

Prepared for:

MAR 13 2019

DSHW-2019-003529

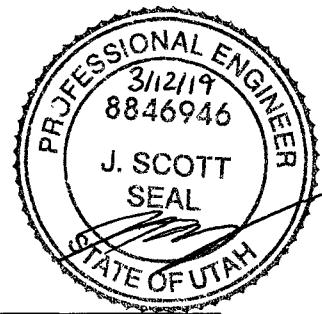
Rusty Lundberg, Interim Director
Permit Manager
Division of Waste Management and Radiation Control
Utah Department of Environmental Quality
PO Box 144880
Salt Lake City, Utah 84114-4880

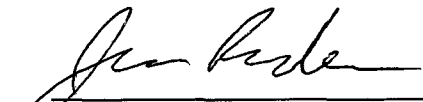
**Western Water Solutions
Sand Pass Landfill Permit Application**

GeoStrata Job No. 705-011

Prepared by:

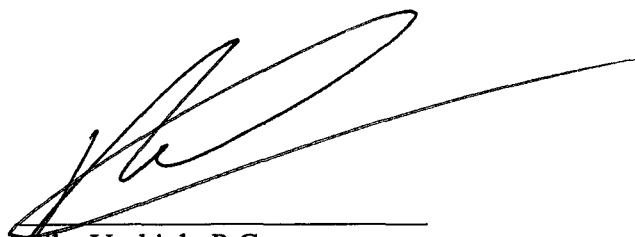
Reviewed by:





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Environmental Scientist

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GeoStrata
14425 South Center Point Way
Bluffdale, UT 84065
(801) 501-0583
March 12, 2019

**Western Water Solutions
Landfill Permit Application**

Prepared By:



GeoStrata Job No. 705-011

March 13, 2019

Prepared for:

**Division of Waste Management and Radiation Control
Utah Department of Environmental Quality
PO Box 144880
Salt Lake City, Utah 84114-4880**

Attention: Rusty Lundberg, Director

INTRODUCTION

This application and technical report are an application to permit and operate an Exploration & Production (E&P) landfill on land owned Western Water Solutions (WWS). The landfill is to be created in an area that is currently vacant.

The facility is located approximately 10 miles south of Roosevelt, Utah. The area to be permitted is located in Section 10 of Township 4 South, Range 1 West of the Uintah Special Base and Meridian in Duchesne County, Utah. The location of the facility in relation to surrounding areas is presented on Plate A-1 in Appendix A.

This permit application is segregated into 3 distinct parts, Part I includes the application form provided from the Utah Division of Waste Management and Radiation Control. Part II is a general report that includes a facility description and proposed landfill operations and activities. Part III is an engineering technical report that provides details on the design of the facility, design of the site closure, describes details of closure and post closure activities and financial assurances as required by State Code.

**PERMIT APPLICATION TO OPERATE AN E&P LANDFILL
FOR
WESTERN WATER SOLUTIONS
DUCHESNE COUNTY, UTAH**

PART I – GENERAL INFORMATION



Utah Division of Solid and Hazardous Waste Solid Waste Management Program

Mailing Address
P.O. Box 144880
Salt Lake City, Utah 84114-4880

Office Location
195 North 1950 West
Salt Lake City, Utah 84116

Phone (801) 536-0200
Fax (801) 536-0222
www.deq.utah.gov

APPLICATION FOR A PERMIT TO OPERATE A CLASS III LANDFILL

Please read the instructions that are found in the document, INSTRUCTIONS FOR APPLICATION FOR A PERMIT TO OPERATE A CLASS III LANDFILL. This application form shall be used for all Class III solid waste disposal facility permits and modifications. Part I, GENERAL INFORMATION, must accompany a permit application. Part II, APPLICATION CHECKLIST, is provided to assist applicants and, if included with the application, will assist review. Part II is provided to assist in preparation and review of a permit application; it is not required by rule. The text of the rule governs all permit application contents and should be consulted when questions arise.

Please note the version date of this form found on the lower right of the page; if you have received this form more than six months after this date it is recommended you contact our office at (801) 536-0200 to determine if this form is still current. When completed, please return this form and support documents, forms, drawings, and maps to:

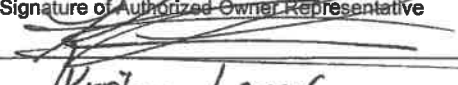

Scott T. Anderson, Director
Division of Solid and Hazardous Waste
Utah Department of Environmental Quality
PO Box 144880
Salt Lake City, Utah 84114-4880

(Note: When the Director has determined that the application is complete, two clean copies of the application as determined complete must be submitted to the Director. One copy is to be available at the Division offices and one copy will be available at a site near the facility for public viewing during the public comment period.)

Utah Class III Landfill Permit Application Form

Part I General Information APPLICANT: PLEASE COMPLETE ALL SECTIONS.					
I. Landfill Type	<input type="checkbox"/> Class IIIa <input checked="" type="checkbox"/> Class IIIb	II. Application Type	<input checked="" type="checkbox"/> New Application <input type="checkbox"/> Renewal Application	<input type="checkbox"/> Facility Expansion <input type="checkbox"/> Modification	
For Renewal Applications, Facility Expansion Applications and Modifications Enter Current Permit Number _____					
III. Facility Name and Location					
Name of Facility WESTERN WATER SOLUTIONS, LLC					
Site Address (street or directions to site) Turn on to 10000 S Sun sand Wash Rd and go east				County Duchesne	
City Mylon		Zip Code		Telephone 801.518.9790	
Township 4S	Range 1W	Section(s) 10	Quarter/Quarter Section SE	Quarter Section NW	
Main Gate Latitude N degrees 40 minutes 9 seconds 18.89			Longitude W degrees 109 minutes 59 seconds 45.32		
IV. Facility Owner(s) Information					
Name of Facility Owner WESTERN WATER SOLUTIONS, LLS					
Address (mailing) 3214 N. UNIVERSITY AVE STE 133					
City PROVO		State UT	Zip Code 84604	Telephone 801.518-9790	
V. Facility Operator(s) Information					
Name of Facility Operator WESTERN WATER SOLUTIONS, LLC					
Address (mailing) 3214 N UNIVERSITY AVE STE 133					
City PROVO		State UT	Zip Code 84604	Telephone 801.518.9790	
VI. Property Owner(s) Information					
Name of Property Owner WESTERN WATER SOLUTIONS, LLC					
Address (mailing) 3214 N UNIVERSITY AVE STE 133					
City PROVO		State UT	Zip Code 84604	Telephone 801.518 - 9790	
VII. Contact Information					
Owner Contact REESE JENSON			Title GENERAL MANAGER		
Address (mailing) 3214 N. UNIVERSITY AVE # 133					
City PROVO		State UT	Zip Code 84604	Telephone 801.518.9790	
Email Address SCDJK@YAHOO.COM			Alternative Telephone (cell or other)		
Operator Contact KRISTEN LAMB			Title COO		
Address (mailing) 3214 N. UNIVERSITY AVE STE 133					
City PROVO		State UT	Zip Code 84604	Telephone	
Email Address KLAMB@ECOVAP.COM			Alternative Telephone (cell or other)		
Property Owner Contact REESE JENSON			Title GENERAL MANAGER		
Address (mailing) 3214 N. UNIVERSITY AVE STE 133					
City PROVO		State UT	Zip Code 84604	Telephone 801.518.9790	
Email Address SCDJK@YAHOO.COM			Alternative Telephone (cell or other)		

Utah Class III Landfill Permit Application Form

Part I General Information (Continued)			
VIII. Waste Types (check all that apply)		IX. Facility Area	
<input type="checkbox"/> All types of non-hazardous industrial waste generated by the facility OR the following specific waste types		Facility Area..... <u>332</u> acres	
Waste Type Combined Disposal Unit Monofill Unit	Disposal Area..... <u>5.7</u> acres		
<input type="checkbox"/> Construction & Demolition <input type="checkbox"/>	Design Capacity		
<input type="checkbox"/> Industrial <input type="checkbox"/>	Years..... <u>10</u>		
<input type="checkbox"/> Incinerator Ash <input type="checkbox"/>	Cubic Yards..... <u>307,000</u>		
<input type="checkbox"/> Animals <input type="checkbox"/>	Tons..... <u>403,000</u>		
<input type="checkbox"/> Asbestos <input type="checkbox"/>	Note: All waste types must be generated by the industry which owns the facility		
<input checked="" type="checkbox"/> Other <u>F and P</u> <input type="checkbox"/>	X. Fee and Application Documents		
Indicate Documents Attached To This Application		<input type="checkbox"/> Application Fee: Amount \$	
<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 type="checkbox"/> Ground Water Report	<input checked="" type="checkbox"/> Closure Design	<input checked="" type="checkbox"/> Cost Estimates	<input checked="" type="checkbox"/> Financial Assurance
I HEREBY CERTIFY THAT THIS INFORMATION AND ALL ATTACHED PAGES ARE CORRECT AND COMPLETE.			
Signature of Authorized Owner Representative  <hr/> Kristen Lamb		Title <u>Manager</u>	Date <u>3/5/19</u>
Name typed or printed		Address <u>1468 S. 1020 E. OREM UT 84097</u>	
Email Address <u>KLamb@eeovap.com</u>	Alternative Telephone (cell or other) <u>801-420-5812</u>		
Signature of Authorized Land Owner Representative (if applicable)		Title	Date
Name typed or printed		Address	
Email Address	Alternative Telephone (cell or other)		
Signature of Authorized Operator Representative (if applicable)		Title	Date
 <hr/> Reese Jensen		Address	
Name typed or printed		Alternative Telephone (cell or other)	
Email Address	Alternative Telephone (cell or other)		

Utah Class III Landfill Permit Application Checklist

Important Note: The following checklist is for the permit application and addresses only the requirements of the Division of Solid and Hazardous Waste. Other federal, state, or local agencies may have requirements that the facility must meet. The applicant is responsible to be informed of, and meet, any applicable requirements. Examples of these requirements may include obtaining a conditional use permit, a business license, or a storm water permit. The applicant is reminded that obtaining a permit under the *Solid Waste Permitting and Management Rules* does not exempt the facility from these other requirements. Please take note of the heading of each section for the facilities that the section applies to.

An application for a permit to construct and operate a landfill is the documentation that the landfill will be located, designed, constructed, operated, and closed in compliance with the requirements of Utah Administrative Code R315-301 through 320 (*Utah Solid Waste Permitting and Management Rules*) and Utah Code Annotated 19-6-101 through 123 (*Utah Solid and Hazardous Waste Act*). The application should be written to be understandable by regulatory agencies, landfill operators, and the general public. The application should also be written so that the landfill operator, after reading it, will be able to operate the landfill according to the requirements with a minimum of additional training.

Copies of the *Solid Waste Permitting and Management Rules*, the *Utah Solid and Hazardous Waste Act*, along with many other useful guidance documents can be obtained by contacting the Division of Solid and Hazardous Waste at 801-536-0200. Most of these documents are available on the Division's web page at www.hazardouswaste.utah.gov. Guidance documents can be found at the solid waste section portion of the web page.

When the Director has determined that the application is complete, submit two paper copies of the application as determined complete by the Director, and an electronic copy of the application.

Part II Application Checklist

I. Facility General Information	
Description of Item	Location In Document
<i>1a. General Information For All Facilities</i>	
Completed Part I General information	Part I
General description of the facility (R315-310-3(1)(b))	Part I 1.1
Legal description of property (R315-310-3(1)(c))	Part II 2.0
Proof of ownership, lease agreement, or other mechanism (R315-310-3(1)(c))	Part II 2.0
A demonstration that the landfill is not a commercial facility (see Utah Code Annotated 19-6-102(3) for definition of Commercial)	Part II 1.7
Waste type and anticipated daily volume (R315-310-3(1)(d))	Part II 3.1
Intended schedule of construction (R315-302-2(2)(a))	Part II 3.1
<i>1b. General Information for New Or Laterally Expanding Class III Landfills</i>	
Documentation that the facility has met the historical survey requirement of R315-302-1(2)(f) (R315-304-4(1)(a) or R315-304-4(2)(a)(iv))	Part II 1.8
Name and address of all property owners within 1000 feet of the facility boundary (R315-310-3(2)(i))	Appendix J
Documentation that a notice of intent to apply for a permit has been sent to all property owners listed above (R315-310-3(2)(ii))	Appendix J
Name of the local government with jurisdiction over the facility site (R315-310-3(2)(iii))	Part II 1.9

Utah Class III Landfill Permit Application Checklist

I. Facility General Information	
Description of Item	Location In Document
<i>Ic. Location Standards for New Class IIIa Landfills (R315-304-4(1))</i>	
Geology	
Geologic maps showing significant geologic features, faults, and unstable areas	Appendix A
Maps showing site soils	Appendix G
Surface water	
Magnitude of 24 hour 25 year and 100 year storm events	Part III 1.2
Average annual rainfall	Part III 1.2
Maximum elevation of flood waters proximate to the facility	Part III 1.3
Maximum elevation of flood water from 100 year flood for waters proximate to the facility	Part III 1.3
Wetlands	Part III 1.4
Ground water	Part III 2.2.5
Historic Preservation Survey	Part II Appendix H
<i>Id. Additional Location Standards for New Class IIIa Landfills Not On Waste Generation Site</i>	
Land use compatibility (R315-304-4(1)(a))	
Maps showing the existing land use, topography, residences, parks, monuments, recreation areas or wilderness areas within 1000 feet of the site boundary	Appendix A
Certifications that no ecologically or scientifically significant areas or endangered species are present in site area	Appendix G
List of airports within five miles of facility and distance to each	Part III 1.5
<i>Ie. Location Standards for New Class IIIb Landfills</i>	
Type text here	
Floodplains as specified in R315-302-1(2)(c)(ii) (R315-304-4(2)(a)(i))	Part III 1.3
Wetlands as specified in R35-302-1(2)(d) (R315-304-4(2)(a)(ii))	Part III 1.4
The landfill is located so that the lowest level of waste is at least ten feet above the historical high level of ground water (R315-304-4(2)(a)(iii))	Part III 2.2.5
Historical Preservation Survey (R315-304-4(2)(a)(iv))	Appendix H
<i>If. Plan of Operations for All Class III Landfills (R315-310-3(1)(e) and R315-302-2(2))</i>	
Description of on-site waste handling procedures and an example of the form that will be used to record the weights or volumes of waste received (R315-302-2(2)(b) And R315-310-3(1)(f))	Part II 3.2
Schedule for conducting inspections and monitoring, and examples of the forms that will be used to record the results of the inspections and monitoring (R315-302-2(2)(c), R315-302-2(5)(a), and R315-310-3(1)(g))	Part II 3.3

Utah Class III Landfill Permit Application Checklist

I. Facility General Information	
Description of Item	Location In Document
Contingency plans in the event of a fire or explosion (R315-302-2(2)(d))	Part II 3.3.3
Plan to control fugitive dust generated from roads, construction, general operations, and covering the waste (R315-302-2(2)(g))	Part II 3.3.1
Plan for letter control and collection (R315-302-2(2)(h))	Part II 3.3.2
Procedures for excluding the receipt of prohibited hazardous or PCB containing wastes (R315-302-2(2)(j))	Part II 3.2.4
Procedures for controlling disease vectors (R315-302-2(2)(k))	Part II 3.2.4
A plan for alternative waste handling (R315-302-2(2)(l))	Part II 3.3.4
A general training plan for site operations (R315-302-2(2)(o))	Part II 3.3.5
Any recycling programs planned at the facility (R315-303-4(6))	Part II 3.2.1
Any other site-specific information pertaining to the plan of operation required by the Director (R315-302-2(2)(p))	NA
Ig. Ground Water Monitoring for Class IIIa landfills	
Ground Water Monitoring Plan (R315-304-5(4)(a))	Part III 2.2.7
II Facility Technical Information	
Ila. Maps for All Class III Landfills	
Topographic map drawn to the required scale with contours showing the boundaries of the landfill unit, ground water monitoring well locations (if required), and the borrow and fill areas (R315-310-4(2)(a)(i))	Appendix A
Most recent U.S. Geological Survey topographic map, 7-1/2 minute series, showing the waste facility boundary; the property boundary; surface drainage channels; any existing utilities and structures within one-fourth mile of the site; and the direction of the prevailing winds (R315-310-4(2)(a)(ii))	Appendix A
Ilb. Geohydrological Assessment for Class IIIa Landfills (R315-310-4(2)(b))	
Local and regional geology and hydrology including faults, unstable slopes and subsidence areas on site (R315-310-4(2)(b)(i))	Part III 2.2
Evaluation of bedrock and soil types and properties including permeability rates (R315-310-4(2)(b)(ii))	Part III 2.2.4
Depth to ground water (R315-310-4(2)(b)(iii))	Part III 2.2.5
Quantity, location, and construction of any private or public wells on-site or within 2,000 feet of the facility boundary (R315-310-4(2)(b)(v))	Appendix A
Tabulation of all water rights for ground water and surface water on-site and within 2,000 feet of the facility boundary (R315-310-4(2)(b)(vi))	Part III 1.5

Utah Class III Landfill Permit Application Checklist

I. Facility General Information	
Description of Item	Location In Document
Identification and description of all surface waters on-site and within one mile of the facility boundary (R315-310-4(2)(b)(vii))	Part III 1.2
For an existing facility, identification of impacts upon the ground water and surface water from leachate discharges (R315-310-4(2)(b)(viii))	Part III 2.4
Calculation of site water balance (R315-310-4(2)(b)(ix))	Part III 2.4
//c. Engineering Report - Plans, Specifications, And Calculations for All Class III Landfills	
Unit design to include cover design; fill methods; and elevation of final cover including plans and drawings signed and sealed by a professional engineer registered in the State of Utah, when required (R315-310-3(1)(b))	Part III 2.0, Appendix D
Design and location of run-on and run-off control systems (R315-310-5(2)(b))	Appendix D
//d. Engineering Report - Plans, Specifications, And Calculations for Class IIIa Landfills	
Engineering reports required to meet the location standards of R315-304-4 including documentation of any demonstration or exemption made for any location standard (R315-310-4(2)(c)(i))	NA
Anticipated facility life and the basis for calculating the facility's life (R315-310-4(2)(c)(ii))	Appendix H
Equipment requirements and availability (R315-310-4(2)(c)(iii))	Part II 1.5
Identification of borrow sources for daily and final cover and for soil liners (R315-310-4(2)(c)(iv))	Part II 3.1, III 3.0
Run-off treatment and disposal and documentation to show that any treatment system being used has been reviewed by the Division of Water Quality (R315-310-4(2)(c)(v) and R315-310-3(1)(i))	Part III 2.4
//e. Closure Requirements for All Class III Landfills	
Closure plan (R315-310-3(1)(h))	Part III 3.0
Closure schedule (R315-310-4(2)(d)(i))	Part III 3.1
Design of final cover (R315-310-4(2)(c)(iii))	Part III 3.2
Capacity of site in volume and tonnage (R315-310-4(2)(d)(ii))	Part III 3.3
Final inspection by regulatory agencies (R315-310-4(2)(d)(iii))	Part III 3.4
//f. Post-Closure Care Requirements for All Class III Landfills	
Post-closure care plan (R315-310-3(1)(h))	Part III 4.0
Changes to record of title, land use, and zoning restrictions (R315-310-4(2)(e)(v))	Part III 4.2
Maintenance activities to maintain cover and run-on/run-off control systems (R315-310-4(2)(e)(iii))	Part III 4.0

Utah Class III Landfill Permit Application Checklist

I. Facility General Information	
Description of Item	Location In Document
List the name, address, and telephone number of the person or office to contact about the facility during the post-closure care period (R315-310-4(2)(e)(vi))	Part III 4.3
<i>Ilg.</i> Financial Assurance Requirements for All Class III Landfills	
Identification of closure costs including cost calculations (R315-310-4(2)(d)(iv))	Part III 5.1
Identification of post-closure care costs including cost calculations (R315-310-4(2)(e)(iv))	5.2
Identification of the financial assurance mechanism that meets the requirements of Rule R315-309 and the date that the mechanism will become effective (R315-309-1(1) and R315-310-3(1)(j))	Part III 5.3

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**PERMIT APPLICATION TO OPERATE AN E&P LANDFILL
FOR
WESTERN WATER SOLUTIONS
DUCHESNE COUNTY, UTAH**

PART II – GENERAL REPORT

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1.0 FACILITY DESCRIPTION

1.1 FACILITY GENERAL DESCRIPTION

The proposed site of the Sand Pass Landfill (proposed landfill) operated by Western Water Solutions (WWS) is located on a 331-acre water disposal facility that is approximately 10 miles south of Roosevelt, Utah. The area to be permitted is located on Sections 10, Township 4 South, Range 1 West of the Uintah Special Base and Meridian in Duchesne County, Utah. The location of the site in relation to surrounding areas is presented on Plate A-1 in Appendix A.

The site is currently utilized as a disposal facility for waste generated in the oil and gas production industry. This facility is primarily used for processing produced water and other oil and gas field liquids. WWS is in the process of updating its oil-water-solids separation system.

The proposed landfill will be constructed with a double lined cell that will be surrounded with a berm that will reach a height approximately 10 ft. above existing grade. The landfill will also cut into the ground surface approximately 9 ft. A staging area will be located to the west of the landfill cell. A map with proposed landfill boundaries, existing and proposed wells and other waste processing components is provided in Appendix A as plate A-2. A more detailed layout of the facility is provided in the permit design drawings in Appendix D.

The prevailing wind direction is from the west. A single ephemeral stream crosses the site from the west to the east. There are several ephemeral streams and a reservoir within a quarter mile of the landfill site. Plate A-4 identifies structures within a quarter mile of the site, drainages and water bodies within a quarter mile, and the prevailing wind direction.

1.2 AREA SERVED

WWS currently manages a produced water facility with clients throughout the Uintah Basin, Utah, Colorado and Wyoming. WWS plans to provide additional services to existing clients including Resource Conservation and Recovery Act (RCRA) exempt exploration and production (E&P) wastes as defined by the Utah Division of Waste

Management and Radiation Control (DWMRC). As noted, the area to be served will generally be within the Uintah Basin, Utah, Colorado and Wyoming areas.

1.3 WASTE TYPES

As recommended by the DWMRC the proposed landfill will be permitted as a Class IIIb landfill. As such the landfill will receive nonhazardous forms of industrial solid waste as characterized by a Class IIIb landfill. It is our understanding based on conversations from the personnel at the DWMRC that this landfill will be allowed to receive RCRA exempt E&P waste. Acceptable E&P waste will include but not limited to drilling mud, frac sands, drill cuttings, soils contaminated with hydrocarbons and other E&P solid wastes.

As required by the DWMRC standards for design the operator must minimize liquids admitted in to the landfill by prohibiting waste that contains free liquids (R315-303-3(1)). All the waste will need to pass the paint filter test (EPA Method 9095B) to be accepted and deposited into the landfill.

1.4 FACILITY HOURS

WWS will accommodate waste disposal activities based on the needs of their clients and customers. It is anticipated that the Sand Pass Waste Facility will have an active water disposal and oil cleaning process that will be crewed 24 hours a day and 365 days a year if necessary. The proposed landfill will be available to accommodate waste from WWS clients/customers at their convenience.

