As mentioned previously, updated mapping by USGS Earthquake Hazards Program – National Seismic Hazard Mapping Project indicates the predicted Maximum Horizontal Acceleration (MHA) at the site is 0.42g. Therefore, the site does lie within a Seismic Impact Zone.

The MHA in lithified earth material is defined in 40 CFR part 258.14 (EPA 1991) as the “maximum expected horizontal acceleration depicted on a seismic hazard map with a 90% or greater probability that the acceleration will not be exceeded in 250 years, or the maximum expected horizontal acceleration based on site specific seismic risk assessment.” This definition was adopted in full by the UDEQ. The acceleration value of approximately 0.42g was obtained from the United States Geologic Survey's (USGS) Earthquake Hazards Program – National Seismic Hazard Mapping Project. The value is an estimated ground surface acceleration of a “firm rock” site, which is identified as having a shear-wave velocity of 760 m/sec in the top 30 meters; sites with different soil types may amplify or de-amplify this value. Section 3.1.2.4 discusses the analyses performed for this permit application and makes reference those performed by others.

### 3.1.2.4 *Seismic Impact Zone Analysis*

A seismic study was performed by Tahoma Companies, Inc. in May of 1996, and was included as attachment 17 to the initial Permit Application for Little Mountain Landfill also dated May 1996. IGES performed a review of Tahoma's seismic study and felt additional analysis should be performed based on the new landfill geometry, more recent and updated data available pertaining to the waste strength properties and the updated MHA value mentioned previously.

Based on the change to the landfill geometry, new cross-sections of the bottom excavation and final cover were generated and used in modeling static and dynamic stability. The most critical sections of the bottom excavation and final cover were modeled. These sections and slope stability modeling are presented in Appendix I.

Municipal Solid Waste (MSW) unit weight and strength properties provided by Tahoma were reviewed. Tahoma had used a value of 50.73 pounds per cubic foot (pcf). Based on the daily cover and compaction processes currently in use at the Little Mountain Landfill we feel 51 pcf is relatively accurate representation of the MSW unit weight.

Based on a large scale direct shear test performed in-situ to measure strength properties of MSW, Withiam et al, 1995, obtained a friction angle of 30 degrees and a cohesion value of 200 psf. Other work by Kavazanjian et al, 1995, suggest a friction angle of 33 degrees for MSW and a shear strength of 500 psf below a normal stress of 627 psf. Based on this information a value of 30 degrees for the angle of internal friction and 150 psf for the cohesion were used to define the strength properties of the Little Mountain MSW. These parameters compare to MSW strength properties of 20 degrees for the angle of internal friction and 50 pounds per square foot (psf) for cohesion used by Tahoma.

Strength properties of the on-site silt and sandy silt soils were estimated by Tahoma to have a friction angel of 32 degrees and a cohesion of 150 psf as well as a unit weight of 105.5 pcf. No basis for these values, such as laboratory testing, was presented. However, these values seem appropriate for the site soils and no modifications were made. The soil and MSW properties used in the seismic analysis are summarized below.

Property	Soil	MSW
Unit Weight (pcf)	105.5	51
Cohesion (psf)	150	150
Internal Friction Angle (deg.)	32	30

Static and pseudo-static analyses of the slope sections were performed using critical sections of the landfill geometry and the soil and waste parameters outlined previously. Results are presented in Appendix I. The static and pseudo-static slope stability analyses were completed using the computer program SLIDE (v. 5.027).

In order to estimate the potential amplification of the bedrock or "firm rock" acceleration of 0.42g as it travels up to the surface and then to the top of the Landfill, the simplified approach developed by GeoSyntec (1994) was used. This method uses information from Sing and Sun (1995) and Kavazanjian and Matasovic (1995) in a three step procedure to estimate the potential amplification. The three step procedure is outlined as follows: 1) classify the soils in the top 100 feet; 2) estimate the free field peak ground surface acceleration; and 3) estimate the peak acceleration at the top of the landfill.

Based on the soil profile identified by Tahoma Companies, Inc. the upper 100 feet of material classifies as a stiff site (stiff to very dense soil according to IBC 2003). Therefore, the free field peak ground surface acceleration is assumed to be approximately equal to the peak bedrock acceleration and the maximum horizontal acceleration (MHA) at the ground surface is considered to be 0.42g using the analytical data from Kavazanjian and Matasovic (1994). Based on this information and maximum fill height of 100 feet, the peak acceleration at the top of the Landfill was estimated to be 0.51g using the analytical data from and Singh and Sun (1995). Appropriately, an average acceleration of 0.465g was used in the stability analysis and deformation screening performed for the waste mass (Repetto et al., 1993).

Hynes and Franklin (1984) performed several Newmark seismic deformation analyses on embankments using 387 strong motion records and 6 artificial accelerograms. The analyses performed considered the yield accelerations (minimum acceleration to cause failure) of the slope sections evaluated by pseudo-static methods and compared them to the anticipated horizontal embankment accelerations. Based on these analyses performed by Hynes and Franklin, deformations are anticipated to be one foot or less if the yield acceleration is less than or equal to one-half the horizontal acceleration of the waste mass. Therefore, using a horizontal acceleration of 0.232g to obtain a pseudo-static factor of safety of 1.0 or greater indicates satisfactory performance of the waste mass under seismic conditions (deformation less than 1 foot).

A summary of the static and seismic (pseudo-static and deformation) analyses is presented below. A graphic presentation of the static and dynamic analysis are provided in Appendix I.

Section	Static Factor of Safety	Pseudo-Static Factor of Safety	Yield Acceleration	Deformation (feet)
A (Excavation)	2.47	1.37	0.40g	<1
B (Final Cover)	2.99	1.57	0.48g	<1
C (Final Cover)	3.14	1.64	0.51g	<1

Typical allowable limits in stability analyses are; a minimum factor of safety of 1.5 during static conditions, a minimum factor of safety of 1.0 during pseudo-static (seismic) conditions, and a maximum allowable deformation of 1 foot. Based on the results of the analyses performed using the planned geometry of the landfill with 3H:1V excavation slopes in the bottom of the landfill and 4H:1V slopes in the final cover, the stability of the slopes are above the minimum standards.

### 3.1.2.5 *Unstable Areas*

The owner or operator of a landfill must consider several factors when determining whether an area is unstable. Among them are soil conditions, geologic or geomorphic features, and human-made features or events at the surface and in the subsurface.

Soil conditions at the proposed Little Mountain Landfill site are well suited for construction of a landfill. Little Mountain is an isolated mountain surrounded by the lowlands of Bear River Valley. Soils in this valley consist mainly of silt and clay deposited under ancient Lake Bonneville. These soils are soft and cohesive. Lesser amounts of sand and gravel occur in the flood plain of Bear River and in ancient beach deposits of Lake Bonneville. Drilling on the Salt Lake Desert valley floor has disclosed silt and clay deposits greater than 1,200 feet thick.

Lake Bonneville covered much of Box Elder County, including Little Mountain, during higher stands of the ancient lake. The huge lake left numerous terraces, gravel bars and sand spits along the margins of the hills and mountains, and on the flat surface of the Great Salt Lake Desert. Thick deposits of silt and clay occur on Little Mountain: a test boring at the Little Mountain Landfill site showed that Bonneville clay, silt, and lesser amounts of sand and gravel are present to a depth of at least 200 feet.

Coarser soils occur at the base of steep limestone bedrock slopes on Little Mountain. These sand and gravel soils consist mainly of fragments of weathered limestone and less common sandstone.

The coarse fragments have accumulated in talus slopes and alluvial fans along with a mixed matrix of silt and clay.

Bedrock is covered at the landfill site by approximately 200 feet of silt, clay and lesser quantities of sand and gravel deposited by ancient Lake Bonneville. Bedrock is exposed only in the hillsides surrounding the alpine pasture. Steeply sloping hillsides to the southeast and northwest are underlain by limestone of the Great Blue, Humbug and Lodgepole Formation. A northwest to southeast trending line north of the site consists of limestone and sandstone of the Oquirrh Formation. All bedrock units are hard and difficult to erode or excavate.

Bedrock formations in the mountains are very old. The rocks were faulted and folded during several intervals of active compression. Compression of the rocks was caused by collisions between the North American and Pacific tectonic plates along the Pacific coast. The area between eastern California and the Colorado Plateau was gradually pushed into a mountainous highland.

About four million years ago, compression ceased when relative motion of the Pacific tectonic plate along the west coast of North America was directed to the north along the San Andreas fault system. Release of the coastal compression allowed the mountains of western Utah and Nevada to expand from east to west. Portions of the mountains between the eastern Sierra Nevada Mountains of California and the Wasatch Mountains of Utah stayed at relatively high elevations, while other portions collapsed, forming the lowland basins.

Local and onsite geologic and geomorphic features are stable. A small subsidence area approximately 400 feet in diameter and 50 feet deep occurs about 5,000 feet southwest from the center of the Little Mountain Landfill. This feature is a very old solution structure in limestone that has subsequently been partially filled with fine-grained Bonneville soils. The feature is now stabilized by the Bonneville soils.

Further solution of the limestone by groundwater is not possible under present conditions. Groundwater levels have been proven deeper than 300 feet below the level of the proposed landfill by drilling, and are probably much greater.

- The proposed landfill site is about 700 feet above the level of the Bear River Valley.

- Fresh water springs do not occur along the base of the mountain, suggesting that little if any groundwater occurs in Little Mountain.

One test boring was drilled to a total depth of 300 feet BGL. The boring was plugged with bentonite clay to eliminate any potential for transmitting surface waters through the Bonneville soils to the underlying fractured limestone.

### **3.1.3 Surface Water**

DSHW has adopted Subtitle D location restrictions for floodplains and wetlands. The proposed Little Mountain Landfill site is not within a floodplain. However, one poorly developed drainage traversed the western boundary of Section 18. The drainage is intermittent, carrying only water from snowmelt or run-off from occasional thunderstorms. All potential run-on water from the drainage will be diverted around the landfill site by shallow ditches or low berms. The proposed Landfill development is not in a wetland.

No permanent impoundments of surface water (with the exception of the 2 evaporation ponds) or perennial streams are present within a one mile radius of the proposed Landfill expansion.

### **3.1.4 Groundwater Requirements**

DSHW location restrictions with respect to groundwater protection include the following:

- No new facility shall be located at a site where the bottom of the lowest liner is less than 5 feet above historical high level of groundwater in the uppermost aquifer.
- No new facility shall be located over a sole source aquifer as designated in 40 CFR 149.
- No new facility shall be located over groundwater classified as IB under Section R317-6-3.3 (an irreplaceable aquifer).
- A new facility located above any aquifer containing groundwater which has a total dissolved solids (TDSs) content below 1,000 milligrams per liter (mg/l) and does not exceed applicable groundwater quality standards for any contaminant is permitted only where the depth to groundwater is greater than 100 feet. For a TDS content between 1,000 and 3,000 mg/l, the separation must be 50 feet or greater. These separation distance requirements are waived if the landfill is constructed with a composite liner.

- No new facility shall be located in designated drinking water source protection areas or, if no such protection area is designated, within a distance to existing drinking water wells or springs for public water supplies of 250-day groundwater travel time

#### **3.1.4.1 Little Mountain Landfill Groundwater**

The lowest point of the bottom of the new landfill expansion (4860 feet above mean sea level) is at least 5 feet above any shallow perched groundwater (none observed at the site) and at least 300 feet above the highest potentially usable aquifer. Therefore, the proposed landfill expansion meets the requirements of the groundwater protection location restrictions.

Groundwater beneath the landfill area is of Class I quality, with a TDS of less than 500 mg/l. It is not a sole source or Class IB (irreplaceable aquifer). Usable drinking water wells are generally drilled to greater than 400-foot depths within a 1-mile radius of the site. A groundwater transport study was not conducted as part of this investigation.

With a TDS concentration less than 1,000 mg/L the minimum separation between the lowest elevation of the landfill and groundwater must be at least 100 feet. The test boring drilled at the site showed that the minimum depth to groundwater is greater than 300 feet BGL. Therefore, the minimum separation distances between the proposed landfill expansion and fresh groundwater, if present, would be exceeded.

No public water systems or impoundments are present at the proposed landfill development. The landfill development is not part of a watershed used for municipal drinking water, nor is it in a location that could cause contamination to a lake, reservoir or pond. A covered concrete reservoir tank holding approximately 200,000 gallons of water is present one mile south of the landfill site. The tank is owned and operated by West Corrine Water Company. Potential run-off from the landfill site could only travel to the northwest, away from the concrete tank.

### **3.2 CLOSURE PLAN - EXISTING AND PROPOSED LANDFILL EXPANSION**

Section 4 of Part II details the closure plans for the Little Mountain Landfill.

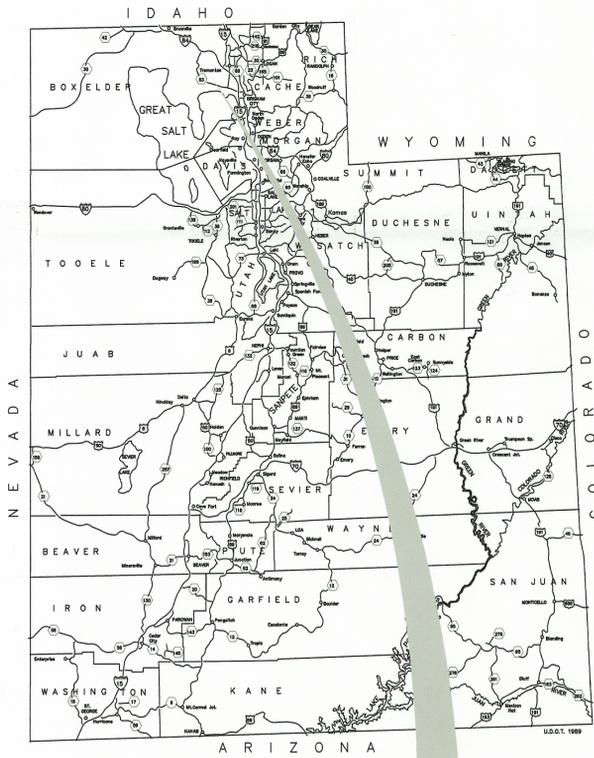
### **3.3 POST-CLOSURE PLAN - EXISTING AND PROPOSED LANDFILL EXPANSION**

Section 5 of Part II details the post-closure plan for the Little Mountain Landfill.

### **3.4 POST-CLOSURE LAND USE - EXISTING AND PROPOSED LANDFILL EXPANSION**

BECSW will design a post-closure land use plan to be implemented at the Little Mountain Landfill within 5 years prior to the end of the landfill's life. BECSW will select an end use for the landfill consistent with good landfilling practices. The final land use selected for the Little Mountain Landfill will be based upon maintaining a functional landfill cover. Land use activities will be approved by Box Elder County prior to implementation. Typical end uses range from recycling operations (which complement existing operations) to recreational activities. Since the closure of the site may be over 40 years away, it is not currently possible to develop those land use plans to be consistent with surrounding land uses and the needs of the county that may be relevant at that future time.

APPENDIX A



SITE LOCATION MAP



SITE VICINITY MAP - 1"=2000'

# *BOX ELDER COUNTY LANDFILL*

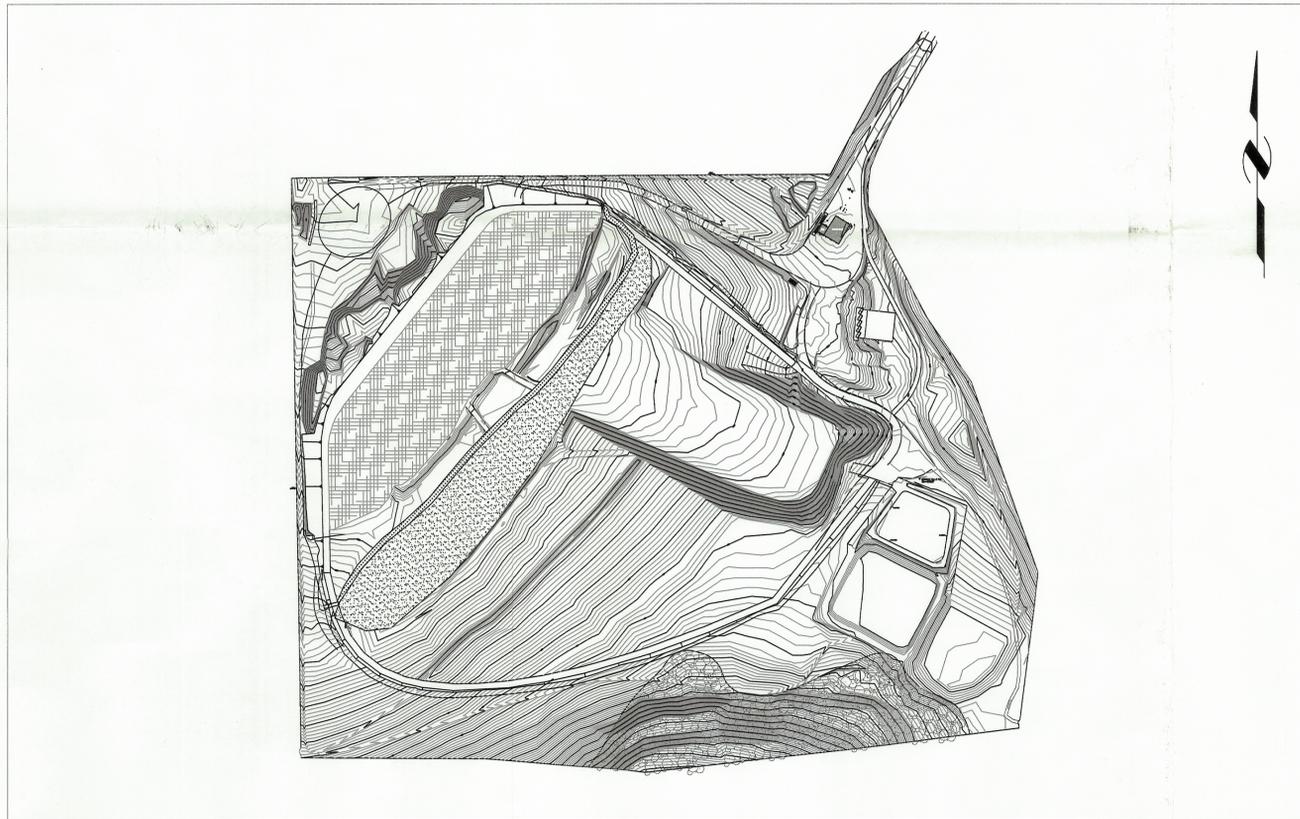
## *(LITTLE MOUNTAIN LANDFILL)*

# *BOX ELDER COUNTY, UTAH*

## *2007 PERMIT*

LIST OF DRAWINGS

- 1 *TITLE SHEET*
- 2 *GENERAL ARRANGEMENT*
- 3 *CELL DEVELOPMENT*
- 4 *FINAL COVER*
- 5 *SECTIONS AND DETAILS*
- 6 *DETAILS*



SITE MAP - 1"=300'



BOX ELDER COUNTY SOLID WASTE  
 9595 W. 6800 N.  
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 CAD DWG FILE: 00167/008/BaseNov2006.dwg  
 DRAWN BY: JAH  
 DESIGNED BY: BDM  
 CHECKED BY: GA  
 COPYRIGHT: IGES 2006

SHEET TITLE  
**BOX ELDER LANDFILL**  
**TITLE**  
**SHEET**

REFERENCE:  
 ADAPTED FROM MAP  
 PROVIDED BY CLIENT.



BOX ELDER COUNTY SOLID WASTE  
 9595 W. 8800 N.  
 BOX ELDER COUNTY, UT  
 (435)-744-2275  
 (435)-744-2290

CONSULTANTS



ideas for a changing world

4153 South Commerce Drive  
 Salt Lake City, Utah 84107  
 (801)270-9400 Fax: (801)270-9401

NOTES

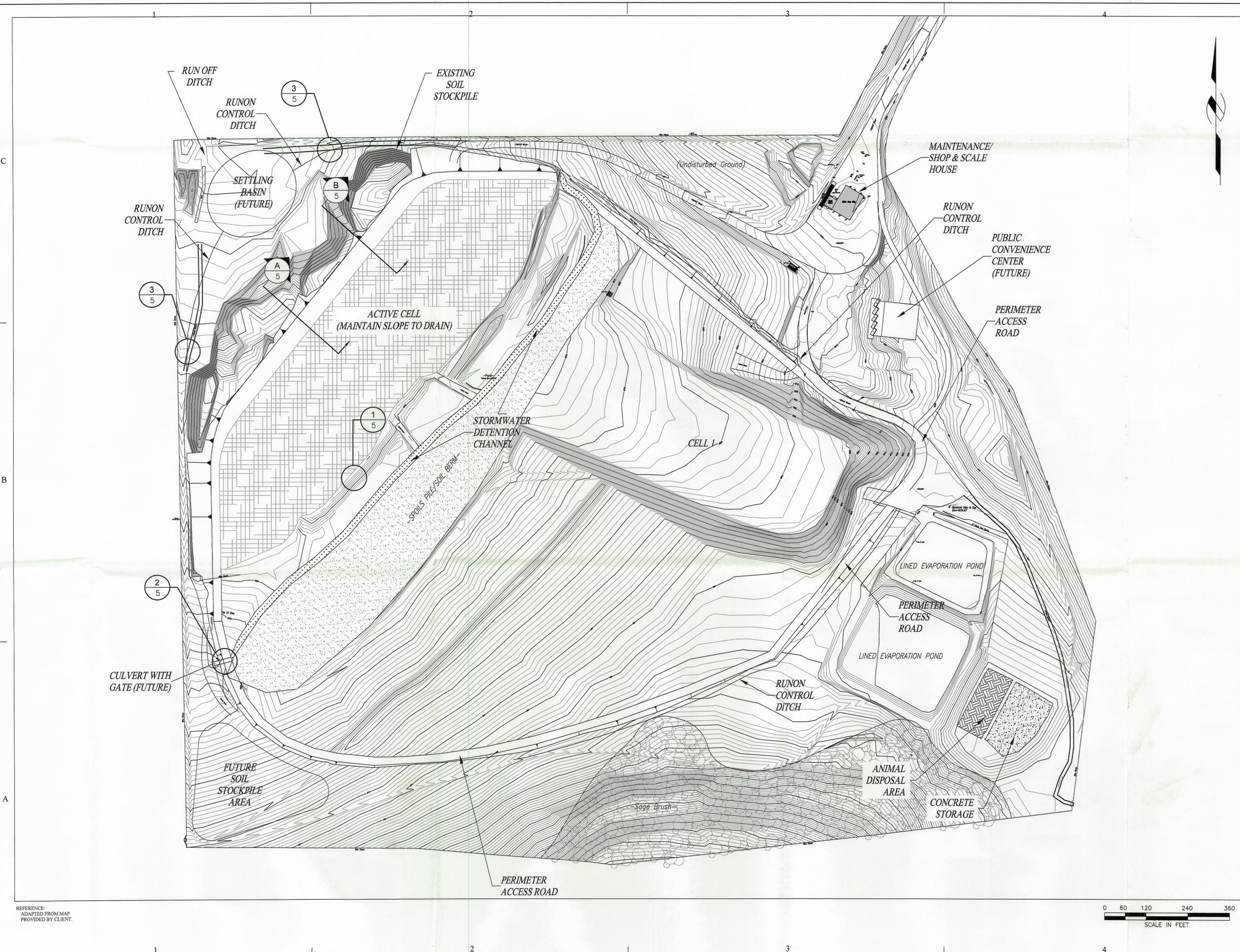
LANDFILLING TO CONTINUE IN CURRENT LOCATION UNTIL APPROXIMATELY 12/08.  
 SIZE AND LOCATION OF SOIL STOCKPILE AREAS TO BE DETERMINED AS EXCAVATION PROGRESSES.

FOR PERMIT PURPOSES ONLY  
 NOT FOR CONSTRUCTION

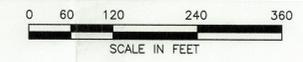
MARK	DATE	PERMIT DESCRIPTION
	12/22/06	PERMIT

ISSUE:  
 PROJECT NO.: 00167-008  
 CAD DWG FILE: 00167/008/BaseNov2006.dwg  
 DRAWN BY: JAH  
 DESIGNED BY: BDM  
 CHECKED BY: GA  
 COPYRIGHT: IGES 2006

SHEET TITLE  
 BOX ELDER LANDFILL  
 GENERAL  
 ARRANGEMENT



REFERENCE:  
 ADAPTED FROM MAP  
 PROVIDED BY CLIENT.





**BOX ELDER COUNTY SOLID WASTE**  
 9595 W. 6800 N.  
 TREMONTON, UT  
 (435)-744-2275  
 (435)-744-2290

CONSULTANTS



ideas for a changing world

4153 South Commerce Drive  
 Salt Lake City, Utah 84107  
 (801)270-9400 Fax: (801)270-9401

- 1 ELEVATION OF LANDFILL BOTTOM IS FOR SOIL CALCULATIONS AND ILLUSTRATIVE PURPOSES ONLY. FINAL EXCAVATION CONTOURS WILL BE MODIFIED TO PROVIDE THE REQUIRED COVER SOILS.
- 2 THE BOTTOM OF THE LANDFILL WILL DROP UNIFORMLY 3' (FEET) FROM THE CONTOURS INDICATED. ADDITIONAL 3' OF SOIL CUT OFFSET SOIL SHORTFALL.

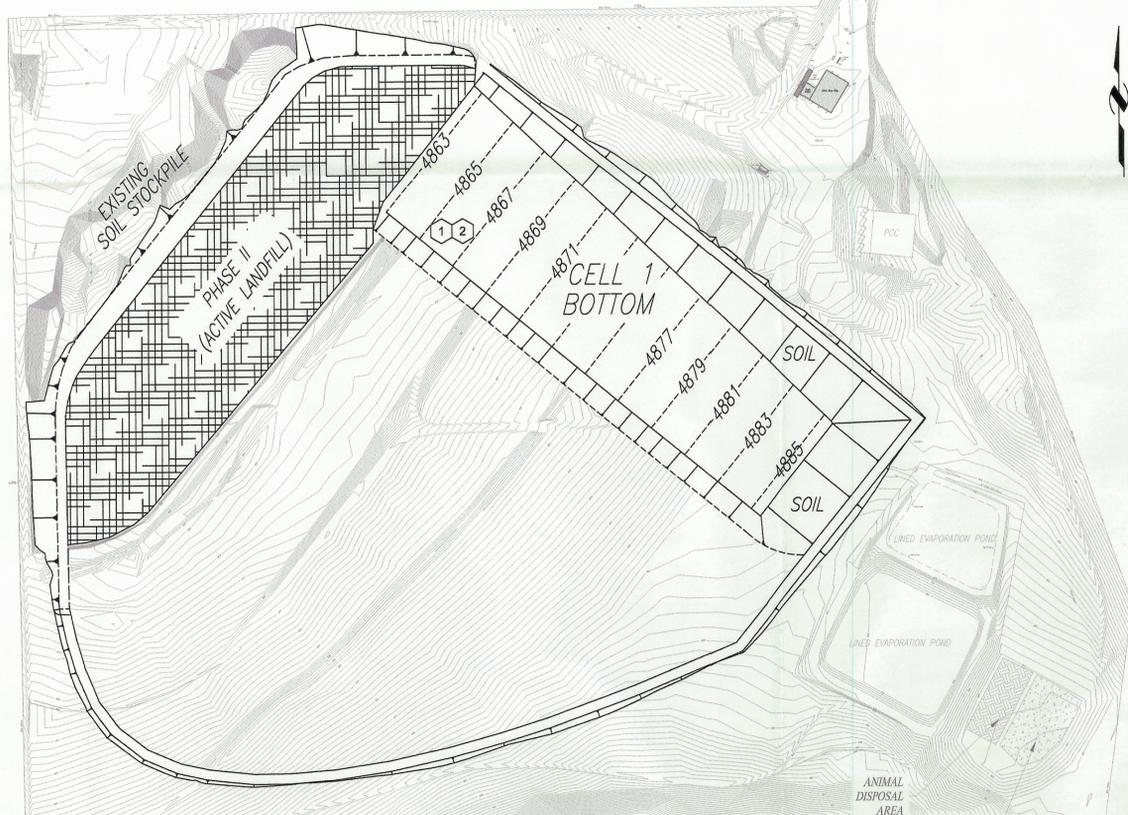
NEW SOIL STOCKPILE, CREATED DURING CELL 3 EXCAVATION. PROVIDES ADDITIONAL COVER SOILS ON PHASE II TEMPORARY COVER.