1.5 LANDFILL EQUIPMENT

The WWS facility currently has equipment to support the existing water disposal operation. This equipment includes a long reach track hoe, a Skid Steer and a telehandler with dozer bucket. Additional equipment will be acquired to facilitate the operation of the proposed E&P landfill to properly place waste material and maintain daily cover. This equipment may include a conveyor system to distribute and place the E&P waste across the landfill area, and a bulldozer to spread daily cover.

1.6 LANDFILL PERSONNEL

The WWS facilities are managed by Mr. Reece Jensen who has more than 7 years of experience managing waste disposal facilities. All WWS employees assigned to work at the proposed landfill will receive direction from Mr. Jensen.

1.7 NON-COMMERCIAL EXCLUSION

The proposed landfill will only accept RCRA exempt E&P waste as defined in Section 1.3 of this application. It is our understanding that this type of landfill will be considered a non-commercial landfill if and only if E&P waste as defined in Section 1.3 of this document is accepted into the landfill. The operational plan will define quality control steps to ensure the acceptance of only approved E&P waste to meet the requirements of a non-commercial landfill.

1.8 HISTORICAL PRESERVATION SURVEY

GeoStrata conducted a review of the landfill construction site and prepared a letter for the State Historical Preservation Officer (SHPO). Based on our evaluation of the site and area of potential effects from the permitting of the new landfill, we found that the site has no historical properties or structures. We provided our findings to the SHPO and we received a response indicating that they concur with our determination. A copy of the letter from the SHPO is provided in this permit application in Appendix H.

1.9 LOCAL GOVERNMENT WITH JURISDICTION

The local government with jurisdiction over the WWS facility is Duchesne County. The mailing address is provided below:

734 North Center Street
PO Box 910
Duchesne, Utah 84021

2.0 LEGAL DESCRIPTION

WWS is the owner of this property and proof of this ownership is provided in Appendix F. Proof documents presented in the Appendix F include a warranty deed. The Warranty Deed includes a legal description of the property.

3.0 OPERATIONS PLAN

3.1 SCHEDULE OF CONSTRUCTION

As previously described, the proposed landfill will be located near the existing waste water disposal facility on a section of undeveloped land. The landfill will be constructed in phases with the construction of multiple cells that will merge into a single large landfill cell. As a landfill waste cell is filled to capacity, an adjacent cell will be constructed to accommodate more waste. Design of the phased landfill cells will include control of storm water and leachate for the entire landfill. As WWS nears the completion of a landfill cell, WWS will work with DWMRC to modify their permit prior to the construction of an additional landfill phase.

Each landfill cell will be constructed with two liners to isolate the landfill from the surrounding soils. An upper liner will be constructed with 60 mil HDPE geosynthetic liner. The lower liner will consist of Geosynthetic Clay liner (GCL). Permit design drawings and specification are provided in Appendix D.

The landfill will also include an access ramp into the cell located at the west side of the cell. To the west, adjacent to the landfill cell will be a waste staging area where waste delivered to the site will be inspected and treated to meet DWMRC standards if necessary, prior to disposal. Waste that requires treatment will be processed in a waste temporary holding area that will be constructed with an impermeable surface to protect ground water from possible waste contamination. Details of the waste staging area are provided in the permitting drawings

At the beginning of landfill operations WWS anticipates that approximately 5 truckloads of E&P waste will be transported to the facility per day. Each truck load will have a volume of approximately 10 cubic yards. WWS anticipates that some waste accepted to the landfill will consist of drilling mud and drilling fluid that will require additional processing to allow these types of waste to be accepted for disposal. Currently WWS is considering using several different techniques to meet the states requirement of waste to stabilize liquid waste and pass the paint filter test. One of the techniques WWS plans to utilize includes but is not limited to a pugmill mixer or a mixing basin where waste will be combined with sawdust, fly ash, native soils and/or other components to stabilize fluids. Waste acceptance procedures and quality control of waste being disposed in the landfill are outlined in sections 3.2.1 and 3.2.2 of this report.

When the final process is defined, the design life of the land will be more accurately estimated. At this preliminary phase the life duration is estimated using the assumptions that intake waste will be approximately 50 cubic yard per day, and assuming that half of the waste arriving at the landfill will be suitable for direct placement into the land fill and the remaining waste will require additional processing, drying or mixing prior to placement in the landfill. Waste that will be mixed with additional material will need to reach a moisture content that corresponds with passing the paint filter test. It is assumed that mixing of native soils with waste at a ratio of approximately 1.5:1 will reach a waste moisture content that will pass the paint filter test. For example, every 1 ton of waste there will be approximately 1.5 tons of native soils added to reach a moisture content that will pass the paint filter test. Calculations used to estimate the mixing ratio are provided in appendix E as plate E-1 and E-2. As the landfill waste acceptance and mixing processes are changed and/or modified throughout the life of the landfill, adjustments to the design life of the landfill will be made.

Based on waste mixing assumptions described above and assuming waste throughput of 50 cubic yards per day and a 10% growth rate over the life of the landfill, the projected life of the landfill is approximately 10 years. However, the projected life may increase or decrease based on the conditions of the market, type of processing and mixing methods required to meet DWMRC standards. A copy of the spreadsheet used to calculate this estimated life is included in Appendix E. All the assumptions presented in the previous paragraphs were used in the spreadsheet calculations.

3.2 DESCRIPTION OF WASTE HANDLING PROCEDURES

The following section describe the general procedures that will be followed under this permit application for accepting, disposing, recording and excluding landfill waste at the Sand Pass Landfill.

3.2.1 General Procedures

All waste will be hauled to the proposed landfill using commercial and/or independently owned trucks. All trucks will enter at the main gate and check in with the landfill office. Every truck load of waste will be inspected for liquid content prior to disposal and a paint filter test will be performed on each load of waste. Waste that is free of liquids and passes the paint filter test will be directed to the landfill for placement. Waste that contain liquids and fail to pass the paint filter test will be placed in a temporary storage area for

further processing. The temporary storage area will be constructed to ensure that the waste will be isolated from the underlying soils. The liner material for the storage area will be composed of either concrete, clay, or an HDPE liner. The temporary storage area will be part of the staging area located to the west of the proposed landfill.

Additional paint filter tests will be conducted on every 15 cubic yards of waste that requires processing prior to being disposed into the landfill. Waste that fail the second paint filter test will remain in the temporary storage area and will be reprocessed by mixing with other materials. Paint filter test procedures are attached to this application in appendix E. After passing the paint filter test waste will be removed from the temporary storage area and then placed in the landfill using heavy equipment or a conveyor system. All Waste will then be placed in a uniform layer in the landfill as described in section 3.2.3 Waste Disposal. All waste found to meet the requirements for disposal and accepted to the site will be disposed in the landfill. There are no plans to implement a recycling program since most anticipated waste materials are soils and drill cuttings.

3.2.2 Waste Shipment Records

The landfill operations manager will maintain and store waste shipment records as part of the daily records of disposal activities. Each truck load of E&P waste delivered to the WWS facility will have a waste shipment ticket completed. The waste shipment ticket will be completed by the truck driver and then verified by the landfill operating staff. An example of the waste shipment ticket is included in Appendix E. The waste shipment ticket will include the following data for record keeping:

- Date and time of arrival
- Load ID number
- Quantity in cubic yards and estimated tons based on unit weight
- Type of waste
- Origin and generator of waste
- Name of trucking company and truck number
- Truck drivers name and signature

3.2.3 Waste Disposal

Waste that is approved for disposal will be transported into the landfill cell by means of either direct placement from delivery truck, heavy equipment or a conveyor system.

Waste deposited in the landfill will be placed in approximately 1ft. thick lifts. Lifts will be distributed by use of heavy equipment and then compacted. Waste will be compacted to reach a firm and unyielding surface to maximize landfill capacity.

Waste deposited in the landfill will not come in direct contact with the HDPE liner. A protective 6-inch layer of soil material will be used as a buffer between waste and the sand for the leachate collection system. Below the 6-inch layer of protective soil, 6-inches of bank run sand will be placed as part of the leachate collection system to make a total of 12-inches of soil between the waste and the HDPE liner. The 6-inches of protective soil and 6-inches of sand will be placed on all surfaces of the HDPE liner. Details of the protective soil layer are included in the permitting drawings located in Appendix D. All equipment moving in or on the landfill will not have contact with the liner and will remain on the protective fill layer or the access ramp. Waste will also be placed in such a way as to protect the liner from puncturing during the compaction process.

3.2.4 Plans for Excluding Waste

WWS will maintain a comprehensive waste screening process when working with waste generators. Non-hazardous industrial waste including E&P waste and RCRA exempt waste will be accepted at the proposed landfill as allowed under a Class IIIb landfill or as directed by DWMRC. Non-E&P waste and waste that is not RCRA exempt will not be accepted at the Sand Pass landfill. To ensure that waste meets this requirement, all potential waste generators that wish to dispose waste at the WWS facility must first provide a waste certification letter. This letter is part of the assessment which will determine the acceptability of the generated waste that is to be disposed of under this permit application.

When requested by WWS generators will provide representative samples of each type of waste for paint filter testing. Generators will be required to provide a waste characterization letter for each type of waste certifying that the waste meets the requirements of disposal in a Class IIIb Landfill. Generators will be required to certify the waste from each of the various sources. Generators will also be required to inform WWS when waste composition changes and then resubmit a waste characterization form with samples.

Wastes that contain PCBs will not be accepted in to the proposed landfill. In addition, WWS does not anticipate any type of waste will be accepted at the landfill that would be considered a disease vector.

3.3 WASTE FACILITY INSPECTION AND MONITORING

WWS personnel will monitor the facility daily and conduct weekly inspect of the facility. The weekly inspection will be conducted to limit operator errors, to avoid facility malfunctions, deterioration, and to circumvent facility discharges that may cause or lead to a threat to human health and/or the environment. Daily and weekly facility inspections will be recorded using inspection logs. An example of these inspection logs is provided in this permit application in Appendix E.

3.3.1 Fugitive Dust Control

As required in Utah Administrative Code R315-302-2(2)(g) WWS has prepared a plan for controlling fugitive dust as part of this permit application. Daily WWS fugitive dust emissions will be monitored, with controls to be put in place as deemed necessary by the landfill operations manager.

During the construction and operational phases of the landfill, sources of dust within the landfill cell will be identified by the landfill operations manager. These sources of dust will be controlled by watering and proper placement of waste in the landfill. WWS will have staff on site that are certified in monitoring opacity and will periodically check the facility for dust control issues. When opacity of the dust exceeds 10% watering controls will be put into place.

The landfill operations manager will also monitor dust on all haul roads on WWS property. Haul roads leading from the main gate to the landfill cell are all unpaved. Proper maintenance of haul roads, speed limit controls and watering when dust opacity exceeds 10% will aid in reducing fugitive dust emissions. In addition, the Sand Pass facility is regulated by the Division of Air Quality for PM emissions. The facility is waiting for a final approval order for the facility that will have recommended control practices for reducing PM emissions for the entire facility.

3.3.2 Plan for Litter Control

WWS does not anticipate accepting waste materials that will cause a wind-blown litter problem. WWS will complete a daily inspection of the landfill and surrounding area and identify any potential waste material that may escape the facility.

3.3.3 Contingency Plan for Fire or Explosion

In the event of a fire or explosion at the WWS facility, the landfill operations manager will be notified. The landfill operations manager will then contact local emergency authorities to initiate emergency response. A list of the local emergency responders is provided in Appendix E of this permit application.

3.3.4 Alternative Waste Handling Plan

In the event of a landfill closure due to an emergency or repairs, WWS will arrange to have the waste transported to the Duchesne County Landfill located at 20550 West and 2000 South as needed.

3.3.5 General Training Plan

As required in R315-302-2(2), every permitted landfill must have a detailed training program. WWS currently has a training program that educates their employees on how to handle E&P waste and how to operate the existing components of the waste facility. Prior to working in the landfill portion of the WWS facility, all employees are required to complete the training program as outlined here-in. This training program will consist of three parts including health and safety training, E&P waste handling, and landfill operations specific training. The training of each employee will be supervised and conducted by the WWS operations manager.

Health and Safety Training:

Prior to completing the WWS health and safety training portion of the education program, each employee will complete a 10-hour safety course provided by OSHA. In addition to the safety training provided by OSHA, WWS will educate the employees on the following safety procedures:

- Facility safety controls
- Emergency procedures and equipment
- Contingency plan procedures
- Fire prevention and control
- Spill prevention and control
- Proper safety equipment and personal protection equipment

- Waste loading and unloading procedures
- Waste disposal equipment handling procedures and safety
- H₂S safety training
- Chemical Hazards

E&P Waste Handling Training:

The WWS operations manager will instruct all employees on proper handling of E&P waste based on current government regulations. This training will cover RCRA exempt E&P, produced water and crude oil. This portion of the training will educate the employees with the following items:

- Overview of E&P waste production and disposal
- Identification of E&P waste types
- Review of regulations relating to E&P waste
- Prohibited waste
- Proper handling and disposal of each waste type
- Proper recordkeeping of accepted waste

Landfill Operations Specific Training

Employees that will be involved in any portion of the Landfill operations will receive landfill specific training. Each employee will also receive hands-on training from the operations manager specific to the employee's assigned duties. This portion of the training will cover the following items:

- Overview of landfill design, construction and components
- Waste identification and characterization
- Documentation of accepted waste
- Landfill hazards and safety
- On-site waste transportation
- Waste loading and unloading procedures
- Waste sampling procedures
- Waste inspection, processing and testing procedures
- Recordkeeping
- Landfill inspection and general maintenance
- Emergency procedures and contingency plan
- Proper transportation and placement of waste in landfill
- Spill prevention and containment

All personnel that will be working on the landfill will be required to participate in weekly safety meetings and morning tailgate safety meetings held at the WWS facility. All employees are required to read and review the landfill permit on a semiannually basis. Annual refresher training of the above-mentioned training program will be conducted for all employees involved with the permitted landfill. Any new information relevant to the permitted landfill will also be covered in the annual refresher training. New employees that are assigned to work associated with the landfill will receive training during the first month of employment and will be trained by a supervisor that has completed the required training. Records of this training will be kept in the WWS database.

3.4 RECORD KEEPING

During the operation of the landfill, the operator and staff will maintain records of landfill activities as required by the division (315-302-2-(3)). These records will be stored electronically in the WWS database at their facility.

3.4.1 Daily Permanent Record

The landfill manager will record the following data daily and maintain the data in a permanent file:

- Waste shipment records as described in section 3.2.2
- The estimated weight in tons and volume in cubic yards of E&P waste received for the day
- The estimated weight in tons and volume in cubic yards of E&P waste that required treatment prior to disposal in the landfill cell
- The estimated weight in tons and volume in cubic yards of material added to treat the waste and the total weight and volume of treated waste
- Number of trucks visiting the Landfill
- Type of E&P waste received
- Paint filter test results
- Deviations from the UDSHW approve Operations Plan
- Staff training records
- Status of groundwater, leachate and gas monitoring as may be necessary
- A written report of daily activities at the landfill site

3.4.2 Other Records

The landfill manager will also include the following data in the permanent records:

- Design documentation of the placement or recirculation of leachate or gas condensate into the landfill
- Closure and post closure care plans and activities
- Cost estimates and financial assurance documentation
- Safety training and landfill specific training for all employees associated with the landfill

**PERMIT APPLICATION TO OPERATE AN E&P LANDFILL
FOR
WESTERN WATER SOLUTIONS
DUCHESNE COUNTY, UTAH**

**PART III
ENGINEERING TECHNICAL REPORT**

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1.0 LOCATION STANDARDS

1.1 GEOLOGIC FAULTS AND UNSTABLE AREAS

An engineering geologist with GeoStrata reviewed geologic maps and identified that the nearest Quaternary fault is the Duchesne-Pleasant Valley fault system (Class B) No. 2414 located within approximately 3.5 miles south and southwest of the WWS facility (Quaternary Fault and Fold Database of the United States, 2018). The Proposed Class III E&P Landfill cells are not 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. Further details of the geologic setting are provided in the Engineering Report. A geologic map of the WWS Facility, the Proposed Class IIIb E&P Landfill, and the surrounding area is provided in this report in Appendix A, Plate A-3.

1.2 SURFACE WATER

The magnitudes of the 24-hour 25-year and 100-year storm events are 1.58 inches and 2.02 inches respectively. The average annual precipitation near the WWS facility is approximately 6.5 inches (NOAA Atlas 14 – Myton Station). Two ephemeral drainages are located within one mile of the Proposed Class III E&P Landfill. Neither of these ephemeral or intermittent drainages are restricted or significantly impacted by the Proposed Class III E&P Landfill.

1.3 FLOODPLAINS

The proposed WWS facility has no available FEMA flood hazard map coverage; however, the adjacent lands directly to the east in Uintah County do have FEMA flood map coverage. This Flood Insurance Rate Map (FIRM map), number 49047C1000D, indicates that the similar terrain directly to the east is mapped as a 0.2% annual chance floodplain and/or area where flood hazards are undetermined, but possible. Two ephemeral drainages are located near the Proposed Class III E&P Landfill. Neither of these ephemeral or intermittent drainages are restricted or significantly impacted by the Proposed Class III E&P Landfill.

1.4 WETLANDS

A search of the National Wetland Inventory of the U.S. Fish and Wildlife Service indicated that there are no wetland areas located within the footprint of the Proposed Class III E&P Landfill (National Wetlands Inventory, 2018). Based on a review of the maps, the Proposed Class III E&P Landfill is not located in a wetland. Further investigation into wetlands was also conducted during the Biological Assessment of the facility and determined that the WWS property contains no permanent water or wetlands. More details of this assessment are described in in Appendix G.

1.5 LAND USE COMPATIBILITY

Plate A-4 shows the location standards requested for this permit application including existing land use, topography, residences, parks, monuments, recreation areas or wilderness areas within 1,000 feet of the facility boundary. No parks, monuments, recreation areas or wilderness areas were identified within 1,000 ft of the facility boundary. Numerous private properties are located within 1,000 ft of the boundary of the Sand Pass facility, however it isn't known if these properties are occupied by residents. All property owners have been notified of the intent to permit the E&P Landfill Facility. Documentation of written notification to all property owners within 1,000 ft of the Proposed Class III E&P Landfill Facility is in Appendix J of this permit application. The WWS Facility has operated as a waste water disposal facility for 8-years and any residents nearby are likely aware of the nature of this facility.

There is one (1) active water-right point of diversion and three (3) lapsed water-right points of diversion located within 2,000 feet of the facility. The active water right is for surface water and the three (3) lapsed water rights are for underground water. Plate A-5 identifies the location of all water-right points of diversion within 2,000 feet of the facility.

A single airport is located within 10 miles of the Proposed Class III E&P Landfill. The Roosevelt Municipal Airport is located approximately 9.3 miles north northwest of the Proposed Class III E&P Landfill.

1.6 ECOLOGICALLY SENSITIVE AREAS

An Ecological Assessment of the Proposed E&P Class III Landfill facility was conducted by Dr. Lindsey Nesbit in March 2018 to assess the ecological attributes of the facility and surrounding area. Dr. Nesbit's Assessment is included in Appendix G of this permit

application. The results of this Assessment revealed that two threatened and endangered species have been identified as having suitable habitat in and around the Proposed E&P Class III Landfill footprint location. These species are the Pariette Cactus (*Sclerocactus brevispinus*) and the Uinta Basin Hookless Cactus (*Sclerocactus wetlandicus*).

A Biological Survey of the Proposed Class III E&P Landfill footprint was conducted on April 19, 2018, by Dr. Nesbit, to assess the presence of the Pariette Cactus (*Sclerocactus brevispinus*) and the Uinta Basin Hookless Cactus (*Sclerocactus wetlandicus*). This Biological Survey found no Pariette Cactus or Uinta Basin Hookless Cactus on or around the proposed landfill site.

A summary table of federally listed, proposed, candidate species and USGS rare plants is included in the Ecological Assessment. If any of the listed species in this summary table are encountered on or near the facility in the future, WWS will contact the Utah Ecological Services Field Office for species identification and preservation.

2.0 ENGINEERING REPORT

2.1 CELL DESIGN

The Proposed Class III E&P Landfill would consist of four landfill cells that will be constructed sequentially, over time. When a landfill cell is approximately 75-percent full and additional storage is anticipated, construction of the next, adjoining cell will be initiated upon approval from DWMRC. Construction location of the Proposed Class III E&P Landfill in an undisturbed area within WWS owned property. The State permitted evaporation ponds are located the west and northwest of the proposed landfill cells and a State permitted E&P landfarm is located to the south of the proposed landfill cells. The permit drawings show the proposed location in relation to the remaining site and surrounding land features.

2.2 GEOHYDROLOGICAL ASSESSMENT

2.2.1 Regional Geology

As noted previously, the WWS facility is located approximately 6.5 miles southeast of Myton, Utah on the south flanks of the Uinta Mountains. The Uinta Mountains began uplifting in the Cretaceous, about 66 million years ago (Ma) and continued till the Eocene about 37 Ma (Hintze, 1988). Topographic basins formed on the north and south of the Uinta Mountains eventually accumulating up to 15,000 ft of sediment (Bradley, 1925; Fouch, 1985).

During the early Tertiary, these basins filled with sediments from alluvial, fluvial, and lacustrine deposits. The strata deposited in these alluvial (floodplain and delta) and inter fingered lacustrine (lake) deposits, are referred to as the Colton and Wasatch Formations. During this same time large freshwater lakes (Lake Flagstaff and Lake Uinta) occupied the Uintah basin. The depositional environment in and around these lakes consisted of open to marginal lacustrine and the rocks deposited in these environments are referred to as the Green River Formation. The Uinta and Duchesne formations are largely alluvial deposits that overlie the Green River formation and were in place by the end of the Oligocene (Hintze, 1988). The landscape during the Holocene has continued to be incised by streams as well as some glacial outwash deposits from the Uinta Mountains (USGS, 2007).

2.2.2 Local Geology

The WWS facility is in the central portion of the Uinta basin. The facility is underlain by both mixed alluvium and eolian deposits and the Uinta Formation (Plate A-3). The Proposed Class III E&P Landfill footprint is located near the mapped geologic boundary between the mixed alluvium and eolian deposits (Qae) on top and Member B of the Uinta Formation (Tub) below. The Qae deposits are a Holocene unit that consists of unconsolidated alluvial mud, silt, and sand mixed with windblown sand and silt. The Tub unit is an Eocene aged Member of the Uintah Formation that consists of light-gray, light-greenish-gray, light-brown, and light-purple, mudstone and claystone with interbeds of greenish-gray, yellow, and brown fine-grained sandstone; contains minor conglomerate and tuffaceous beds; forms nonresistant slopes and thin resistant ledges. The Qae and Tub units were identified during field investigations and were found to underlie the footprint of the Proposed Class III E&P Landfill.

2.2.3 Facility Soils

The online National Resource Conservation Service (NRCS) was used to identify the soil units that are present at the Target Property (NRCS 2018). The soil map, located in Appendix G of this permit application, indicated that the entirety of the WWS owned property has No Digital Data Available. The uncertainty of mapped units at the proposed facility exists because the NRCS has not formally completed their survey in this part of Duchesne County. The unit is as follows:

- NOTCOM – No Digital Data Available – 100%

The site soils were also evaluated based on samples collected from four test pits that were excavated at the subject site. The characteristics of the encountered soils are explained in section 2.3.2 of this report.