FOR PERMIT PURPOSES ONLY NOT FOR CONSTRUCTION

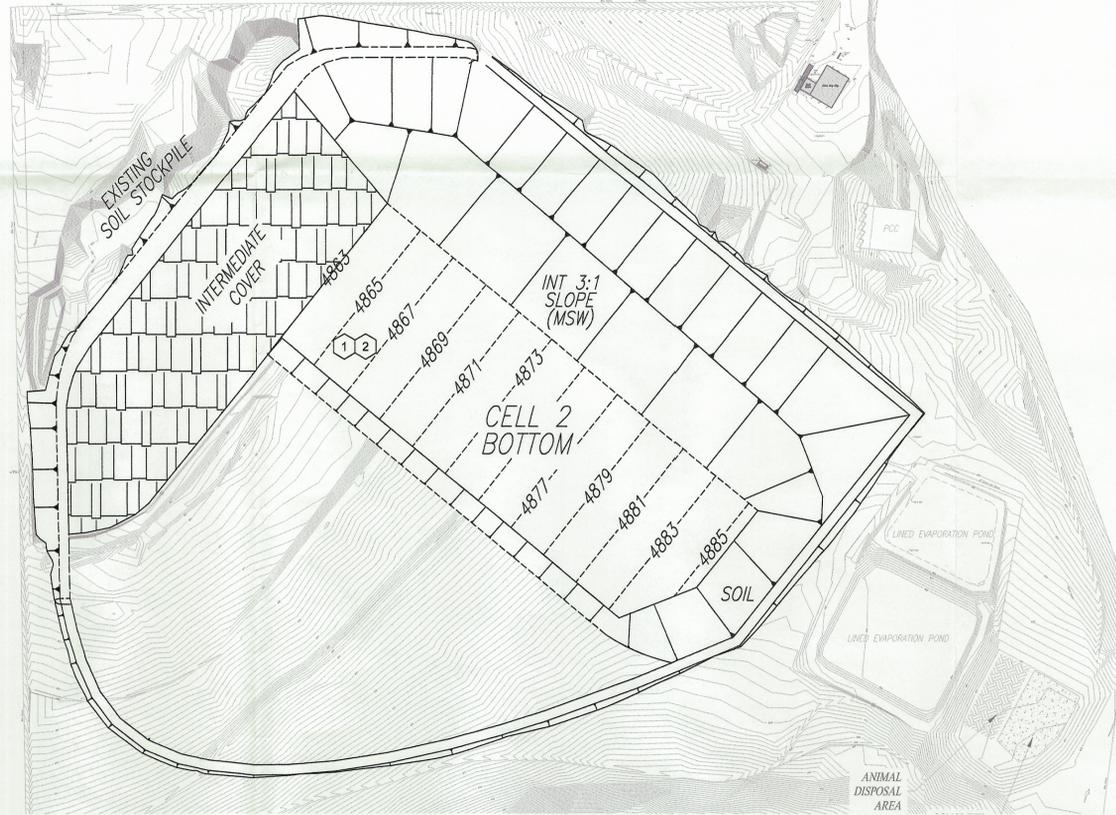
MARK	DATE	DESCRIPTION
	12/22/06	PERMIT

ISSUE:  
 PROJECT NO.: 00167-008  
 CAD DWG FILE: 00167/008/BaseNov2006.dwg  
 DRAWN BY: JAH  
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 COPYRIGHT: IGES 2006

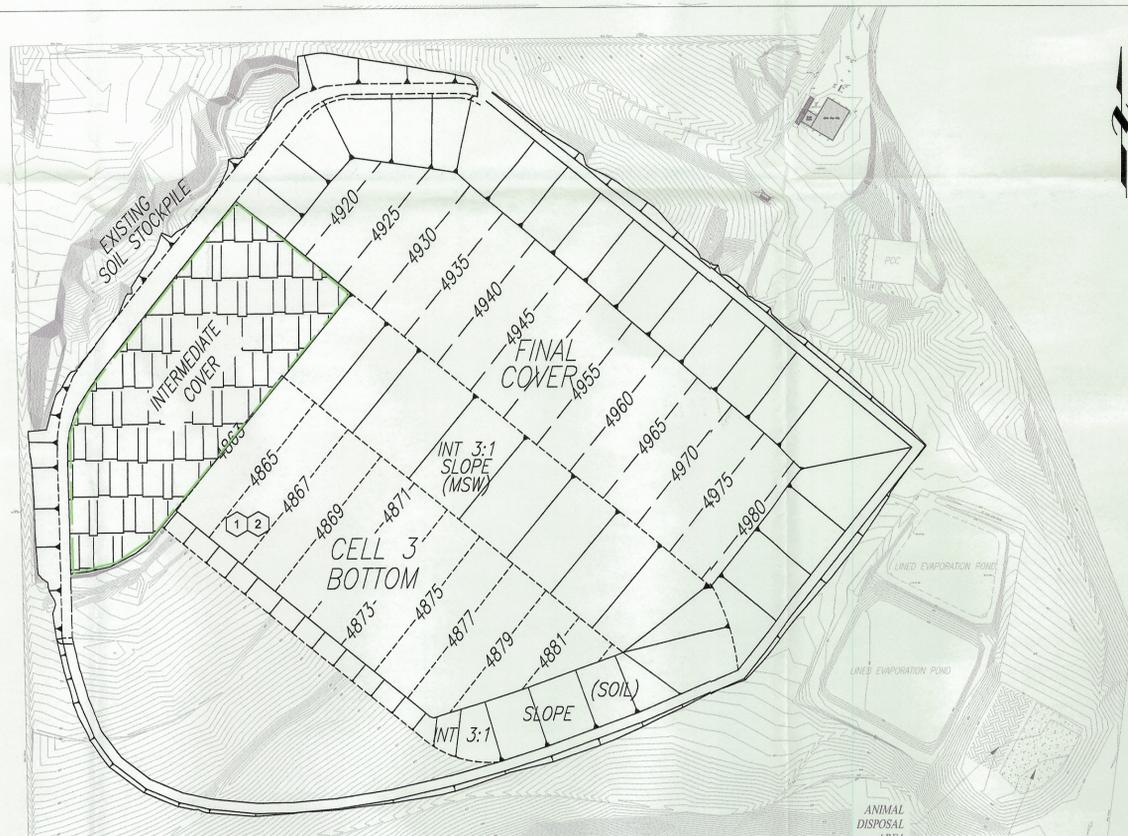
SHEET TITLE  
**BOX ELDER LANDFILL  
 CELL  
 DEVELOPMENT**



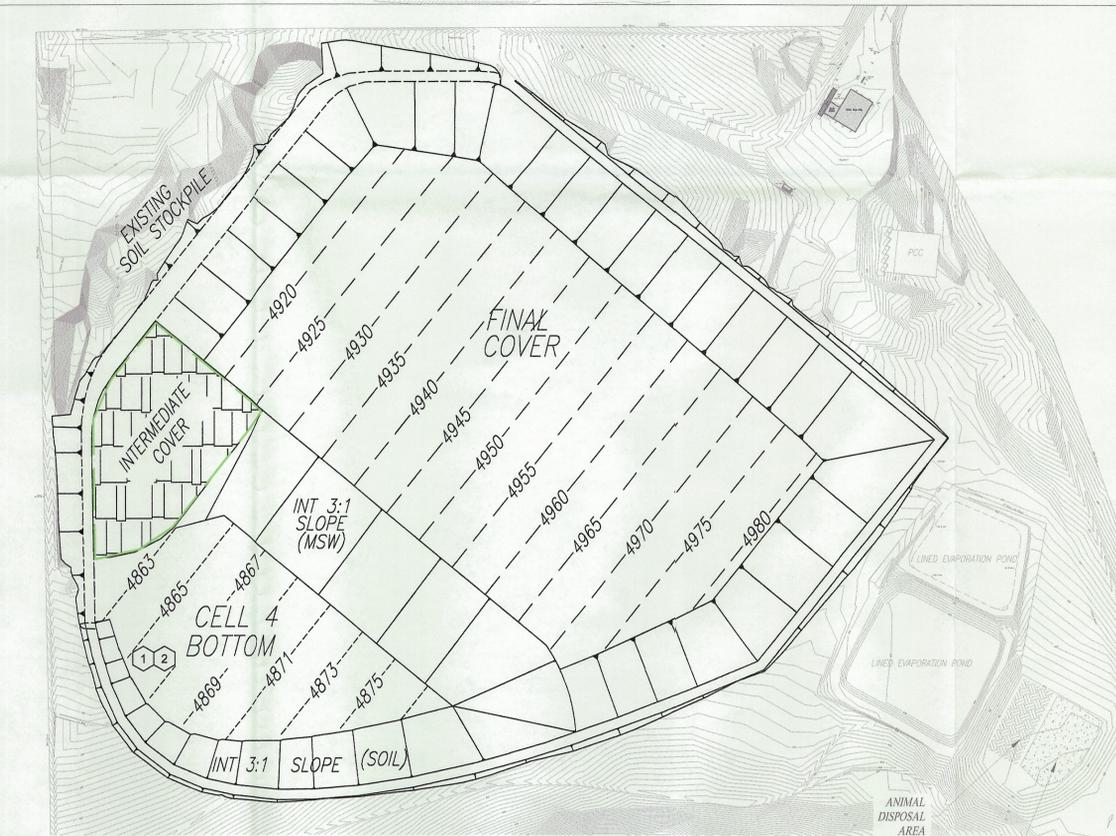
**CELL 1 DEVELOPMENT**



**CELL 2 DEVELOPMENT**

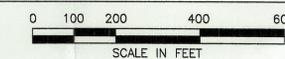


**CELL 3 DEVELOPMENT**



**CELL 4 DEVELOPMENT**

REFERENCE:  
 ADAPTED FROM MAP  
 PROVIDED BY CLIENT.





**BOX ELDER COUNTY SOLID WASTE**  
 9595 W. 6800 N.  
 TREMONTON, UT  
 (435)-744-2275  
 (435)-744-2290

CONSULTANTS



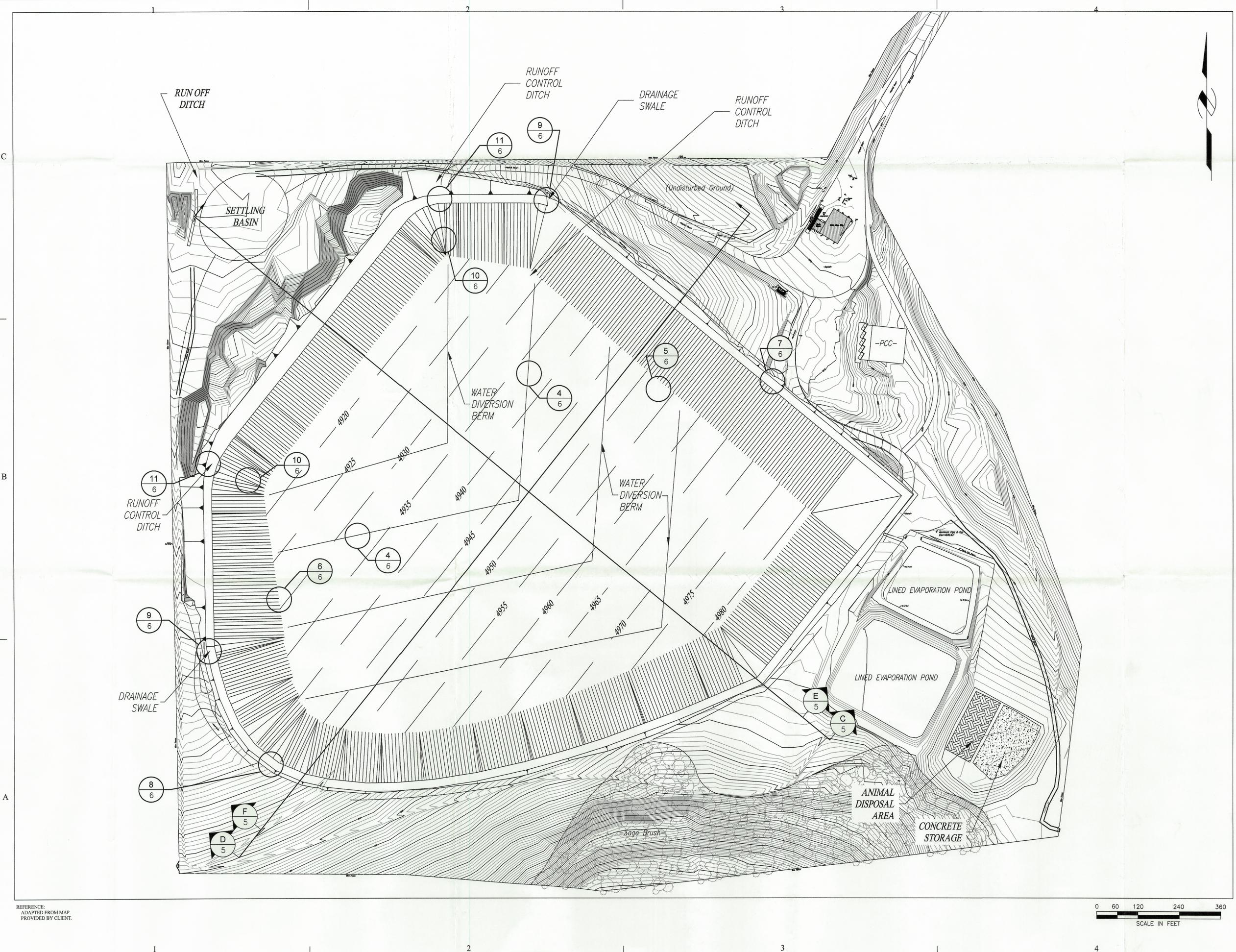
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 Salt Lake City, Utah 84107  
 (801)270-9400 Fax: (801)270-9401

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ISSUE:		
PROJECT NO.:	00167-008	
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DESIGNED BY:	BDM	
CHECKED BY:	GA	
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SHEET TITLE  
**BOX ELDER LANDFILL  
 FINAL  
 COVER**





**BOX ELDER COUNTY SOLID WASTE**  
 9595 W. 6800 N.  
 TREMONTON, UT  
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① THE BOTTOM OF THE LANDFILL WILL DROP UNIFORMLY 3' (FEET) FROM CONTOURS INDICATED.

FOR PERMIT  
 PURPOSES ONLY  
 NOT FOR  
 CONSTRUCTION

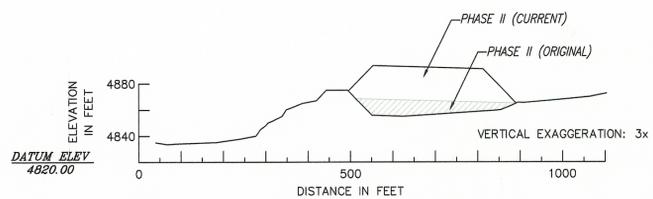

MARK	DATE	DESCRIPTION
	12/22/06	PERMIT

ISSUE:

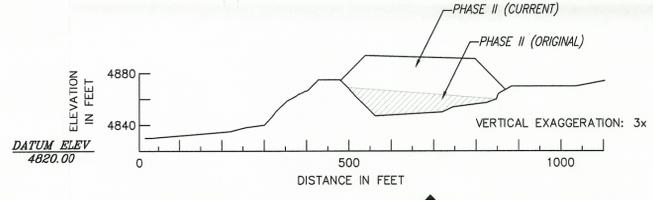
PROJECT NO.:	00167-008
CAD DWG FILE:	00167/008/DETAILS 5-6.dwg
DRAWN BY:	JAH
DESIGNED BY:	BDM
CHECKED BY:	GA
COPYRIGHT:	IGES 2006

SHEET TITLE

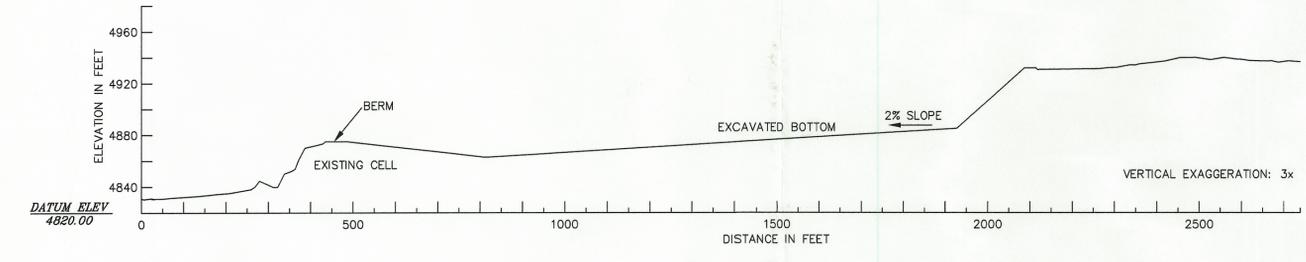
# BOX ELDER LANDFILL SECTIONS & DETAILS



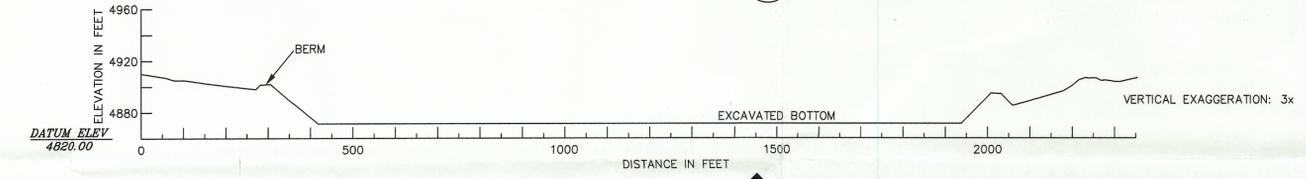
SECTION A  
 2



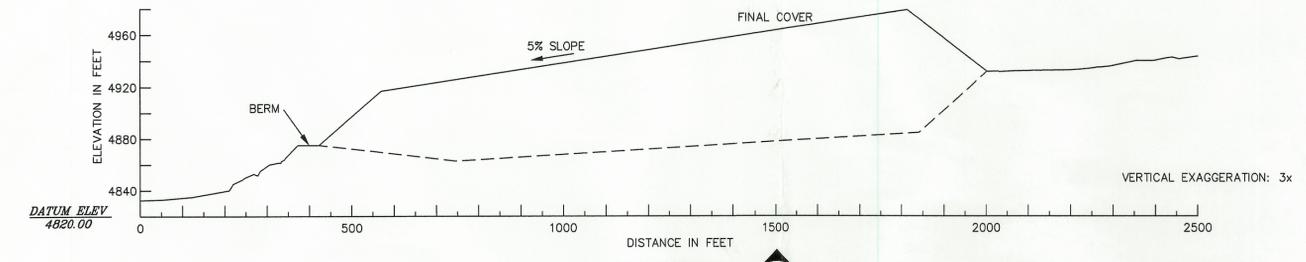
SECTION B  
 2



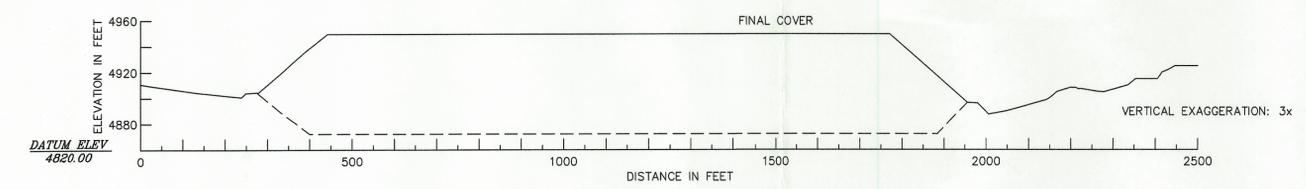
SECTION C  
 4



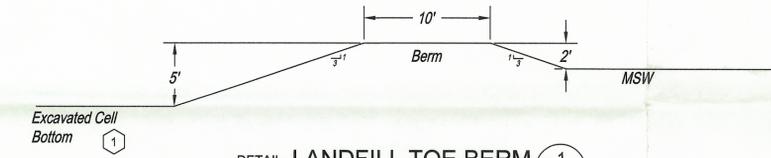
SECTION D  
 4



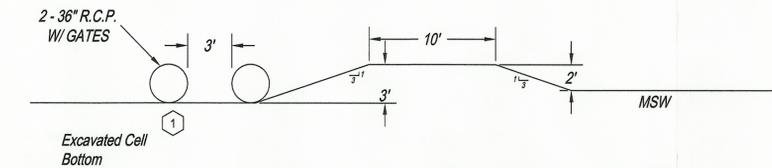
SECTION E  
 4



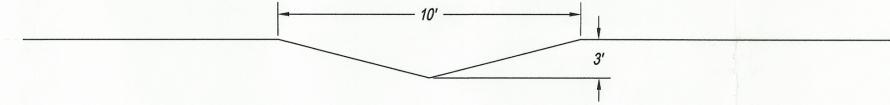
SECTION F  
 4



DETAIL LANDFILL TOE BERM  
 (NTS) 1/2



DETAIL RUN-ON CONTROL BERM  
 (NTS) 2/2



DETAIL RUN-ON CONTROL DITCH  
 (NTS) 2/2



**BOX ELDER COUNTY SOLID WASTE**  
 9595 W. 6800 N.  
 TREMONTON, UT  
 (435)-744-2275  
 (435)-744-2290

CONSULTANTS



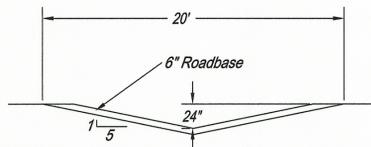
ideas for a changing world

4153 South Commerce Drive  
 Salt Lake City, Utah 84107  
 (801)270-9400 Fax: (801)270-9401

FOR PERMIT  
 PURPOSES ONLY  
 NOT FOR  
 CONSTRUCTION

Water Diversion Berm

DETAIL DIVERSION BERM (NTS) 4/4

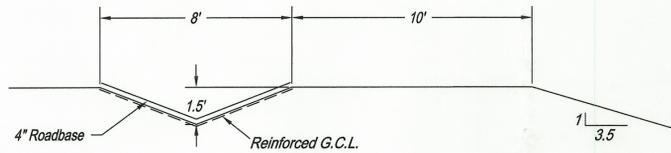


DETAIL DRAINAGE SWALE (NTS) 9/4

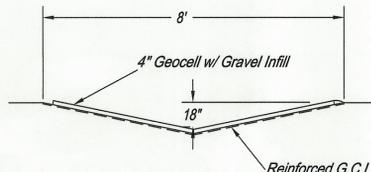
6" min. Cohesive silt and clay w/ sand from native stockpile.



DAILY COVER (NTS) 12/-



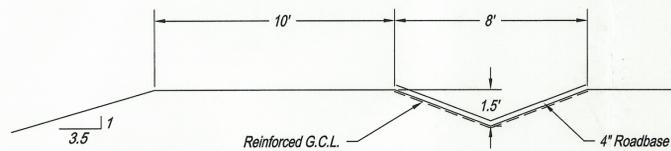
DETAIL DIVERSION DITCH (NTS) 5/4



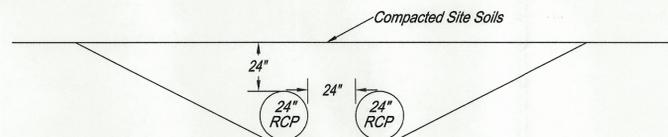
DETAIL DRAINAGE SWALE (NTS) 10/4



ALTERNATE DAILY COVER (NTS) 13/-



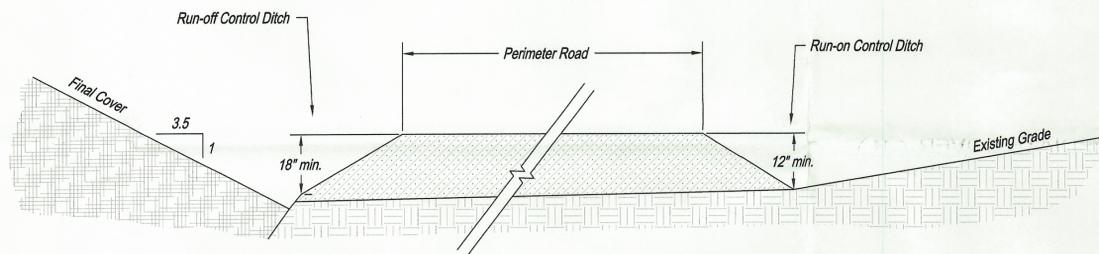
DETAIL DIVERSION DITCH (NTS) 6/4



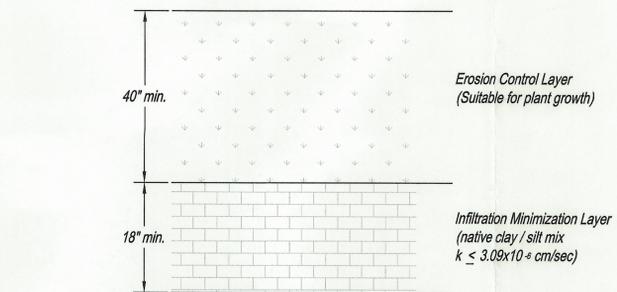
DETAIL CULVERT (NTS) 11/4



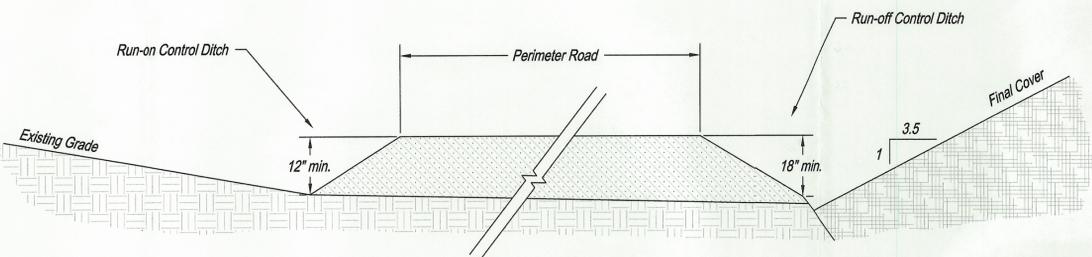
INTERMEDIATE COVER (NTS) 14/-



DETAIL TYPICAL PERIMETER ROAD SECTION (NTS) 7/4



FINAL COVER (NTS) 15/-



DETAIL TYPICAL PERIMETER ROAD SECTION (NTS) 8/4

MARK	DATE	DESCRIPTION
	12/22/06	PERMIT
ISSUE:		
PROJECT NO.: 00167-008		
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SHEET TITLE  
**BOX ELDER LANDFILL**

**DETAILS**

**APPENDIX B**

EXHIBIT A

PARCEL 1: (04-003-0010)

Beginning at a point 525.7 Feet North of the Southwest Corner of Section 18, Township 10 North, Range 3 West, SLM, thence running North 2021.4 feet, thence South 09 degrees 30' East 2037.6 feet, thence South 7 degrees 35' West 92.4 feet; thence South 27 degrees 27' East 472.9 feet; thence South 33 degrees 00' East 272.8 feet; thence South 17 degrees 56' East 704.5 feet; thence South 9 degrees 02' West 547.2 feet; thence South 84 degrees 37' West 1307 feet; thence North 84 degrees 36' West 563 feet, thence North 88 degrees 38' West 663 feet to beginning. Together with a right of way through Section 12, Township 10 North, Range 4 West, SLM, and Sections 7 and 18, Township 10 North, Range 3 West, SLM, referred to in Book R, of Misc., at Page 163, records of Box Elder County, Utah.

PARCEL 2: (04-091-0003)

Southeast Quarter of Section 1, Township 10 North, Range 4 West, SLM. Less a 2 Rod strip on the North for road.

All of Grantors right, title and interest in and to all existing easements and rights-of-way, of every type and nature, wherever situate, currently used for the purpose of ingress and egress to the above-described property, including but not limited to any right, title or interest which Grantors may have in or to the following:

Easement dated November 13, 1931, and recorded January 29, 1932 as Entry No. 29619F in BOOK R of Misc., at Page 163 records of BOX ELDER County, Utah, from PORTLAND CATTLE LOAN COMPANY, INC., a Corp., to S. M. JASPER for a right of way upon and over the following: A right of way two rods wide and bordered on the East by the East line of Section 7, Township 10 North, Range 3 West, SLM, and on the West by a line parallel to two Rods West of said East line of said Section 7, and said right of way shall extend upon and across the East side of Section 7. ALSO a right of way to a certain tract of land located in Section 18, Township 10 North, Range 3 West, SLM, which tract of land is enclosed by a barbed wire fence and contains 112.04 acres, more or less. This right of way shall transverse and extend over portions of Section 12, 7, and 18 located in Township 10 North, Range 3 West, SLM. (Parcel 1)

Together with all water rights appurtenant thereto and all mineral, water, gas, and oil rights owned by Grantors, and together with each and every other type of real property interest owned by Grantors related to or connected with the above-described parcels, including but not limited to all water rights, equipment, pumps, casings, and other items associated with all wells on the property and the following well permits: Permit #29-1802

Recorded at Request of \_\_\_\_\_

at \_\_\_\_\_ M. Fee Paid \$ \_\_\_\_\_

by \_\_\_\_\_ Dep. Book \_\_\_\_\_ Page \_\_\_\_\_ Ref: \_\_\_\_\_

Mail tax notice to \_\_\_\_\_ Address \_\_\_\_\_

H-49257

### WARRANTY DEED

STUART A. CORNWALL and CHARLENE L. CORNWALL, TRUSTEES OF THE STUART A. CORNWALL and CHARLENE L. CORNWALL JOINT INTER VIVOS TRUST of Box Elder County, CONVEY and WARRANT to

grantors, State of Utah, hereby

THE MUNICIPAL BUILDING AUTHORITY OF BOX ELDER COUNTY, UTAH, a body politic of the State of Utah,

grantee, for the sum of TEN DOLLARS,

and other good and valuable consideration the following described tract of land in State of Utah:

Box Elder County,

As described on Exhibit "A" attached.