2.2.4 Evaluation of Bedrock

The Proposed Class III E&P Landfill is underlain by Quaternary mixed alluvium and eolian deposits (Qae) and then by the Member B of the Uinta Formation (Tub) directly under the Qae. The Qae is 0 to 5-meters thick and the Tub is mapped as being approximately 600-meters thick within the footprint of the Proposed Class III E&P Landfill Cells (Sprinkel, 2007).

GeoStrata excavated four test pits near the Proposed Class III E&P Landfill footprint (Plate A-2) to characterize the geology of the site. Bedrock was encountered in the test pits located at the south end of the proposed landfill. Bedrock was slightly fractured tight sandstone.

2.2.5 Ground Water

Two monitor wells have been installed near the Proposed Class III E&P Landfill. The location map for these monitor wells is in Appendix A, Plate A-2. P-1 is the up-gradient well and P-2 is the down-gradient monitoring well. Water levels have been measured, with the most recent measurement occurring on March 1, 2019. Ground water elevation data are included in table 2.2.5.a.

Table 2.2.5. a

			3/1/2019
Well Number	Well Surface Elevation (ft)	Well Bottom Elevation (ft)	Water Elevation (ft)
P-1	5058	4999	5043
P-2	5054	5038	5039

The monitor well logs and completion details for each of the monitoring wells are in Appendix B, Plate B-5 through B-6. Water elevation data collected in March 2019 was used to determine the direction of ground water flow at the subject site. Groundwater generally flows to the east towards the Green River. A cross section of the proposed landfill also identifies the elevation of the potentiometric surface of the groundwater (Appendix D, Page B-4).

Based on our finding of groundwater at the WWS facility, groundwater is measured as being greater than 5 feet below the lowest portion of the Proposed Class III E&P Landfill. A cross-section of the Proposed Class III E&P Landfill identifies bedrock, soils and inferred elevations of ground water under the WWS facility (Appendix D, Page B-4). The data used to create these cross sections was obtained using the geologic map (Appendix A, Plate A-3), subsurface exploration data (section 2.3.1) and ground water data provided in the table above.

2.2.6 Surface Water

The Reservoir on Pleasant Valley Draw is located on the extreme south-central portion of the WWS owned Property, approximately 1,500 feet southwest of the Proposed Class III E&P Landfill. There are numerous ephemeral drainages that are identified near the facility. A map locating these drainages is provided in Appendix A as plate A-4. No landfill related activities will impact these drainages. The mapped ephemeral drainage that is near the northwest corner of the Landfill cell was not observed during the on-site visits.

2.2.7 Groundwater and Surface Water Monitoring Plan

Groundwater was encountered at the subject site in wells P-1 South and P-2 North. The groundwater resides in alluvial aquifers overlying bedrock and permeable sandstone beds within the bedrock. WWS may utilize P-1 and P-2 for supplementary ground water level monitoring because these wells were not constructed with the intent for monitoring groundwater quality. Additional wells will be constructed and utilized as up gradient monitoring and down gradient monitoring of ground water quality. The proposed locations of these wells are indicated on Plate A-2 of Appendix A. WWS will use the proposed wells to sample groundwater semiannually. Water will be analyzed for the following analytes as required in R315-308-4:

- Heavy Metals including Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Mercury, Nickel, Selenium, Silver, Thallium, Vanadium, Zinc
- Inorganic Constituents including Ammonia, Carbonate/Bicarbonate, Calcium, Chemical Oxygen Demand (COD), Chloride, Iron, Magnesium, Manganese, Nitrate, pH, Potassium, Sodium, Sulfate, Total Dissolved Solids (TDS), Total Organic Carbon (TOC)
- Gasoline Range Organics (Method SW-846 8260C)

As required in R315-308-2(8) WWS will use a statistical method for determining whether a significant change has occurred as compared to background. To establish a background range of groundwater constituents, at least eight rounds of sampling will be completed over the course of 12 months after the completion of the landfill construction. Based on the sampling results for each constituent the 95% upper confidence interval will be calculated and will assume homoscedasticity. During operations of the landfill, semiannual samples will be collected, and results of each constituent will be compared using a parametric analysis of variance. If concentrations of a constituent are greater than the 95% confidence

interval, it will be considered an outlier and will be further evaluated to determine if it is a normal fluctuation in the groundwater or if it is a result of possible leachate or other contaminated water from the water disposal facility. A report of the data and outliers will be provided to the division which will determine an appropriate response to this data.

2.3 SLOPE STABILITY

2.3.1 Subsurface Investigation

As part of this investigation, subsurface soil conditions were explored by advancing four exploratory test pits in the area of the proposed land fill as well as the area of the potential source material for the construction of the berms surrounding the landfill. The test pits were advanced to depths ranging from 6½ to 8 feet below the site grade as it existed at the time of our investigation. The approximate locations of the explorations are shown on the Exploration Location Map, Plate A-2. The test pit locations were selected to provide a representative cross section of the subsurface soil conditions throughout the embankments. Subsurface soil conditions as encountered in the explorations were logged at the time of our investigation by qualified personnel working under the direction of a geotechnical engineer and are presented on the enclosed Test Pit Logs, Plates B-1 to B-4 in Appendix B.

The test pits were advanced using a PC220 tracked excavator. Due to the granular nature of the exposed soils, it was not feasible to obtain relatively undisturbed samples from test pit locations. As such, only bulk soil samples were obtained. All samples were transported to our laboratory for testing to evaluate engineering properties of the various earth materials observed. The soils were classified according to the Unified Soil Classification System (USCS) by the Geotechnical Engineer. Classifications for the individual soil units are shown on the attached Test Pit Logs.

2.3.2 Laboratory Testing

Geotechnical laboratory tests were conducted on samples obtained during our field investigation. The laboratory testing program was designed to evaluate the engineering characteristics of onsite earth materials. Laboratory tests conducted during this investigation include:

- Natural Moisture and Unit Weight of Soils
- Grain Size Distribution Analysis (ASTM D422)

- Atterberg Limits (ASTM D4318)
- Direct Shear Test (ASTM D3080)
- Moisture-Density Relationship Test (ASTM D1557)
- Back Pressure Permeability (ASTM D5084)

Results of our laboratory testing indicate that the native soils vary from a Poorly Graded SAND (SP) with silt to a Lean CLAY (CL) with sand. The fines content (silt and clay material) ranging from 5.0 to 91.5 percent. The moisture contents of the soils as measured in our laboratory ranged from 2.0 to 10.5 percent. The results of our Atterberg Limit's testing indicate that the soils tested have low to no plasticity.

Results of our direct shear testing indicate that the samples tested had friction angles ranging from 30 to 37 degrees, with cohesion ranging from 15 to 140 psf. The results of all laboratory tests are presented on the Test Pit Logs in Appendix B (Plates B-1 to B-4), the Laboratory Summary Table and the test result plates presented in Appendix C.

2.3.3 Subsurface Conditions

Based on the explorations advanced at the site as well as on the results of our laboratory testing, the native site soils generally consist of Silty SAND (SM) grading into a Lean Clay (CL) with sand. The Clay soils persisted to the full depth of our investigations (9½ ft.). The stratification lines shown on the enclosed test pit logs represent an approximate boundary between soil types. The actual in situ transition may be more gradual.

No groundwater was encountered in any of the 4 test pits advanced for this investigation. In addition, the moisture contents measured in our test pits indicate that the near-surface soils have relatively low moisture contents. As such, we do not anticipate groundwater adversely affecting the stability of the embankments/slopes of the landfill.

2.3.4 Landfill Embankment Stability

GeoStrata has evaluated the stability of the proposed landfill cell embankments and slopes using SLIDE, a computer application incorporating (among others) Bishop's Simplified Method of analysis. Calculations for stability were developed by searching for the minimum factor of safety for a circular-type failure. Stability analyses were conducted at a representative cross-section of the proposed embankment/slope as shown on Plate A-2. The exterior landfill buttress slopes were modeled using three scenarios; 1) the landfill is empty, 2) the landfill has been filled to the top of the embankment, and 3) the landfill has been filled above the top of the embankment at a 3H:1V grade. The stability of the embankments was assessed under static and pseudo-static

conditions. The pseudo-static condition is used to assess stability of slopes during seismic events. The peak ground acceleration for the Maximum Credible Earthquake (MCE) was estimated using the site's approximate latitude and longitude and the OSHPD Seismic Design Maps ground motion calculator which correlates the MCE to a 2 percent probability of exceedance in 50 years. Using this procedure, the peak ground acceleration is estimated to be 0.13g. In accordance with Hynes-Griffin (1984), half of this value was used in our analyses. This methodology assumes that no greater than 3 meters of deformation will occur if the calculated factor of safety is greater than 1.0.

The strength value for the embankment soils was based on the results of our laboratory testing as well as on published literature. As a summary, the following strength parameters were utilized in our model;

Soil Strength Parameters	Embankment Material	Native Soils (Sandy Material)	Native Soils (Clayey Material)	Landfill Waste Material
Friction Angle (phi) (degrees)	32	37	30	25
Cohesion (psf)	100	15	140	100
Unit Weight (pcf)	120	120	110	100

The soil strength parameters for the native sandy and clayey soils were obtained utilizing the direct shear testing completed as part of this investigation. The soil strength parameters for the embankment material was obtained by taking an average value of the onsite sandy soils and the onsite clayey soils assuming that the embankment will be constructed utilizing a mixture of onsite soils. The strength parameters utilized for the landfill waste material was selected based on direct shear testing completed on samples of similar material for other projects in the area. It is anticipated that the landfill material may vary in composition and moisture content, and as such GeoStrata recommends that additional strength testing be completed on a representative sample of the material to be placed within the landfill. Finally, we understand that the landfill will incorporate a geosynthetic liner. We therefore assumed no seepage from the landfill cell. It is recommended that a textured liner be utilized in the construction of the interior of the embankment to increase friction between the waste soils and the embankment support.

The results of our stability modeling indicate the following factors of safety for embankment slope failure assuming that the internal slope will be graded at a 2H:1V grade, whereas the external embankment will be graded at a 3H:1V slope maximum:

Stability Assessment	Factor of Safety
Plate I-1 – Southern Slope Static	4.88
Plate I-2 – Southern Slope P-Static	3.36
Plate I-3 – Northern Slope Interior Static	3.33
Plate I-4 – Northern Slope Interior P-Static	2.59
Plate I-5 – Northern Slope Exterior Static	3.99
Plate I-6 – Northern Slope Exterior P-Static	3.13
Plate I-7 – Southern Slope Static – Partially Filled Landfill	5.37
Plate I-8 – Southern Slope P-Static – Partially Filled Landfill	3.69
Plate I-9 – Northern Slope Static - Partially Filled Landfill	4.34
Plate I-10 – Northern Slope P-Static – Partially Filled Landfill	3.25
Plate I-11 – Southern Slope Static – Filled Landfill	2.16
Plate I-12 – Southern Slope P-Static – Filled Landfill	1.71
Plate I-13 – Northern Slope Static – Filled Landfill	2.26
Plate I-14 – Northern Slope P-Static – Filled Landfill	1.79

Results of the slope stability modeling are presented in Appendix I as Plates I-1 to I-14 attached to this Permit Application. Slopes with factors of safety greater than 1.5 and 1.1 for the static and pseudo static conditions respectively are typically considered stable. As indicated above the embankments have factors of safety for the static and pseudo static conditions greater than 1.5 and 1.1, respectively. It is therefore GeoStrata’s opinion that the proposed plans for embankments are suitable for use for the planned landfill.

2.4 STORM WATER MANAGMENT

In order to minimize liquids admitted into the active areas of the landfill and run-off waters from the active areas of the land fill as required by R315-303-3(c) and (d), the landfill has been designed to prevent run-on of surface waters into the active landfill and control run-off waters from the active area of the landfill resulting from a maximum flow of a 25-year storm. Potential run-on storm water is diverted around the landfill. The total anticipated volume of run-off volume of water in a 25-year storm event is approximately 1,700 cubic yards.

3.0 CLOSURE PLAN

3.1 CLOSURE SCHEDULE

The Proposed Class III E&P Landfill will be closed in a single operation that includes the final grading of the waste material and the placement of the final cover. The expected duration of the land fill operation is approximately 10 years at a 10% growth rate. Sixty days prior to the expected final receipt of waste, WWS will notify the division of their intent to begin closure operations. WWS will begin its closure operations after the final receipt of waste is obtained. It is anticipated that the closure operation will take place over an anticipated duration of 90 to 120 days. During this period the landfill will be graded, covered and surveyed. As-built plans will be generated for reference for the final inspection by the division.

3.2 DESIGN OF FINAL COVER

The final cover will consist of two soil layers. The lower layer will consist of a compacted clay soil liner which will be overlain by an upper layer of soil that will be seeded with native grasses. The construction of the lower layer portion of the final cover will be an Alternative Design that will achieve equivalent requirements as the Standard Design as prescribed in R315-303-3(4)(c)(i). The upper layer will follow the Standard Design requirements as explained in R315-303-3(4)(a)(ii). Cover soils will be constructed from soils that are available on site. All testing and calculations are based on samples of the native soils at the site.

In the alternative final cover design the waste will be covered with a minimum of 6 inches of clay that will have a permeability of at most 1×10^{-6} cm/second. The Utah regulation R315-303-3(4)(c)(i) requires that the alternative final cover of a soil liner must achieve an equivalent reduction in infiltration as achieved by the standard design. Standard design calls for at least 18 inches of compacted soil, or equivalent, with a permeability of 1×10^{-5} cm/sec or less, or equivalent. The proposed soils used for the final cover are far less permeable than this requirement. The proposed lower layer will use 6 inches of clay soils that have a permeability of no greater than 1×10^{-7} cm/s. Preliminary testing show that the soils have a permeability of less than 1×10^{-8} cm/s. Based on engineering calculations 6 inches of soils with a permeability no more than 1×10^{-7} cm/sec is equivalent to 18 inches of soils that are permeable up to 1×10^{-5} cm/second. These calculations are included as part of our mathematical model that can

be found in Appendix D of this permit application and explained in the following paragraph.

As part of the requirements of an alternative final cover design, expected performance of the alternative cover has been documented by use of a mathematical model as required in R315-303-3(4)(d). Line item 3 of the model includes a hydraulic conductivity test that was performed on a sample of cover soils obtained from the Sand Pass facility. The lab test was performed in accordance with ASTM D5084 method C that resulted in a lab measurement of 4.31×10^{-6} cm/second. This result exceeds minimum requirement of 1×10^{-5} cm/second of the standard design. The mathematical model also includes other lab tests on the soil that demonstrate that the soil is non-dispersive (line 1). Lines 5 through 15 include the model that demonstrates the performance of the soils used for the alternative cover. This model includes in line Item 5 the climatic conditions including the normal precipitation and wettest 5 years on record as required in R315-303-3(4)(d)(i) and (ii). Using this data, we then calculated the annual soil erosion rate was based on the Revised Universal Soil Loss Equation that is commonly used by the EPA and NRCS. Using this equation, we are able to show that the proposed cover design would lose annually 0.05 inches of soil over the entire cap (line 14). Applying a factor of safety of 10, the unattended and unrepaired cover would lose 6 inches of soil after 10 years. It is our engineering opinion that this alternative design is equivalent to the Standard Design.

In addition, R315-303-3(4)(a)(ii) also requires that a second layer of soil is to be used for reducing erosion consisting of at least 6 inches of soil capable of sustaining vegetative growth placed over the compacted soil cover and seeded with grass, other shallow rooted vegetation, or other native vegetation. In our proposed design follows the standard design requirements in that the compacted clay liner soils will be covered with a second soil layer that will be a minimum of 6 inches of soil as prescribed in R315-303-3(4)(a)(ii). This soil layer will be capable of sustaining vegetative growth and will be seeded with native shallow root vegetation or native vegetation to minimize erosion of the final cover. It is our understanding that locally available topsoil suitable for vegetative growth may be readily available to be utilized at the time of closure. These soils may be tested for organic content, permeability and cohesion prior to use as final cover soil.

The final cover for each cell will be graded to no steeper than a 3:1 slope around the outer perimeter of the landfill cell. The top elevation of the landfill cap will be rectangular and will have a slope of no less than 2%. To control the run-off of storm water and minimize erosion of the final cover material, it is intended that the final cover soils be seeded with native grasses and use other erosion controls as needed. The final cover may be reseeded as needed during the post closure phase of the landfill. The final cover plans of each landfill cell are included in Appendix D of this permit application.

3.3 CAPACITY OF LANDFILL

The estimated capacity of the Proposed Class III E&P Landfill, up to the final cover, is 307,000 cubic yards. With an estimated dry density of 97.2 lb./cu-ft. based on the assumption of half the waste being mixed with additional material, the landfill will have an estimated total of 403,000 tons of waste at the time of closure. A table with the projected life of at 0, 2, 3, 5, and 10 percent growth rate for the landfill is provided in Appendix E, Plate E-1. The growth rate is defined as the number of trucks delivered to the site on an average daily basis. With an increase in the growth rate, the life of the landfill will be reduced.

3.4 FINAL INSPECTION

After the completion of the final cover, the final inspection of the landfill will be conducted by officials from DWMRC. WWS will notify the division of the anticipated date of completion and arrange for scheduling the inspection.

4.0 POST CLOSURE CARE

Immediately after the completion of construction for the final cover of the landfill, the post closure care plan will be implemented. As required in R315-302-3(5) the post closure care activities will take place for 30 years or as long as the Director determines is necessary for the facility or unit to become stabilized and to protect human health and the environment. A licensed engineer with the state of Utah will direct the post-closure care of the facility and will provide WWS with recommendations to properly maintain the landfill site and prevent any release of harmful substances. The engineer will also provide the division with documentation if he determines that the site is safe to reduce or discontinue site monitoring prior to the end of the 30-year period.

4.1 POST CLOSURE CARE PLANS

During the post closure period the following activities will take place:

Site Monitoring: Portions of the WWS facility are operated 24 hours a day 7 day a week. WWS personnel will be onsite every day to monitor activities at the facility and restrict access to the landfill. Access to the landfill will be restricted with fencing and locked gates at the roadway entrance. Signs will be posted advising of the potential dangers associated with the landfill. Only authorized personnel of WWS will have access to the landfill site.

On a quarterly basis the landfill cover will be inspected to check for rutting and depressions that could result in rapid erosion. If rutting or depressions in the cover are identified they will be repaired by grading and seeding the surface. Slopes of the final cover will also be inspected and maintained. WWS will insure that a 2% slope will be maintained on the top of the cover and a 3:1 slope will be maintained around the perimeter of the landfill.

Run-off water from the final cover will be directed into the existing drainages to the south and east of the landfill. WWS will on a Quarterly basis inspect the run-off collection system and ensure that they are properly diverting water into the existing storm water drainages. Repairs will be made as needed.

Surface and Ground Water Monitoring: Samples will be collected of groundwater from the monitoring wells on site. No samples of surface waters will be collected

because there are no observed streams, springs or other surface waters at the site of the proposed landfill. All sampling will be completed by a Utah certified groundwater sampler. Sampling will take place every six months during the closure and post-closure care period. The water will be field tested for pH, water temperature, and water conductivity. Samples will also be collected for lab analysis, testing for heavy metals and organic constituents will be conducted as required in R315-308-4. The results of the water sample testing will be recorded and statistically analyzed for significant changes in concentrations of constituents utilizing a parametric analysis of variance (ANOVA). If significant changes are detected, then WWS will follow the guidelines in R315-308-2(13).

4.2 RECORD OF TITLE, LAND USE, ZONING

The Duchesne County Recorder will be notified during the closure period of the completion of the disposal site. The county recorder will be provided with documentation and plats of the location of the disposal site. Notification of the closure, and location of the land fill will also be sent to the county recorder and zoning changes will be made if necessary. Documentation of the history of the landfill will permanently appended to the title of record and land use restrictions will be put in place.

4.3 POST CLOSURE CONTACTS

The point of contact during the post closure care period for this facility is Reece Jensen. His contact information is provided below:

Reece Jensen

Western Water Solutions

1145 S. 800 E Suite 259

Orem, Utah 84097

801-518-9790

5.0 FINANCIAL ASSURANCES

5.1 CLOSURE COSTS

The Proposed Class III E&P Landfill is planned to close in a single operation when the waste reaches final design grade. The closure costs for the Proposed Class III E&P Landfill are based on the cost to construct the final cover. The final cover construction is to include the placement and grading of the 6-inch clay cover, 6-inch topsoil layer and seeding of topsoil. Detailed financial assurance costs are presented in Appendix H of this permit application.

5.2 POST CLOSURE CARE COSTS

Post closure care of inactive sections of the Proposed Class III E&P Landfill will consist of maintaining the integrity of the final and vegetative covers. Any areas subject to erosion will be corrected and appropriate measures will be implemented to identify and eliminate the run on source. No active or technical devices are proposed for at the Proposed Class III E&P Landfill. Best management practices will be implemented to minimize the infiltration and assure the integrity of the run-on/run-off system. Evaluation of the system will be made during the quarterly inspections and corrective measures if any will be implemented. All run-on and run-off from events smaller than the 25-year storm will be controlled through drainage design.

Leachate collection devices are proposed for the facility. The closed landfill will be inspected as part of the quarterly reviews performed by the landfill operator. The closed landfill will also be inspected as a part of the in-depth annual inspection. Any deficiencies will be repaired as soon as practical. For those failures which jeopardize the environmental integrity of the facility or permit, the uncontrolled infiltration of significant amounts of moisture, corrective measures will be initiated immediately.

Ground water monitoring is also proposed for the post closure care. Ground water will be sampled biannually and tested for the listed constituents provided in section 2.2.7 of this report. The results of this testing will be included in the in-depth annual inspections report.

Post closure care costs are estimated by the cost of maintaining the previously described activities for a 30-year period. A detailed financial assurance cost is provided in Appendix H.

5.3 FINANCIAL ASSURANCE

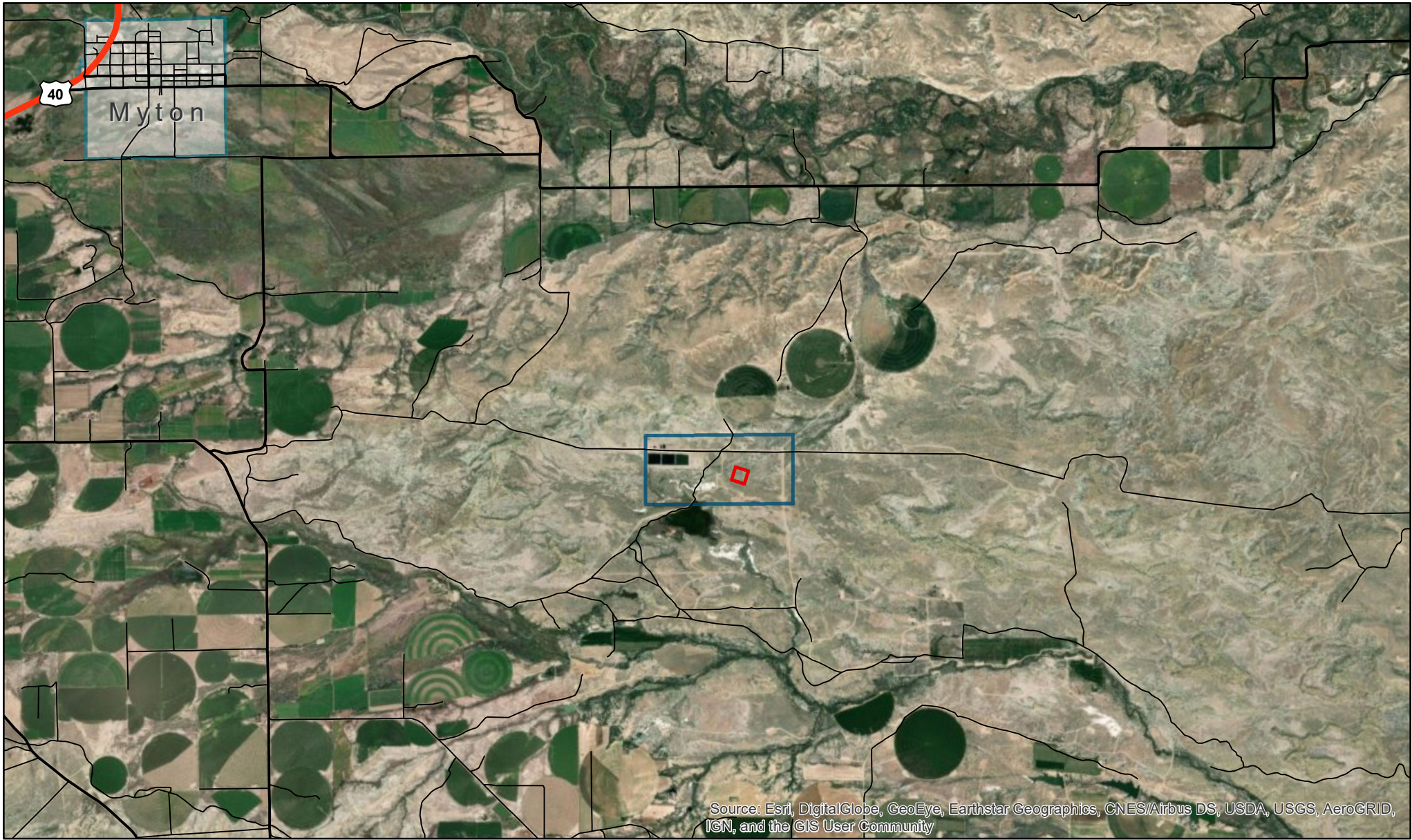
This section of the permit describes compliance with Subsection R315-309, Financial Assurance of the Administrative Rules for Solid Waste Permitting and Management. Cost estimates consider the most expensive option during the period and are based on in house personnel performing closure and post closure care.

The WWS team complies with financial assurance test requirements for private entities based on 1) acceptable bond ratings, 2) financial statements prepared in conformity with generally accepted accounting principles for private entities audited by independent CPA's

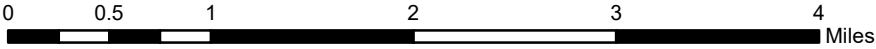
WORKS CITED

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<http://earthquake.usgs.gov/hazards/qfaults/>

Appendix A





Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



1:60,000



Legend

-  Landfill Cell
-  Property Boundary







Landfill Permit
Western Water Solutions
Duchesne County, Utah
Project Number: 705-011

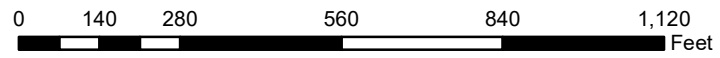
**Plate
A-1**

Site Vicinity Map



Legend

-  Monitoring Well
-  Test Pit
-  Proposed Monitoring Well
-  Future Landfill Phases
-  Landfill Cell
-  Property Boundary



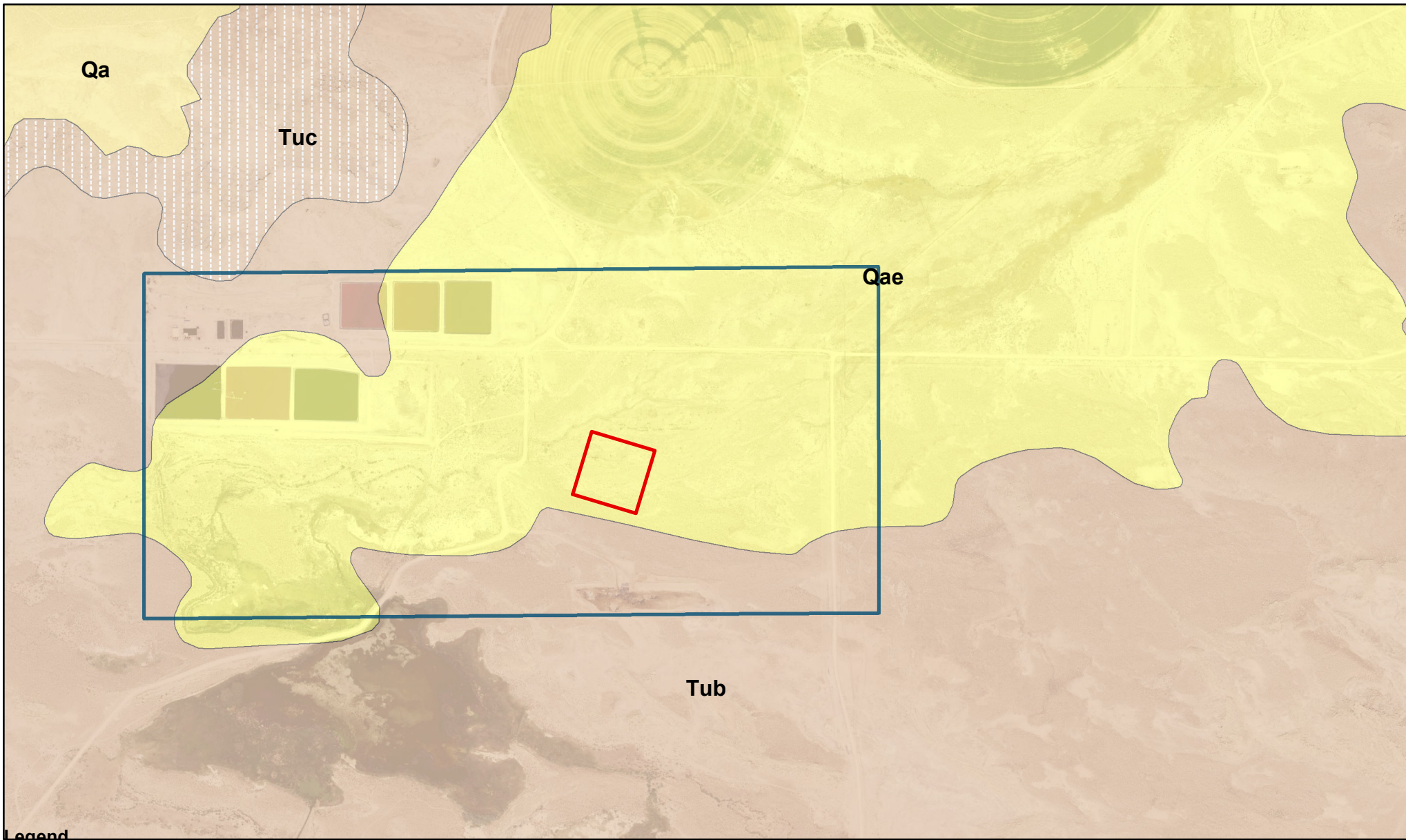
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Landfill Permit
 Western Water Solutions
 Duchesne County, Utah
 Project Number: 705-011

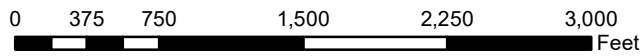
**Plate
 A-2**

Landfill Site Map



Legend

- Landfill Cell
- Property Boundary
- Qa - Piedmont alluvium, undivided
- Qae - mixed alluvium and eolian deposits
- Tuc - member C of Uinta Formation
- Tub - member B of Uinta Formation



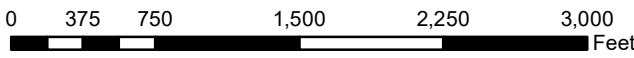
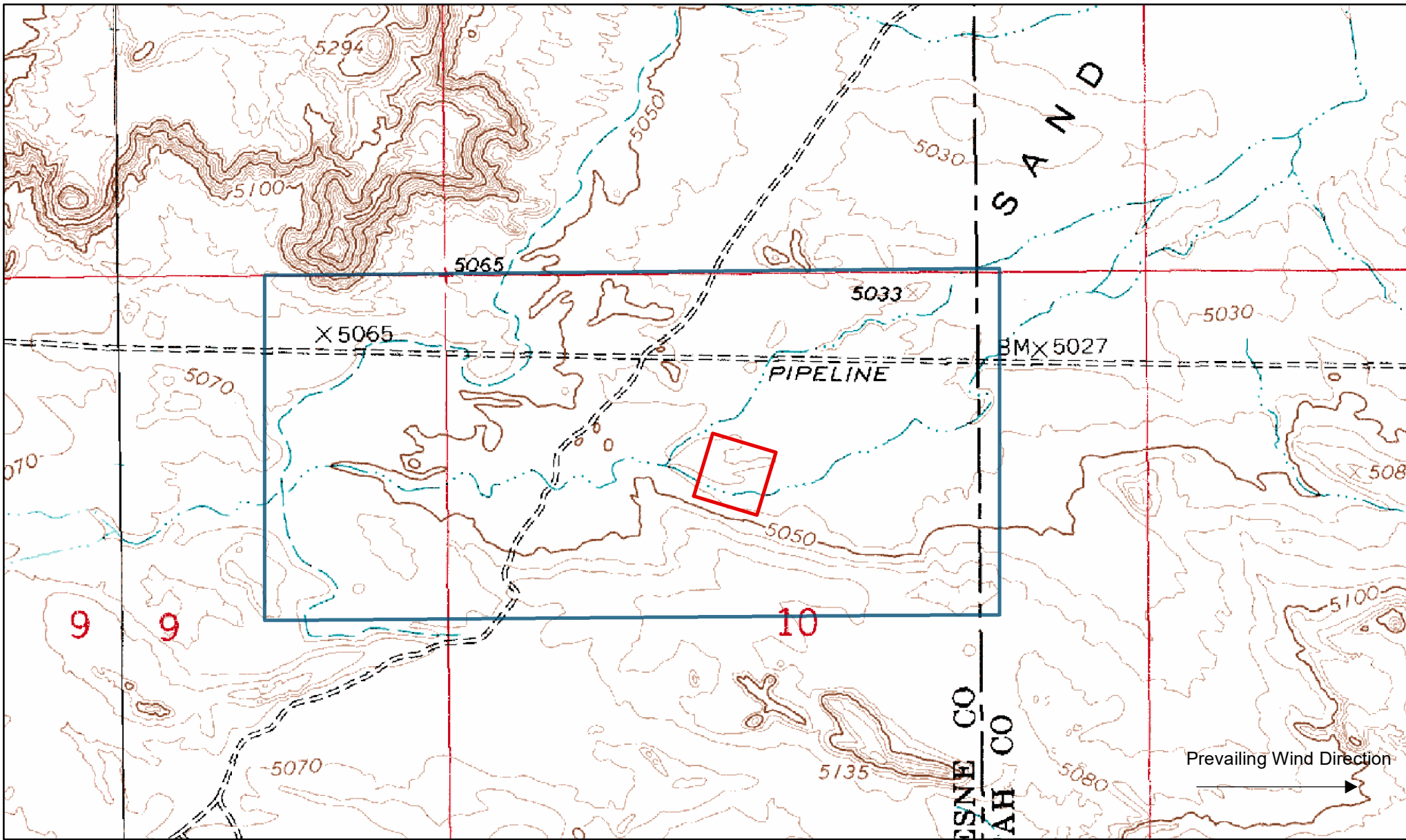
1:12,000



Landfill Permit
 Western Water Solutions
 Duchesne County, Utah
 Project Number: 705-011

**Plate
 A-3**

Geologic Map



1:12,000



Prevailing Wind Direction →

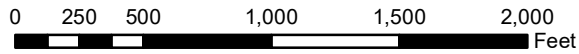
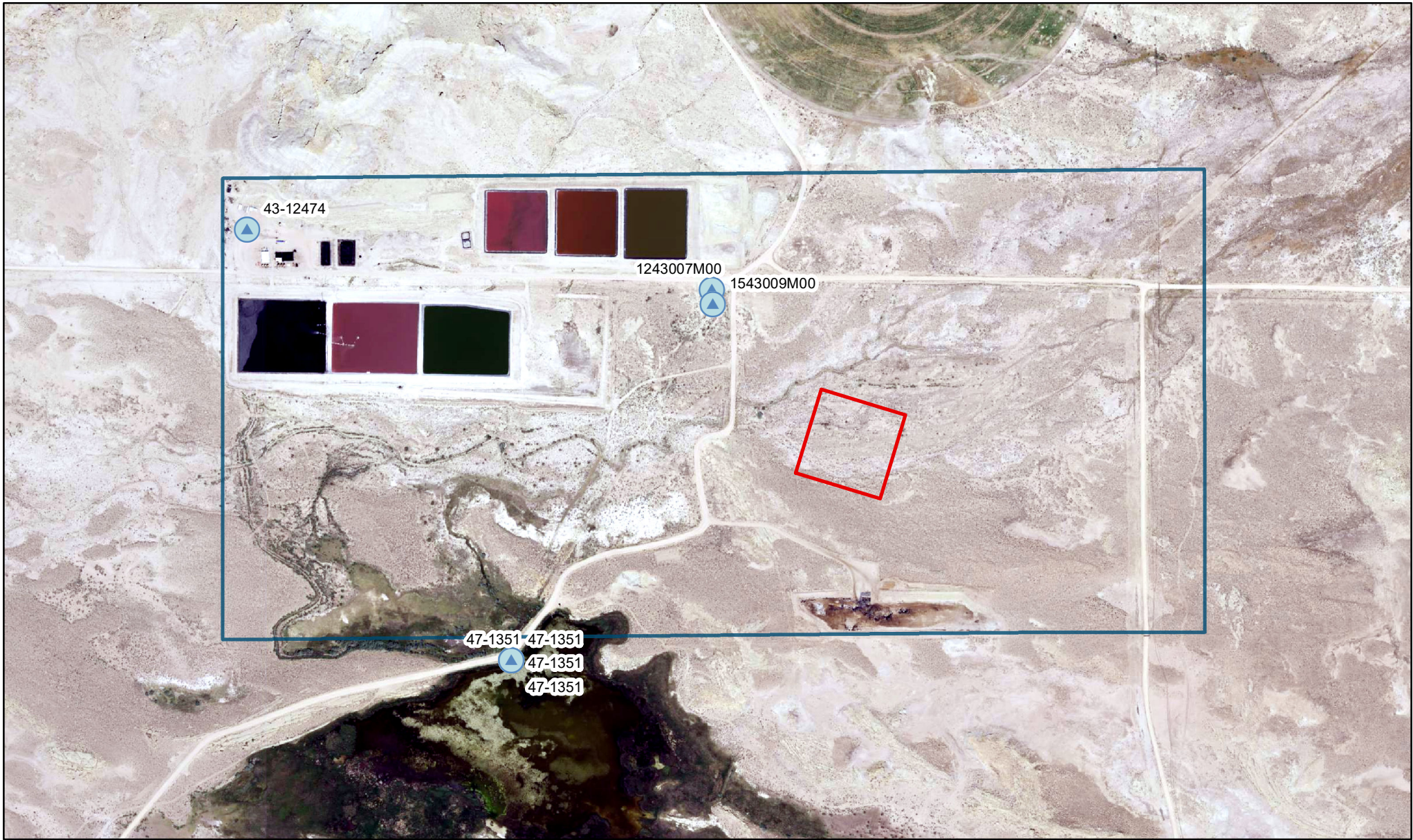


- Legend**
- Landfill Cell
 - Property Boundary

Landfill Permit
Western Water Solutions
Duchesne County, Utah
Project Number: 705-011

Plate
A-4

Land Use Map






1:9,000



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Legend

-  wrpod
-  Landfill Cell
-  Property Boundary

Landfill Permit
Western Water Solutions
Duchesne County, Utah
Project Number: 705-011

**Plate
A-5**

Water Right Location Map

Appendix B

DATE		Western Water Solutions Sand Pass Landfill Permit , Utah			GeoStrata Rep: J. Sage		TEST PIT NO: TP-NE												
STARTED: 11/15/18		Project Number 705-011			Rig Type:		Sheet 1 of 1												
COMPLETED: 11/15/18																			
BACKFILLED: 11/15/18																			
DEPTH		LOCATION			Dry Density (pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits									
METERS	FEET	SAMPLES	WATER LEVEL	GRAPHICAL LOG						UNIFIED SOIL CLASSIFICATION	NORTHING	EASTING	ELEVATION	Plastic Limit	Moisture Content	Liquid Limit			
		MATERIAL DESCRIPTION																	
0	0				SM	Silty SAND - dense, medium brown, moist													
1																			
2					CL	Lean CLAY - stiff, dark brown, moist			1.1	15.3	NP	NP							
					CL	Lean CLAY with sand - stiff, dark brown, moist			10.5	91.5	36	19							
					CL	Lean CLAY with sand - stiff, dark brown, moist			4.6	84.8	39	19							
						Bottom of Test Pit @ 6.5 Feet													
3																			



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

WATER LEVEL
 ▼ - MEASURED
 ▽ - ESTIMATED

NOTES:

**Plate
B-1**

DATE		Western Water Solutions Sand Pass Landfill Permit , Utah			GeoStrata Rep: J. Sage		TEST PIT NO: TP-NW														
STARTED: 11/15/18		Project Number 705-011			Rig Type:		Sheet 1 of 1														
COMPLETED: 11/15/18																					
BACKFILLED: 11/15/18																					
DEPTH		SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	LOCATION			Moisture Content and Atterberg Limits												
METERS	FEET					NORTHING	EASTING	ELEVATION	Dry Density (pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Plastic Limit	Moisture Content	Liquid Limit					
MATERIAL DESCRIPTION						<table border="1"> <tr> <td>10</td><td>20</td><td>30</td><td>40</td><td>50</td><td>60</td><td>70</td><td>80</td><td>90</td> </tr> </table>							10	20	30	40	50	60	70	80	90
10	20	30	40	50	60	70	80	90													
0	0					TOPSOIL; Clayey SILT - hard, brown with white mottling, moist															
					SM	Silty SAND - dense, medium brown, moist					18.3	NP	NP								
						Bottom of Test Pit @ 6.1 Feet															



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

WATER LEVEL
 - MEASURED
 - ESTIMATED



NOTES:



**Plate
B-2**

DATE		STARTED: 11/15/18		Western Water Solutions Sand Pass Landfill Permit , Utah Project Number 705-011			GeoStrata Rep: J. Sage		TEST PIT NO: TP-SE											
		COMPLETED: 11/15/18					Rig Type:		Sheet 1 of 1											
DEPTH		METERS	FEET	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	LOCATION			Moisture Content and Atterberg Limits									
								NORTHING	EASTING	ELEVATION	Dry Density (pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Plastic Limit	Moisture Content	Liquid Limit		
		MATERIAL DESCRIPTION																		
0		0					SM	Poorly Graded SAND with silt - dense, medium brown, moist												
							ML	Sandy SILT - stiff, medium brown, moist			2.0	5.0	NP	NP						
								Bottom of Test Pit @ 7 Feet												
1																				
5																				
2																				
3																				



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

WATER LEVEL
 - MEASURED
 - ESTIMATED

NOTES:

Plate
B-3

DATE	STARTED:	11/15/18	Western Water Solutions Sand Pass Landfill Permit , Utah			GeoStrata Rep: J. Sage		TEST PIT NO: TP-SW											
	COMPLETED:	11/15/18									Project Number 705-011			Rig Type:			Sheet 1 of 1		
	BACKFILLED:	11/15/18																	
DEPTH		LOCATION				Dry Density (pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits								
METERS	FEET	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION						NORTHING	EASTING	ELEVATION	Plastic Limit	Moisture Content	Liquid Limit			
		MATERIAL DESCRIPTION																	
0	0				ML	Sandy SILT - stiff to hard, brown, moist				10 20 30 40 50 60 70 80 90									
5					CL	Sandy Lean CLAY - stiff, brown, moist				8.6	61.3	27	16	●					
						Bottom of Test Pit @ 8 Feet													
3																			

LOG OF TEST PITS (B) LOGS.GPI.GEOSTRATA.GDT 3/6/19



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SAMPLE TYPE

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

WATER LEVEL

- ▼ - MEASURED
- ▽ - ESTIMATED

NOTES:

**Plate
B-4**

DATE
 STARTED: 2/28/19
 COMPLETED: 2/28/19
 BACKFILLED: 2/28/19

Sand Pass Landfill Permit
Sand Pass Landfill Permit
Myton, Utah
 Project Number 705-011

IGES Rep: J. Sage
 Rig Type:

WELL COMPLETION LOG
 BORING NO: **P-1**
 Sheet 1 of 1

DEPTH		SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	LOCATION			WELL LOG DESCRIPTION	Moisture Content and Atterberg Limits		
METERS	FEET					NORTHING	EASTING	ELEVATION		Plastic Limit	Moisture Content	Liquid Limit
MATERIAL DESCRIPTION						WELL DESCRIPTION						
0	0											
1	5											
2												
3	10											
4			▼									
5	15											
6	20											
7												
8	25											
9	30											
10												
11	35											
12	40											
13												
14	45											
15	50											
16												
17	55											
18	60											

WELL ONLY LOGS.GPJ IGES,GDT 3/6/19



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- SAMPLE TYPE**
- ☒ - 2" O.D./1.38" I.D. SPLIT SPOON SAMPLER
 - ☒ - 3.25" O.D./2.42" I.D. U SAMPLER
 - ☒ - 3" O.D. THIN-WALLED SHELBY SAMPLER
 - ☐ - GRAB SAMPLE
 - ☒ - Modified California Sampler

NOTES:

Bentonite 10-20 Silica Sand 20 Slot Screen Pipe Cap

WATER LEVEL

▼ - MEASURED ▽ - ESTIMATED

Plate

B-5

DATE
 STARTED: 2/28/19
 COMPLETED: 2/28/19
 BACKFILLED: 2/28/19

Sand Pass Landfill Permit
Sand Pass Landfill Permit
Myton, Utah
 Project Number 705-011

IGES Rep: J. Sage
 Rig Type:

WELL COMPLETION LOG
 BORING NO: **P-2**
 Sheet 1 of 1

DEPTH		SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	LOCATION			WELL LOG DESCRIPTION	Moisture Content and Atterberg Limits		
METERS	FEET					NORTHING	EASTING	ELEVATION		Plastic Limit	Moisture Content	Liquid Limit
MATERIAL DESCRIPTION						WELL DESCRIPTION			 10 20 30 40 50 60 70 80 90			
0	0											
1	5											
2												
3	10											
4												
5	15		▼									
6	20											
7												
8	25											
9	30											
10												
11	35											
12	40											
13												
14	45											
15	50											
16												
17	55											
18	60											