085081 Bk 0618 Pg 0571  
Lofan Adams, Box Elder County Recorder  
03/12/1996 2:34pm FEE: .00 Dep:MM  
Rec'd From HILLMAN REST & INS AGENCY INC

WITNESS, the hand of said grantor, this

*March*

, A.D. 1996.

*12th*

day of

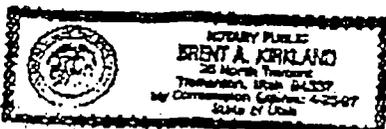
Signed in the Presence of

*Stuart A. Cornwall*  
STUART A. CORNWALL  
*Charlene L. Cornwall*  
CHARLENE L. CORNWALL

STATE OF UTAH,

County of Box Elder

On the *12* day of *March*, A.D. 1996, personally appeared before me STUART A. CORNWALL and CHARLENE L. CORNWALL, as Trustees of the Stuart A. Cornwall and Charlene L. Cornwall Joint Inter Vivos Trust, the signers of the within instrument, who duly acknowledged to me that they executed the same.



*Brent A. Kirkland*  
Notary Public.

My commission expires *4-25-97* Residing in *Tremonton, UT*





# Daily Checklist

Serial #: \_\_\_\_\_

Date: \_\_\_\_\_

Equip/Vehicle#: \_\_\_\_\_

	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Comments:
	OK	OK	OK	OK	OK	OK	
Engine oil level							
Transmission oil level							
Coolant level							
Hydraulic oil level							
Final drive oil							
Leaks (oil, air, water, fuel)							
Clean windows, mirrors, lights							
Backup alarm & alarm sensor							
Brakes (foot, park, hand)							
Windshield wipers							
Heater & defroster							
Cab condition							
All grease fittings lubricated							
Cutting edges							
Rollers & Idlers on track							
Cleaned air filter							
Other repairs needed:							

2

# BOX ELDER COUNTY LANDFILL OPERATOR INSPECTION FORM

INSPECTED BY: \_\_\_\_\_

LANDFILL SITE: \_\_\_\_\_ DATE: \_\_\_\_\_

GENERAL CONDITIONS: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**SPECIFIC CONDITIONS:**

CLOSED COVERED AREA: \_\_\_\_\_

WORKING FACE: \_\_\_\_\_

RUN ON/OFF: \_\_\_\_\_

FENCES: \_\_\_\_\_

FUEL AND SUPPLIES: \_\_\_\_\_

IMMEDIATE ACTION ITEMS: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_  
INSPECTOR'S SIGNATURE

# BOX ELDER COUNTY LANDFILL SUPERVISOR INSPECTION FORM

INSPECTED BY: \_\_\_\_\_

LANDFILL SITE: \_\_\_\_\_ DATE: \_\_\_\_\_

PERSONNEL ON SHIFT: \_\_\_\_\_

GENERAL REPORT: \_\_\_\_\_

## SPECIFIC CONDITIONS:

CLOSED COVER MATERIAL: \_\_\_\_\_

DAILY COVER: \_\_\_\_\_

RUN ON CONDITIONS: \_\_\_\_\_

RUN OFF CONDITIONS: \_\_\_\_\_

FENCES: \_\_\_\_\_

OFFICE: \_\_\_\_\_

EQUIPMENT CHECK: \_\_\_\_\_

CORRECTIVE ACTION NEEDED: \_\_\_\_\_

\_\_\_\_\_  
SUPERVISOR'S SIGNATURE

# Box Elder County Solid Waste Landfill Gas Log

Landfill Site: \_\_\_\_\_

Date of Inspection: \_\_\_\_\_ Time: \_\_\_\_\_

Test Location:	LEL Reading:	Remarks:
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Weather Conditions: \_\_\_\_\_

\_\_\_\_\_  
(Inspector)

\_\_\_\_\_  
(Verified by:)

Comments:

**BOX ELDER COUNTY SOLID WASTE  
RANDOM LOAD INSPECTION FROM  
LITTLE MOUNTAIN SITE**

Date of Inspection: \_\_\_\_\_

Owner of Load: \_\_\_\_\_

Address of Owner: \_\_\_\_\_

**Types of Materials in Load**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Approximate Quantity of Load: \_\_\_\_\_ Tons or

\_\_\_\_\_ Cu. / Yd. or

\_\_\_\_\_ Size

\_\_\_\_\_  
Signature of Owner / Carrier

\_\_\_\_\_  
Signature of Inspector

APPENDIX D

Channel Calculator  
North

Given Input Data:

Shape .....	Advanced
Solving for .....	Flowrate
Slope .....	0.0520 ft/ft
Manning's n .....	0.0200
Depth .....	1.1000 ft
Height .....	8.0000 ft
Bottom width .....	0.0000 ft
Left radius .....	0.0000 ft
Right radius .....	0.0000 ft
Left slope .....	1.0000 ft/ft (V/H)
Right slope .....	0.4500 ft/ft (V/H)

Computed Results:

Flowrate .....	19.6876 cfs
Velocity .....	10.0991 fps
Full Flowrate .....	3908.8766 cfs
Flow area .....	1.9494 ft <sup>2</sup>
Flow perimeter .....	4.2362 ft
Hydraulic radius .....	0.4602 ft
Top width .....	3.5444 ft
Area .....	103.1111 ft <sup>2</sup>
Perimeter .....	30.8086 ft
Percent full .....	13.7500 %

critical Information

Critical depth .....	1.5615 ft
Critical slope .....	0.0080 ft/ft
Critical velocity .....	5.0119 fps
Critical area .....	3.9282 ft <sup>2</sup>
Critical perimeter .....	6.0133 ft
Critical hydraulic radius .....	0.6532 ft
Critical top width .....	5.0314 ft
Specific energy .....	2.6850 ft
Minimum energy .....	2.3422 ft
Froude number .....	2.4008
Flow condition .....	Supercritical

Graphical Peak Discharge method

Given Input Data:

Description .....	North Area run-on
Rainfall distribution .....	Type II
Frequency .....	25 years
Rainfall, P (24-hours) .....	2.3800 in
Drainage area .....	44.3811 ac
Runoff curve number, CN .....	74
Time of concentration, Tc .....	21.4478 min
Pond and Swamp Areas .....	0.0000 % of Area

Computed Results:

Initial abstraction, Ia .....	0.7027 in
Ia/P .....	0.2953
Unit peak discharge, qu .....	527.3983 csm/in
Runoff, Q .....	0.5420 in
Pond and swamp adjustment, Fp ...	1.0000
Peak discharge, qp .....	19.8217 cfs

Channel Calculator  
East

Given Input Data:

Shape .....	Advanced
Solving for .....	Flowrate
Slope .....	0.0190 ft/ft
Manning's n .....	0.0200
Depth .....	1.2100 ft
Height .....	8.0000 ft
Bottom width .....	0.0000 ft
Left radius .....	0.0000 ft
Right radius .....	0.0000 ft
Left slope .....	1.0000 ft/ft (V/H)
Right slope .....	0.4500 ft/ft (V/H)

Computed Results:

Flowrate .....	15.3443 cfs
Velocity .....	6.5051 fps
Full Flowrate .....	2362.8007 cfs
Flow area .....	2.3588 ft2
Flow perimeter .....	4.6598 ft
Hydraulic radius .....	0.5062 ft
Top width .....	3.8989 ft
Area .....	103.1111 ft2
Perimeter .....	30.8086 ft
Percent full .....	15.1250 %

Critical Information

Critical depth .....	1.4133 ft
Critical slope .....	0.0083 ft/ft
Critical velocity .....	4.7682 fps
Critical area .....	3.2181 ft2
Critical perimeter .....	5.4427 ft
Critical hydraulic radius .....	0.5913 ft
Critical top width .....	4.5540 ft
Specific energy .....	1.8676 ft
Minimum energy .....	2.1199 ft
Froude number .....	1.4744
Flow condition .....	Supercritical

Graphical Peak Discharge method

Given Input Data:

Description .....	East Area run-on
Rainfall distribution .....	Type II
Frequency .....	25 years
Rainfall, P (24-hours) .....	2.3800 in
Drainage area .....	37.0498 ac
Runoff curve number, CN .....	74
Time of concentration, Tc .....	25.0211 min
Pond and Swamp Areas .....	0.0000 % of Area

Computed Results:

Initial abstraction, Ia .....	0.7027 in
Ia/P .....	0.2953
Unit peak discharge, qu .....	486.4193 csm/in
Runoff, Q .....	0.5420 in
Pond and swamp adjustment, Fp ...	1.0000
Peak discharge, qp .....	15.2617 cfs

Channel Calculator  
South

Given Input Data:

Shape .....	Advanced
Solving for .....	Flowrate
Slope .....	0.0190 ft/ft
Manning's n .....	0.0200
Depth .....	1.4000 ft
Height .....	8.0000 ft
Bottom width .....	0.0000 ft
Left radius .....	0.0000 ft
Right radius .....	0.0000 ft
Left slope .....	1.0000 ft/ft (V/H)
Right slope .....	0.4500 ft/ft (V/H)

Computed Results:

Flowrate .....	22.6392 cfs
Velocity .....	7.1694 fps
Full Flowrate .....	2362.8007 cfs
Flow area .....	3.1578 ft <sup>2</sup>
Flow perimeter .....	5.3915 ft
Hydraulic radius .....	0.5857 ft
Top width .....	4.5111 ft
Area .....	103.1111 ft <sup>2</sup>
Perimeter .....	30.8086 ft
Percent full .....	17.5000 %

Critical Information

Critical depth .....	1.6512 ft
Critical slope .....	0.0079 ft/ft
Critical velocity .....	5.1539 fps
Critical area .....	4.3926 ft <sup>2</sup>
Critical perimeter .....	6.3589 ft
Critical hydraulic radius .....	0.6908 ft
Critical top width .....	5.3205 ft
Specific energy .....	2.1988 ft
Minimum energy .....	2.4768 ft
Froude number .....	1.5107
Flow condition .....	Supercritical

tmp#12.txt

Graphical Peak Discharge method

Given Input Data:

Description .....	South Area run-on
Rainfall distribution .....	Type II
Frequency .....	25 years
Rainfall, P (24-hours) .....	2.3800 in
Drainage area .....	43.2554 ac
Runoff curve number, CN .....	74
Time of concentration, Tc .....	16.5453 min
Pond and Swamp Areas .....	0.0000 % of Area

Computed Results:

Initial abstraction, Ia .....	0.7027 in
Ia/P .....	0.2953
Unit peak discharge, qu .....	601.0539 csm/in
Runoff, Q .....	0.5420 in
Pond and swamp adjustment, Fp ...	1.0000
Peak discharge, qp .....	22.0170 cfs



# POINT PRECIPITATION FREQUENCY ESTIMATES FROM NOAA ATLAS 14



Utah 41.6 N 112.2314 W 4914 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: Tue Nov 28 2006

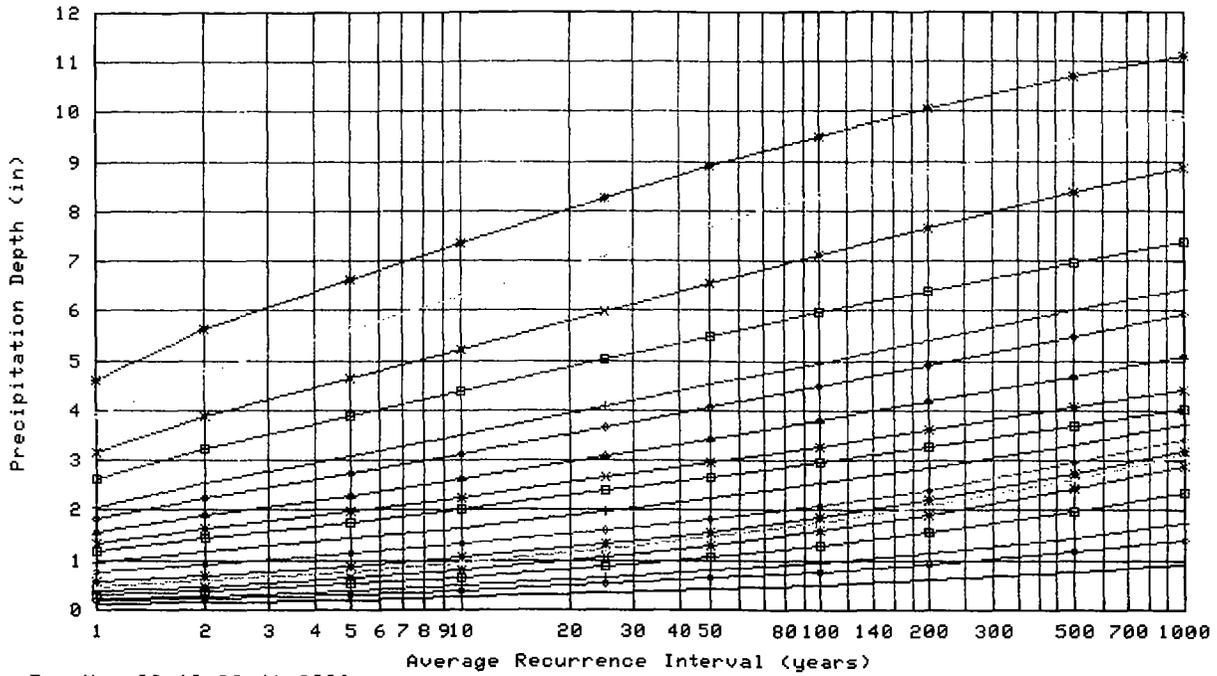
[Confidence Limits](#) | [Seasonality](#) | [Location Maps](#) | [Other Info](#) | [GIS data](#) | [Maps](#) | [Help](#) | [Docs](#) | [U.S. Ma](#)

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	0.12	0.18	0.22	0.30	0.37	0.47	0.56	0.74	0.95	1.17	1.33	1.55	1.84	2.06	2.63	3.16	3.89	4.60	
2	0.15	0.23	0.28	0.38	0.47	0.59	0.69	0.92	1.17	1.44	1.63	1.91	2.26	2.54	3.24	3.88	4.77	5.64	
5	0.21	0.32	0.39	0.53	0.65	0.78	0.88	1.13	1.43	1.75	1.97	2.30	2.73	3.07	3.88	4.63	5.64	6.61	
10	0.26	0.39	0.49	0.66	0.81	0.95	1.05	1.32	1.66	2.02	2.26	2.62	3.12	3.50	4.38	5.22	6.30	7.34	
25	0.34	0.52	0.64	0.86	1.07	1.22	1.32	1.61	1.99	2.38	2.65	3.08	3.65	4.08	5.02	5.99	7.13	8.26	
50	0.42	0.63	0.78	1.06	1.31	1.47	1.57	1.84	2.25	2.67	2.96	3.43	4.06	4.52	5.50	6.56	7.73	8.90	
100	0.50	0.77	0.95	1.28	1.59	1.76	1.85	2.11	2.54	2.97	3.29	3.80	4.48	4.97	5.96	7.13	8.29	9.50	
200	0.61	0.93	1.15	1.54	1.91	2.10	2.19	2.42	2.84	3.28	3.62	4.18	4.91	5.42	6.41	7.67	8.81	10.05	
500	0.77	1.18	1.46	1.97	2.43	2.65	2.73	2.96	3.33	3.71	4.08	4.70	5.49	6.01	6.98	8.37	9.44	10.70	
1000	0.92	1.41	1.74	2.35	2.91	3.14	3.22	3.45	3.72	4.04	4.43	5.10	5.93	6.45	7.39	8.89	9.86	11.13	

[text version of table](#)

\* These precipitation frequency estimates are based on a partial duration series. **ARI** is the Average Recurrence Interval. Please refer to the documentation for more information. NOTE: Formatting forces estimates near zero to appear as zero.

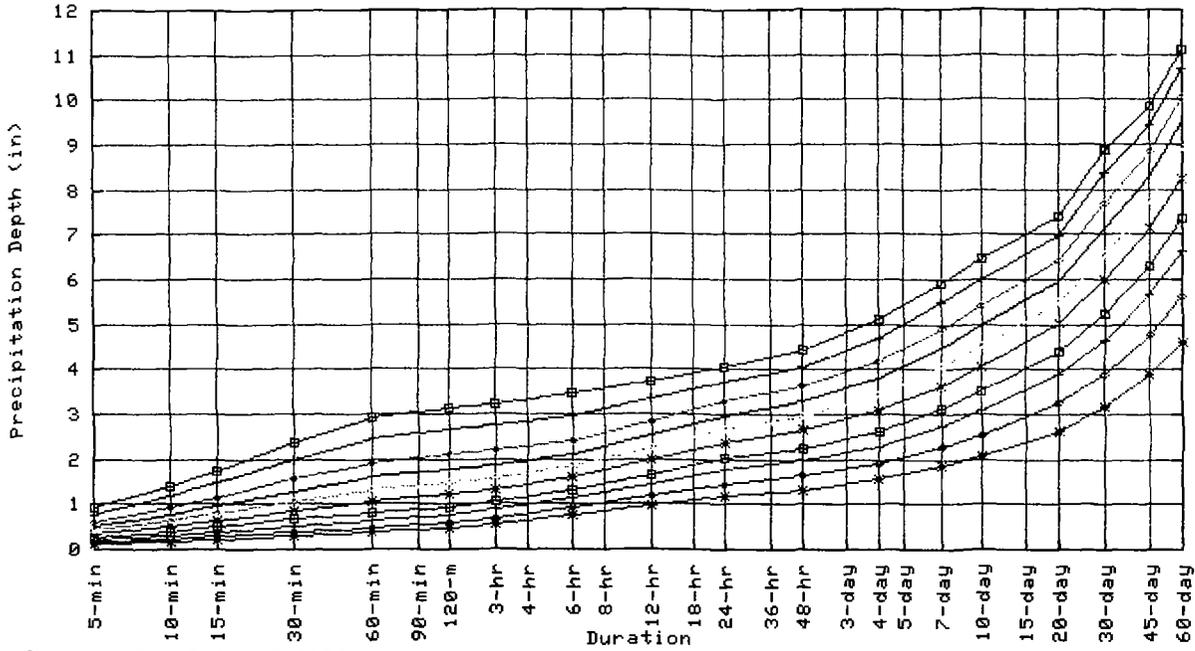
Partial duration based Point Precipitation Frequency Estimates Version: 4  
 41.6 N 112.2314 W 4914 ft



Tue Nov 28 18:28:41 2006

Duration			
5-min	—	10-min	—
10-min	+	3-hr	*
15-min	+	6-hr	+
30-min	+	12-hr	+
60-min	*	24-hr	+
		48-hr	*
		30-day	*
		4-day	+
		7-day	+
		10-day	+
		20-day	+
		60-day	*

Partial duration based Point Precipitation Frequency Estimates Version: 4  
41.6 N 112.2314 W 4914 ft



Tue Nov 28 18:28:40 2006

Average Recurrence Interval (years)	
1	*
2	+
5	+
10	+
25	*
50	+
100	+
200	+
500	+
1000	+

**Confidence Limits -**

**\* 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	0.21	0.26	0.34	0.43	0.54	0.63	0.82	1.04	1.28	1.46	1.70	2.03	2.26	2.86	3.43	4.20	4.96
2	0.17	0.27	0.33	0.44	0.55	0.67	0.78	1.01	1.28	1.58	1.79	2.09	2.50	2.79	3.52	4.21	5.16	6.08
5	0.24	0.36	0.45	0.61	0.75	0.88	0.99	1.25	1.57	1.92	2.16	2.51	3.01	3.36	4.21	5.01	6.07	7.11
10	0.30	0.45	0.56	0.76	0.94	1.07	1.18	1.47	1.82	2.21	2.47	2.87	3.43	3.83	4.75	5.65	6.78	7.89
25	0.40	0.60	0.74	1.00	1.24	1.39	1.50	1.79	2.19	2.61	2.90	3.36	4.01	4.46	5.45	6.47	7.67	8.87
50	0.48	0.74	0.92	1.23	1.53	1.69	1.78	2.07	2.50	2.92	3.24	3.75	4.46	4.94	5.96	7.09	8.30	9.56
100	0.59	0.90	1.12	1.51	1.87	2.04	2.14	2.39	2.85	3.26	3.60	4.16	4.92	5.43	6.47	7.71	8.91	10.20
200	0.73	1.11	1.37	1.85	2.29	2.48	2.57	2.78	3.23	3.60	3.97	4.58	5.40	5.93	6.97	8.31	9.47	10.80
500	0.95	1.44	1.79	2.41	2.98	3.20	3.29	3.47	3.85	4.08	4.48	5.15	6.05	6.59	7.61	9.09	10.16	11.53
1000	1.16	1.76	2.18	2.94	3.64	3.88	3.95	4.12	4.38	4.47	4.89	5.62	6.55	7.10	8.07	9.68	10.63	12.01

\* 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 the documentation for more information. NOTE: Formatting prevents estimates near zero to appear as zero.

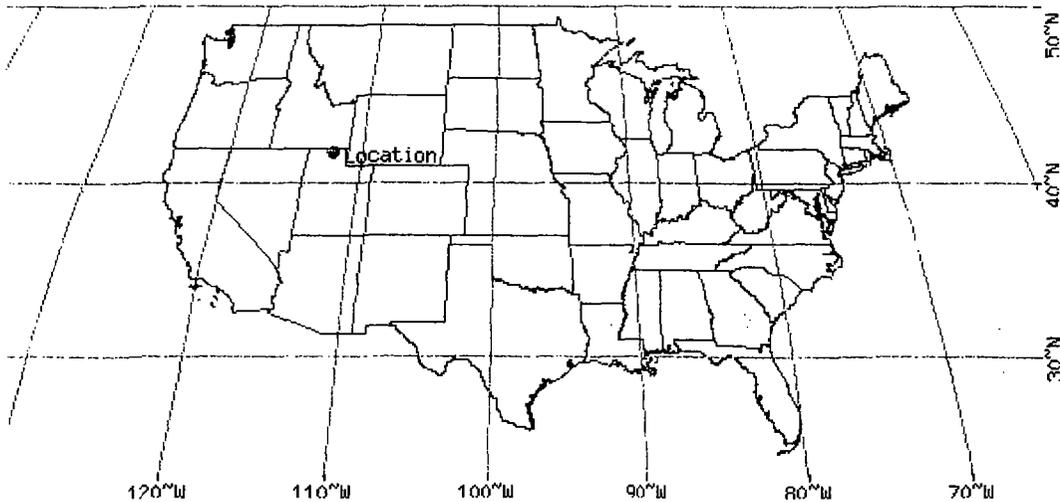
**\* Lower bound of the 90% confidence interval  
Precipitation Frequency Estimates (inches)**

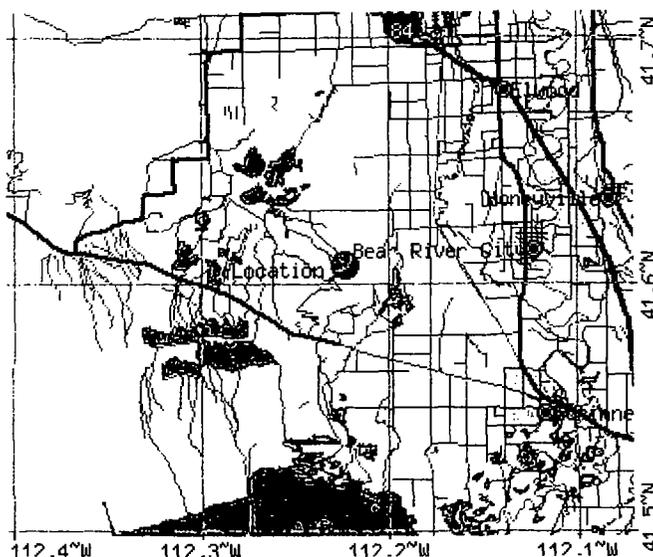
ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.10	0.16	0.19	0.26	0.32	0.42	0.50	0.68	0.87	1.07	1.22	1.42	1.68	1.88	2.42	2.91	3.60	4.27
2	0.13	0.20	0.25	0.34	0.42	0.53	0.63	0.84	1.08	1.32	1.50	1.75	2.07	2.32	2.98	3.58	4.42	5.23
5	0.18	0.27	0.34	0.46	0.57	0.69	0.79	1.03	1.31	1.61	1.81	2.10	2.49	2.81	3.58	4.28	5.22	6.13
10	0.22	0.34	0.42	0.57	0.70	0.83	0.94	1.19	1.51	1.84	2.06	2.40	2.84	3.19	4.03	4.82	5.83	6.81
25	0.29	0.44	0.55	0.73	0.91	1.05	1.16	1.43	1.79	2.16	2.42	2.80	3.31	3.71	4.62	5.52	6.59	7.65
50	0.34	0.52	0.65	0.87	1.08	1.24	1.34	1.62	2.00	2.42	2.69	3.11	3.67	4.09	5.04	6.04	7.13	8.24
100	0.41	0.62	0.77	1.03	1.28	1.44	1.55	1.82	2.22	2.67	2.96	3.43	4.03	4.49	5.46	6.54	7.64	8.78
200	0.47	0.72	0.89	1.20	1.49	1.67	1.78	2.04	2.44	2.93	3.24	3.74	4.39	4.87	5.84	7.01	8.11	9.28
500	0.57	0.87	1.08	1.46	1.80	1.99	2.13	2.43	2.78	3.28	3.61	4.17	4.87	5.36	6.33	7.60	8.66	9.86
1000	0.66	1.00	1.24	1.67	2.06	2.27	2.41	2.75	3.03	3.55	3.89	4.49	5.23	5.73	6.68	8.02	9.03	10.24

\* 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 the [documentation](#) for more information. NOTE: Formatting prevents estimates near zero to appear as zero.

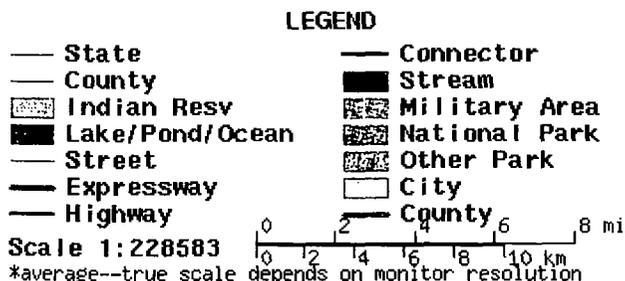
**Maps -**





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.



## 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 our documentation.*

Using the **National Climatic Data Center's (NCDC)** station search engine, locate other climate stations within:

**1/30minutes** ...OR... **1/1degree** of this location (41.6/-112.2314). 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](mailto:HDSC.Questions@noaa.gov)

[Disclaimer](#)

Graphical Peak Discharge method

Given Input Data:

Description .....	North Area run-on
Rainfall distribution .....	Type II
Frequency .....	100 years
Rainfall, P (24-hours) .....	2.9700 in
Drainage area .....	44.3811 ac
Runoff curve number, CN .....	74
Time of concentration, Tc .....	21.3446 min
Pond and Swamp Areas .....	0.0000 % of Area

Computed Results:

Initial abstraction, Ia .....	0.7027 in
Ia/P .....	0.2366
Unit peak discharge, qu .....	557.8138 csm/in
Runoff, Q .....	0.8893 in
Pond and swamp adjustment, Fp ...	1.0000
Peak discharge, qp .....	34.3982 cfs

Channel Calculator  
North Area

## Given Input Data:

Shape .....	Advanced
Solving for .....	Flowrate
Slope .....	0.0520 ft/ft
Manning's n .....	0.0200
Depth .....	1.3550 ft
Height .....	8.0000 ft
Bottom width .....	0.0000 ft
Left radius .....	0.0000 ft
Right radius .....	0.0000 ft
Left slope .....	1.0000 ft/ft (V/H)
Right slope .....	0.4500 ft/ft (V/H)

## Computed Results:

Flowrate .....	34.3281 cfs
Velocity .....	11.6050 fps
Full Flowrate .....	3908.8766 cfs
Flow area .....	2.9580 ft <sup>2</sup>
Flow perimeter .....	5.2182 ft
Hydraulic radius .....	0.5669 ft
Top width .....	4.3661 ft
Area .....	103.1111 ft <sup>2</sup>
Perimeter .....	30.8086 ft
Percent full .....	16.9375 %

Critical Information

Critical depth .....	1.9504 ft
Critical slope .....	0.0075 ft/ft
Critical velocity .....	5.6014 fps
Critical area .....	6.1285 ft <sup>2</sup>
Critical perimeter .....	7.5110 ft
Critical hydraulic radius .....	0.8159 ft
Critical top width .....	6.2845 ft
Specific energy .....	3.4479 ft
Minimum energy .....	2.9255 ft
Froude number .....	2.4856
Flow condition .....	Supercritical

Graphical Peak Discharge method

Given Input Data:

Description .....	East Area run-on
Rainfall distribution .....	Type II
Frequency .....	100 years
Rainfall, P (24-hours) .....	2.9700 in
Drainage area .....	37.0498 ac
Runoff curve number, CN .....	74
Time of concentration, Tc .....	24.7881 min
Pond and Swamp Areas .....	0.0000 % of Area

Computed Results:

Initial abstraction, Ia .....	0.7027 in
Ia/P .....	0.2366
Unit peak discharge, qu .....	516.9433 csm/in
Runoff, Q .....	0.8893 in
Pond and swamp adjustment, Fp ...	1.0000
Peak discharge, qp .....	26.6120 cfs

channel calculator  
East Area

## Given Input Data:

Shape .....	Advanced
Solving for .....	Flowrate
Slope .....	0.0190 ft/ft
Manning's n .....	0.0200
Depth .....	1.4870 ft
Height .....	8.0000 ft
Bottom width .....	0.0000 ft
Left radius .....	0.0000 ft
Right radius .....	0.0000 ft
Left slope .....	1.0000 ft/ft (V/H)
Right slope .....	0.4500 ft/ft (V/H)

## Computed Results:

Flowrate .....	26.5878 cfs
Velocity .....	7.4634 fps
Full Flowrate .....	2362.8007 cfs
Flow area .....	3.5624 ft <sup>2</sup>
Flow perimeter .....	5.7265 ft
Hydraulic radius .....	0.6221 ft
Top width .....	4.7914 ft
Area .....	103.1111 ft <sup>2</sup>
Perimeter .....	30.8086 ft
Percent full .....	18.5875 %

critical information

Critical depth .....	1.7609 ft
Critical slope .....	0.0077 ft/ft
Critical velocity .....	5.3223 fps
Critical area .....	4.9955 ft <sup>2</sup>
Critical perimeter .....	6.7812 ft
Critical hydraulic radius .....	0.7367 ft
Critical top width .....	5.6739 ft
Specific energy .....	2.3526 ft
Minimum energy .....	2.6413 ft
Froude number .....	1.5260
Flow condition .....	Supercritical

Graphical Peak Discharge method

Given Input Data:

Description .....	South Area run-on
Rainfall distribution .....	Type II
Frequency .....	100 years
Rainfall, P (24-hours) .....	2.9700 in
Drainage area .....	43.2554 ac
Runoff curve number, CN .....	74
Time of concentration, Tc .....	16.1648 min
Pond and Swamp Areas .....	0.0000 % of Area

Computed Results:

Initial abstraction, Ia .....	0.7027 in
Ia/P .....	0.2366
Unit peak discharge, qu .....	638.1617 csm/in
Runoff, Q .....	0.8893 in
Pond and swamp adjustment, Fp ...	1.0000
Peak discharge, qp .....	38.3548 cfs

Channel Calculator  
South Area

## Given Input Data:

Shape .....	Advanced
Solving for .....	Flowrate
Slope .....	0.0190 ft/ft
Manning's n .....	0.0200
Depth .....	1.7060 ft
Height .....	8.0000 ft
Bottom width .....	0.0000 ft
Left radius .....	0.0000 ft
Right radius .....	0.0000 ft
Left slope .....	1.0000 ft/ft (V/H)
Right slope .....	0.4500 ft/ft (V/H)

## Computed Results:

Flowrate .....	38.3529 cfs
Velocity .....	8.1793 fps
Full Flowrate .....	2362.8007 cfs
Flow area .....	4.6890 ft <sup>2</sup>
Flow perimeter .....	6.5699 ft
Hydraulic radius .....	0.7137 ft
Top width .....	5.4971 ft
Area .....	103.1111 ft <sup>2</sup>
Perimeter .....	30.8086 ft
Percent full .....	21.3250 %

## Critical Information

Critical depth .....	2.0388 ft
Critical slope .....	0.0073 ft/ft
Critical velocity .....	5.7270 fps
Critical area .....	6.6969 ft <sup>2</sup>
Critical perimeter .....	7.8516 ft
Critical hydraulic radius .....	0.8529 ft
Critical top width .....	6.5695 ft
Specific energy .....	2.7457 ft
Minimum energy .....	3.0582 ft
Froude number .....	1.5613
Flow condition .....	Supercritical

41.6° N  
112.2314° W

● Potential Run - on

North Area

A = 44.4 acres

Depth of flow @ berm

1.35 ft

Q<sub>p</sub> = 34.37

East Area

A = 37.0 acres

Q<sub>p</sub> = 26 cfs

berm =

South Area

A = 43.3 acres

Depth of flow

BOX ELDER COUNTY - 2001 PERMIT

ACTIVE CELL RUNOFF ASSESSMENT:

COMPACTOR WHEEL DATA:

WHEEL DIAMETER (FT)	6
WHEEL CIRCUMFERENCE (FT)	18.8496
WHEEL WIDTH (FT)	3.92
WHEEL AREA (FT <sup>2</sup> )	73.9
WHEEL AREA (IN. <sup>2</sup> )	10,640.2

COMPACTOR TOOTH DATA:

WIDTH (IN.)	11.6
LENGTH (IN.)	6.5
DEPTH (IN.)	5.9
VOULUME / TOOTH (IN.3)	444.9
TEETH / WHEEL	25
TOTAL VOLUME OF TEETH / WHEEL (IN. <sup>3</sup> )	11,121.50

DESIGN STORM:

DESIGN STORM EVENT (IN.)	2.52
WHEEL AREA (IN. <sup>2</sup> )	10,640.2
DESIGN STORM VOLUME / WHEEL AREA (IN. <sup>3</sup> )	26,813.36

SURFACE DEPRESSION STORAGE:

TOTAL VOLUME OF TEETH / WHEEL (IN. <sup>3</sup> )	11,121.50
SURFACE STORAGE OF TWO COMPACTOR PASSES*	22,243.00

ACTUAL STORM VOULUME IN EXCESS OF STORAGE:

STORM VOLUME MINUS STORAGE (IN. <sup>3</sup> )	4,570.36
--	----------

MODIFIED STORM EVENT (IN.)

STORM VOLUME MINUS STORAGE / WHEEL AREA(IN.3)	4,570.36
STORM INTENSITY (IN.)	0.43

SCS RUNOFF CALCULATIONS:

$Q = (P - I_a)^2 / (P - I_a) + S$	P =	0.43	0.43
	S =	2.5	5.38
Q = Runoff (in)	$I_a = 0.2S$	0.5	1.08
P = Rainfall (in.)	CN =	80	65
S = Potential max. retention after runoff begins (in.)	Q =	0.002	0.088
$I_a$ = Initial abstraction (in.)			

\* Typical number of passes of a landfill compactor on MSW is between 3 and 5 times to obtain maximum compaction of the MSW.  
Therefore: 2 passes of a compactor is a conservative estimation of the number of surface depressions that would be present on the working area of a landfill.

## Culvert Calculator

## Entered Data:

Shape .....	Circular
Number of Barrels .....	① Double Barrel
Solving for .....	Headwater
Chart Number .....	1
Scale Number .....	1
Chart Description .....	CONCRETE PIPE CULVERT; NO BEVELED RING ENTRANCE
Scale Description .....	SQUARE EDGE ENTRANCE WITH HEADWALL
Flowrate .....	18.0000 cfs ( $\frac{1}{2}$ of 36 cfs)
Manning's n .....	0.0130
Roadway Elevation .....	4578.0000 ft
Inlet Elevation .....	4575.0000 ft
Outlet Elevation .....	4574.5000 ft
Diameter .....	24.0000 in
Length .....	70.0000 ft
Entrance Loss .....	0.0000
Tailwater .....	2.0000 ft

## Computed Results:

Headwater .....	4577.6395 ft From Inlet
Slope .....	0.0071 ft/ft
Velocity .....	6.9057 fps

## Channel Calculator

## Given Input Data:

Shape .....	Trapezoidal
Solving for .....	Flowrate
Slope .....	0.0330 ft/ft
Manning's n .....	0.0700
Depth .....	26.1495 in
Height .....	28.0000 in
Bottom width .....	0.0000 in
Left slope .....	0.5000 ft/ft
Right slope .....	0.5000 ft/ft

## Computed Results:

Flowrate .....	36.0001 cfs
Velocity .....	3.7906 fps
Flow area .....	9.4972 ft <sup>2</sup>
Flow perimeter .....	116.9441 in
Hydraulic radius .....	11.6944 in
Top width .....	104.5980 in
Area .....	10.8889 ft <sup>2</sup>
Perimeter .....	125.2198 in
Percent full .....	93.3911 %

*Run-on  
Control Channel*

## Critical Information

Critical depth .....	21.8774 in
Critical slope .....	0.0854 ft/ft
Critical velocity .....	5.4156 fps
Critical area .....	6.6475 ft <sup>2</sup>
Critical perimeter .....	97.8387 in
Critical hydraulic radius .....	9.7839 in
Critical top width .....	87.5096 in
Specific energy .....	2.4024 ft
Minimum energy .....	2.7347 ft
Froude number .....	0.6402
Flow condition .....	Subcritical

*Cover Run - off Channel*  
Channel Calculator

## Given Input Data:

Shape .....	Trapezoidal
Solving for .....	Depth of Flow
Flowrate .....	14.2000 cfs
Slope .....	0.0500 ft/ft
Manning's n .....	0.0700
Height .....	16.0000 in
Bottom width .....	0.0000 in
Left slope .....	0.3333 ft/ft
Right slope .....	0.3333 ft/ft

## Computed Results:

Depth .....	14.4436 in
Velocity .....	3.2669 fps
Flow area .....	4.3467 ft <sup>2</sup>
Flow perimeter .....	91.3578 in
Hydraulic radius .....	6.8513 in
Top width .....	86.6705 in
Area .....	5.3339 ft <sup>2</sup>
Perimeter .....	101.2020 in
Percent full .....	90.2727 %

## Critical Information

Critical depth .....	12.8214 in
Critical slope .....	0.0944 ft/ft
Critical velocity .....	4.1459 fps
Critical area .....	3.4251 ft <sup>2</sup>
Critical perimeter .....	81.0970 in
Critical hydraulic radius .....	6.0818 in
Critical top width .....	76.9361 in
Specific energy .....	1.3695 ft
Minimum energy .....	1.6027 ft
Froude number .....	0.7424
Flow condition .....	Subcritical

## Road Way Bypass Culvert

## Culvert Calculator

## Entered Data:

Shape .....	Circular
Number of Barrels .....	1 <sup>(2)</sup>
Solving for .....	Headwater
Chart Number .....	1
Scale Number .....	1
Chart Description .....	CONCRETE PIPE CULVERT; NO BEVELED RING ENTRANCE
Scale Description .....	SQUARE EDGE ENTRANCE WITH HEADWALL
Flowrate .....	7.1000 cfs ( $\frac{1}{2}$ of 14.2 cfs)
Manning's n .....	0.0130
Roadway Elevation .....	4578.0000 ft
Inlet Elevation .....	4575.0000 ft
Outlet Elevation .....	4574.8900 ft
Diameter .....	18.0000 in
Length .....	20.0000 ft
Entrance Loss .....	0.0000
Tailwater .....	0.8300 ft

## Computed Results:

Headwater .....	4576.6522 ft From Inlet
Slope .....	0.0055 ft/ft
Velocity .....	4.9994 fps

## Manning Pipe Calculator

*Roadway  
Bypass Culvert*

## Given Input Data:

Shape .....	Circular
Solving for .....	Depth of Flow
Diameter .....	18.0000 in
Flowrate .....	7.1000 cfs
Slope .....	0.0055 ft/ft
Manning's n .....	0.0130

## Computed Results:

Depth .....	13.4939 in
Area .....	1.7671 ft <sup>2</sup>
Wetted Area .....	1.4210 ft <sup>2</sup>
Wetted Perimeter .....	37.6850 in
Perimeter .....	56.5487 in
Velocity .....	4.9965 fps
Hydraulic Radius .....	5.4299 in
Percent Full .....	74.9661 %
Full flow Flowrate .....	7.7902 cfs
Full flow velocity .....	4.4084 fps

## Critical Information

Critical depth .....	12.5677 in
Critical slope .....	0.0063 ft/ft
Critical velocity .....	5.3402 fps
Critical area .....	1.3295 ft <sup>2</sup>
Critical perimeter .....	35.4098 in
Critical hydraulic radius .....	5.4068 in
Critical top width .....	18.0000 in
Specific energy .....	1.4944 ft
Minimum energy .....	1.5710 ft
Froude number .....	0.9208
Flow condition .....	Subcritical

# Appendix E

# LITTLE MOUNTAIN LANDFILL LIFE

## AIRSPACE (AIR QUALITY REGULATION LIMITED)

MSW in Tons	Maximum Airspace (Limited by Air Quality Regs.) =	2,760,000 (Tons)
MSW in Cubic Yards*	Maximum Airspace (Limited by Air Quality Regs.) =	4,609,200 (Yds <sup>3</sup> )
Cover Soil	Additional Airspace allotted for soil use =	1,152,300 (Yds <sup>3</sup> )
Total Combined Airspace in Cubic Yards	Total Available Airspace (Air Quality Reg. Limited) =	5,761,500 (Yds <sup>3</sup> )

## AIRSPACE CONSUMPTION 1996 - 2054

Initial Little Mountain Airspace (Cubic Yards) = 5,543,773 (Yds<sup>3</sup>)

Year	Total (Tons)	Waste Water (Tons)	Solid Waste (Tons)	Projected Solid Waste @1.1% growth (Tons)	Solid Waste (Cubic Yards)	Soil (Cubic Yards)	Annual Airspace Consumption (Cubic Yards)	Cumulative Airspace Remaining (Cubic Yards)
1997	12,126	0	12,126		20,250	5,061	25,313	5,518,460
1998	28,892	0	28,892		48,250	12,062	60,312	5,458,148
1999	41,146	3,209	37,937		68,714	17,178	85,892	5,372,256
2000	34,384	4,141	30,243		57,421	14,355	71,777	5,300,479
2001	71,553	5,718	65,835		119,494	29,873	149,367	5,151,112
2002	39,604	5,757	33,847		66,139	16,535	82,673	5,068,439
2003	41,960	6,027	35,933		70,073	17,518	87,592	4,980,847
2004	85,096	5,504	79,592		142,110	35,528	177,638	4,803,209
2005	73,300	4,401	68,899		122,411	30,603	153,014	4,650,196
2006	38,460	3,708	34,752		58,036	14,509	72,545	4,577,651
2007				35,134	58,674	14,669	73,343	4,504,308
2008				35,521	59,320	14,830	74,150	4,430,158
2009				35,911	59,972	14,993	74,965	4,355,193
2010				36,307	60,632	15,158	75,790	4,279,403
2011				36,706	61,299	15,325	76,624	4,202,780
2012				37,110	61,973	15,493	77,466	4,125,314
2013				37,518	62,655	15,664	78,319	4,046,995
2014				37,931	63,344	15,836	79,180	3,967,815
2015				38,348	64,041	16,010	80,051	3,887,764
2016				38,770	64,745	16,186	80,932	3,806,832
2017				39,196	65,457	16,364	81,822	3,725,011
2018				39,627	66,177	16,544	82,722	3,642,289
2019				40,063	66,905	16,726	83,632	3,558,657
2020				40,504	67,641	16,910	84,552	3,474,105
2021				40,949	68,385	17,096	85,482	3,388,624
2022				41,400	69,138	17,284	86,422	3,302,201
2023				41,855	69,898	17,475	87,373	3,214,829
2024				42,316	70,667	17,667	88,334	3,126,495
2025				42,781	71,444	17,861	89,306	3,037,189
2026				43,252	72,230	18,058	90,288	2,946,902
2027				43,727	73,025	18,256	91,281	2,855,620
2028				44,208	73,828	18,457	92,285	2,763,335
2029				44,695	74,640	18,660	93,300	2,670,035
2030				45,186	75,461	18,865	94,327	2,575,709
2031				45,683	76,291	19,073	95,364	2,480,344
2032				46,186	77,131	19,283	96,413	2,383,931
2033				46,694	77,979	19,495	97,474	2,286,458
2034				47,208	78,837	19,709	98,546	2,187,912
2035				47,727	79,704	19,926	99,630	2,088,282
2036				48,252	80,581	20,145	100,726	1,987,556
2037				48,783	81,467	20,367	101,834	1,885,722
2038				49,319	82,363	20,591	102,954	1,782,768
2039				49,862	83,269	20,817	104,087	1,678,681
2040				50,410	84,185	21,046	105,231	1,573,450
2041				50,965	85,111	21,278	106,389	1,467,061
2042				51,525	86,047	21,512	107,559	1,359,502
2043				52,092	86,994	21,748	108,742	1,250,759
2044				52,665	87,951	21,988	109,939	1,140,821
2045				53,245	88,918	22,230	111,148	1,029,673
2046				53,830	89,896	22,474	112,371	917,302
2047				54,422	90,885	22,721	113,607	803,696
2048				55,021	91,885	22,971	114,856	688,839
2049				55,626	92,896	23,224	116,120	572,720
2050				56,238	93,918	23,479	117,397	455,323
2051				56,857	94,951	23,738	118,688	336,634
2052				57,482	95,995	23,999	119,994	216,640
2053				58,114	97,051	24,263	121,314	95,326
2054				58,754	98,119	24,530	122,648	-27,322

Total Tons Solid Waste (Yds<sup>3</sup>) = 4,263,031  
 Total Volume Solid Waste (Yds<sup>3</sup>) = 4,456,876

\* MSW waste totals include C&D waste  
 \*\* Spike in Waste caused by a one-time waste inflow from Weber County  
 \*\*\* The last 2 weeks of the year are projected

# Appendix F

DATE	STARTED: 4/14/00	Box Elder County Landfill			IGES Rep: K. Harley	TEST PIT NO:											
	COMPLETED: 4/14/00	Tremonton, Utah			Rig Type: Rubber Tire Backhoe	TP-1											
	BACKFILLED: 4/14/00	Project Number 00167-003				Sheet 1 of 1											
DEPTH	LOCATION			Dry Density (pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits								
METERS	NORTHING	EASTING	ELEVATION						Plastic Limit	Moisture Content	Liquid Limit						
FEET	MATERIAL DESCRIPTION																
SAMPLES									10	20	30	40	50	60	70	80	90
WATER LEVEL																	
GRAPHICAL LOG																	
UNIFIED SOIL CLASSIFICATION																	
0	Lean CLAY with sand - brown, moist to slightly moist, medium stiff, roots to 1' depth																
1	Fat CLAY - brown with white veins, slightly moist, stiff to very stiff, veins composed of leached salt deposits				12.2		52	33									
5	Lean CLAY - light tan to white, slightly moist, stiff, light unit weight																
2	Bottom of Test Pit @ 8 Feet																
3																	
4																	

LOG OF TEST PIT PLATE 167-003.GPJ IGES.GDY 4/16/01



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- SAMPLE TYPE**
- ▬ GRAB SAMPLE
  - ▣ 3" O.D. THIN-WALLED HAND SAMPLER

- WATER LEVEL**
- ▼ MEASURED
  - ▽ ESTIMATED

NOTES:

PLATE  
1

LOG OF TEST PIT PLATE 167-003.GPJ IGES.GDT 4/16/01

DATE	STARTED: 4/14/00	Box Elder County Landfill			IGES Rep	K. Hartley		TEST PIT NO											
	COMPLETED: 4/14/00	Tremonton, Utah			Rig Type:	Rubber Tire Backhoe		TP-2											
	BACK FILLED: 4/14/00	Project Number 00167-003			Sheet 1 of 1														
DEPTH		LOCATION			Dry Density (pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits									
METERS	FEET	NORTHING	EASTING	ELEVATION						Plastic Limit	Moisture Content	Liquid Limit							
		MATERIAL DESCRIPTION																	
0	0									10	20	30	40	50	60	70	80	90	
						20.4													
1							54.6	37	17										
5																			
2																			
3	10																		
4																			



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**SAMPLE TYPE**  
 - GRAB SAMPLE  
 - 3" O.D THIN-WALLED HAND SAMPLER

**WATER LEVEL**  
 - MEASURED  
 - ESTIMATED

**NOTES:**

PLATE  
2

DATE	STARTED: 4/14/00	Box Elder County Landfill			IGES Rep: K. Hartley		TEST PIT NO					
	COMPLETED: 4/14/00	Tremonton, Utah			Rig Type: Rubber Tire Backhoe		TP-3					
	BACKFILLED: 4/14/00	Project Number 00167-003					Sheet 1 of 1					
DEPTH		LOCATION			Dry Density (pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits		
METERS	FEET	NORTHING	EASTING	ELEVATION						Plastic Limit	Moisture Content	Liquid Limit
		MATERIAL DESCRIPTION										
0		Lean CLAY - brown, moist, medium stiff, with roots to 1' depth						10 20 30 40 50 60 70 80 90				
1		Silty CLAY - moist to slightly moist, medium stiff to stiff, with veins of white salt deposits			18.2			49 29				
5		SILT - brown, mottled white, slightly moist, stiff with large veins of white salt deposits			14.7							
2		-grades tan to white below 6'			65.5							
3		Bottom of Test Pit @ 7 Feet										
4												

LOG OF TEST PITS, PLATE 167-003.GPJ IGES.GDT 4/16/01



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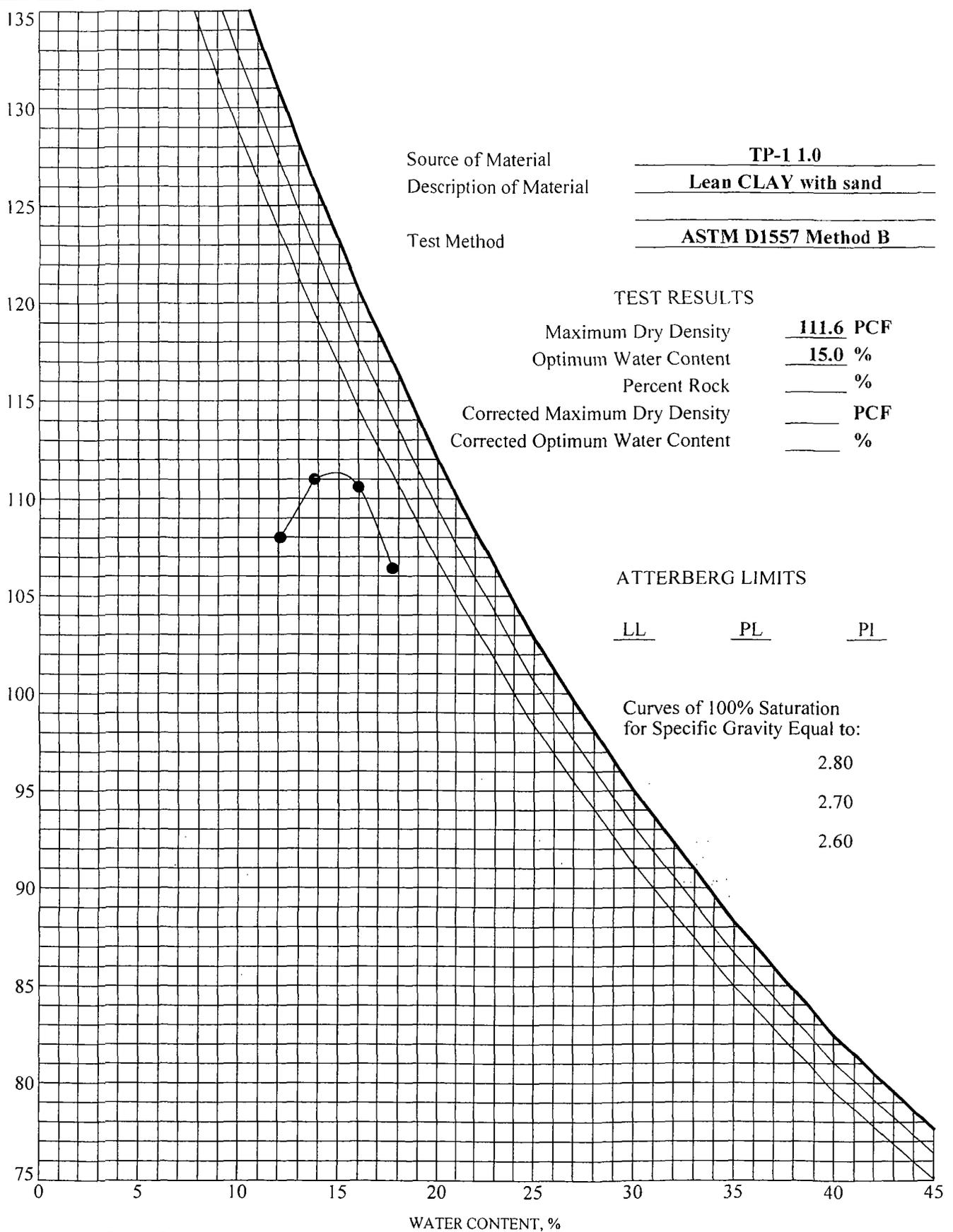
<b>SAMPLE TYPE</b>	
<input type="checkbox"/>	GRAB SAMPLE
<input checked="" type="checkbox"/>	3" O.D. THIN-WALLED HAND SAMPLER
<b>WATER LEVEL</b>	
<input checked="" type="checkbox"/>	MEASURED
<input type="checkbox"/>	ESTIMATED

**NOTES:**

PLATE  
3

US COMPACTION (PLATE) 167-003.GPJ IGES.GDT 4/16/01

DRY DENSITY, pcf



Source of Material TP-1 1.0  
 Description of Material Lean CLAY with sand  
 Test Method ASTM D1557 Method B

TEST RESULTS

Maximum Dry Density 111.6 PCF  
 Optimum Water Content 15.0 %  
 Percent Rock \_\_\_\_\_ %  
 Corrected Maximum Dry Density \_\_\_\_\_ PCF  
 Corrected Optimum Water Content \_\_\_\_\_ %

ATTERBERG LIMITS

LL      PL      PI

Curves of 100% Saturation  
 for Specific Gravity Equal to:

- 2.80
- 2.70
- 2.60

**COMPACTION TEST**

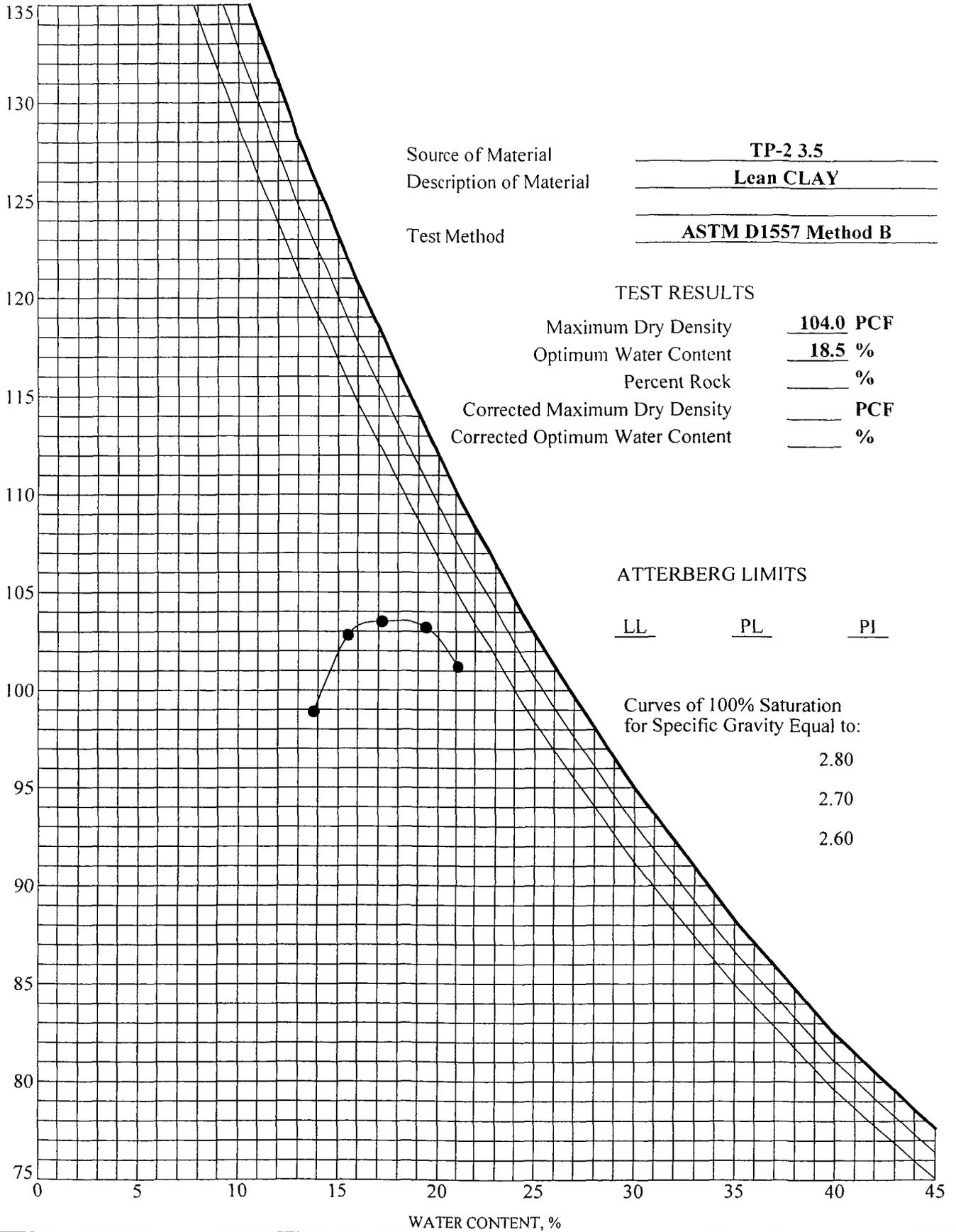


Box Elder County Landfill  
 Tremonton, Utah  
 Project Number: 00167-003

PLATE  
**4**

US\_COMPACTION (PLATE) 167-003.GPJ IGES.GDT 4/16/01

DRY DENSITY, pcf



WATER CONTENT, %

**COMPACTION TEST**



Box Elder County Landfill  
 Tremonton, Utah  
 Project Number: 00167-003

PLATE  
**5**

APPENDIX G

TAHOMA COMPANIES, INCORPORATED ❖ WDBE

444 South Main Street, Suite C-7, Cedar City, Utah 84720 ☎ (801) 865-0131 fax 865-0161

FILE COPY

February 13, 1996:

Mr. Ralph T. Bohn  
Manager, Solid Waste Section  
Utah Division of Solid and Hazardous Waste  
288 North 1460 West  
Salt Lake City, Utah 84114-4880

Dear Mr. Bohn:

Thank you for your review of the Request for Exemption from Liner, Leachate Control, and Ground Water Monitoring at the proposed Upper Little Mountain landfill site. We are pleased that your staff agrees that the site appears suitable for use as a landfill without the added expense of liners and other ground water protection facilities.