WELL ONLY LOGS.GPJ IGES,GDT 3/6/19



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SAMPLE TYPE

- 2" O.D./1.38" I.D. SPLIT SPOON SAMPLER
- 3.25" O.D./2.42" I.D. U SAMPLER
- 3" O.D. THIN-WALLED SHELBY SAMPLER
- GRAB SAMPLE
- Modified California Sampler

NOTES:

Bentonite
 10-20 Silica Sand
 20 Slot Screen
 Pipe Cap

WATER LEVEL

- MEASURED
 - ESTIMATED

Plate

B-6

DATE	STARTED:	11/15/18
	COMPLETED:	11/15/18
	BACKFILLED:	11/15/18

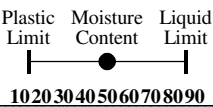
Sand Pass Landfill Permit
Sand Pass Landfill Permit
Myton, Utah
 Project Number 705-011

WELL COMPLETION LOG

IGES Rep: J. Sage
 Rig Type:

BORING NO:
TP-NE
 Sheet 1 of 1

DEPTH		SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	LOCATION			WELL LOG DESCRIPTION	Moisture Content and Atterberg Limits		
METERS	FEET					NORTHING	EASTING	ELEVATION		MATERIAL DESCRIPTION	WELL DESCRIPTION	Plastic Limit
0	0				SM	Silty SAND - dense, medium brown, moist						
1	5											
2	2				CL	Lean CLAY - stiff, dark brown, moist						
3	10				CL	Lean CLAY with sand - stiff, dark brown, moist						
4	6.5					Bottom of Boring @ 6.5 Feet						



WELL ONLY LOGS.GPJ IGES,GDT 3/6/19



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- ☒ - 2" O.D./1.38" I.D. SPLIT SPOON SAMPLER
 - ☒ - 3.25" O.D./2.42" I.D. U SAMPLER
 - ☒ - 3" O.D. THIN-WALLED SHELBY SAMPLER
 - ☐ - GRAB SAMPLE
 - ☒ - Modified California Sampler

NOTES:

Bentonite 10-20 Silica Sand 20 Slot Screen Pipe Cap

WATER LEVEL

▼ - MEASURED ▽ - ESTIMATED

Plate
A - 2

DATE	STARTED:	11/15/18
	COMPLETED:	11/15/18
	BACKFILLED:	11/15/18

Sand Pass Landfill Permit
Sand Pass Landfill Permit
Myton, Utah
 Project Number 705-011

IGES Rep: J. Sage
 Rig Type:

BORING NO:
TP-NW
 Sheet 1 of 1

WELL COMPLETION LOG

DEPTH		SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	LOCATION			WELL LOG DESCRIPTION	Moisture Content and Atterberg Limits								
METERS	FEET					NORTHING	EASTING	ELEVATION		Plastic Limit	Moisture Content	Liquid Limit						
0	0				BM					10	20	30	40	50	60	70	80	90
TOPSOIL; Clayey SILT - hard, brown with white mottling, moist																		
Silty SAND - dense, medium brown, moist																		
Bottom of Boring @ 6.1 Feet																		

WELL ONLY LOGS.GPJ IGES.GDT 3/6/19



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SAMPLE TYPE

- 2" O.D./1.38" I.D. SPLIT SPOON SAMPLER
- 3.25" O.D./2.42" I.D. U SAMPLER
- 3" O.D. THIN-WALLED SHELBY SAMPLER
- GRAB SAMPLE
- Modified California Sampler

NOTES:

Bentonite **Silica Sand** **20 Slot Screen** **Pipe Cap**

WATER LEVEL
 - MEASURED - ESTIMATED

Plate
A - 3

DATE	STARTED:	11/15/18
	COMPLETED:	11/15/18
	BACKFILLED:	11/15/18

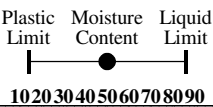
Sand Pass Landfill Permit
Sand Pass Landfill Permit
Myton, Utah
 Project Number 705-011

WELL COMPLETION LOG

IGES Rep: J. Sage
 Rig Type:

BORING NO:
TP-SE
 Sheet 1 of 1

DEPTH		SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	LOCATION			WELL LOG DESCRIPTION	Moisture Content and Atterberg Limits		
METERS	FEET					NORTHING	EASTING	ELEVATION		Plastic Limit	Moisture Content	Liquid Limit
0	0				SM	Poorly Graded SAND with silt - dense, medium brown, moist						
1	5				ML	Sandy SILT - stiff, medium brown, moist						
3	10					Bottom of Boring @ 7 Feet						
18	60											



WELL ONLY LOGS.GPJ IGES,GDT 3/6/19



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- SAMPLE TYPE**
- 2" O.D./1.38" I.D. SPLIT SPOON SAMPLER
 - 3.25" O.D./2.42" I.D. U SAMPLER
 - 3" O.D. THIN-WALLED SHELBY SAMPLER
 - GRAB SAMPLE
 - Modified California Sampler

NOTES:

Bentonite
 10-20 Silica Sand
 20 Slot Screen
 Pipe Cap

WATER LEVEL

- MEASURED
 - ESTIMATED

Plate
A - 4

DATE
 STARTED: 11/15/18
 COMPLETED: 11/15/18
 BACKFILLED: 11/15/18

Sand Pass Landfill Permit
Sand Pass Landfill Permit
Myton, Utah
 Project Number 705-011

IGES Rep: J. Sage
 Rig Type:

WELL COMPLETION LOG
 BORING NO: **TP-SW**
 Sheet 1 of 1

DEPTH		SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	LOCATION			WELL LOG DESCRIPTION	Moisture Content and Atterberg Limits		
METERS	FEET					NORTHING	EASTING	ELEVATION		MATERIAL DESCRIPTION	WELL DESCRIPTION	Plastic Limit
0	0				ML							
1	5				CL							
3	10					Bottom of Boring @ 8 Feet						

WELL ONLY LOGS.GPJ IGES,GDT 3/6/19



- SAMPLE TYPE**
- ☒ - 2" O.D./1.38" I.D. SPLIT SPOON SAMPLER
 - ☒ - 3.25" O.D./2.42" I.D. U SAMPLER
 - ☒ - 3" O.D. THIN-WALLED SHELBY SAMPLER
 - ☐ - GRAB SAMPLE
 - ☒ - Modified California Sampler

NOTES:

Bentonite
 10-20 Silica Sand
 20 Slot Screen
 Pipe Cap

WATER LEVEL

- MEASURED
 - ESTIMATED

Plate

A - 5

Appendix C

Test Pit No.	Sample Depth (feet)	USCS Soil Classification	Natural Moisture Content (%)	Optimum Moisture Content (%)	Maximum Dry Density (pcf)	Gradation			Atterberg	
						Gravel (%)	Sand (%)	Fines (%)	LL	PI
TP-NE	3.5	SM	1.1	16.2	109.8	0.6	84.1	15.3	NP	NP
TP-NE	6.5	CL	10.5	20.5	102.9	0.0	8.5	91.5	36	19
TP-NE	7.5	CL	4.6	16.4	103.8	0.0	15.2	84.8	39	19
TP-NW	2	SM	4.7	13	116.3	0.5	81.2	18.3	NP	NP
TP-SE	1	SP-SM	2	17	101.1	0.0	95.0	5.0	NP	NP
TP-SW	4.5	CL	8.6	14.2	117	1.3	37.4	61.3	27	16

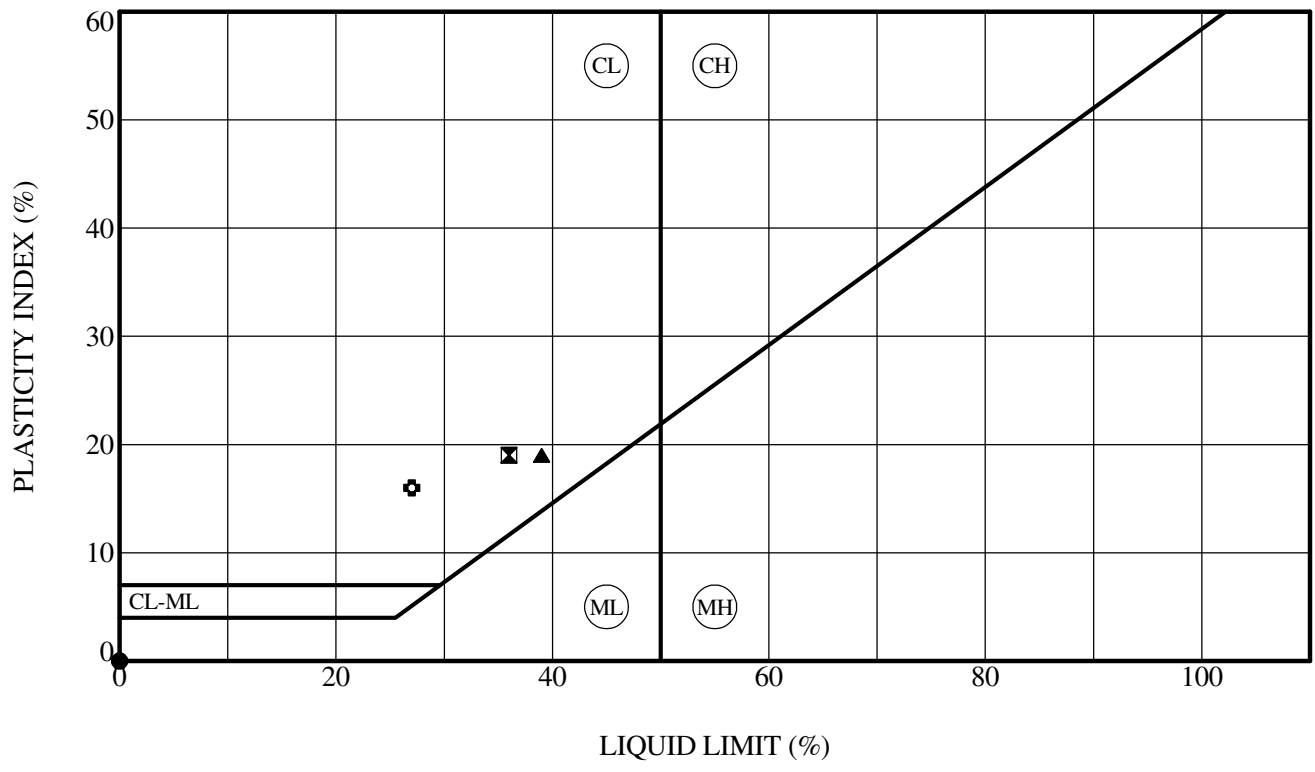


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Lab Summary Report

Western Water Solutions
Sand Pass Landfill Permit
Myton, Ut
Project Number: 705-011

**Plate
C - 1**

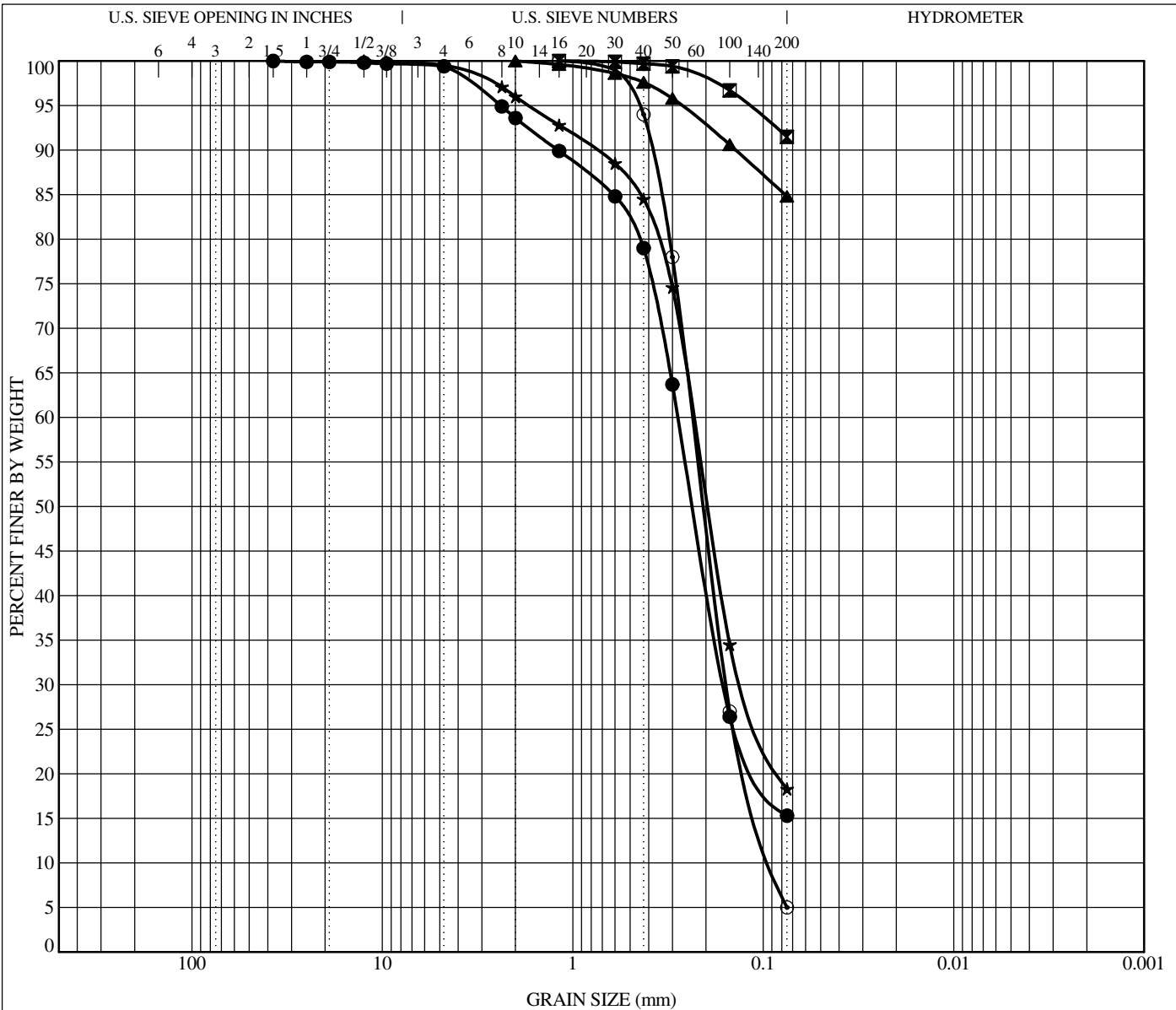


Sample Location	Depth (ft)	LL (%)	PL (%)	PI (%)	Fines (%)	Classification
● TP-NE	3.5	NP	NP	NP	15.3	Silty SAND
⊠ TP-NE	6.5	36	17	19	91.5	Lean CLAY
▲ TP-NE	7.5	39	20	19	84.8	Lean Clay with sand
★ TP-NW	2.0	NP	NP	NP	18.3	Silty SAND
⊙ TP-SE	1.0	NP	NP	NP	5.0	Poorly Graded SAND with silt
⊕ TP-SW	4.5	27	11	16	61.3	Sandy Lean CLAY

C_ATTERBERG LOGS.GPJ GEOSTRATA.GDT 3/6/19

ATTERBERG LIMITS' RESULTS - ASTM D 4318	
Western Water Solutions Sand Pass Landfill Permit Myton, Utah Project Number: 705-011	Plate C - 2





COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

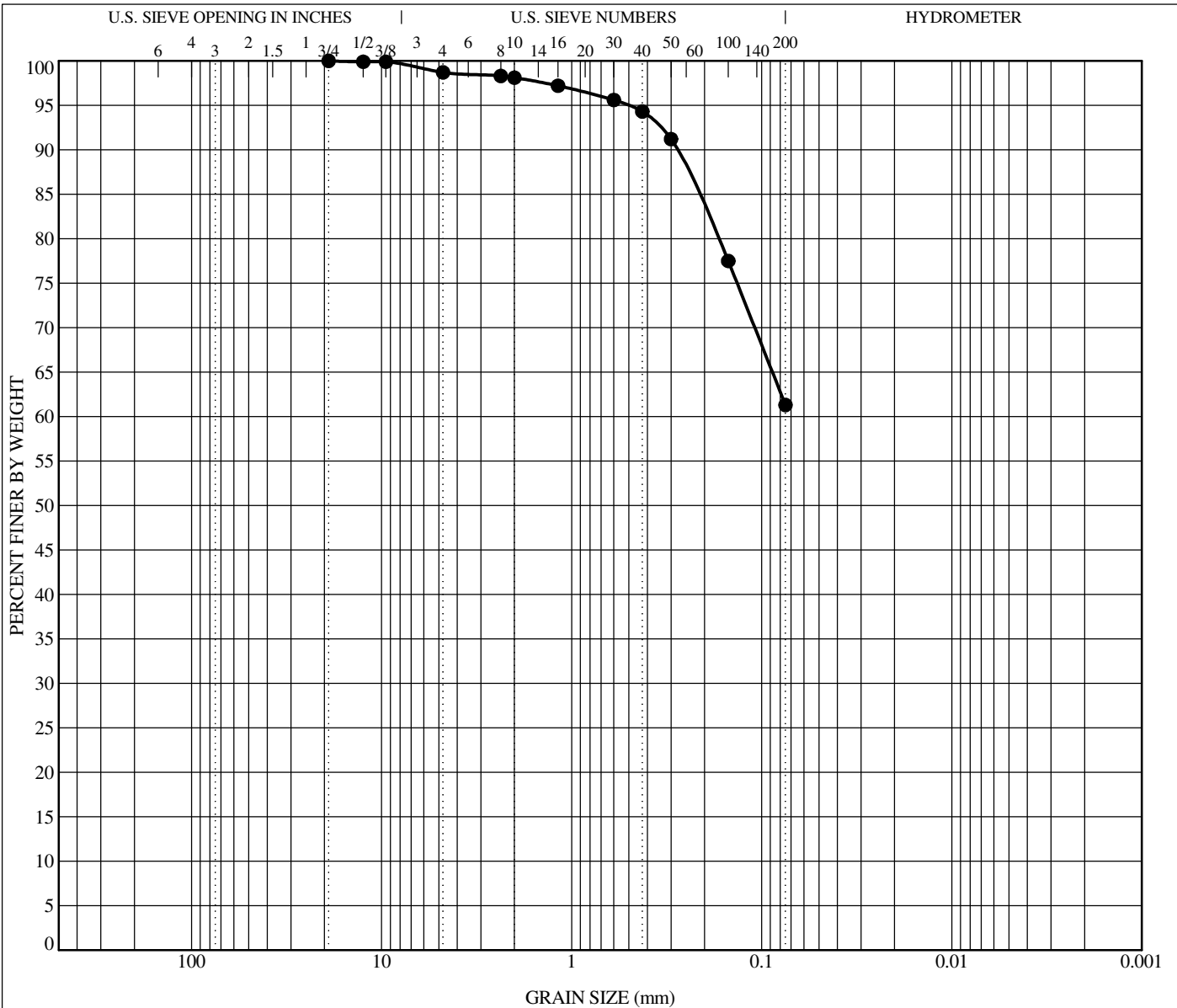
Sample Location	Depth	Classification					LL	PL	PI	Cc	Cu
● TP-NE	3.5	Silty SAND					NP	NP	NP		
▣ TP-NE	6.5	Lean CLAY					36	17	19		
▲ TP-NE	7.5	Lean Clay with sand					39	20	19		
★ TP-NW	2.0	Silty SAND					NP	NP	NP		
⊙ TP-SE	1.0	Poorly Graded SAND with silt					NP	NP	NP	1.18	2.68
Sample Location	Depth	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay		
● TP-NE	3.5	37.5	0.28	0.16		0.6	84.1	15.3			
▣ TP-NE	6.5	1.18				0.0	8.5	91.5			
▲ TP-NE	7.5	2				0.0	15.2	84.8			
★ TP-NW	2.0	12.5	0.233	0.124		0.5	81.2	18.3			
⊙ TP-SE	1.0	1.18	0.235	0.156	0.088	0.0	95.0	5.0			

GRAIN SIZE DISTRIBUTION - ASTM D422



Western Water Solutions
 Sand Pass Landfill Permit
 Myton, Utah
 Project Number: 705-011

Plate
C - 3



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Sample Location	Depth	Classification					LL	PL	PI	Cc	Cu
● TP-SW	4.5	Sandy Lean CLAY					27	11	16		

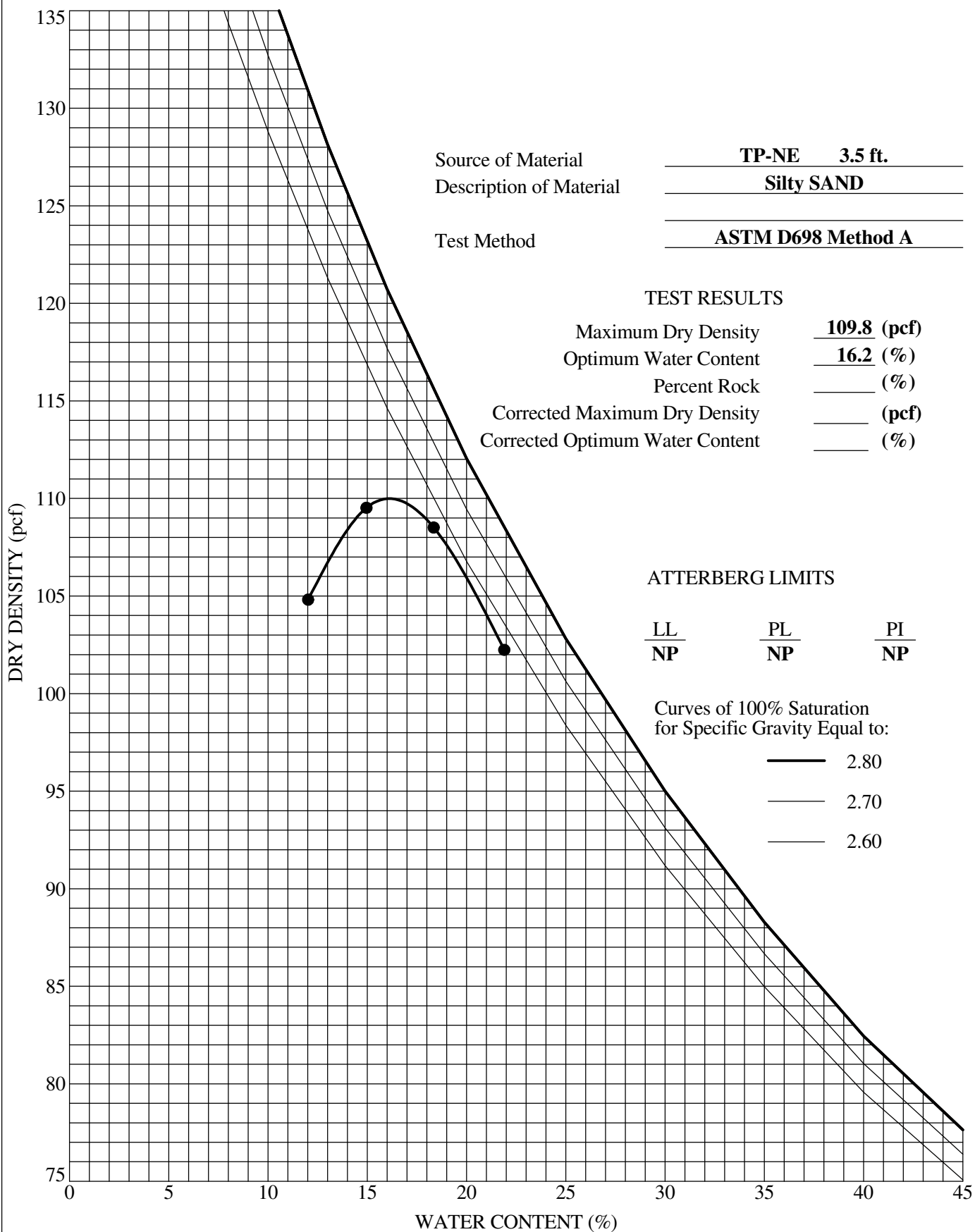
Sample Location	Depth	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● TP-SW	4.5	19				1.3	37.4	61.3	