This letter is intended to provide answers to questions raised in your review dated January 29, 1996. Some of the questions you asked will be answered in greater detail in the Permit Application (PA). Others are addressed in the following Response.

1) Topographic Maps. The landfill and related access roads will be constructed on lands within the USGS 7.5 minute Quadrangle Maps "Tremonton, Utah" and "Bear River City, Utah." Appropriately marked copies of these maps will be included with the PA. A copy of the "Bear River City, Utah" quadrangle map showing the proposed landfill location is included with this Response.

The site and access road have both been photographed by Olympus Aerial Surveys of Salt Lake City. Detailed topographic maps have been prepared at a scale of 1" = 200'. All engineering plans will be prepared utilizing the detailed topographic maps.

2) Boring Log. The test boring was drilled concurrently with a detailed test pit exploration of the landfill site. Undisturbed samples of soils were collected from twelve test pits. All of the test pits were excavated down slope from the test boring, exposing soils stratigraphically equivalent to the first 100 feet of soils penetrated by the test boring. The test pit samples have been tested for permeability, gradation, Atterburg Limits, natural moisture content, optimum moisture content, maximum dry density and specific gravity. The results of the testing will be presented with the PA.

3) Run-On Control. Run-on will be prevented from entering the landfill area. A drainage study and a design for appropriately sized ditches and berms will be presented along with the PA.

4) Final Cover. The Box Elder County Commissioners have agreed to placement of final cover in conformance with state requirements in effect at the time of closure. All final cover placed during the initial five year permit life of the landfill will include 18 inches of low permeability soils (equal to or less than the permeability of the natural soils beneath the landfill) and 40 inches of topsoil to protect the low permeability layer.

5) Faults. The landfill elevation cross section (Figure 7) shows an inactive fault within Little Mountain at the base of the Bonneville lakebed silts. This fault brings together two formations of ancient Paleozoic rocks that were deposited millions of years apart. Hellmut Doelling (1980, pages 73 and 74) stated that the faults bounding the mountain ranges of the Basin and Range Province began to form in Late Tertiary time, but *earlier orogenies (structural events) are mostly responsible for the interior structures of the individual mountain ranges*. The inactive fault within Little Mountain is an interior structure that formed before Late Tertiary time (more than five million years ago). Suzanne Hecker (1993, in Plate 1, Quaternary Faults and Folds, Utah) confirmed that the interior fault at Little Mountain is not active.

The subsurface trace of the inactive fault passes under the northeast corner of the proposed landfill site. This portion of the landfill is underlain by 200 feet of dry Bonneville lakebed silts. The silts were originally deposited under relatively still waters during high stands of ancient Lake Bonneville. As the silts settled to the bottom of the lake, they plugged any openings that could have existed along the fault surface. Therefore, the fault surface has little or no potential to serve as a pathway for downward movement of water or leachate.

Our depiction of the fault on the landfill elevation cross section (Figure 7) was probably in error. A more appropriate way of drawing the fault would have been to stop it the base of the Bonneville soils. In that case, the western contact of Bonneville soils with the Pennsylvanian Oquirrh Formation would be a depositional contact, rather than a fault line. It is most likely that the steeply dipping surface on the Oquirrh rocks represents an erosional surface equivalent to a fault line scarp. The fault line scarp was gradually covered by Bonneville soils during high stands of Bonneville Lake.

Surface exposures of the inactive fault are present on a ridge southeast of the landfill site. These exposures will be inspected in the spring of 1996 and a description of the fault surface included with the PA.

6) Travel Time. The discussion of hydraulic conductivity and HELP model percolation rates provided by the UDSHW is appropriate and useful. Tahoma agrees that these measurements are not directly equivalent.

We also appreciate your statement that "this (leachate) percolation rate is still probably one of the limiting factors in the potential for ground water contamination." In our opinion, the leachate percolation rate is the most important limiting factor.

The HELP program simulates daily water movement into, through and out of a landfill. Surface and subsurface processes are modeled. The surface processes modeled are snowmelt, interception of rainfall by vegetation, surface runoff, and evaporation of water, interception and snow from the surface. The subsurface processes modeled are evaporation of water from the soil, plant transpiration, vertical unsaturated drainage, geomembrane liner leakage and barrier soil liner percolation (not applicable in this case, as no liner was included in model runs), and lateral saturated drainage. In summary, the HELP program considers all sources of water when calculating a percolation rate for the leachate.

Any percolating leachate will descend vertically in unsaturated materials for at least 300 feet, as there are no aquifers present beneath the landfill site in that distance to deflect the flow. Unsaturated hydraulic conductivity in the 200 feet of silty soils at Upper Little Mountain has been calculated to range from 8 to 13 orders of magnitude less than saturated hydraulic conductivity in the same soils using equations included in the *Engineering Documentation for Version 3* of the HELP model and in Maidment, ed., 1992. The calculations that substantiate these unsaturated hydraulic conductivity values are included in the attached Appendix.

Unsaturated hydraulic conductivity of the naturally occurring soils will determine the rate at which leachate initially moves through the soils. This rate is substantially slower than the percolation of leachate out the bottom of the landfill. Once a partial column of soil becomes saturated with leachate, the rate of leachate percolation through the natural soils will increase until percolation is limited by the quantity of leachate available. Percolation at the "leachate front" (the lowermost limit of leachate percolation) will then stabilize at a rate intermediate between the saturated and unsaturated hydraulic conductivities.

The actual rate of infiltration is difficult to determine, but it will be somewhere between the unsaturated hydraulic conductivity (about  $10^{-15}$  cm/second) and the saturated hydraulic conductivity (about  $3 \times 10^{-6}$  cm/second) of the natural soil substrate. The HELP model predicts that only enough leachate will be generated by the landfill to provide moisture to the natural soils at the rate of  $4.841 \times 10^{-9}$  cm/second (equivalent to .06 inches per year), and it is unlikely that leachate will saturate the uniformly layered natural soils any faster than it is generated by the landfill.

Help Model - General. HELP model runs conducted on other landfill models have shown that shortening the growing season by five days would cause less moisture to remain in the upper layers of a closed landfill. The reduction in moisture predicted by the HELP model may be

caused by a reduction in the plant residue decay rate as the soil temperature in the bottom of the evaporative zone falls below 35 degrees Centigrade.

The HELP model has also predicted that evapotranspiration at an open landfill would be slightly higher with the growing season shortened by five days. Evapotranspiration in the model is the sum of both soil evaporation and plant transpiration.

Plant transpiration is equal to zero at an open landfill. Therefore, soil evaporation must increase slightly to account for the increase in evapotranspiration. The increase in soil evaporation in the HELP model occurs because lower soil temperatures (resulting from the shorter growing season) allow more water to be available in the soils.

The selection of a "fair" stand of grass for computing the runoff curve number is appropriate for the landfill site after final closure. Cover types for runoff calculations are defined by the U.S. Department of Agriculture in Technical Release 55 ( revised June 1986, p. 2-7). The final cover type at the landfill site will be "pasture, grassland, or range--continuous forage for grazing." Existing conditions at the site are good: "greater than 75% ground cover and lightly or only occasionally grazed."

Correct application of final cover and seed during late autumn will result in germination and growth of at least a fair stand of grass at the closed landfill. A "fair" stand of grass will consist of "50 to 75% ground cover, not heavily grazed."

Thanks again for helping Tahoma Companies and Box Elder County meet our goal of conforming to the landfill regulations at a reasonable cost.

Sincerely,



Gary F. Player  
Vice President and Principal Geologist

cc: Rodger Harper  
Jay Hardy  
Elaine Forbes

K:\CLIENTS\95007-4\CORRESPONSE.WPD



DEPARTMENT OF ENVIRONMENTAL QUALITY  
DIVISION OF SOLID AND HAZARDOUS WASTE

Michael O. Leavitt  
Governor

Dianne R. Nielson, Ph.D.  
Executive Director

Dennis R. Downs  
Director

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(801) 538-6715 Fax  
(801) 536-4414 T.D.D.  
[www.deq.state.ut.us](http://www.deq.state.ut.us) Web

September 9, 1998

Rodger D. Harper, Supervisor  
Box Elder County Solid Waste  
01 South Main  
Brigham City, Utah 84302

RE: Little Mountain Landfill Alternative Daily Cover Request

Dear Mr. Harper:

We have reviewed your request for use of shredded tires as alternative daily cover at the Little Mountain Landfill, as described in your letter of August 24, 1998. Your request is hereby approved. The tire chips used as cover material must be two inches or less in size.

This does not constitute approval of the Little Mountain Landfill as a recycler nor does this constitute approval of tires used for daily cover as recycling.

If you have questions regarding this letter or other solid waste issues, please contact Phil Burns or Ralph Bohn at 538-6170.

Sincerely,

Dennis R. Downs, Executive Secretary  
Utah Solid and Hazardous Waste Control Board

DRD/PEB/sm

c: John C. Bailey, M.D., M.S.P.H., Health Off/Dept Director, Bear River Health Dept.



DEPARTMENT OF ENVIRONMENTAL QUALITY  
DIVISION OF SOLID AND HAZARDOUS WASTE

Michael O. Leavitt  
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[www.deq.state.ut.us Web](http://www.deq.state.ut.us/Web)

August 19, 1998

Rodger D. Harper, Supervisor  
Box Elder County Solid Waste  
01 South Main  
Brigham City, Utah 84302

RE: Little Mountain Landfill Alternative Cover Request

Dear Mr. Harper:

We have reviewed your request for use of the plastic sheeting described in your letter of August 12, 1998 as alternative daily cover at the Little Mountain Landfill. Your request is hereby approved. Twelve inches of soil cover should be placed on top of each lift as the lift advances, as is the current procedure. This soil will serve as a fire and insect retardant and provide moisture holding capacity within the landfill.

If you have questions regarding this letter or other solid waste issues, please contact Phil Burns or Ralph Bohn at 538-6170.

Sincerely,



Dennis R. Downs, Executive Secretary

Utah Solid and Hazardous Waste Control Board

DRD/PEB/sm

c: John C. Bailey, M.D., M.S.P.H., Health Off/Dept Director, Bear River Health Dept.



DEPARTMENT OF ENVIRONMENTAL QUALITY  
DIVISION OF SOLID AND HAZARDOUS WASTE

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Ernie R. Nielson, Ph.D.  
Executive Director

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www.deq.state.ut.us Web

Dennis R. Downs  
Director

April 13, 1999

Roger D. Harper, Supervisor  
Box Elder County Solid Waste  
01 South Main  
Brigham City, Utah 84302

RE: Little Mountain Landfill Revised Liquids Solidification Request

Dear Mr. Harper:

We have reviewed your revised request for receipt of non-hazardous liquids for solidification at the Little Mountain Landfill, as described in your letter of April 9, 1999. Your request is hereby approved.

Future analyses of the waste water should be performed annually or whenever a process change occurs, and include all RCRA TCLP metals. The material placed in the landfill must pass the paint filter test, in compliance with the Utah Solid Waste Permitting and Management Rules (R315-303-1(1)(b) UAC) and the facility's permit.

Construction of a surface impoundment for storage of the waste water when weather conditions do not permit mixing with soil is proposed. In a letter dated April 7, 1999, the Division of Water Quality deferred review of this proposal to the Division of Solid and Hazardous Waste. As we have discussed with you, the impoundment must be designed and constructed in accordance with the appropriate rules normally administered by the Division of Water Quality.

If you have questions regarding this letter or other solid waste issues, please contact Phil Burns or Ralph Bohn at 538-6170.

Sincerely,



Dennis R. Downs, Executive Secretary  
Utah Solid and Hazardous Waste Control Board

DRD/PEB/ser

c: John C. Bailey, M.D., M.S.P.H., Health Off/Dept Director, Bear River Health Dept.

F:\SHWASPB\BURNS\WP\BOX2\Box solidif2.wpd  
FILE: Box Elder Co Upper Little Mtn



State of Utah

DEPARTMENT OF ENVIRONMENTAL QUALITY  
DIVISION OF SOLID AND HAZARDOUS WASTE

Michael O. Leavitt  
Governor

Dianne R. Nielson, Ph.D.  
Executive Director

Dennis R. Downs  
Director

288 North 1460 West  
P.O. Box 144880  
Salt Lake City, Utah 84114-4880  
(801) 538-6170  
(801) 538-6715 Fax  
(801) 536-4414 T.D.D.  
[www.deq.state.ut.us](http://www.deq.state.ut.us) Web

December 22, 1998

Roger D. Harper, Supervisor  
Box Elder County Solid Waste  
01 South Main  
Brigham City, Utah 84302

RE: Little Mountain Landfill Liquids Solidification Request

Dear Mr. Harper:

We have reviewed your request for receipt of non-hazardous liquids for solidification at the Little Mountain Landfill, as described in your letter of November 30, 1998. Your request is hereby approved.

Future analyses of the waste water should be performed annually or whenever a process change occurs, and include all RCRA TCLP metals. The material placed in the landfill must pass the paint filter test, in compliance with the Utah Solid Waste Permitting and Management Rules (R315-303-1(1)(b) UAC) and the facility's permit. In addition, you should contact Kiran Bhayani of the Division of Water Quality at 538-6146 to determine if regulations for impoundments are applicable to your proposed concrete solidification pit.

If you have questions regarding this letter or other solid waste issues, please contact Phil Burns or Ralph Bohn at 538-6170.

Sincerely,

Dennis R. Downs, Executive Secretary  
Utah Solid and Hazardous Waste Control Board

DRD/PEB/ser

c: John C. Bailey, M.D., M.S.P.H., Health Off/Dept Director, Bear River Health Dept.



# State of Utah

## DEPARTMENT OF ENVIRONMENTAL QUALITY DIVISION OF SOLID AND HAZARDOUS WASTE

Michael O. Leavitt  
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288 North 1460 West  
P.O. Box 144880  
Salt Lake City, Utah 84114-4880  
(801) 538-6170 Voice  
(801) 538-6715 Fax  
(801) 536-4414 T.D.D.

January 29, 1996

FEB 01 1996

Jay E. Hardy  
Box Elder County Commissioner  
01 South Main St.  
Brigham City, Utah 84302

Dear Commissioner Hardy:

Enclosed is our review of the Request for Exemption From Liner, Leachate Control, and Ground Water Monitoring at the proposed Upper Little Mountain landfill site submitted to the Division of Solid and Hazardous Waste on November 29, 1995. The issues presented in this review were discussed with Gary Player of Tahoma Companies at our January 17, 1996 meeting. In general, the proposed site appears suitable for an exemption from the liner, leachate collection, and ground water monitoring requirements provided that the questions raised in this review are satisfactorily answered and that the design and operations plan in the full permit application are adequate.

We have also received Box Elder County's request for the location standard exemption for the six acres of farmland of "statewide importance" at the northwest corner of the site. We have no objection to this exemption, and the request will be included in the public notice and public comment period on the full permit application.

If you have questions regarding permitting procedures, please call me or Phil Burns at 538-6170.

Sincerely,

Ralph T. Bohn, Manager  
Solid Waste Section

enclosure

c: John C. Bailey, Director, Bear River Health Department  
Gary Player, Tahoma Resources - with enclosure

f:...pburns/wp/box2/revlet  
file to: Box Elder County, Upper Little Mountain Correspondence



BOX ELDER COUNTY CLASS I LANDFILL  
UPPER LITTLE MOUNTAIN SITE

REVIEW OF REQUEST FOR EXEMPTION  
FROM LINER, LEACHATE CONTROL  
AND GROUND WATER MONITORING

January 23, 1996

- 1) Topographic Maps The only topographic map provided in the exemption request is the regional map on which precipitation is shown (Appendix A). It is not possible to assess the topography of the site from this map. Provide adequate topographic maps of the site as required in R315-310-4(2)(a).
- 2) Boring Log The boring log (Appendix B) of the boring drilled on site indicates that grab samples were taken. Why were only grab samples taken and not split-spoon or thin-wall samples in the unconsolidated soils and core samples in bedrock? These types of samples could have been laboratory tested for permeability and other properties.
- 3) Run-On Control Run-on must be prevented from entering the landfill area. The exemption request states that "Tahoma will recommend that a ditch or berm be constructed" along the western perimeter of the landfill (p. 17). Ditches and berms to control run-on must be constructed wherever there is potential for run-on (which appears to be most of the perimeter of the site) and designed to handle the 25-year, 24-hour storm, or a demonstration must be made to show that no run-on can occur. This information must be included in the full permit application. Run-on control is one of the primary considerations in qualifying for an exemption from liner and leachate collection systems and ground water monitoring.
- 4) Final Cover A final cover of 18 inches of low permeability soils covered with six inches of topsoil is proposed as a final cover for the landfill (p. 18). The two soil samples from test pits that were analyzed for hydraulic conductivity showed values of  $3.09 \times 10^{-6}$  cm/s and  $4.18 \times 10^{-6}$  cm/s, yet a value of  $4.2 \times 10^{-5}$  cm/s was used for the low permeability layer as material texture number 12 in the HELP model. While this value in the model would potentially allow greater percolation through the cap to the waste and is therefore "conservative" in running model simulations, the actual final cover can have no greater permeability than the natural subsoils (R315-303-4(4)(a)(ii)) as acknowledged in the exemption request (p. 18). Therefore the 18-inch low permeability layer of the final cover must be constructed to have no greater hydraulic conductivity than  $1 \times 10^{-6}$  cm/s.

A top soil layer of six inches will not be sufficient to protect the integrity of the low permeability layer. As stated in the Engineering Documentation for Version 3 of the HELP model, the program assumes Darcian flow for vertical drainage through *homogeneous, temporally uniform* soil and waste layers. It does not consider preferential flow through channels such as cracks, root holes, or animal burrows. "As such, the program will tend to overestimate the storage of water during the early part of the simulation and overestimate the

time required for leachate to be generated" (p. 107). Also, while the HELP model does adjust the hydraulic conductivity in the top half of the "evaporative zone" for roots channels, the model does not take into account degradation of the *low permeability layer* by roots, desiccation, or frost. (The model does account for the effects of frozen soil on runoff and evaporation, but not soil permeability or drainage.)

The exemption request document attempts to address the issue of potential effects of vegetation roots and frost penetration by discussing the results of modeling runs done for Emery County in which the topsoil layer was increased to 40 inches in thickness, and in which the permeability of the low permeability layer was increased by a factor of 100 to simulate damage from freezing. In the first case, the approach is invalid because the HELP model does not account for the effects of freezing, desiccation, and root penetration in the low permeability layer; whether a six-inch or 40-inch topsoil layer is modeled, the low permeability layer retains its full integrity in the model. The low permeability layer will be compromised under a six-inch layer of topsoil, but since the model does not account for this little difference would be expected between simulations with six and 40 inches of topsoil. The only effects in the model of increasing the top soil thickness are to decrease runoff and evapotranspiration, thus permitting larger heads and longer sustaining heads since a greater thickness of material below the evaporative zone is free from extraction of water by evapotranspiration. While these larger heads provide a greater pressure gradient to increase the leakage rate through the cover system, this effect is thought to be less important than the degradation of the cover system by freezing, desiccation, and root penetration.

Increasing the permeability of the clay cover in the modeling simulations results in a *uniformly* higher permeability for this material, rather than the cracks and channels that would result from freezing, desiccation, or root penetration. Preferential flow is likely to occur once the clay has been degraded by these processes. Freeze/thaw cycles can cause an increase in hydraulic conductivity of one to two orders of magnitude after only one to two cycles of freezing and thawing (Design and Construction of RCRA/CERCLA Final Covers, 1991, p.20).

The integrity of the low permeability layer cover must be preserved to minimize infiltration of water. This can only be accomplished by covering this with a thickness of topsoil that equals or exceeds the depth of penetration of roots, desiccation, and frost. Therefore a topsoil layer 40 inches thick will be required as part of the final cover.

5) Faults The landfill elevation cross section (Figure 7) shows an inactive fault at the boundary of the Quaternary Bonneville lakebed silts and clays and the Oquirrh Formation, with the fault as the contact between the Oquirrh and Great Blue formations below the lake sediments. How close is the landfill to this fault? Show the location of the landfill on Figure 7. How long ago did movement occur on this fault and how was this age determined? How much potential exists for this fault to serve as a pathway for downward movement of water or leachate?

6) Travel Time In the Request for Exemption document the percolation rate determined from HELP model runs is discussed as being equivalent in nature, and is compared in

magnitude, to hydraulic conductivity (p. 26). This rate is then used in time of travel calculations (p.27). These two "rates" are not equivalent despite apparently having the same units. Hydraulic conductivity is the proportionality constant (K) in the equation for Darcy's law. It is a function of the medium and the fluid flowing through it and includes the term for intrinsic permeability. It describes the ease with which a fluid can move through a medium under a hydraulic gradient. Hydraulic conductivity (like permeability), has units of velocity, commonly expressed as m/s, ft/s, or gal/day/ft<sup>2</sup>. However, it should be noted that although K appears to have dimensions of velocity, this is an artifact due to the cancellation of units. The true dimensions are cm<sup>3</sup>/cm<sup>2</sup> s (i.e. volume per unit area per unit time) (Goldman, et al., 1990, Clay Liners for Waste Management Facilities, p. 88).

The percolation rate determined from the HELP model is an amount of fluid generated or released from the lowermost layer of the landfill over a specified period of time, not the rate of movement of that liquid through soil. The time of travel calculations should use the hydraulic conductivity of the sediments through which the fluid is flowing, rather than the percolation rate obtained from the HELP model. (Ideally, the unsaturated hydraulic conductivity would be determined and used in this calculation.) The hydraulic conductivity value to be used in this calculation is three orders of magnitude larger than the percolation rate (based on the hydraulic conductivity values determined from test pit samples); this will have the effect of greatly decreasing the calculated travel times. If the percolation rate determined from the HELP model is accurate within even two orders of magnitude, this percolation rate is still probably one of the limiting factors in the potential for groundwater contamination.

7) Help Model - General If a shorter growing season causes less moisture to remain in the upper layers of a closed landfill (p.23), what is the fate of this moisture? Explain why annual evapotranspiration is higher at an open landfill with a shorter growing season (p.23). This effect seems contrary to what would be expected. At this location would a "poor" stand of grass after closure be more appropriate for computing the runoff curve number than a "fair" stand?



August 25, 1995

Tahoma Companies, Inc. WDBE  
444 S. Main Street  
Suite C-7  
Cedar City, Utah 84720

Dear Mr. Prevatte

In response to your letter dated August 23, 1995, you requested information, regarding if the following lands contained any national, state or county parks, monuments, or recreation area; wilderness (designated or study area), or wild and scenic river area.

T. 10 N., R. 3 W., SLM  
Sec. 18: W1\2

After checking the records on file at this office it was determined that these lands are privately owned and not under the Bureau of Land Management's jurisdiction. Nor are there any federal lands within one thousand feet of the above described land. If you have any further questions please feel free to call, Susan Bauman at (801)539-4001.

*Susan Bauman*



United States Department of the Interior

FISH AND WILDLIFE SERVICE

UTAH FIELD OFFICE  
LINCOLN PLAZA  
145 EAST 1300 SOUTH, SUITE 404  
SALT LAKE CITY, UTAH 84115

September 22, 1995

SEP 27 1995

Chad M. Prevatte  
Tahoma Companies, Incorporated WDBE  
444 S. Main Street, Suite C-7  
Cedar City, Utah 84720

Dear Mr. Prevatte:

In response to your letter of August 23, 1995 concerning the proposed establishment of a sanitary land fill in Section 18, T.10N., R.3W. SLB&M. in Box Elder County, Utah, the U.S. Fish and Wildlife Service advises that no federally listed threatened or endangered species are known to occur on the project site. If we can be of any further assistance please contact us.

Sincerely,

Robert D. Williams  
Assistant Field Supervisor

bcc: Official file  
Reading file

JLE/jm:9/22/95  
C:\wp51\Consult\EPA-001.ms  
file:EPA\informal\species list



United States  
Department of  
Agriculture

Natural Resources  
Conservation  
Service

P. O. Box 11350  
Salt Lake City, Utah 84147

November 9, 1995

Mr. Chad Prevatte  
Tahoma Companies, Inc.  
444 S. Main St. Suite C-7  
Cedar City, Utah 84720

Dear Mr. Prevatte:

This letter is to revise the Prime Farmland determination for Section 18, T10N, R3W near the top of Little Mountain.

Our response of October 31, 1995, indicated that there were 13 acres of Prime Farmland. Due to a lack of a dependable irrigation water supply, this should have been designated as Statewide Important Farmland. A revised Form AD-1106 is enclosed.

*Mike Domeier*

MIKE DOMEIER  
Soil Correlator

Enclosure

cc:  
Gary Player

# FARMLAND CONVERSION IMPACT RATING

PART I (To be completed by Federal Agency)		Date Of Land Evaluation Request	11/9/95
Name Of Project		Federal Agency Involved	
Proposed Land Use Landfill		County And State	Box Elder, Utah

PART II (To be completed by SCS)		Date Request Received By SCS	
Does the site contain prime, unique, statewide or local important farmland? (If no, the FPPA does not apply - do not complete additional parts of this form).		Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Major Crop(s) Dryland, hay, grain		Acres Irrigated 0	Average Farm Size 85
Farmable Land In Govt. Jurisdiction Acres: %		Amount Of Farmland As Defined In FPPA Acres: 368,000 %	
Name Of Land Evaluation System Used		Name Of Local Site Assessment System	
		Date Land Evaluation Returned By SCS	

PART III (To be completed by Federal Agency)	Alternative Site Rating			
	Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly				
B. Total Acres To Be Converted Indirectly				
C. Total Acres In Site				

PART IV (To be completed by SCS) Land Evaluation Information	
A. Total Acres Prime And Unique Farmland	0
B. Total Acres Statewide And Local Important Farmland	13
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted	00004
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value	25

PART V (To be completed by SCS) Land Evaluation Criterion  
Relative Value Of Farmland To Be Converted (Scale of 0 to 100 Points)

PART VI (To be completed by Federal Agency)		Maximum Points
Assessment Criteria (These criteria are explained in 7 CFR 658.5(b))		
1. Area In Nonurban Use		
2. Perimeter In Nonurban Use		
3. Percent Of Site Being Farmed		
4. Protection Provided By State And Local Government		
5. Distance From Urban Builtup Area		
6. Distance To Urban Support Services		
7. Size Of Present Farm Unit Compared To Average		
8. Creation Of Nonfarmable Farmland		
9. Availability Of Farm Support Services		
10. On-Farm Investments		
11. Effects Of Conversion On Farm Support Services		
12. Compatibility With Existing Agricultural Use		
<b>TOTAL SITE ASSESSMENT POINTS</b>	<b>160</b>	

PART VII (To be completed by Federal Agency)	
Relative Value Of Farmland (From Part V)	100
Total Site Assessment (From Part VI above or a local site assessment)	160
<b>TOTAL POINTS (Total of above 2 lines)</b>	<b>260</b>

Selected:	Date Of Selection:	Was A Local Site Assessment Used? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
-----------	--------------------	--

Reason For Selection:



United States  
Department of  
Agriculture

Natural Resources  
Conservation  
Service

P. O. Box 11350  
Salt Lake City, Utah 84147

December 29, 1995

Mr. Chad M. Prevatte  
Tahoma Companies Inc.  
444 S Main St. Suite C-7  
Cedar City, Utah 84720

Dear Mr. Prevatte:

Enclosed are three copies of the soil survey map for the proposed Little Mountain Landfill. On one of the copies I have worked the KeB unit (Kearns silt loam, 1 to 3 percent slopes) which is the Important Farmland units in or near the project site.

If you have any questions, please call me at 524-5064.

*Mike Domeier*

MIKE DOMEIER  
Soil Correlator

Enclosure

# FARMLAND CONVERSION IMPACT RATING

PART I (To be completed by Federal Agency)		Date Of Land Evaluation Request	
Name Of Project		11/9/95	
Proposed Land Use Box Elder County Landfill		Federal Agency Involved	
Landfill		County And State	
PART II (To be completed by SCS)		Date Request Received By SCS	
Box Elder, Utah			

Does the site contain prime, unique, statewide or local important farmland? (If no, the FPPA does not apply - do not complete additional parts of this form).		Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Acres Irrigated	Average Farm Size
				0	85
Major Crop(s)	Farmable Land In Govt. Jurisdiction	Amount Of Farmland As Defined in FPPA			
Dryland, hay, grain	Acres: %	Acres: 368,000 %			
Name Of Land Evaluation System Used	Name Of Local Site Assessment System	Date Land Evaluation Returned By SCS			

PART III (To be completed by Federal Agency)	Alternative Site Rating			
	Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly				
B. Total Acres To Be Converted Indirectly				
C. Total Acres In Site				

PART IV (To be completed by SCS) Land Evaluation Information	
A. Total Acres Prime And Unique Farmland	0
B. Total Acres Statewide And Local Important Farmland	13
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted	00004
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value	25

PART V (To be completed by SCS) Land Evaluation Criterion  
Relative Value Of Farmland To Be Converted (Scale of 0 to 100 Points)

PART VI (To be completed by Federal Agency)	Maximum Points			
Assessment Criteria (These criteria are defined in 7 CFR 658.41)				
1. Area In Nonurban Use				
2. Perimeter In Nonurban Use				
3. Percent Of Site Being Farmed				
4. Protection Provided By State And Local Government				
5. Distance From Urban Builtup Area				
6. Distance To Urban Support Services				
7. Size Of Present Farm Unit Compared To Average				
8. Creation Of Nonfarmable Farmland				
9. Availability Of Farm Support Services				
10. On-Farm Investments				
11. Effects Of Conversion On Farm Support Services				
12. Compatibility With Existing Agricultural Use				
<b>TOTAL SITE ASSESSMENT POINTS</b>	<b>160</b>			

PART VII (To be completed by Federal Agency)	
Relative Value Of Farmland (From Part V)	100
Total Site Assessment (From Part VI above or a local site assessment)	160
<b>TOTAL POINTS (Total of above 2 lines)</b>	<b>260</b>

Site Selected:	Date Of Selection:	Was A Local Site Assessment Used?
		Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>

Reason For Selection:



January 18, 1996

Mr. Phil Burns  
Environmental Scientist  
Utah Division of Solid and Hazardous Waste  
288 North 1460 West  
Salt Lake City, Utah 84114-4880

Dear Phil:

Thank you for meeting with our Consultant, Tahoma Companies, Inc. yesterday. It is great to know that our preliminary plans for the Box Elder County landfill are progressing in a manner that will be acceptable to your agency.

We have completed our analysis of the location standards for the Upper Little Mountain site. Mr. Mike Domeier of the Natural Resources Conservation Service (NRCS) identified 13 acres of Important Farmland in two small areas at the northwestern and southeastern edges of the site. This represents 0.00004 percent of the farmland in Box Elder County.

The Important Farmland consists of Kearns silt loam with slopes ranging from 1 to 3 percent. According to the NRCS, approximately twenty five (25) percent of the farmland in Box Elder County has the same or higher relative value.

Box Elder County proposes to refrain from developing the approximately 5 acre patch of Kearns silt loam that occurs at the southeastern edge of the landfill site. The area will be available for use as dry land pasture or for hay production.

Approximately six acres of Kearns silt loam occur at the northwest corner of the landfill site. Box Elder County proposes to dispose of municipal waste on about two acres of the Kearns silt loam. The remainder (approximately four acres) will be utilized for a retention basin to control run-off from within the landfill.

The Box Elder County Commissioners believe that landfill construction is the best way to use this land. The land is too inaccessible and scattered to add significant economic resources to County agriculture.

Page 2

Please approve our decision to utilize this small area of Important Farmland for construction of the new Box Elder County Landfill.

Sincerely,

Jay E. Hardy  
Box Elder County Commissioner

Enclosures:

- 1) Map of soil types at Upper Little Mountain, Box Elder County
- 2) USDA Farmland Conversion Impact Rating
- 3) Correspondence from NRCS, 11/9/95
- 4) Correspondence from NRCS, 12/29/95



# State of Utah

DEPARTMENT OF ENVIRONMENTAL QUALITY  
DIVISION OF SOLID AND HAZARDOUS WASTE

Michael O. Leavitt  
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Dianne R. Nielson, Ph.D.  
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Salt Lake City, Utah 84114-4880  
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(801) 536-4414 T.D.D.

January 29, 1996

FEB 01 1996

Jay E. Hardy  
Box Elder County Commissioner  
01 South Main St.  
Brigham City, Utah 84302

Dear Commissioner Hardy:

Enclosed is our review of the Request for Exemption From Liner, Leachate Control, and Ground Water Monitoring at the proposed Upper Little Mountain landfill site submitted to the Division of Solid and Hazardous Waste on November 29, 1995. The issues presented in this review were discussed with Gary Player of Tahoma Companies at our January 17, 1996 meeting. In general, the proposed site appears suitable for an exemption from the liner, leachate collection, and ground water monitoring requirements provided that the questions raised in this review are satisfactorily answered and that the design and operations plan in the full permit application are adequate.

We have also received Box Elder County's request for the location standard exemption for the six acres of farmland of "statewide importance" at the northwest corner of the site. We have no objection to this exemption, and the request will be included in the public notice and public comment period on the full permit application.

If you have questions regarding permitting procedures, please call me or Phil Burns at 538-6170.

Sincerely,

Ralph T. Bohn, Manager  
Solid Waste Section

enclosure

c: John C. Bailey, Director, Bear River Health Department  
Gary Player, Tahoma Resources - with enclosure

f:...pburns/wp/box2/revlet  
file to: Box Elder County, Upper Little Mountain Correspondence



**interoffice**  
M E M O R A N D U M

---

to: File  
from: Gary Farnsworth Player  
subject: Reconnaissance of Man-Made Structures, Box Elder County Landfill Site, Upper Little Mountain  
date: August 4, 1995

I was on location for the last week at the Upper Little Mountain landfill site to conduct geotechnical studies. We dug several test pits and a test boring to 300 feet.

While at the site I took the opportunity to look around for structures. I observed that there are no structures other than livestock fences within a one-mile radius circle centered on the west quarter corner of section 18, T. 10 N., R. 3 W., Salt Lake BL&M.

There are, in fact, no structures within sections 7, 17, 18, 19 and 20 of T. 10 N., R. 3 W., or within sections 12, 13 and 24 of T. 10 N., R. 4 W.

The closest structures to the proposed landfill are in the southwest quarter of section 8, T. 10 N., R. 3 W. These structures are farm buildings on the Bear River Valley floor, approximately 5,700 feet northeast of the northeast corner of the landfill.

*Gary F. Player*



# State of Utah

Department of Community & Economic Development  
Division of State History  
Utah State Historical Society



Michael O. Leavitt  
Governor  
Max J. Evans  
Director

300 Rio Grande  
Salt Lake City, Utah 84101-1182  
(801) 533-3500 • FAX: 533-3503 • TDD: 533-3502  
cehistory.ushs@email.state.ut.us

September 6, 1995

Chad M. Prevatte  
Environmental Scientist  
Tahoma Companies, Incorporated WDBE  
444 South Main Street, Suite C-7  
Cedar City, Utah 84720

RE: Box Elder's Landfill - T10N, R3W, Section 18

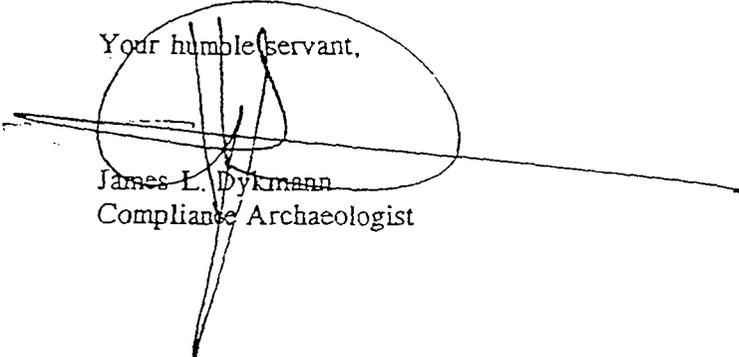
In Reply Please Refer to Case No. 95-1120

Dear Mr. Prevatte:

The Utah State Historical Preservation Office received the above referenced cultural resources report on August 25, 1995. After review of the material provided, the Utah Preservation Office recommends that there would be No Effect upon cultural resources by the project.

This information is provided on request to assist with Section 106 responsibilities as specified in 36CFR800. If you have questions, please contact me at (801) 533-3555.

Your humble servant,

  
James L. Dykmann  
Compliance Archaeologist

JLD:95-1120 OR/NE

TAHOMA COMPANIES, INC.  
444 SOUTH MAIN STREET, SUITE C-7  
CEDAR CITY, UT 84720  
(801) 865-0131 FAX 865-0161

October 12, 1995

Scott Fredrickson  
FAA  
Airports District Office  
Suite 300  
5440 Roslyn  
Denver, CO 80216

Dear Mr. Fredrickson:

I have received your message concerning the location standards for Box Elder County. I am pleased to see that you found Box Elder's landfill site, West ½ of Section 18, Township 10 North, Range 3 West, to be 8.15 nautical miles bearing 108.27 from Brigham City Municipal Airport. This distance is greater than the ten thousand feet required for turbojet aircraft and greater than the 5 miles required before a landfill must notify the affected airport.

It was a pleasure to get such efficient service. Thank you very much.

Sincerely,



Chad M. Prevatte  
Environmental Scientist

TAHOMA COMPANIES, INC.  
444 SOUTH MAIN STREET, SUITE C-7  
CEDAR CITY, UT 84720  
(801) 865-0131 FAX 865-0161

October 13, 1995

Denton Beecher  
Zoning Administrator  
County Surveyors  
01 S. Main  
Brigham City, UT 84302

**SUBJECT: ZONING AT PROPOSED LANDFILL SITE**

Dear Mr. Beecher:

I spoke with you on Thursday October 12 about the Box Elder County's Little Mountain site (W  $\frac{1}{4}$  of Section 18, T 10 N, Range 3 West) zoning requirements. You informed me that the area is unzoned and therefore available for use as the county's future landfill.

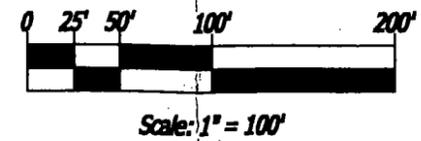
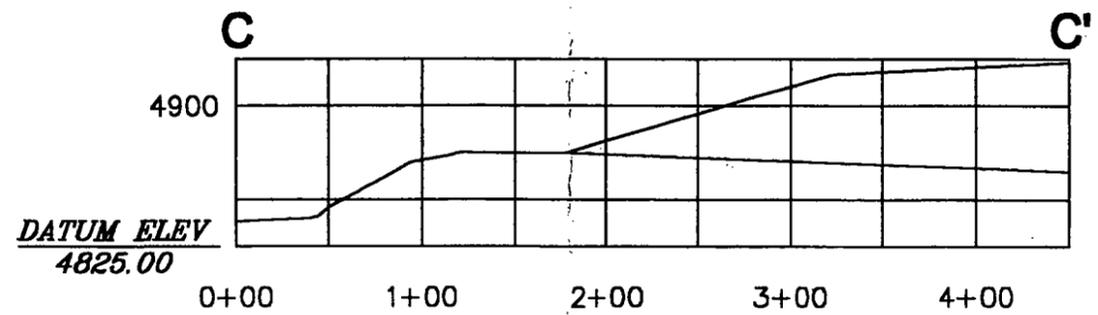
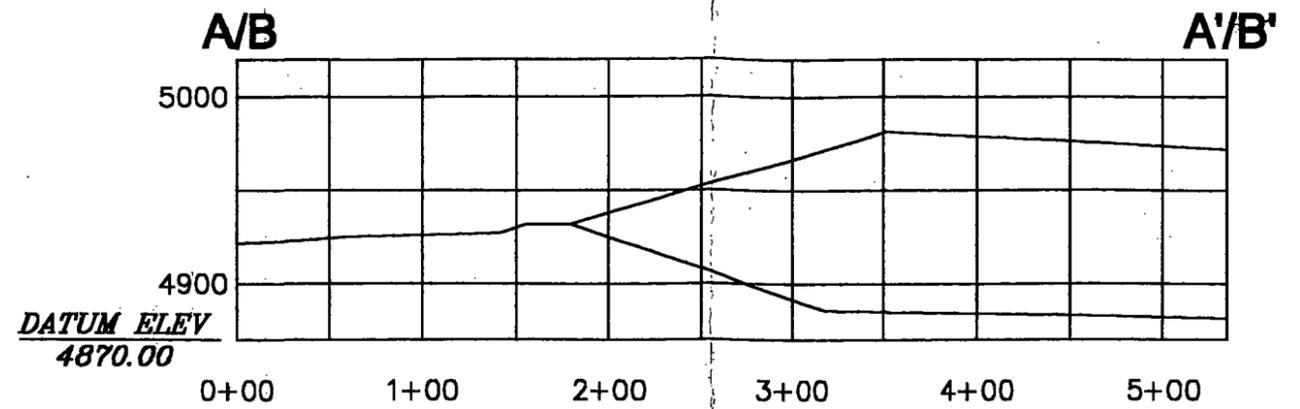
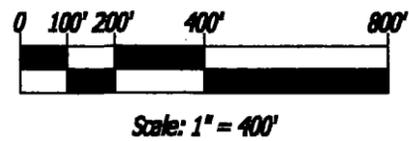
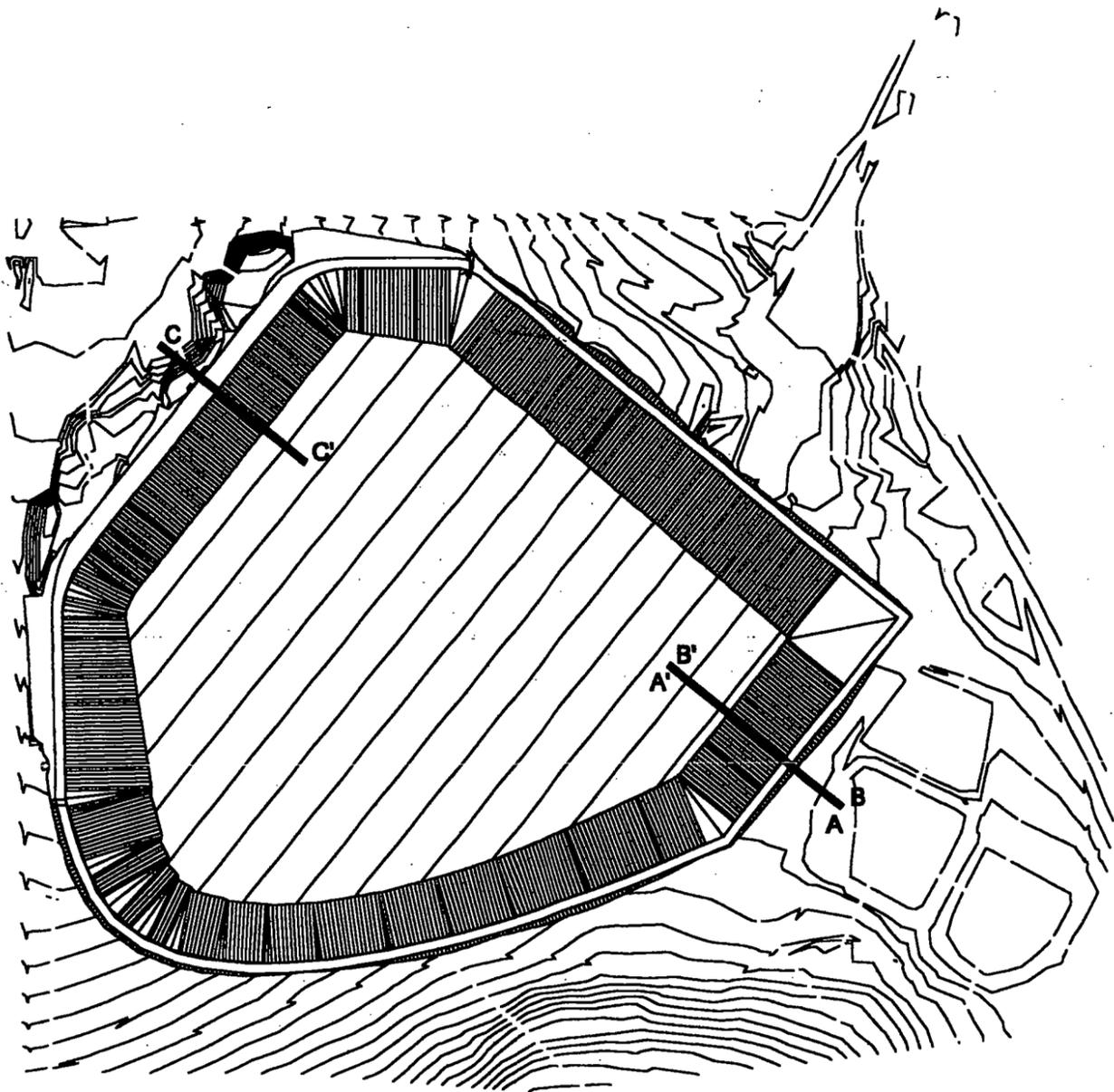
Thank you very much for the information.

Sincerely,



Chad M. Prevatte  
Environmental Scientist

APPENDIX I



**SITE GROUND MOTION (IBC SECTION 1615)**

Project: **Box Elder Landfill**  
 Latitude = **41.6**  
 Longitude = **-112.2314**

Number: **00167-008**  
 Date: **11/30/06**  
 By: **jah**

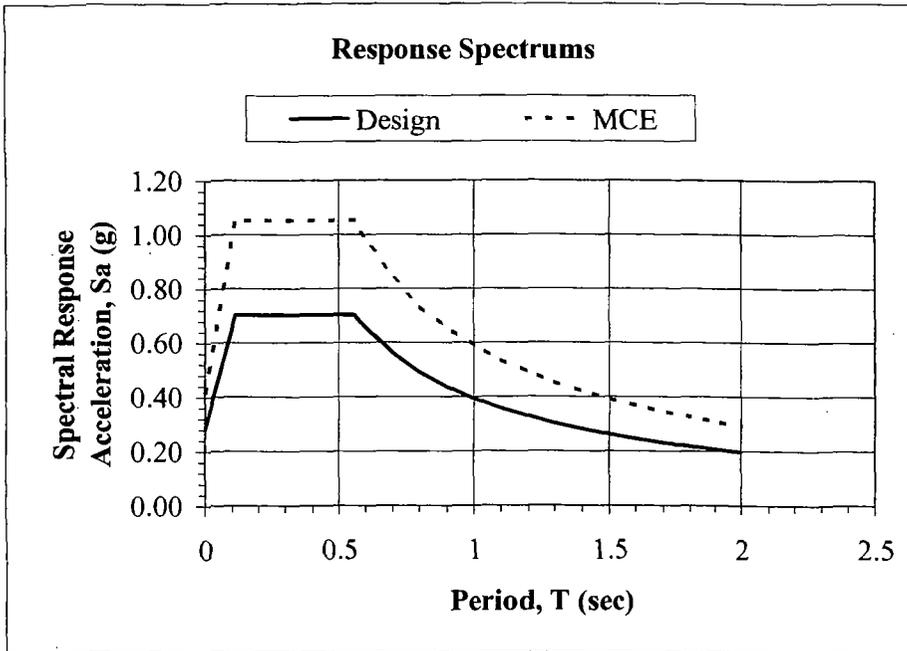
$S_s = 0.936$  (g) The mapped spectral acceleration for short periods [1615.1]  
 $S_1 = 0.344$  (g) The mapped spectral acceleration for a 1-second period

Site Class = **D** Table 16.15.1.1  
 $F_a = 1.13$  Table 1615.1.2(1)  
 $F_v = 1.71$  Table 1615.1.2(2)

$S_{MS} = 1.054$   $S_{MS} = F_a * S_s$  \*The maximum considered E.Q. spectral response accelerations  
 $S_{M1} = 0.589$   $S_{M1} = F_v * S_1$  for short and 1-second periods [1615.1.2]  
**MCE/PGA = 0.421**  **$0.4 * S_{MS}$  [Equation 16-42 in accordance with 1802.2.7 and 1615.2.1]**

$S_{DS} = 0.702$   $S_{DS} = 2/3 * S_{MS}$  \*The design spectral response acceleration  
 $S_{D1} = 0.393$   $S_{D1} = 2/3 * S_{M1}$  at short and 1-second periods

$T_0 = 0.112$   $T_0 = 0.2 * S_{D1} / S_{DS}$   
 $T_s = 0.559$   $T_s = S_{D1} / S_{DS}$   
 $\Delta T = 0.1$  Time step for diagram



T (sec)	Sa (g)	Sa (MCE) (g)
0	0.28	0.42
0.11	0.70	1.05
0.56	0.70	1.05
0.60	0.65	0.98
0.70	0.56	0.84
0.80	0.49	0.74
0.90	0.44	0.65
1.00	0.39	0.59
1.10	0.36	0.54
1.20	0.33	0.49
1.30	0.30	0.45
1.40	0.28	0.42
1.50	0.26	0.39
1.60	0.25	0.37
1.70	0.23	0.35
1.80	0.22	0.33
1.90	0.21	0.31
2.00	0.20	0.29

Latitude = 41.6

Longitude = -112.2314

MCE Response Spectra for Site Class B

Ss and S1 = Mapped Spectral Acceleration Values

Site Class B - Fa = 1.0 ,Fv = 1.0

Period (sec)	Sa (g)	Sd (inches)
0.000	0.374	0.000
0.074	0.936	0.049
0.200	0.936	0.366
0.368	0.936	1.237
0.400	0.860	1.345
0.500	0.688	1.681
0.600	0.574	2.018
0.700	0.492	2.354
0.800	0.430	2.690
0.900	0.382	3.026
1.000	0.344	3.363
1.100	0.313	3.699
1.200	0.287	4.035
1.300	0.265	4.371
1.400	0.246	4.708
1.500	0.229	5.044
1.600	0.215	5.380
1.700	0.202	5.716
1.800	0.191	6.053
1.900	0.181	6.389
2.000	0.172	6.725

Conterminous 48 States

2003 NEHRP Seismic Design Provisions

Latitude = 41.6

Longitude = -112.2314

Site Modified Response Spectra for Site Class Site Class D

SMs = FaSs and SM1 = FvS1

Site Class D - Fa = 1.126 ,Fv = 1.712

Period (sec)	Sa (g)	Sd (inches)
0.000	0.421	0.000
0.112	1.054	0.129
0.200	1.054	0.412

0.600	0.982	3.454
0.700	0.842	4.030
0.800	0.737	4.605
0.900	0.655	5.181
1.000	0.589	5.757
1.100	0.536	6.332
1.200	0.491	6.908
1.300	0.453	7.484
1.400	0.421	8.059
1.500	0.393	8.635
1.600	0.368	9.211
1.700	0.347	9.786
1.800	0.327	10.362
1.900	0.310	10.938
2.000	0.295	11.513

Conterminous 48 States  
2003 NEHRP Seismic Design Provisions  
Latitude = 41.6  
Longitude = -112.2314  
Spectral Response Accelerations Ss and S1  
Ss and S1 = Mapped Spectral Acceleration Values  
Site Class B - Fa = 1.0 ,Fv = 1.0  
Data are based on a 0.05 deg grid spacing

Period	Sa
(sec)	(g)
0.2	0.936 Ss, Site Class B
1.0	0.344 S1, Site Class B

Conterminous 48 States  
2003 NEHRP Seismic Design Provisions  
Latitude = 41.6  
Longitude = -112.2314  
Spectral Response Accelerations SMs and SM1  
SMs = FaSs and SM1 = FvS1  
Site Class D - Fa = 1.126 ,Fv = 1.712

Period	Sa
(sec)	(g)
0.2	1.054 SMs, Site Class D
1.0	0.589 SM1, Site Class D

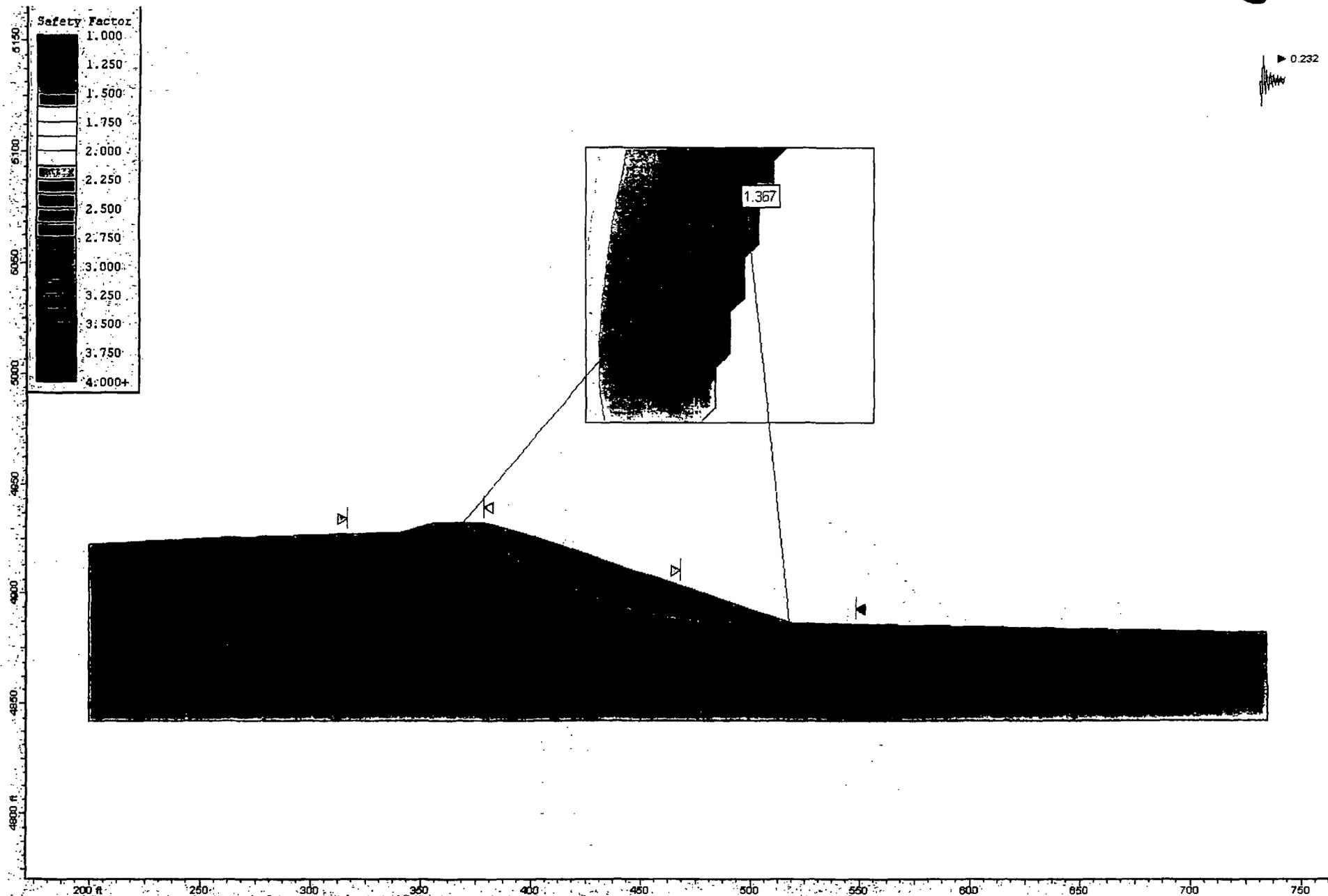
Conterminous 48 States  
2003 NEHRP Seismic Design Provisions  
Latitude = 41.6  
Longitude = -112.2314  
SDs = 2/3 x SMs and SD1 = 2/3 x SM1  
Site Class D - Fa = 1.126 ,Fv = 1.712