GRAIN SIZE DISTRIBUTION - ASTM D422

Western Water Solutions
Sand Pass Landfill Permit
Myton, Utah
Project Number: 705-011

Plate
C - 4



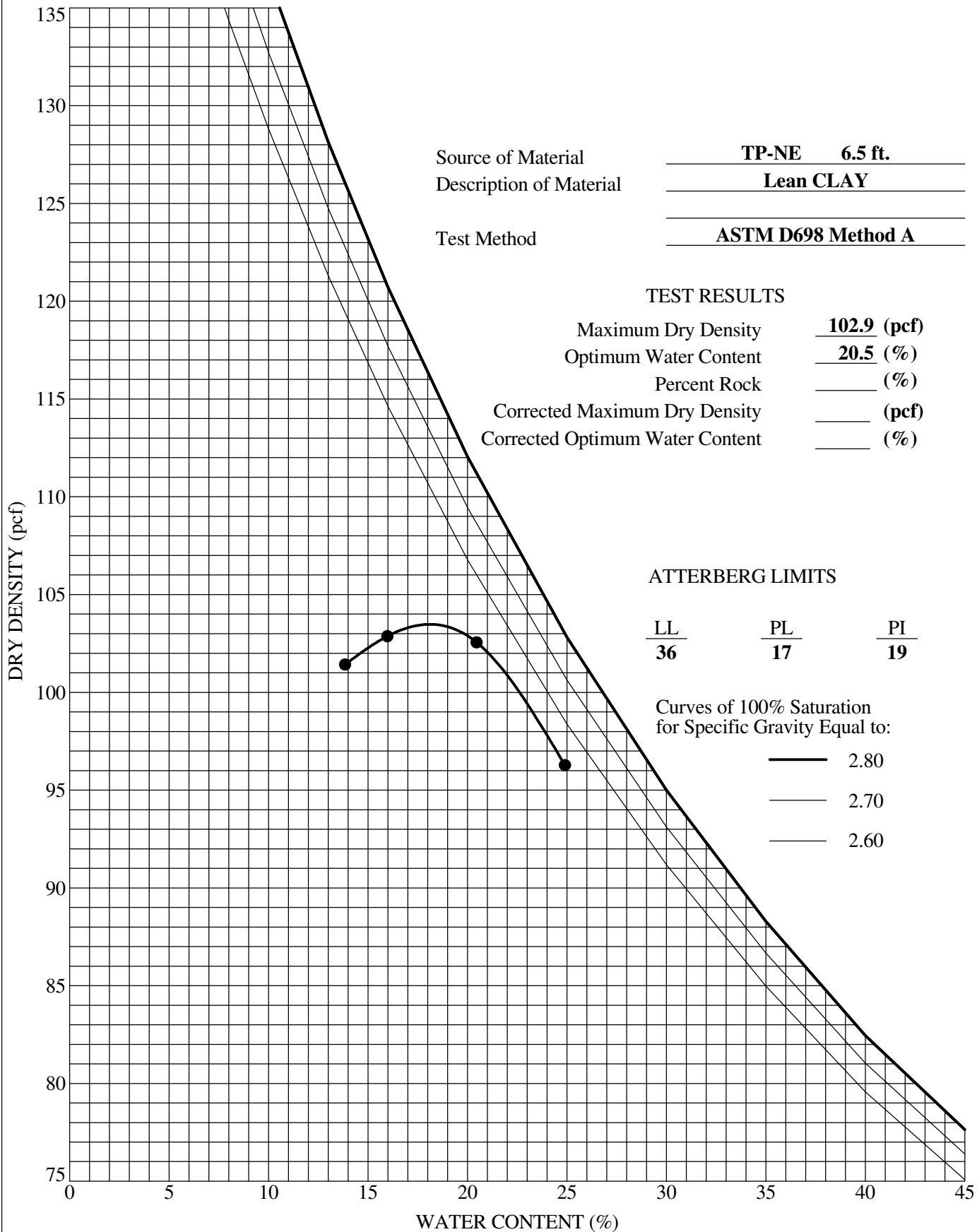


COMPACTION TEST



Western Water Solutions
 Sand Pass Landfill Permit
 Myton, Utah
 Project Number: 705-011

Plate
C - 5



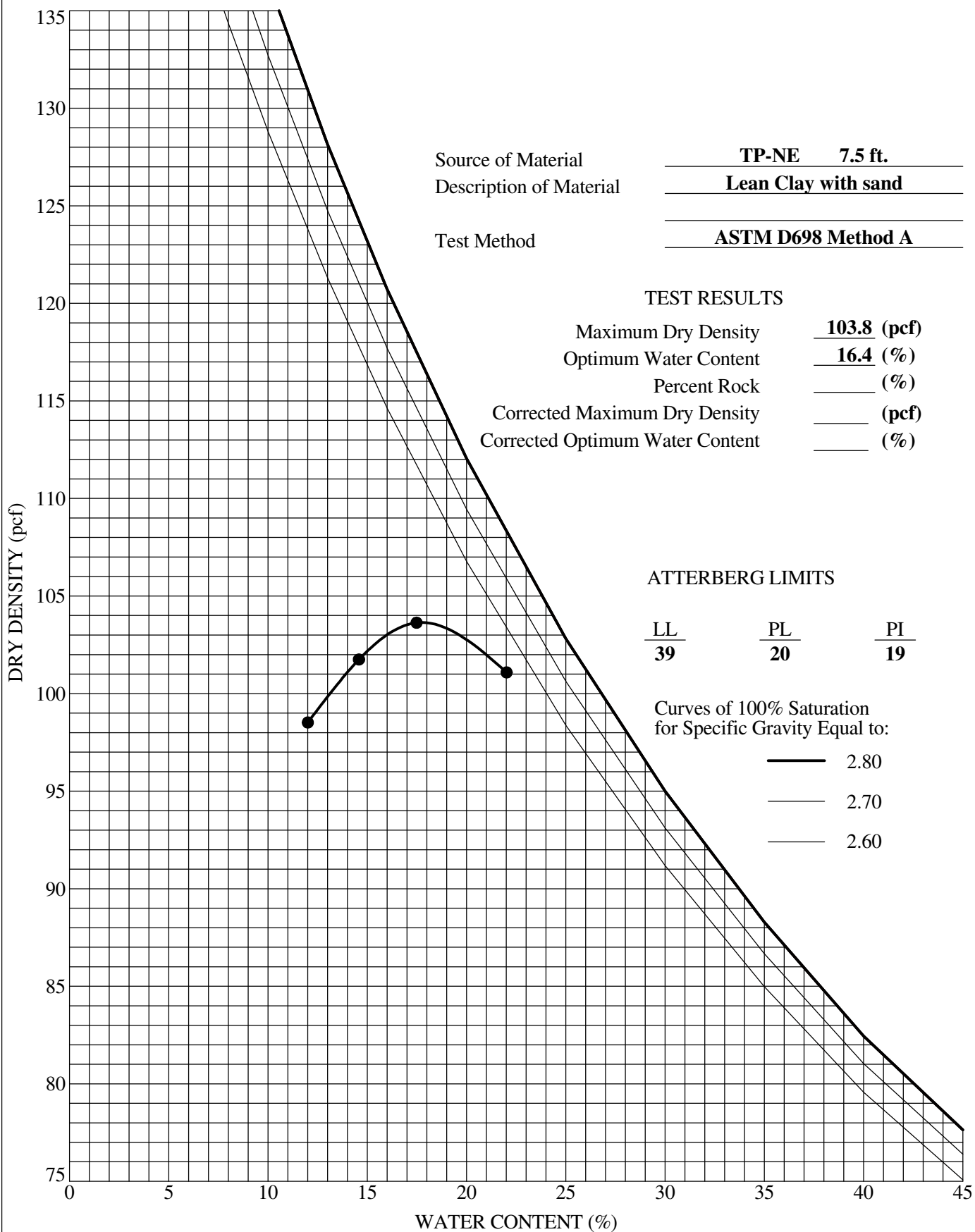
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COMPACTION TEST

Western Water Solutions
 Sand Pass Landfill Permit
 Myton, Utah
 Project Number: 705-011

Plate
C - 6

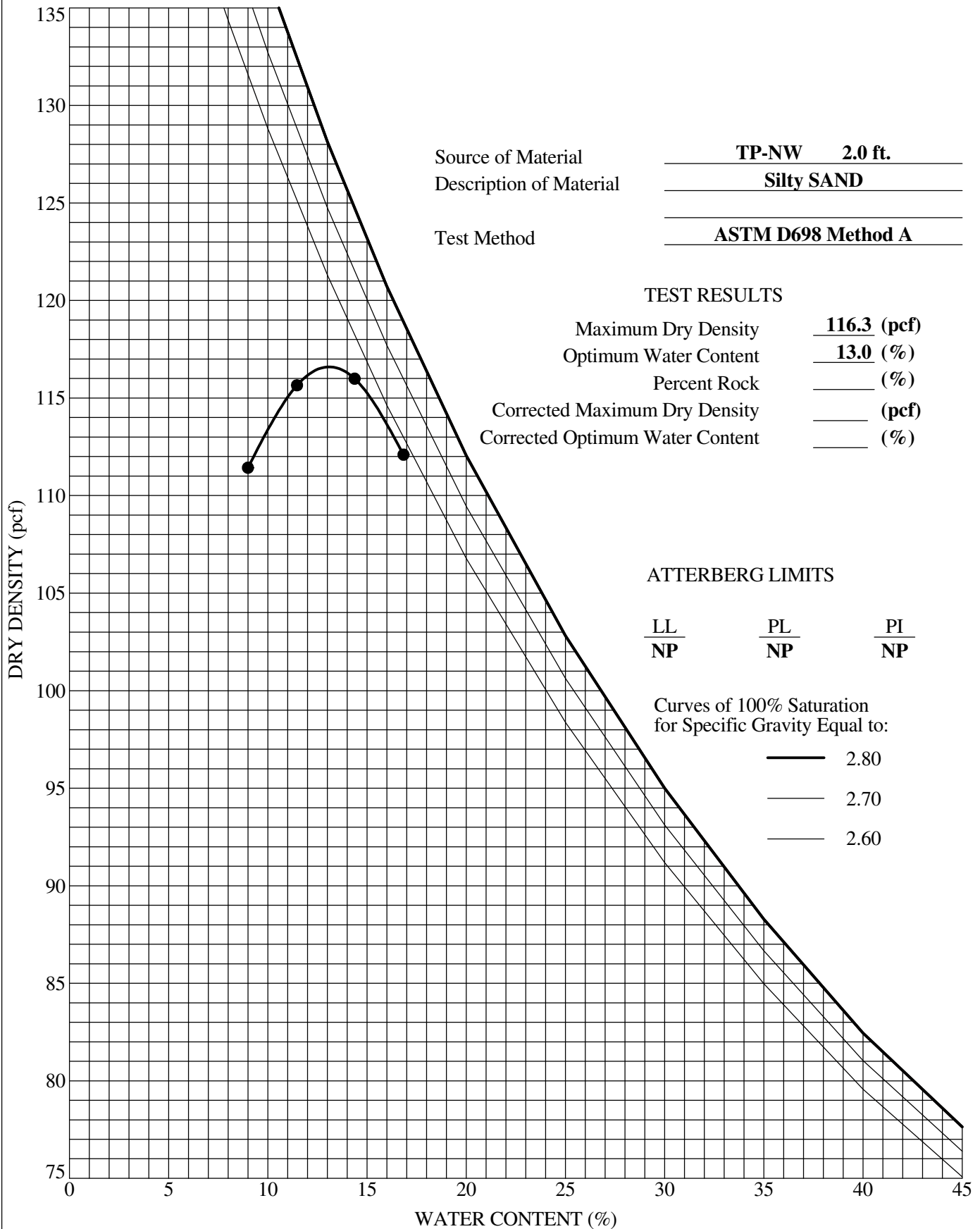


COMPACTION TEST



Western Water Solutions
 Sand Pass Landfill Permit
 Myton, Utah
 Project Number: 705-011

Plate
C - 7



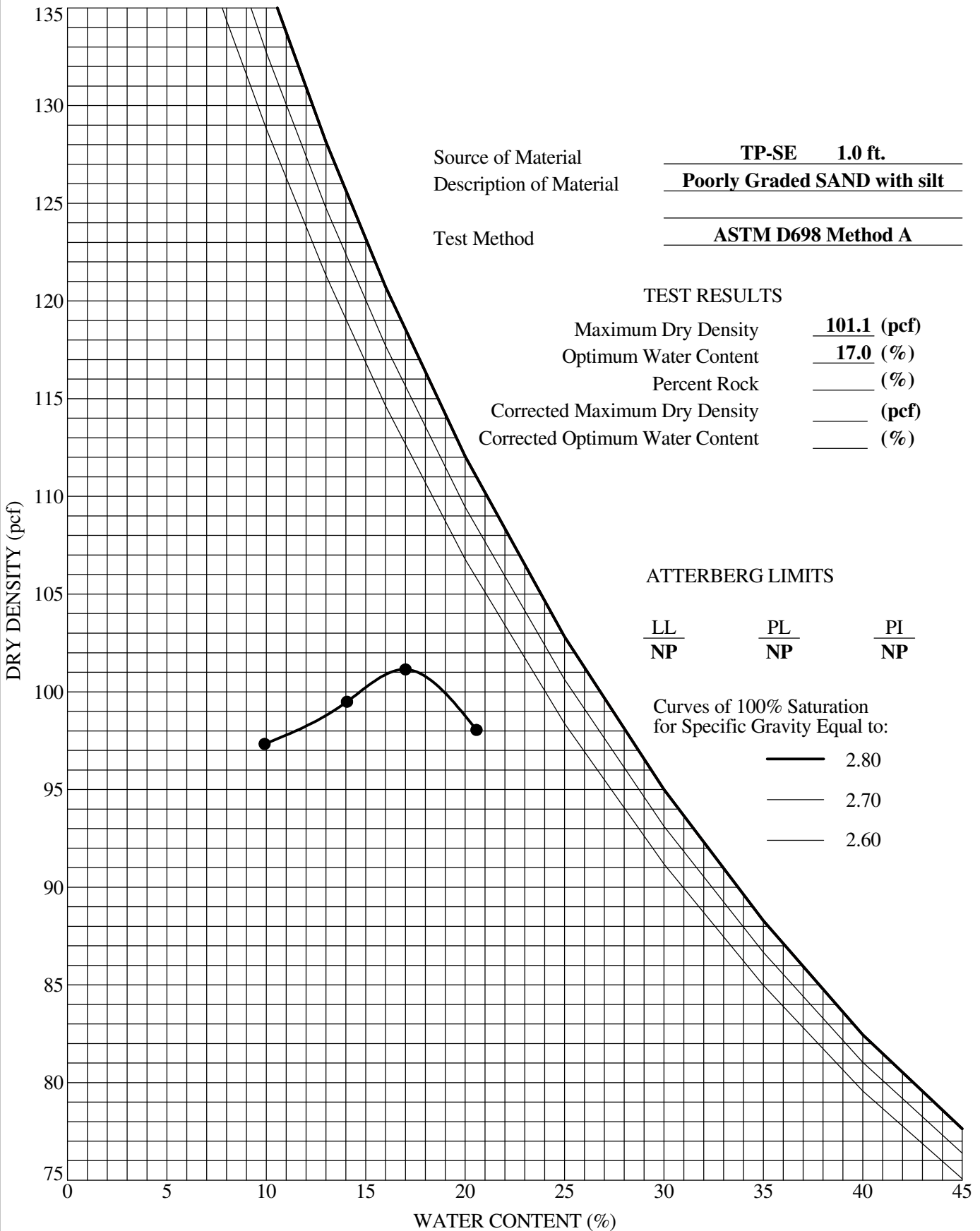
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COMPACTION TEST

Western Water Solutions
 Sand Pass Landfill Permit
 Myton, Utah
 Project Number: 705-011

Plate
C - 8



Source of Material TP-SE 1.0 ft.
 Description of Material Poorly Graded SAND with silt
 Test Method ASTM D698 Method A

TEST RESULTS

Maximum Dry Density 101.1 (pcf)
 Optimum Water Content 17.0 (%)
 Percent Rock _____ (%)
 Corrected Maximum Dry Density _____ (pcf)
 Corrected Optimum Water Content _____ (%)

ATTERBERG LIMITS

LL NP	PL NP	PI NP

Curves of 100% Saturation
for Specific Gravity Equal to:

- 2.80
- 2.70
- 2.60

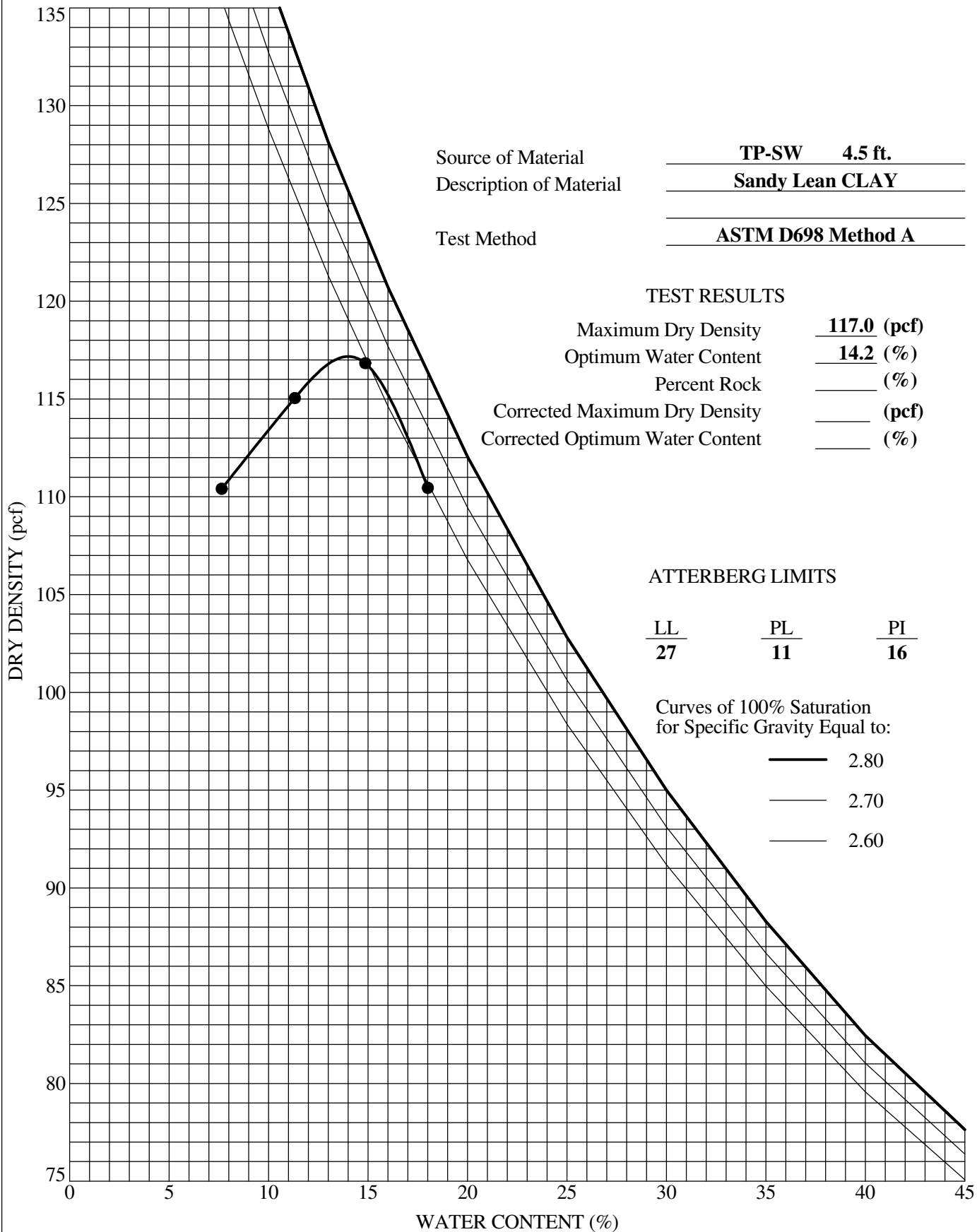
C_COMPACTON LOGS.GPJ GEOSTRATA.GDT 3/6/19



COMPACTION TEST

Western Water Solutions
 Sand Pass Landfill Permit
 Myton, Utah
 Project Number: 705-011