Period	Sa
(sec)	(g)
0.2	0.702 SDs, Site Class D
1.0	0.393 SD1, Site Class D

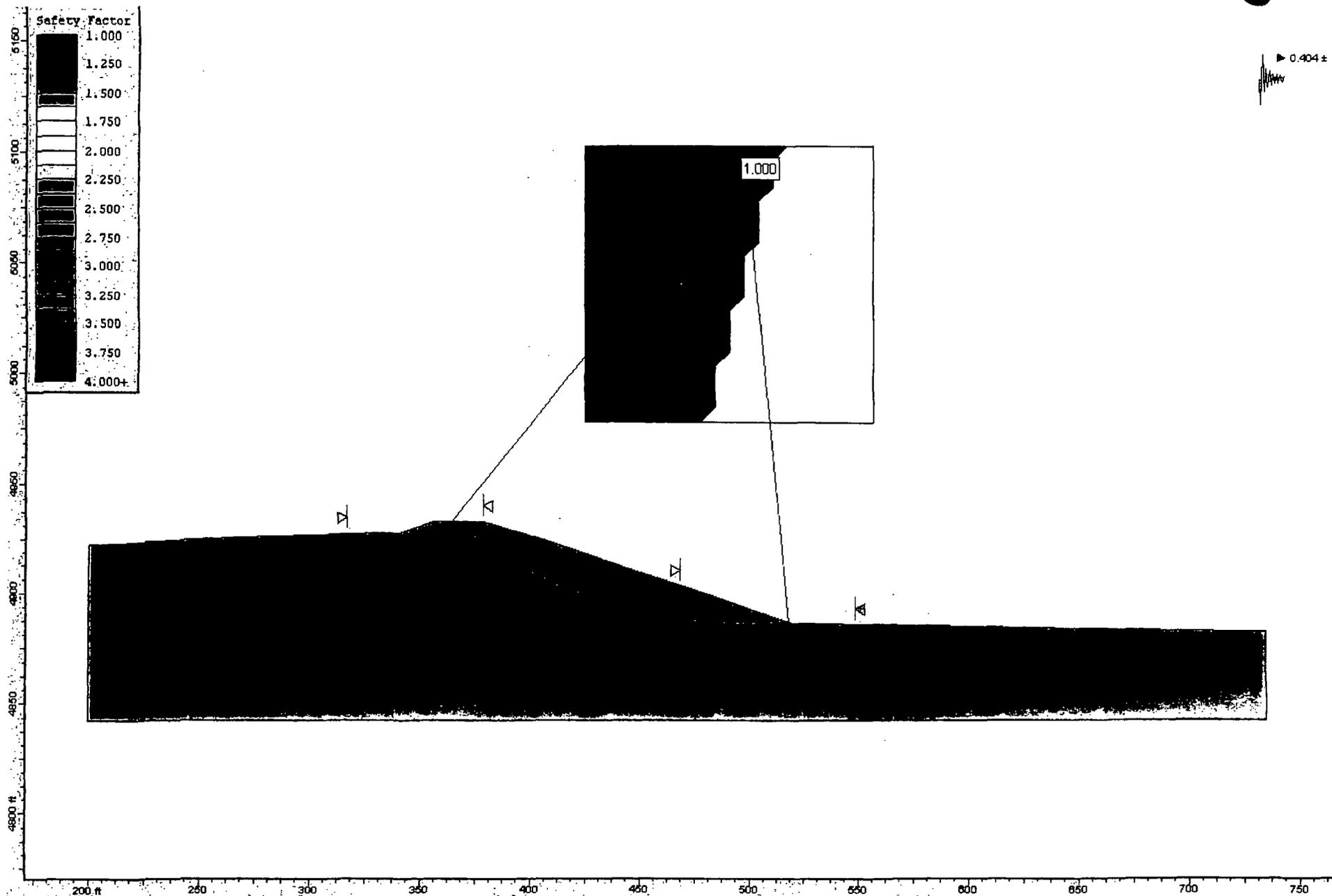
Conterminous 48 States



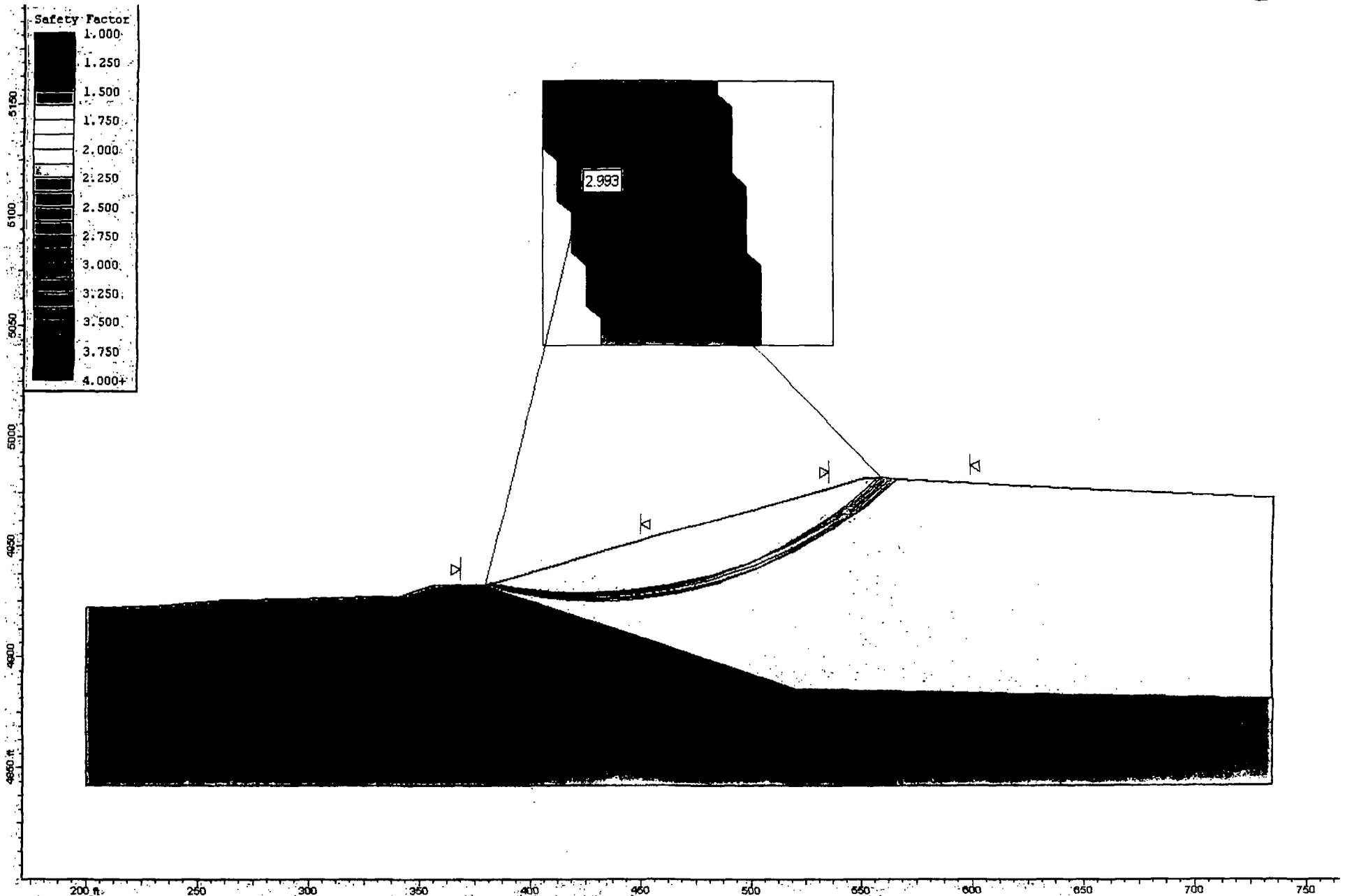
Section A-A - Excavation (Static) FS Min=2.47



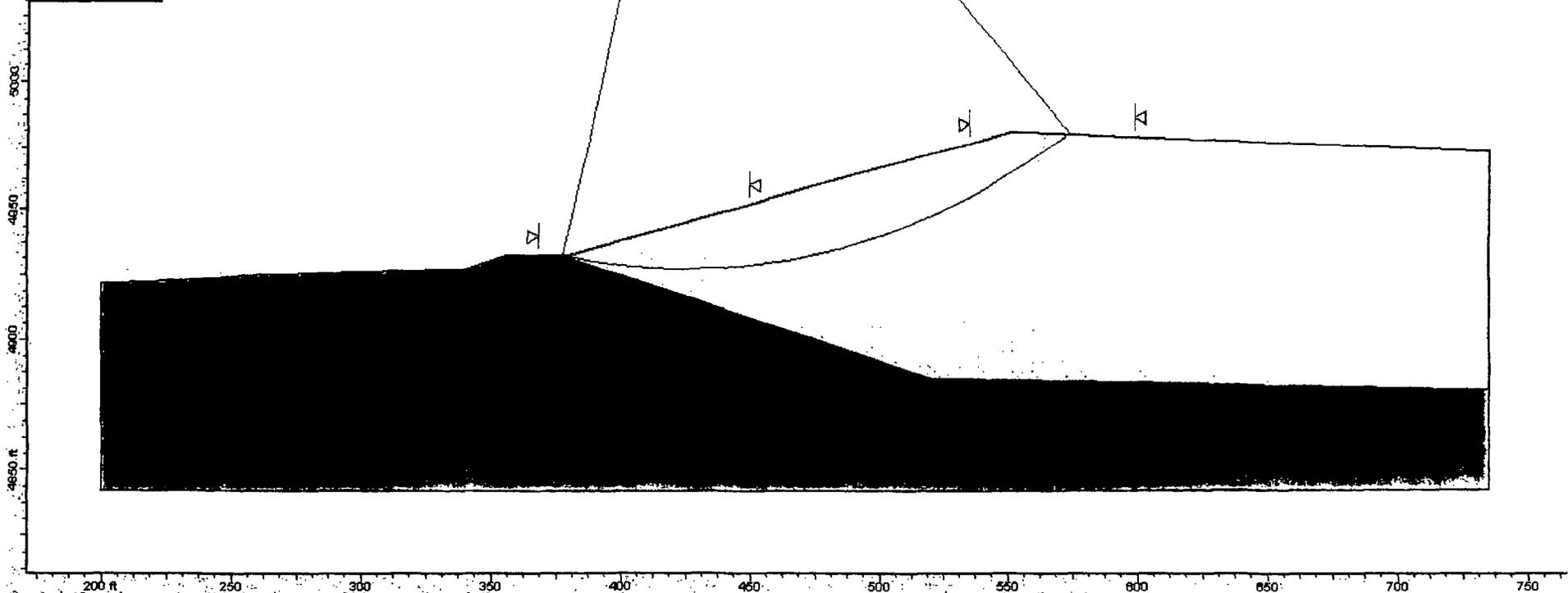
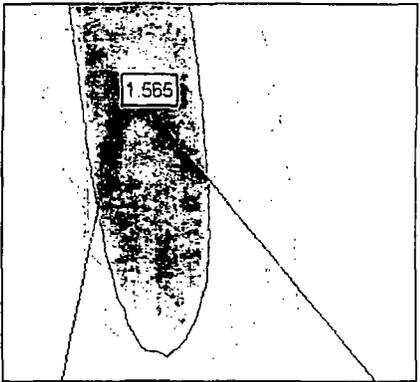
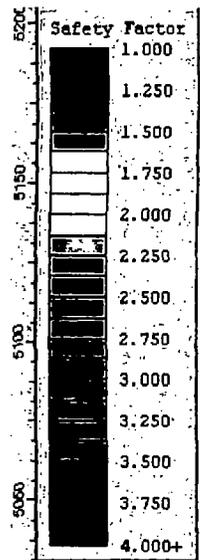
Section A-A - Excavation (Pseudo-static) FS Min=1.37



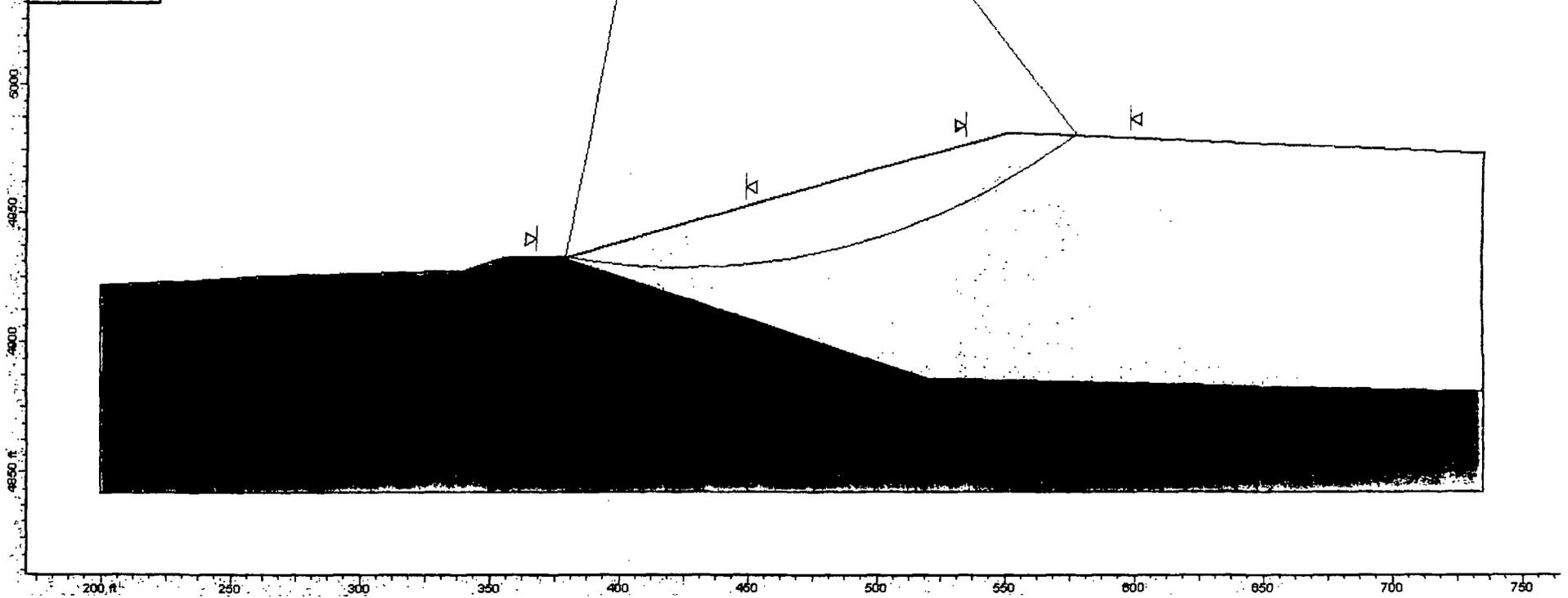
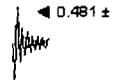
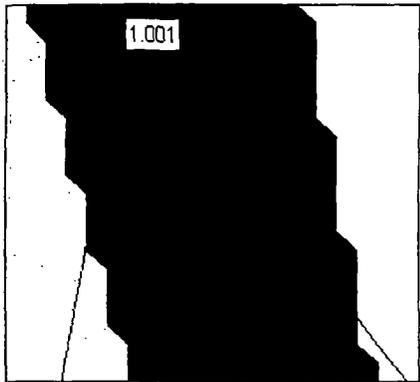
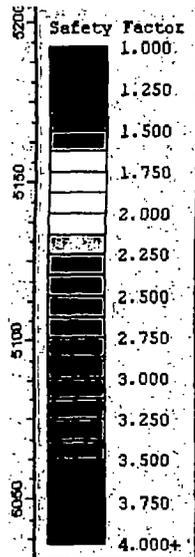
Section A-A - Excavation (Yield Acceleration)  $k_y=0.3956$



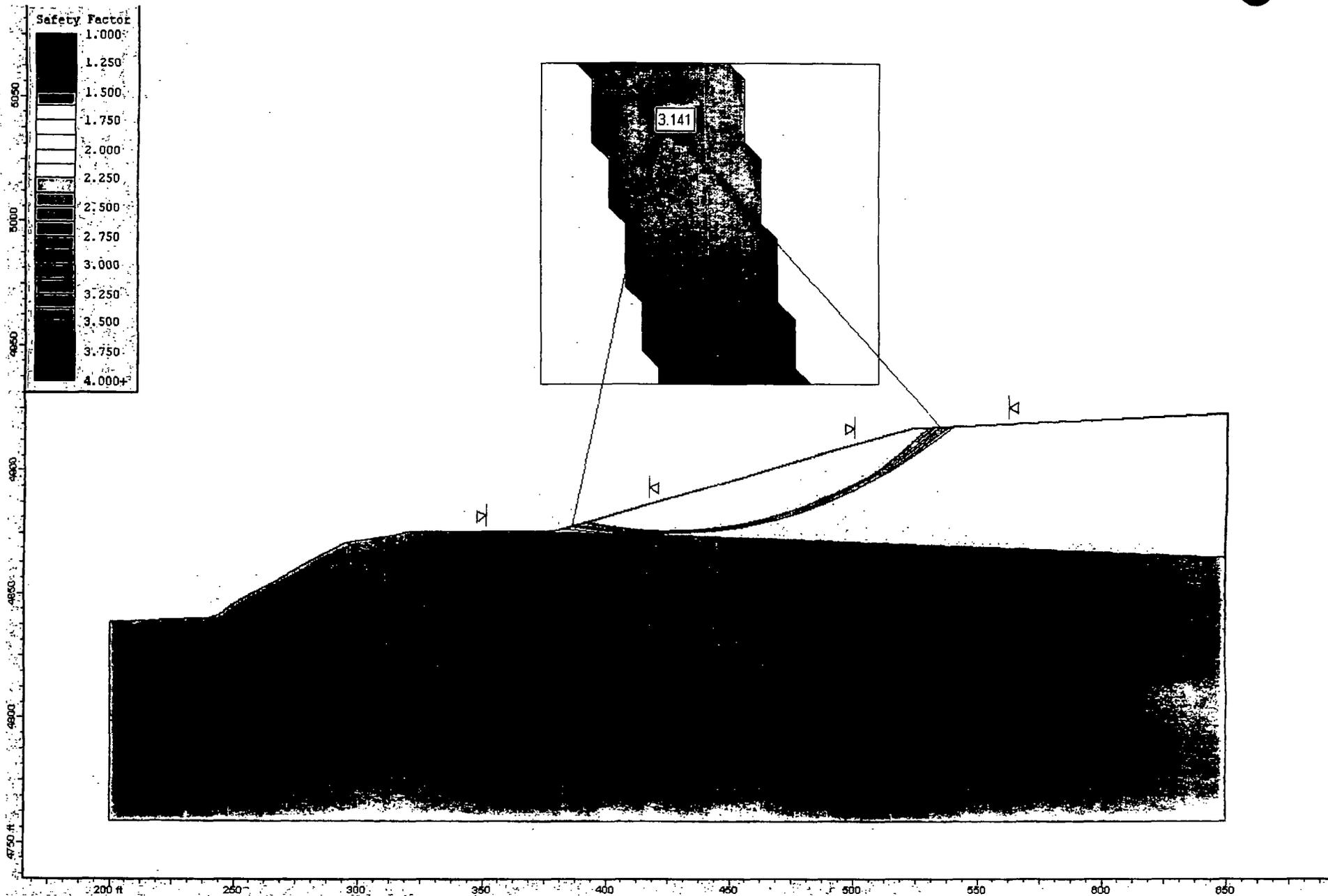
Section B-B – Final Cover (Static) FS Min=2.99



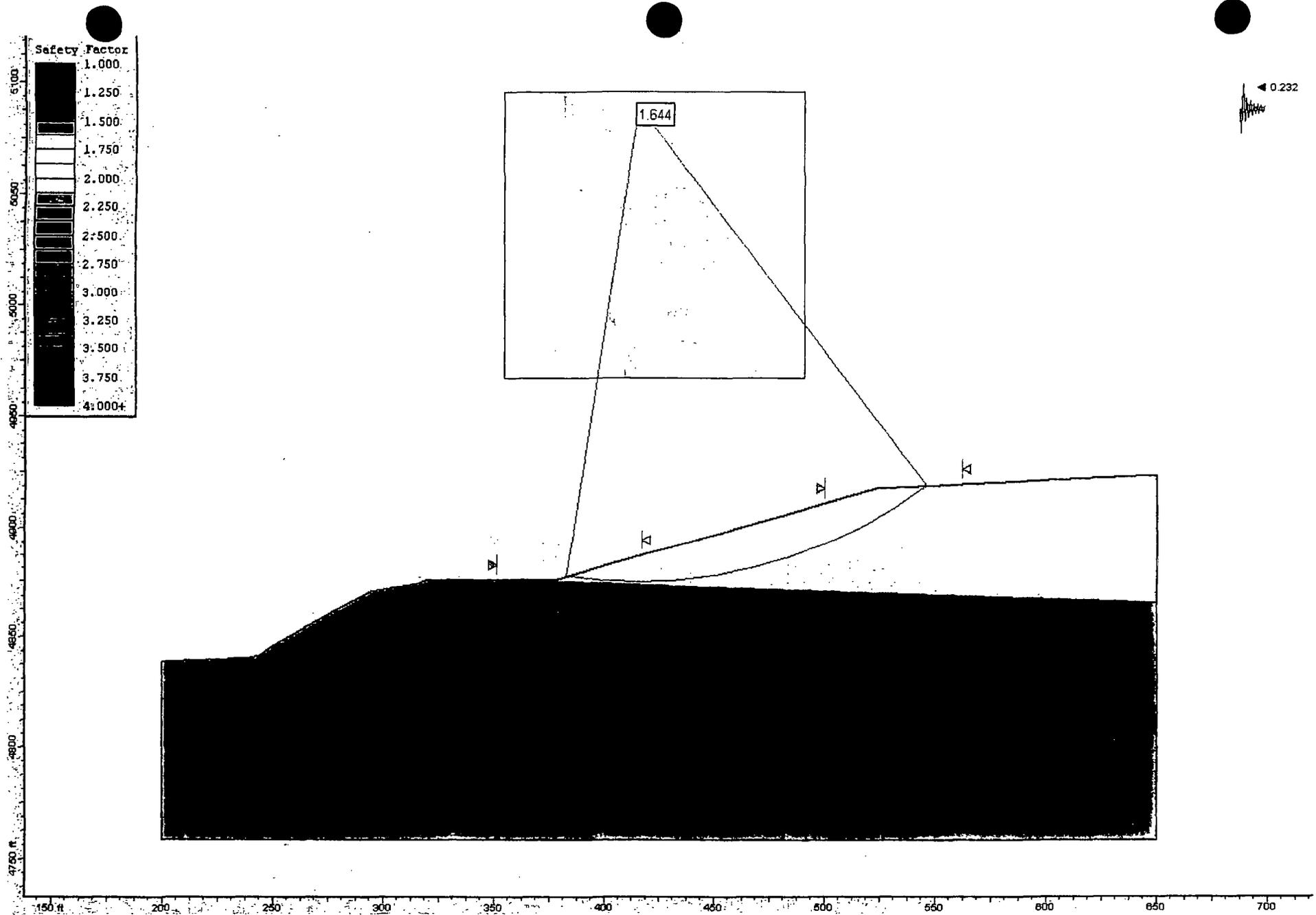
Section B-B – Final Cover (Pseudo-static) FS Min=1.57



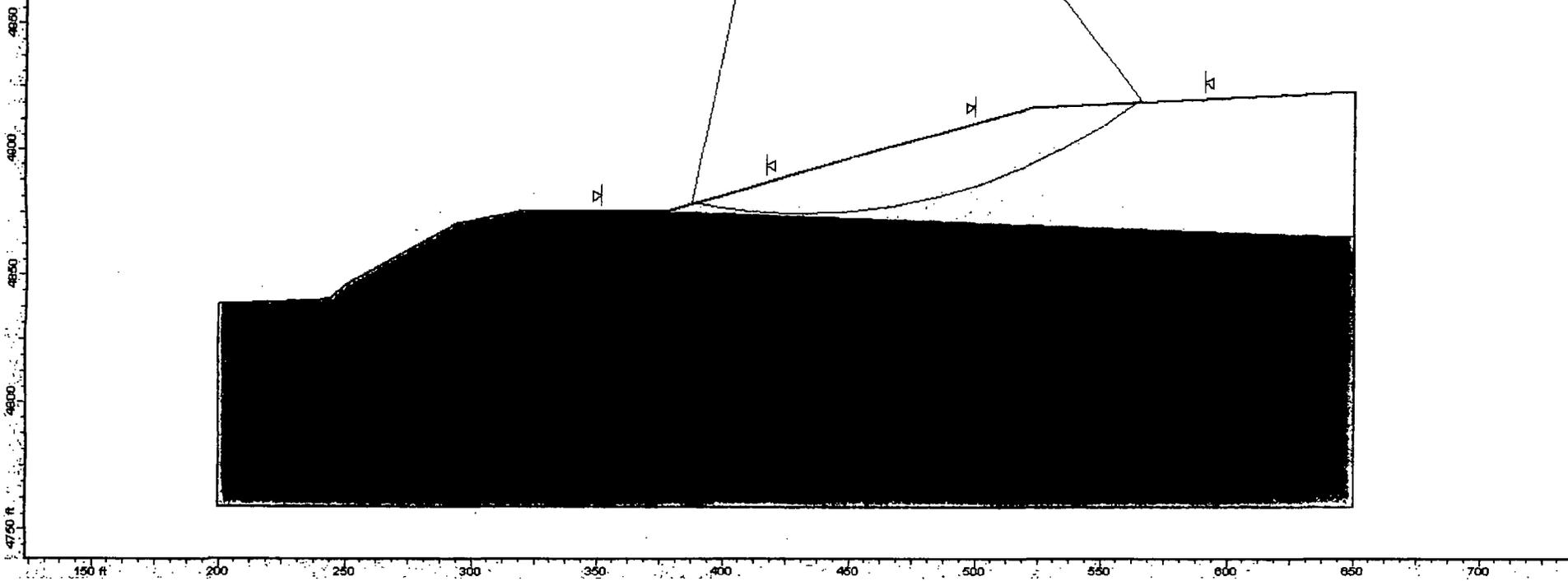
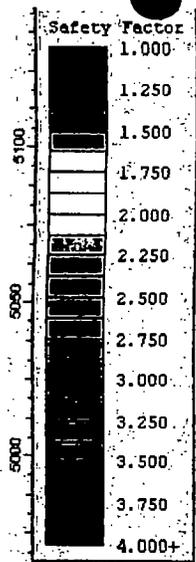
Section B-B - Final Cover (Yield Acceleration)  $k_y=0.481$