Plate
C - 9



C:\COMPACTON LOGS.GPJ GEOSTRATA.GDT 3/6/19

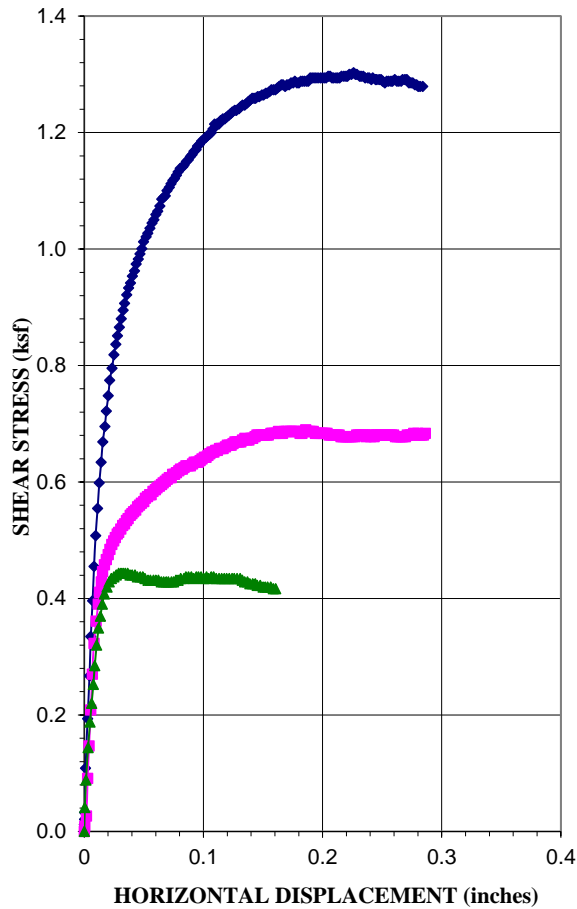
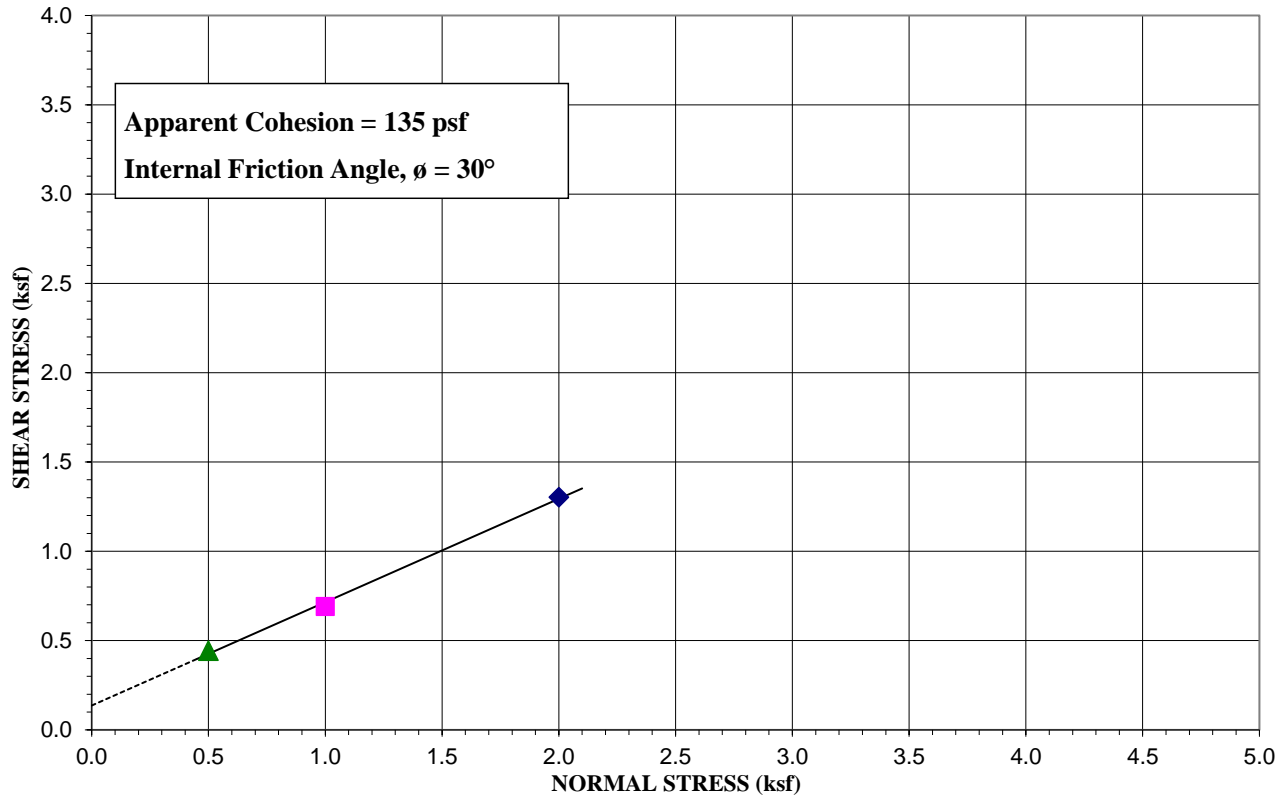


COMPACTION TEST

Western Water Solutions
 Sand Pass Landfill Permit
 Myton, Utah
 Project Number: 705-011

Plate
C - 10

DIRECT SHEAR TEST



Source:	TP-NW 6" - 48"
Type of Test:	Consolidated Drained/Saturated

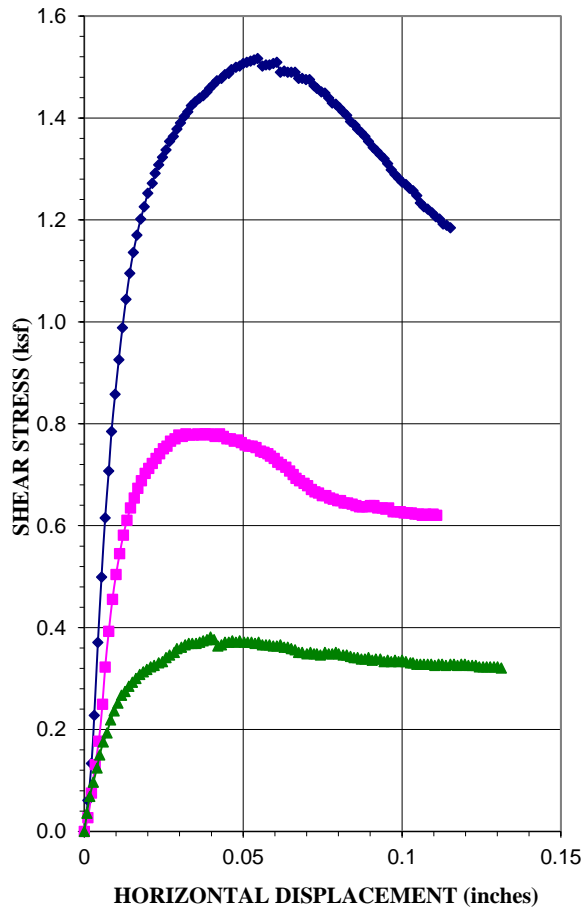
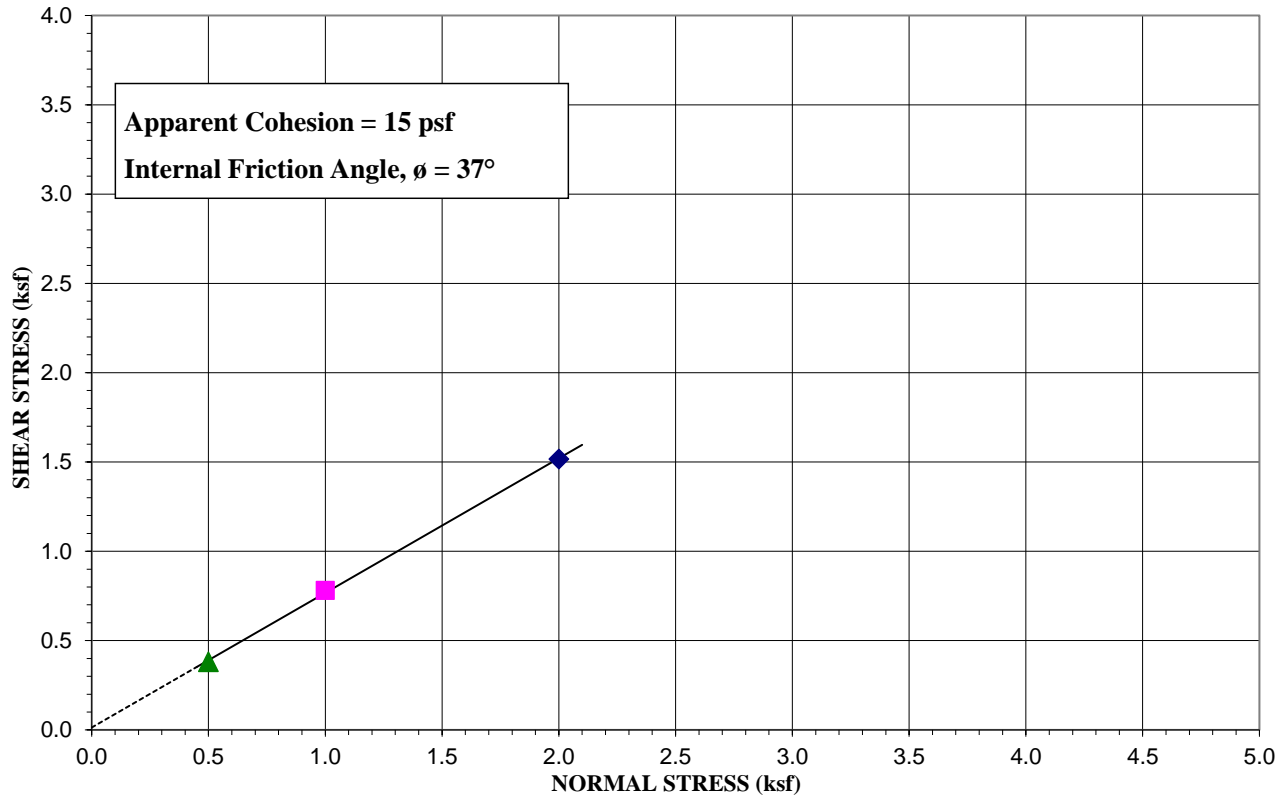
Test No. (Symbol)	1 (◆)	2 (◻)	3 (▲)
Sample Type	Remolded		
Initial Height, in.	1	0.992	0.958
Diameter, in.	2.5	2.5	2.5
Dry Density Before, pcf	89.2	89.6	94.3
Dry Density After, pcf	91.0	91.5	96.2
Moisture % Before	7.2	7.2	6.3
Moisture % After	21.8	21.7	21.8
Saturation, % Before	22.2	22.4	22.0
Saturation, % After	70.8	71.4	80.4
Normal Load, ksf	2.0	1.0	0.5
Shear Stress, ksf	1.30	0.69	0.44
Strain Rate	0.003333 IN/MIN		

Sample Properties	
Cohesion, psf	135
Friction Angle, ϕ	30
Liquid Limit, %	NP
Plasticity Index, %	NP
Percent Gravel	0.5
Percent Sand	81.2
Percent Passing No. 200 sieve	18.3
Classification	SM

PROJECT: WWS Landfill

PROJECT NO.: 705-012

DIRECT SHEAR TEST



Sample Location:	TP-SE @ 0-18"
Type of Test:	Consolidated Drained/Saturated

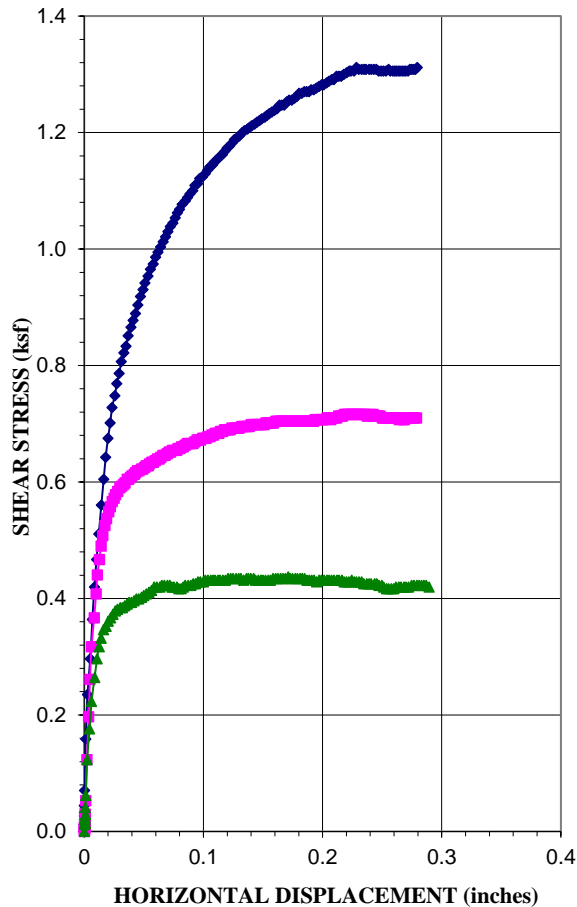
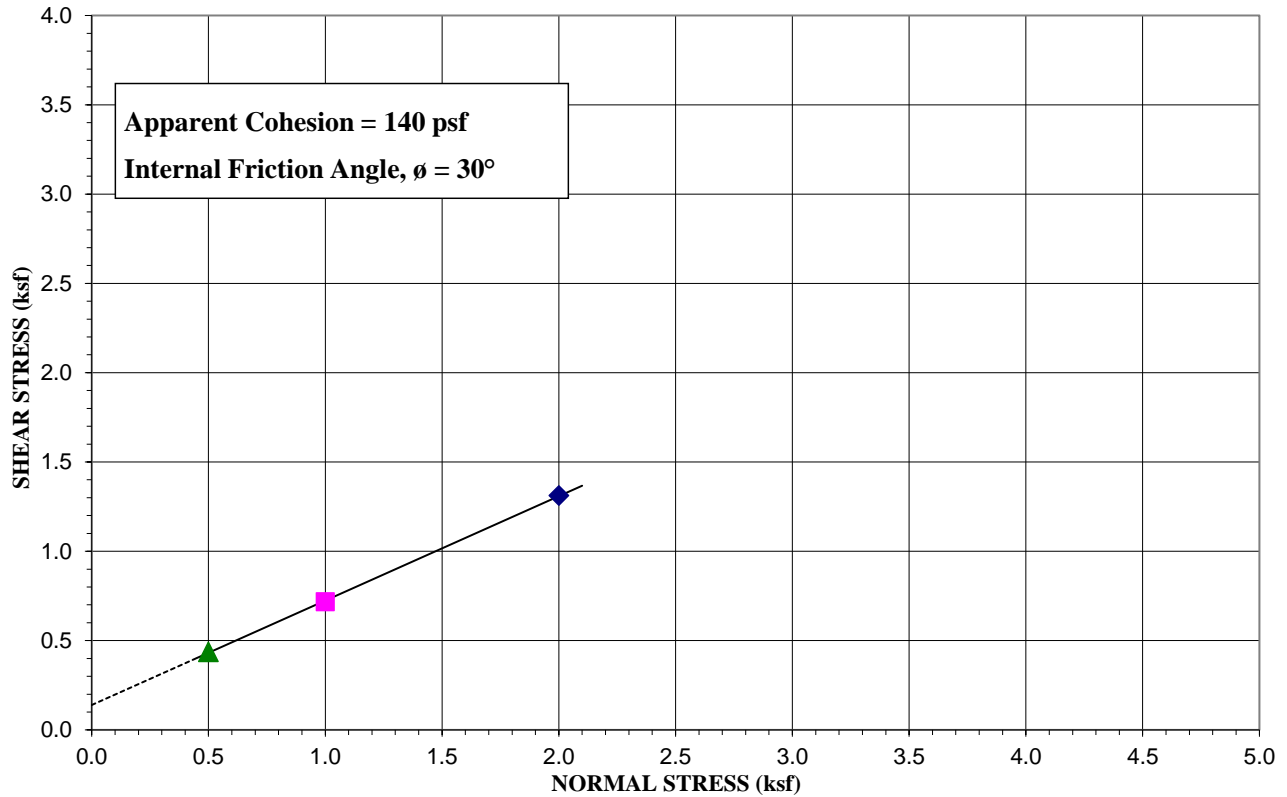
Test No. (Symbol)	1 (◆)	2 (■)	3 (▲)
Sample Type	Remolded		
Initial Height, in.	0.92	0.908	0.93
Diameter, in.	2.5	2.5	2.5
Dry Density Before, pcf	96.9	97.9	97.1
Dry Density After, pcf	99.0	100.0	99.0
Moisture % Before	7.2	7.2	6.3
Moisture % After	21.8	21.7	21.8
Saturation, % Before	26.8	27.5	23.6
Saturation, % After	86.2	88.1	86.4
Normal Load, ksf	2.0	1.0	0.5
Shear Stress, ksf	1.52	0.78	0.38
Strain Rate	0.002327 IN/MIN		

Sample Properties	
Cohesion, psf	15
Friction Angle, ϕ	37
Liquid Limit, %	NP
Plasticity Index, %	Np
Percent Gravel	0.0
Percent Sand	95
Percent Passing No. 200 sieve	5
Classification	SP

PROJECT: Sand Pass Front Design

PROJECT NO.: 705-012

DIRECT SHEAR TEST



Source:	TP-SW @ 5
Type of Test:	Consolidated Drained/Saturated

Test No. (Symbol)	1 (◆)	2 (■)	3 (▲)
Sample Type	Remolded		
Initial Height, in.	0.982	0.949	0.982
Diameter, in.	2.5	2.5	2.5
Dry Density Before, pcf	100.9	105.7	105.7
Dry Density After, pcf	102.7	107.5	107.5
Moisture % Before	10.2	11.3	6.4
Moisture % After	21.8	22.5	18.8
Saturation, % Before	42.1	52.9	30.2
Saturation, % After	94.7	110.8	92.5
Normal Load, ksf	2.0	1.0	0.5
Shear Stress, ksf	1.31	0.72	0.44
Strain Rate	0.0032 IN/MIN		

Sample Properties	
Cohesion, psf	140
Friction Angle, ϕ	30
Liquid Limit, %	27
Plasticity Index, %	11
Percent Gravel	1.3
Percent Sand	37.4
Percent Passing No. 200 sieve	61.3
Classification	CL

PROJECT: WWS Landfill

PROJECT NO.: 705-012

Hydraulic Conductivity of Saturated Poursous Materials Using a Flexible Wall Permeameter

ASTM D5084, Method C

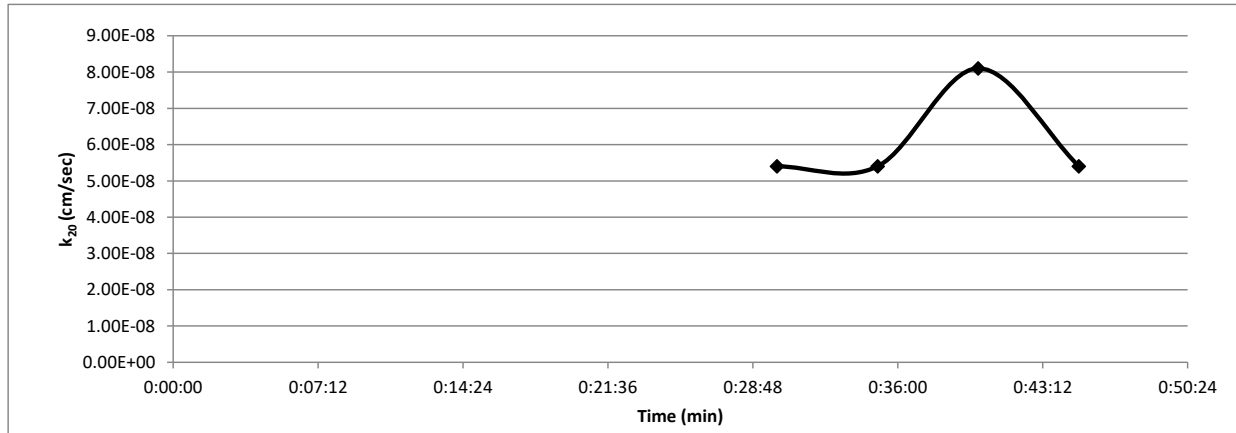
Project: Sandpass Landfill Permit
Project Number: 705-011
Soil Classification: CL
Boring: TP-NE
Depth: 42"-77"
Sample Type: Remolded
Test Date:

	Initial	Final
G_s:	2.71	2.71
Mass (g):	590.5	629.3
Height (in.):	2.819	2.819
Diameter (in.):	2.871	2.871
Area (cm²):	41.77	41.77
Volume (cm³):	299.1	299.1
Water Content (%):	15.81	23.42
Dry Unit Weight, γ_d (pcf):	106.4	106.4
Saturation (%):	73	108

Permeant Liquid: Deaired Water
Total Backpressure (psi): 80
Effective Consolidation Stress (psi): 3

Recorded Time	Elapsed Time (sec)	Bottom Burette (cm ³)	Top Burette (cm ³)	Δh (cm)	K (cm/sec)	Temp (°C)	Viscosity Ratio, Rf	k ₂₀ (cm/sec)
0:30:00	300	0.26	8.74	211.1	5.41E-08	20.1	0.998	5.40E-08
0:35:00	300	0.28	8.72	211.1	5.41E-08	20.1	0.998	5.40E-08
0:40:00	300	0.30	8.68	211.1	8.12E-08	20.1	0.998	8.10E-08
0:45:00	300	0.32	8.66	211.1	5.41E-08	20.1	0.998	5.40E-08

Average k₂₀ 6.08E-08 cm/sec



PROJECT NO.: 705-011



FIGURE NO.: C-14

Hydraulic Conductivity of Saturated Pours Materials Using a Flexible Wall Permeameter

ASTM D5084, Method C

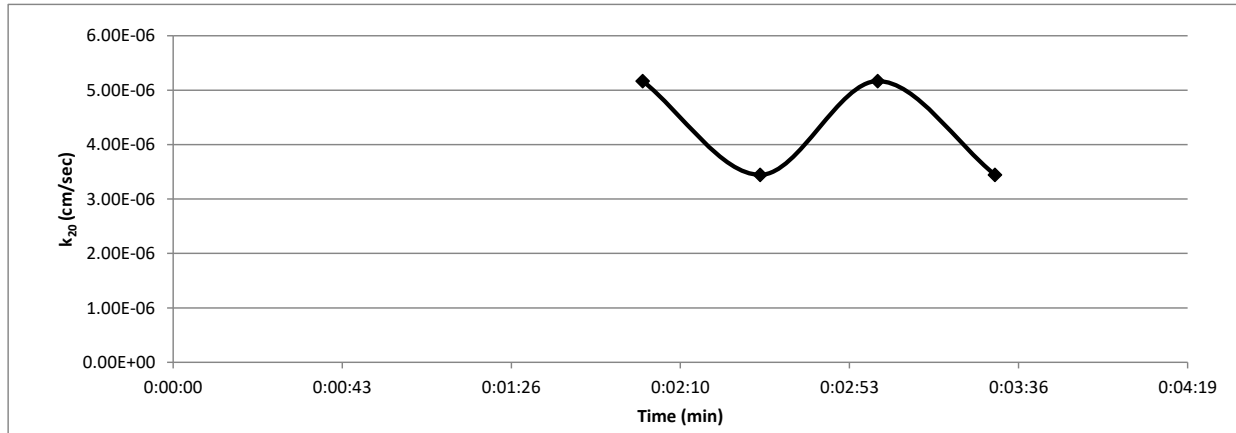
Project: Sand Pass Front Design
Project Number: 705-011
Soil Classification: Sandy SILT
Sample Location: TP-SW
Depth: 57"-97"
Sample Type: Remolded
Test Date:

	Initial	Final
G_s:	2.71	2.71
Mass (g):	650.2	664.0
Height (in.):	2.868	2.868
Diameter (in.):	2.868	2.868
Area (cm²):	41.69	41.69
Volume (cm³):	303.7	303.7
Water Content (%):	15.35	17.79
Dry Unit Weight, γ_d (pcf):	115.9	115.9
Saturation (%):	91	105

Permeant Liquid: Deaired Water
Total Backpressure (psi): 80
Effective Consolidation Stress (psi): 3

Recorded Time	Elapsed Time (sec)	Bottom Burette (cm ³)	Top Burette (cm ³)	Δh (cm)	K (cm/sec)	Temp (°C)	Viscosity Ratio, Rf	k ₂₀ (cm/sec)
0:02:00	30	2.44	8.66	70.4	4.97E-06	18.4	1.041	5.17E-06
0:02:30	30	2.48	8.62	70.4	3.31E-06	18.4	1.041	3.44E-06
0:03:00	30	2.54	8.56	70.4	4.97E-06	18.4	1.041	5.17E-06
0:03:30	30	2.58	8.52	70.4	3.31E-06	18.4	1.041	3.44E-06

Average k₂₀ 4.31E-06 cm/sec



PROJECT NO.: 705-012



FIGURE NO.: C-15

Hydraulic Conductivity of Saturated Pours Materials Using a Flexible Wall Permeameter