Section C-C – Final Cover (Static) FS Min=3.141

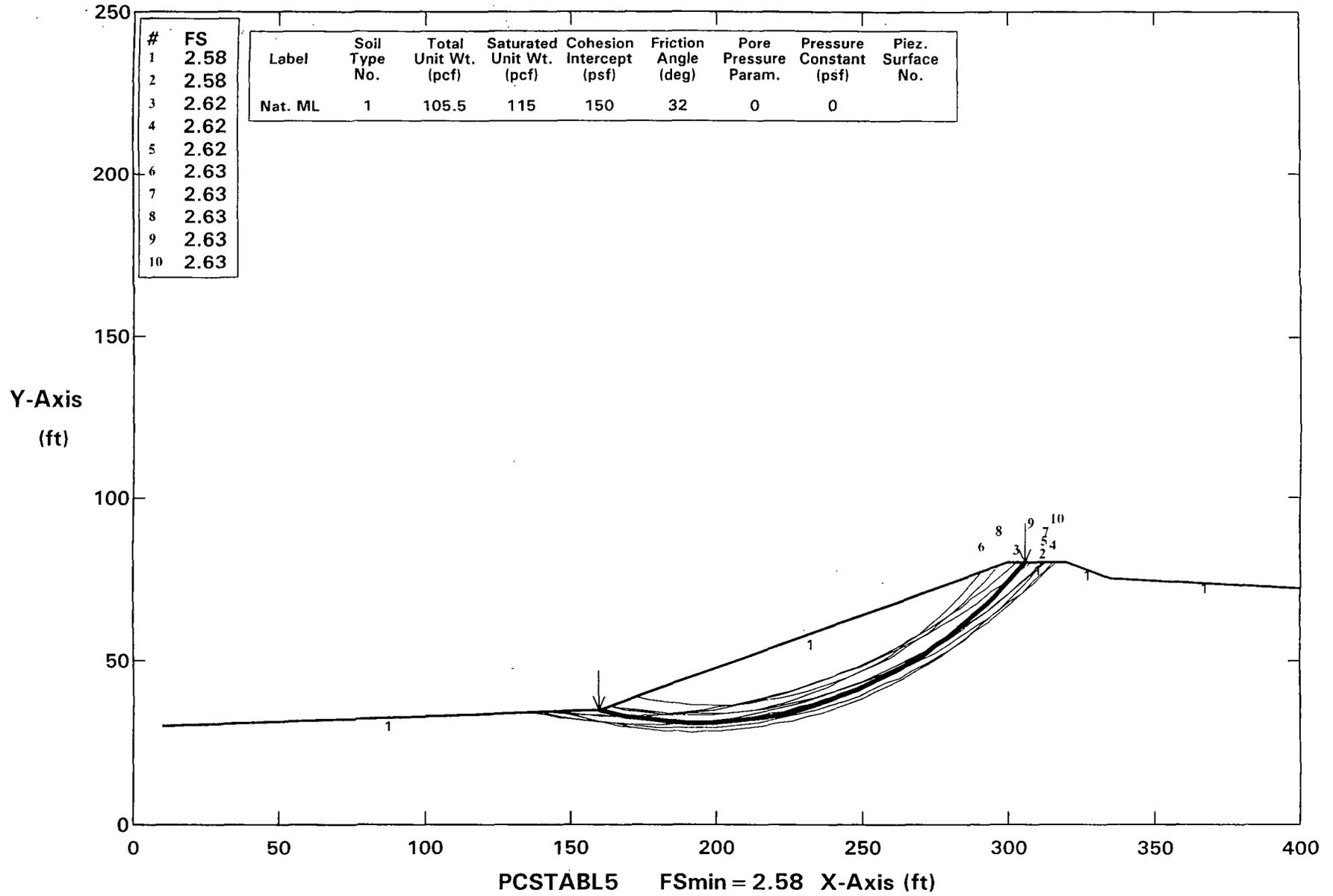


Section C-C – Final Cover (Pseudo-static) FS Min=1.644



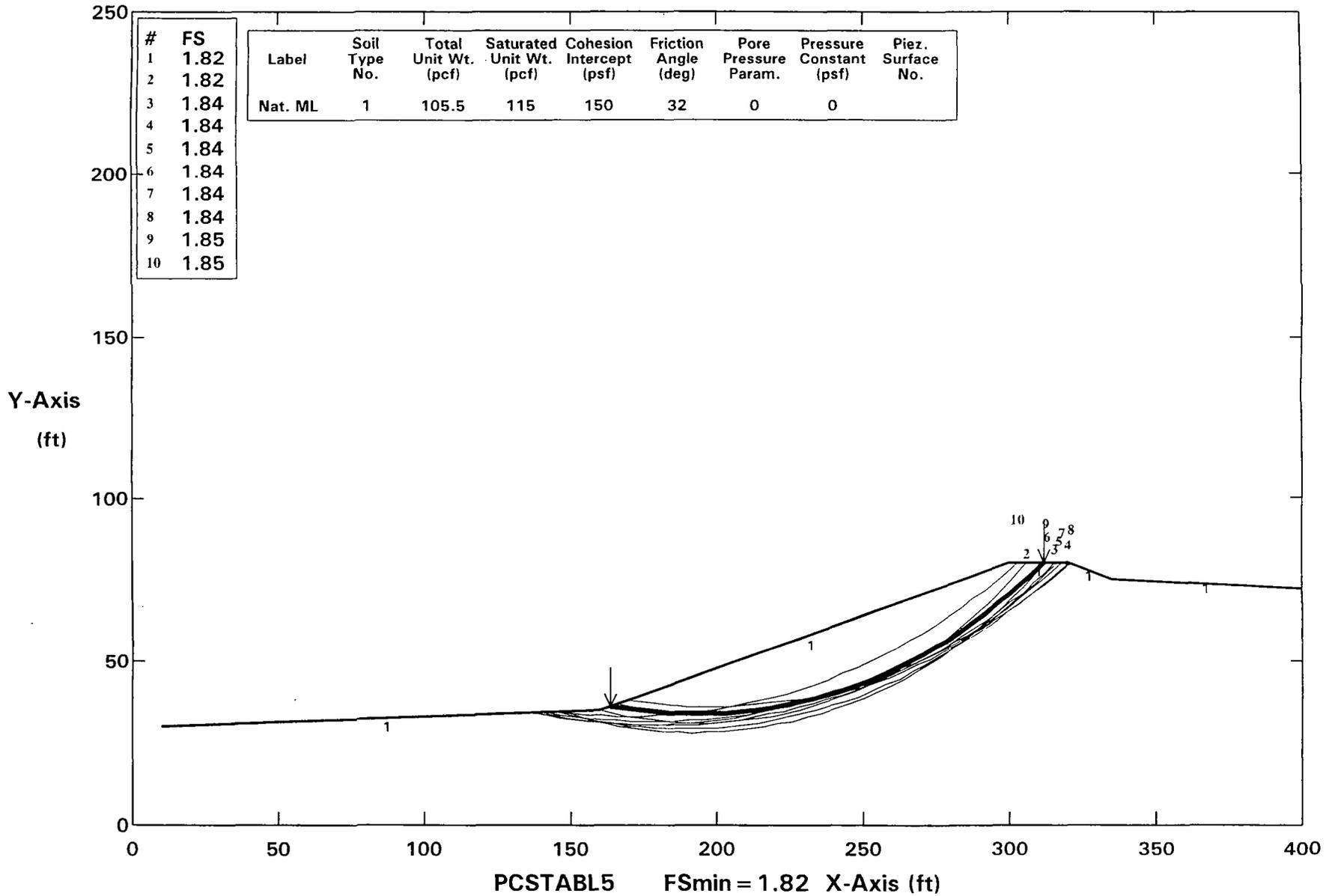
Section C-C – Final Cover (Yield Acceleration)  $k_y=0.5119$

**BOX ELDER COUNTY LANDFILL - Section A, Static**  
**Ten Most Critical. A:BXA.PLT**

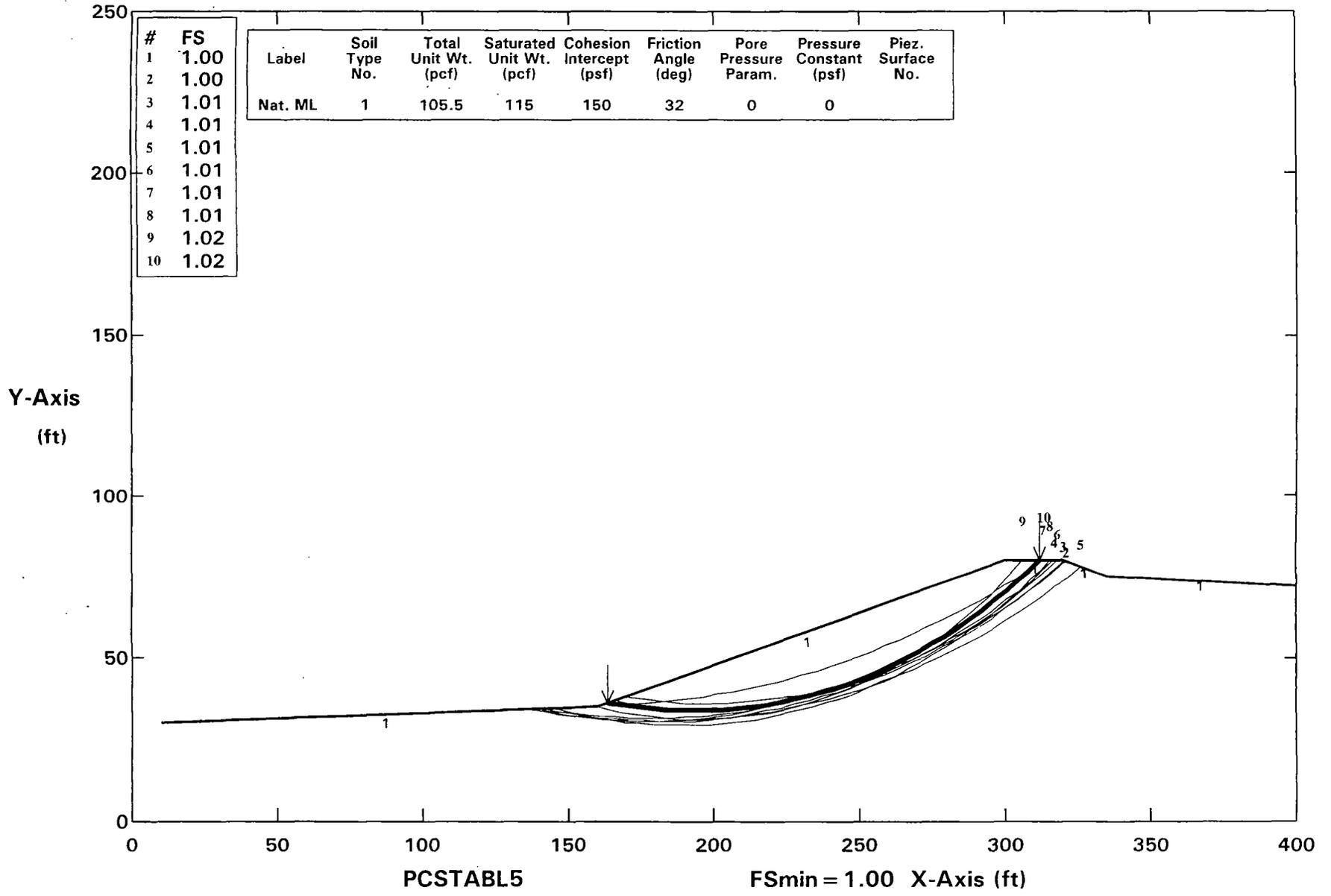


# BOX ELDER COUNTY LANDFILL - Section A, Pseudo-static

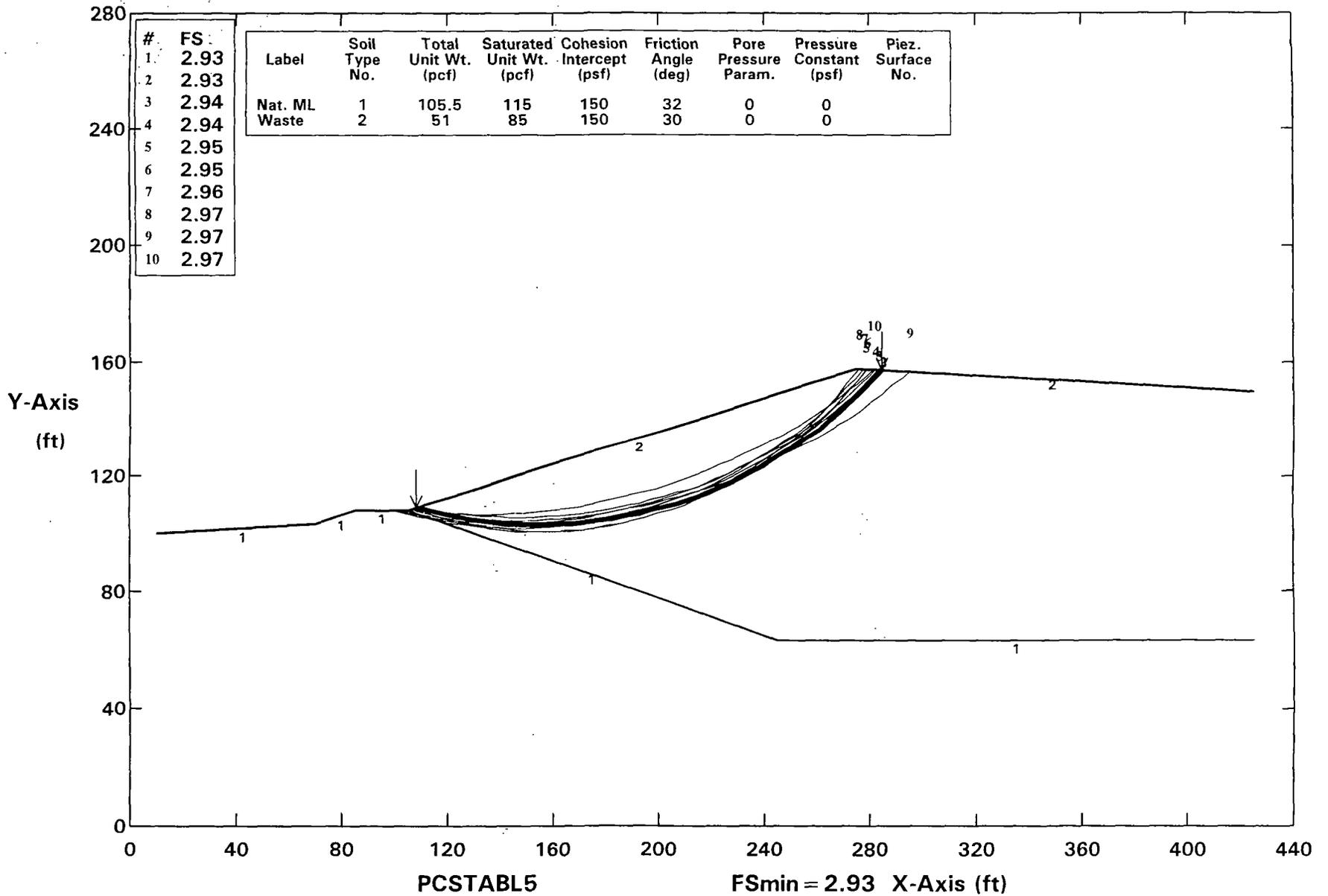
Ten Most Critical. A:BXAS.PLT



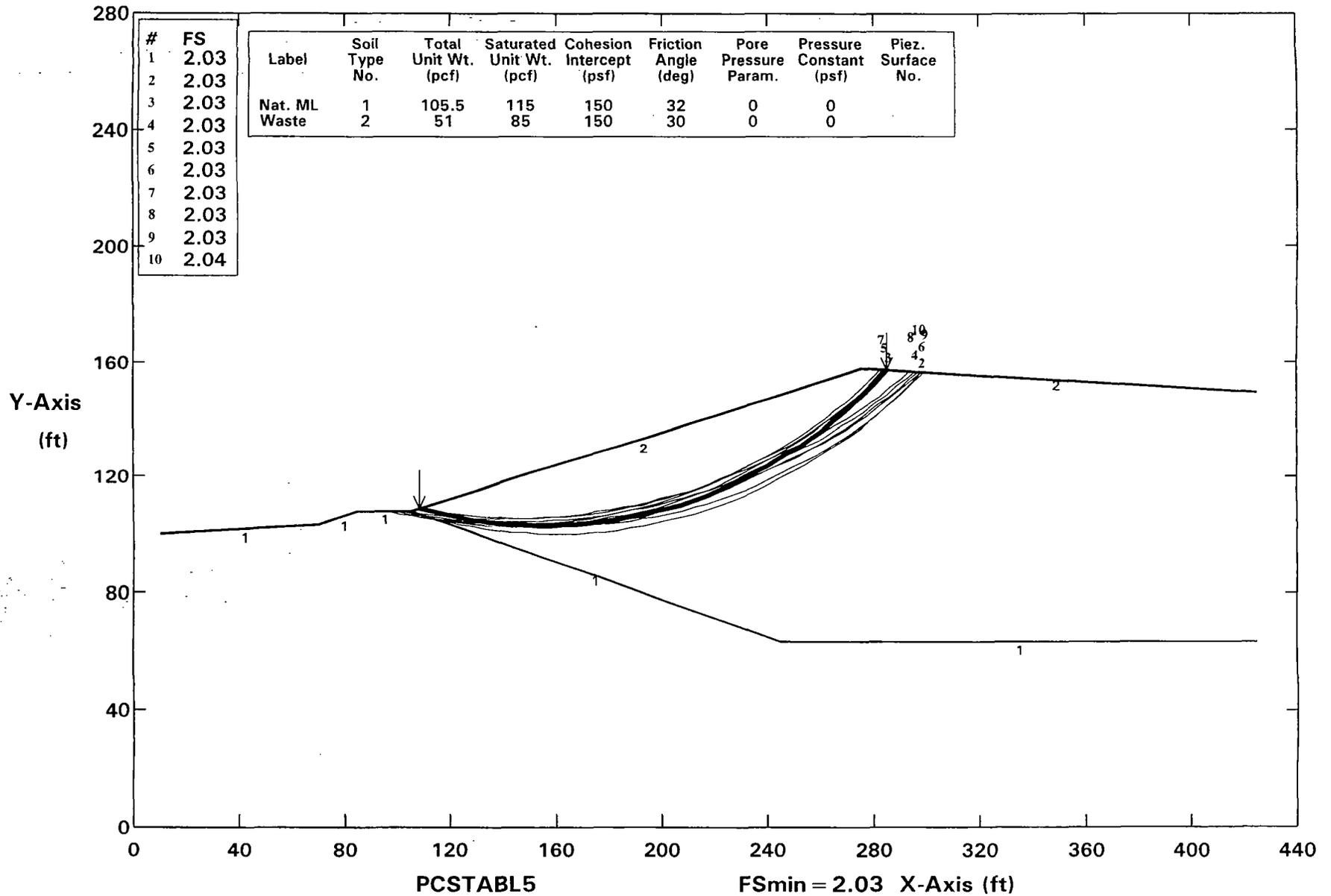
**BOX ELDER COUNTY LANDFILL - Section A, Yield Acceleration = 0.42g**  
**Ten Most Critical. A:BXASY.PLT**



**BOX ELDER COUNTY LANDFILL - Section B, Static**  
**Ten Most Critical. A:BXB.PLT**

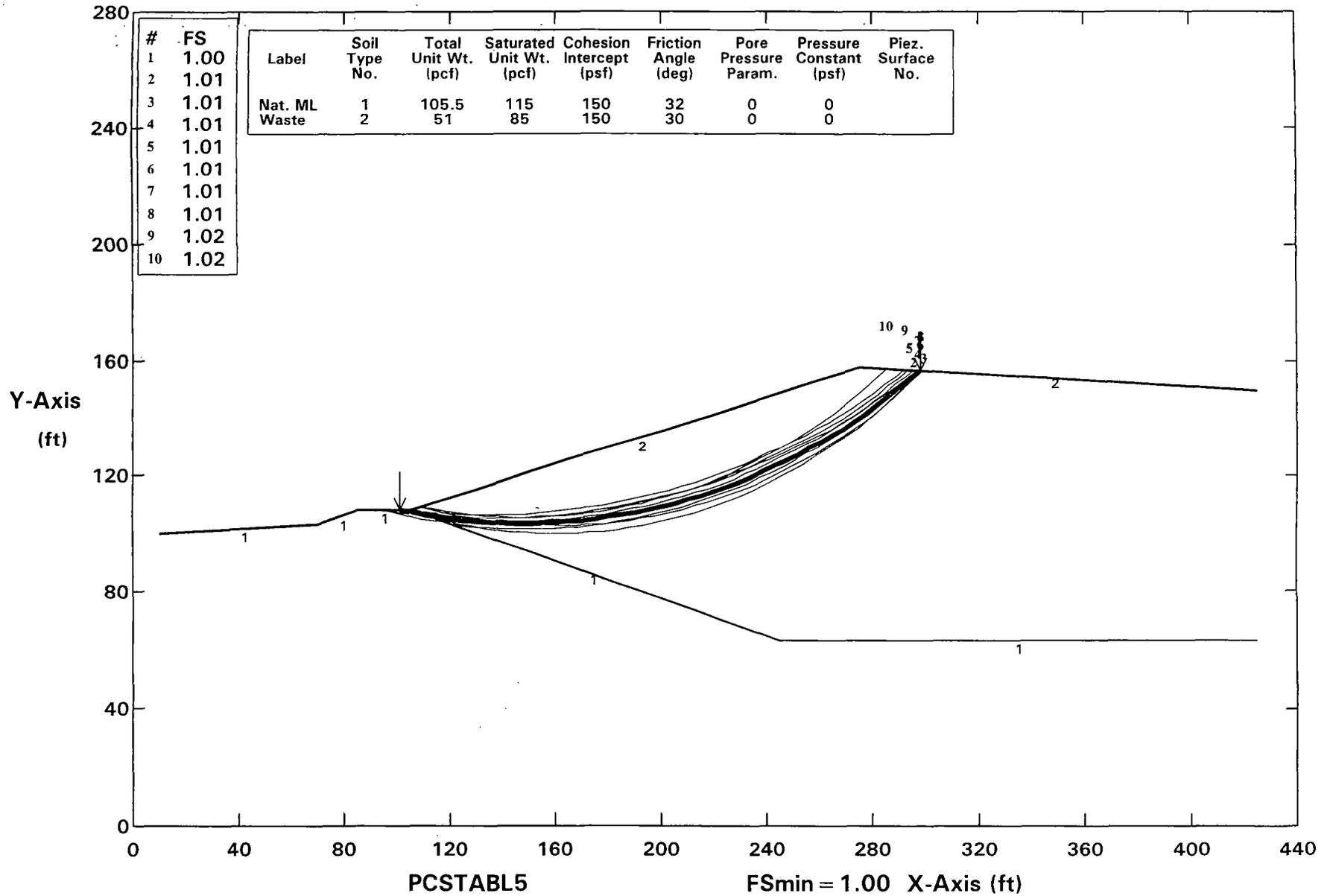


**BOX ELDER COUNTY LANDFILL - Section B, Pseudo-Static**  
**Ten Most Critical. A:BXBS.PLT**

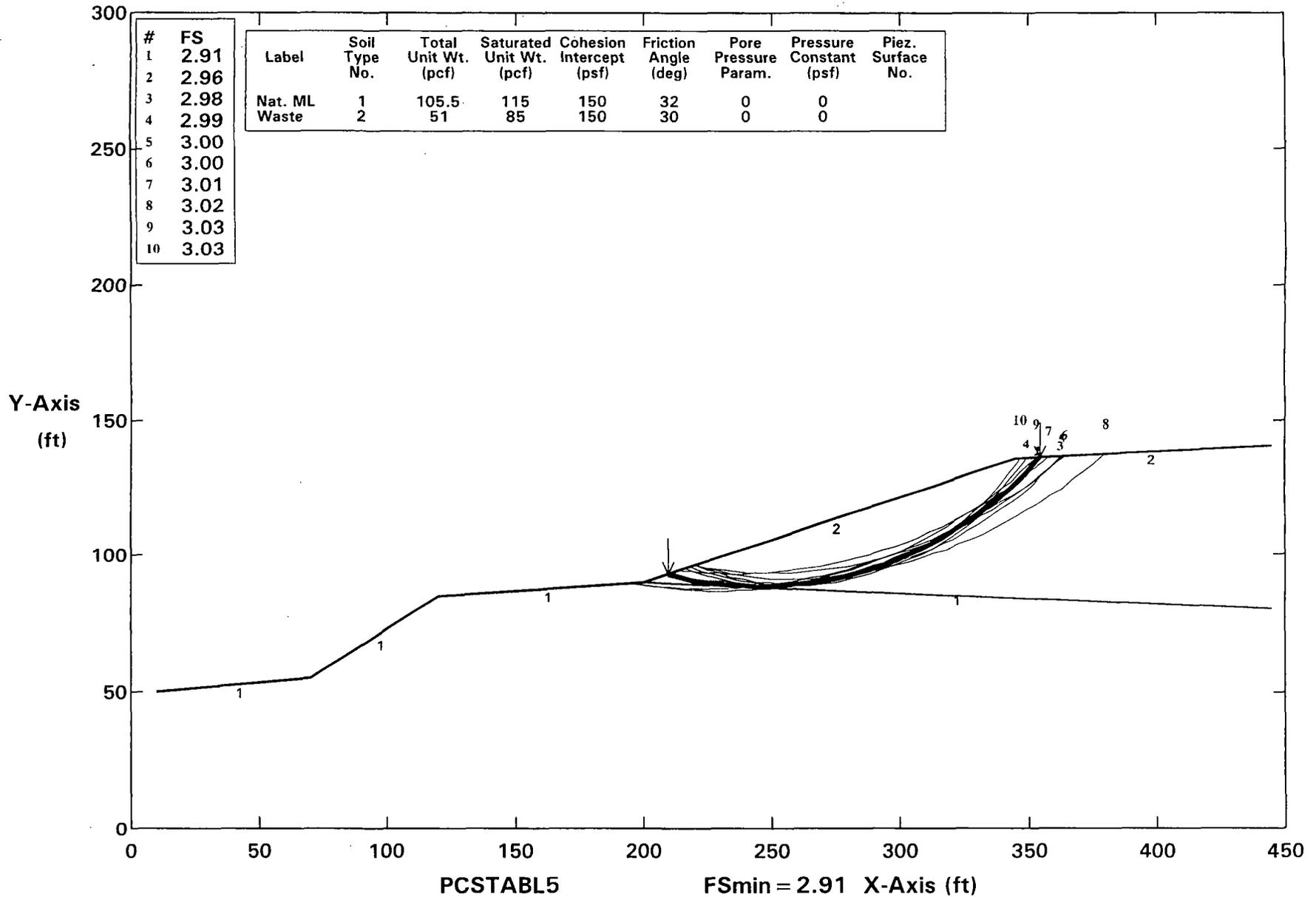


# BOX ELDER COUNTY LANDFILL - Section B, Yield Acceleration = 0.48g

Ten Most Critical. A:BXBSY.PLT

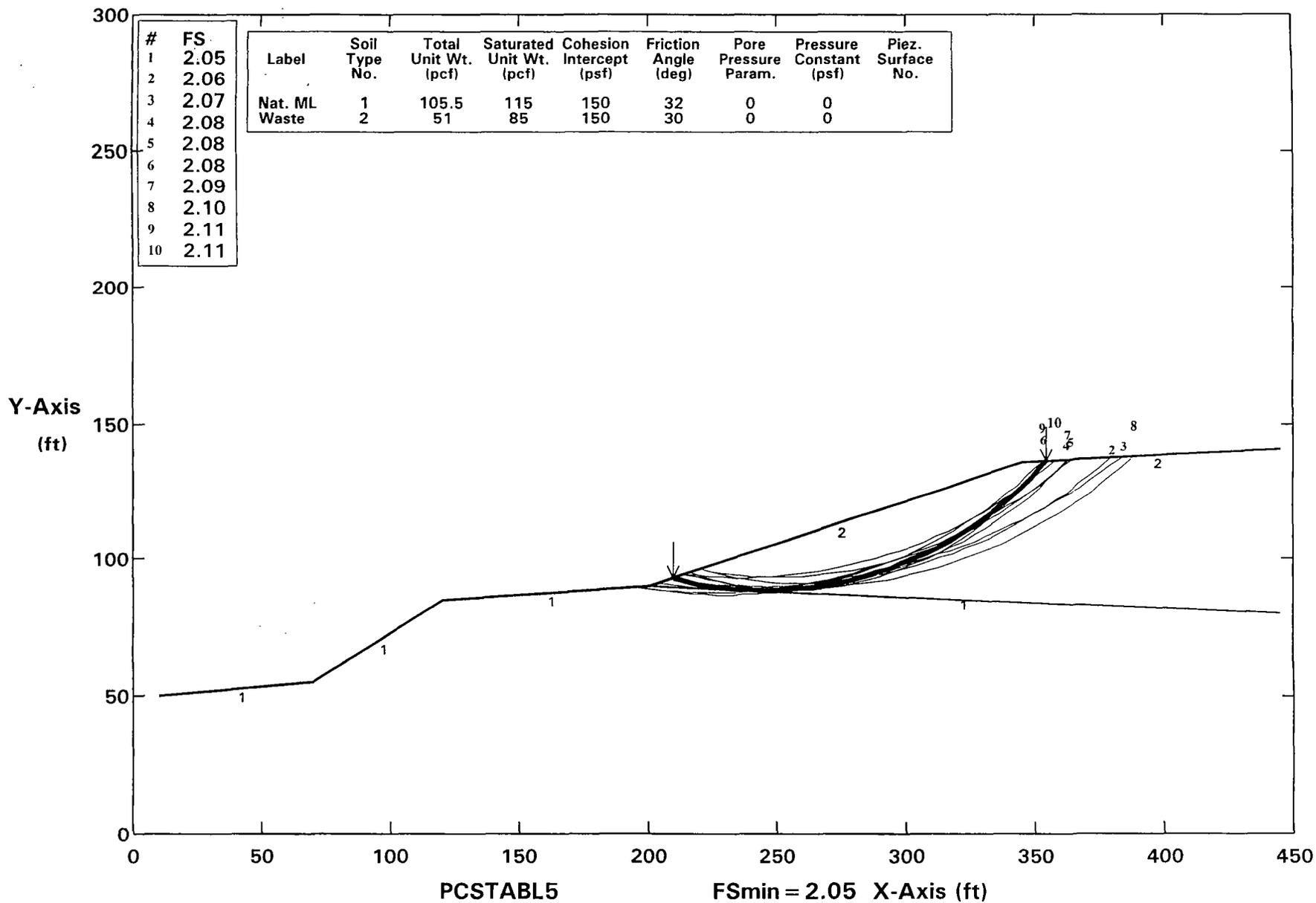


**BOX ELDER COUNTY LANDFILL - Section C, Static**  
**Ten Most Critical. A:BXC.PLT**



# BOX ELDER COUNTY LANDFILL - Section C, Pseudo-Static

Ten Most Critical. A:BXCS.PLT



# BOX ELDER COUNTY LANDFILL - Section C, Yield Acceleration = 0.49g

Ten Most Critical. A:BXCSY.PLT