ASTM D5084, Method C

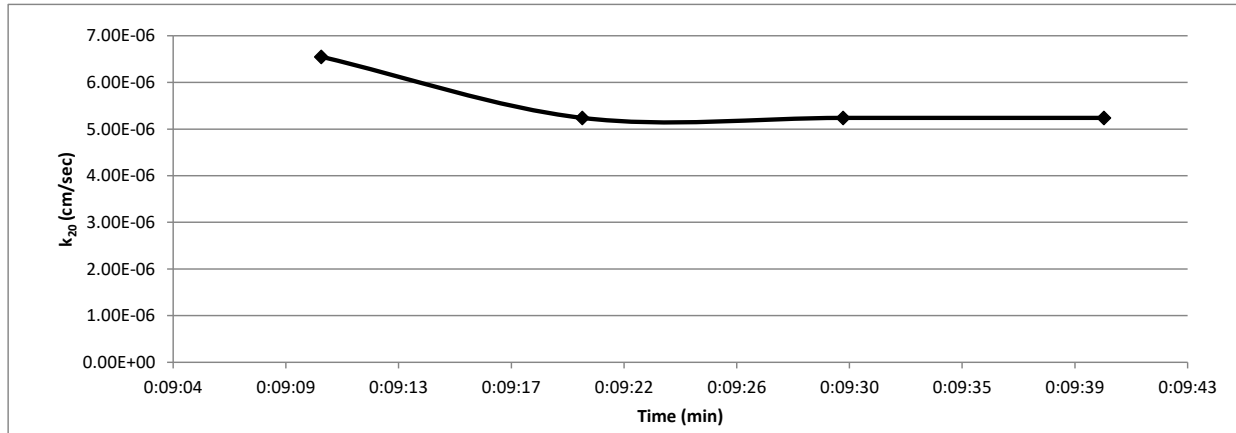
Project: Sand Pass Front Design
Project Number: 705-012
Soil Classification: Sandy Lean CLAY
Sample Location: TP-SW @ 57" - 97"
Depth:
Sample Type: Remolded
Test Date:

	Initial	Final
G_s:	2.71	2.71
Mass (g):	631.6	639.7
Height (in.):	2.832	2.832
Diameter (in.):	2.841	2.841
Area (cm²):	40.91	40.91
Volume (cm³):	294.2	294.2
Water Content (%):	15.36	16.84
Dry Unit Weight, γ_d (pcf):	116.2	116.2
Saturation (%):	91	100

Permeant Liquid: Deaired Water
Total Backpressure (psi): 80
Effective Consolidation Stress (psi): 3

Recorded Time	Elapsed Time (sec)	Bottom Burette (cm ³)	Top Burette (cm ³)	Δh (cm)	K (cm/sec)	Temp (°C)	Viscosity Ratio, Rf	k ₂₀ (cm/sec)
0:09:10	8	2.18	9.52	70.4	6.25E-06	18.1	1.049	6.55E-06
0:09:20	10	2.20	9.50	70.4	5.00E-06	18.1	1.049	5.24E-06
0:09:30	10	2.22	9.48	70.4	5.00E-06	18.1	1.049	5.24E-06
0:09:40	10	2.24	9.46	70.4	5.00E-06	18.1	1.049	5.24E-06

Average k₂₀ 5.57E-06 cm/sec



PROJECT NO.: 705-012



FIGURE NO.: C-16

Appendix D

Proposed Landfill Location



CONTENTS

B-1	3D Plan View
B-2	Cross Section A
B-3	Plan & Elevation
B-4	Cross Section B
B-5	Berm Detail
B-6	Leachate Detail
B-7	Storm Basin Detail
B-8	Storm Drain Detail
B-9	Final Cover Detail
B-10	Topography

CONSTRUCTION VOLUMES

Excavated Earth	51,582 CY
Constructed Berm (10ft)	31,115 CY
Final Cover 18" Clay	16,486 CY
Final Cover 6" Soil	5,497 CY
6" Protective Soil	4,942 CY
6" Leachate Sand	5,255 CY
60ml HDPE Liner	335,000 SF
GCL (10"-12")	335,000 SF
6" Grading Sand	5,490 CY

FILL/ WASTE VOLUMES

Landfill floor to top of 10 ft berm	108,837 CY
Stacked waste to 25 ft	198,895 CY
Total waste material	307,732 CY

A	11/9/18	BER	FOR PERMITTING USE ONLY
REV	DATE	BY	DESCRIPTION

LOCATION	WWS Sand Pass Landfill	B-0
PROJECT	WWS Landfill Permit Application	
TITLE	Cover Page	NO



A	11/9/18	BER	FOR PERMITTING USE ONLY
REV	DATE	BY	DESCRIPTION

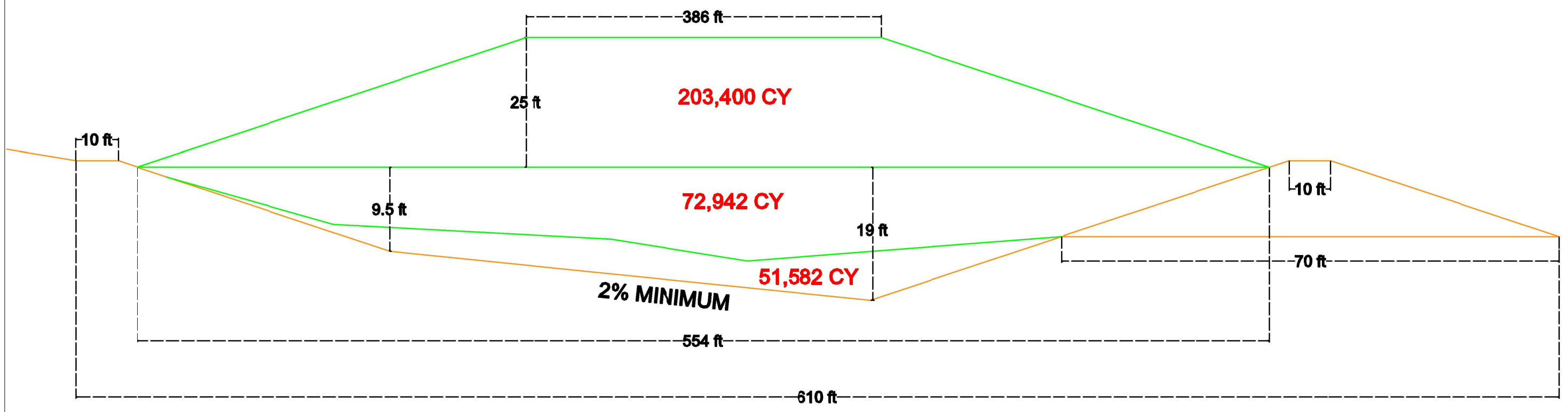

 BLUFFDALE, UTAH

LOCATION	WWS Sand Pass Landfill	B-1
PROJECT	WWS Landfill Permit Application	
TITLE	3D Plan	NO



A'

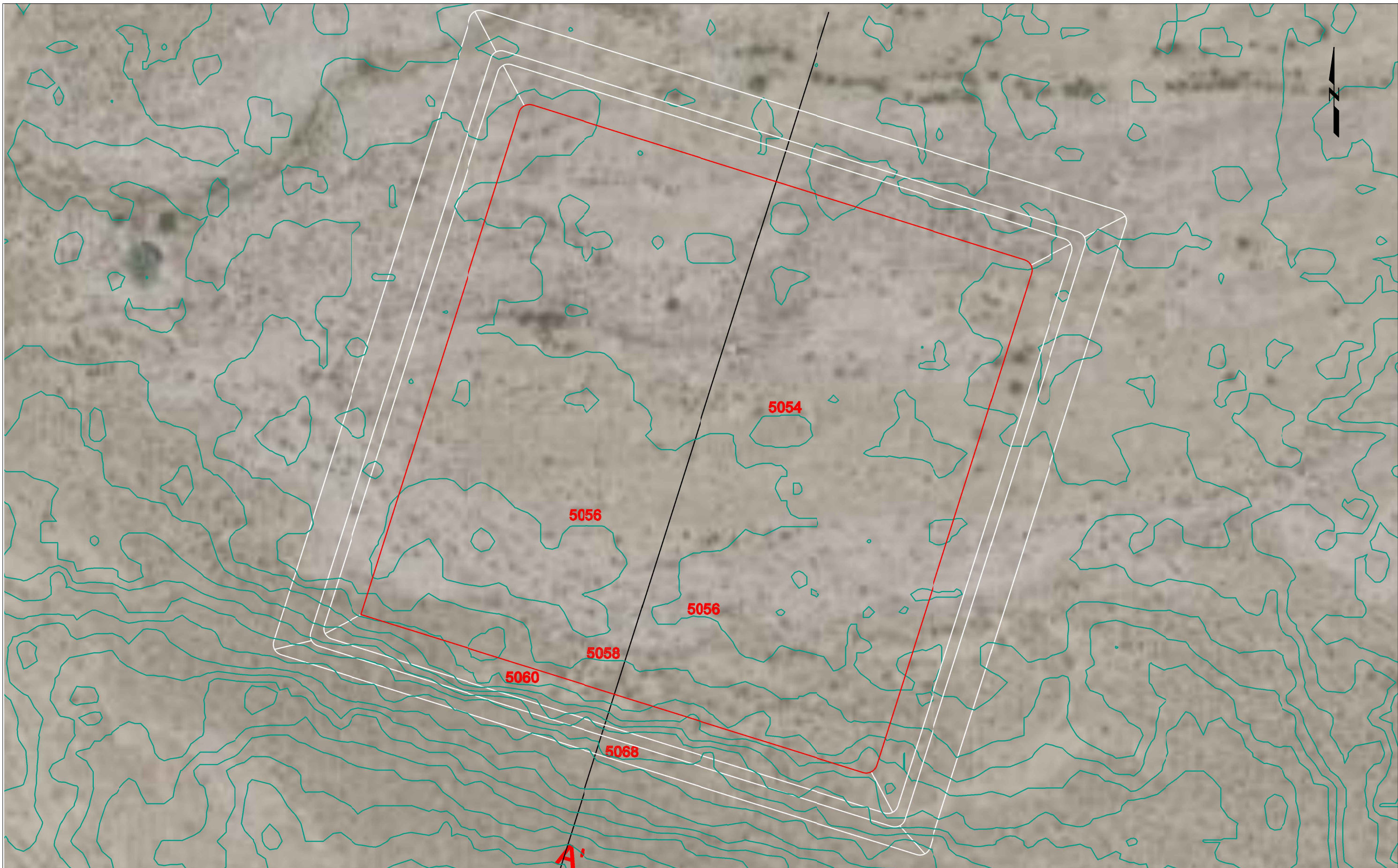
A



A	11/9/18	BER	FOR PERMITTING USE ONLY
REV	DATE	BY	DESCRIPTION



LOCATION	WWS Sand Pass Landfill	B-2
PROJECT	WWS Landfill Permit Application	
TITLE	Cross Section A	NO



A	11/9/18	BER	FOR PERMITTING USE ONLY
REV	DATE	BY	DESCRIPTION


 BLUFFDALE, UTAH

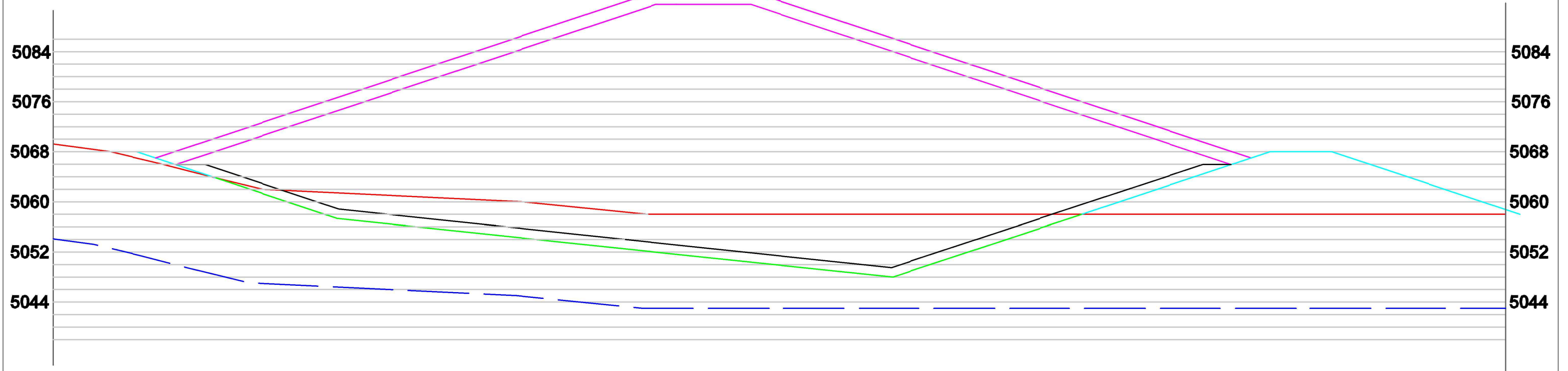
LOCATION	WWS Sand Pass Landfill
PROJECT	WWS Landfill Permit Application
TITLE	Plan & Elevation

B-3
NO



A'

A

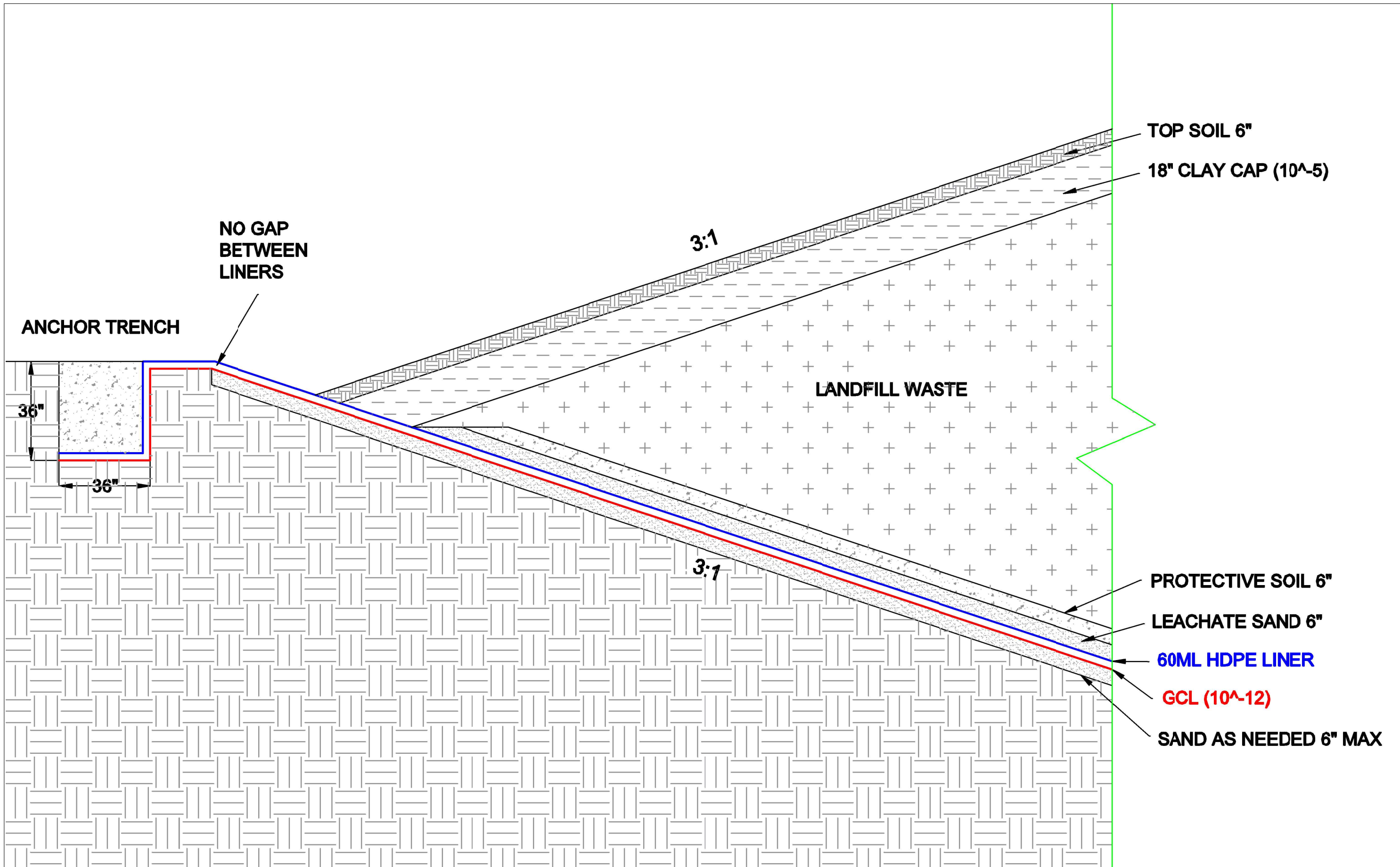


- Berm** ———
- Undisturbed Ground Surface** ———
- Bottom of Excavated Landfill** ———
- Top of Liner and Protective Soil** ———
- Completed Landfill Cap** ———
- Ground Water** - - - - -

A	11/9/18	BER	FOR PERMITTING USE ONLY
REV	DATE	BY	DESCRIPTION



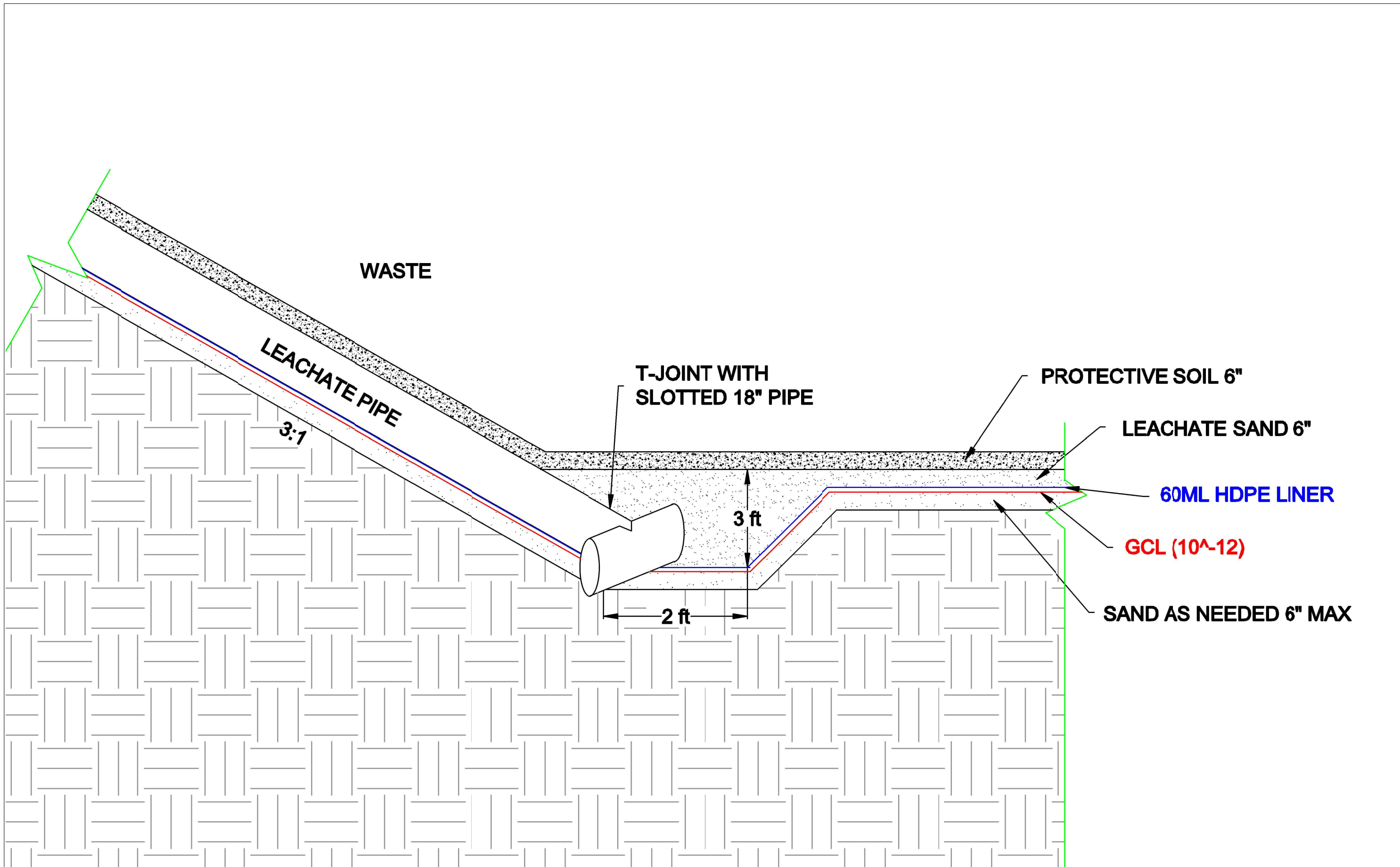
LOCATION	WWS Sand Pass Landfill	B-4
PROJECT	WWS Landfill Permit Application	
TITLE	Cross Section B	NO



REV	DATE	BY	DESCRIPTION
A	11/9/18	BER	FOR PERMITTING USE ONLY



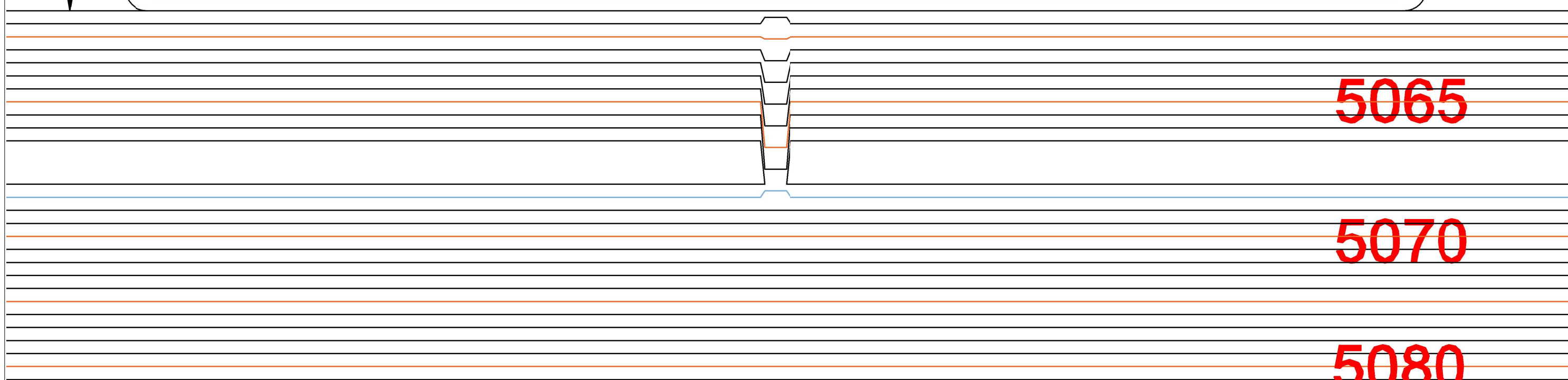
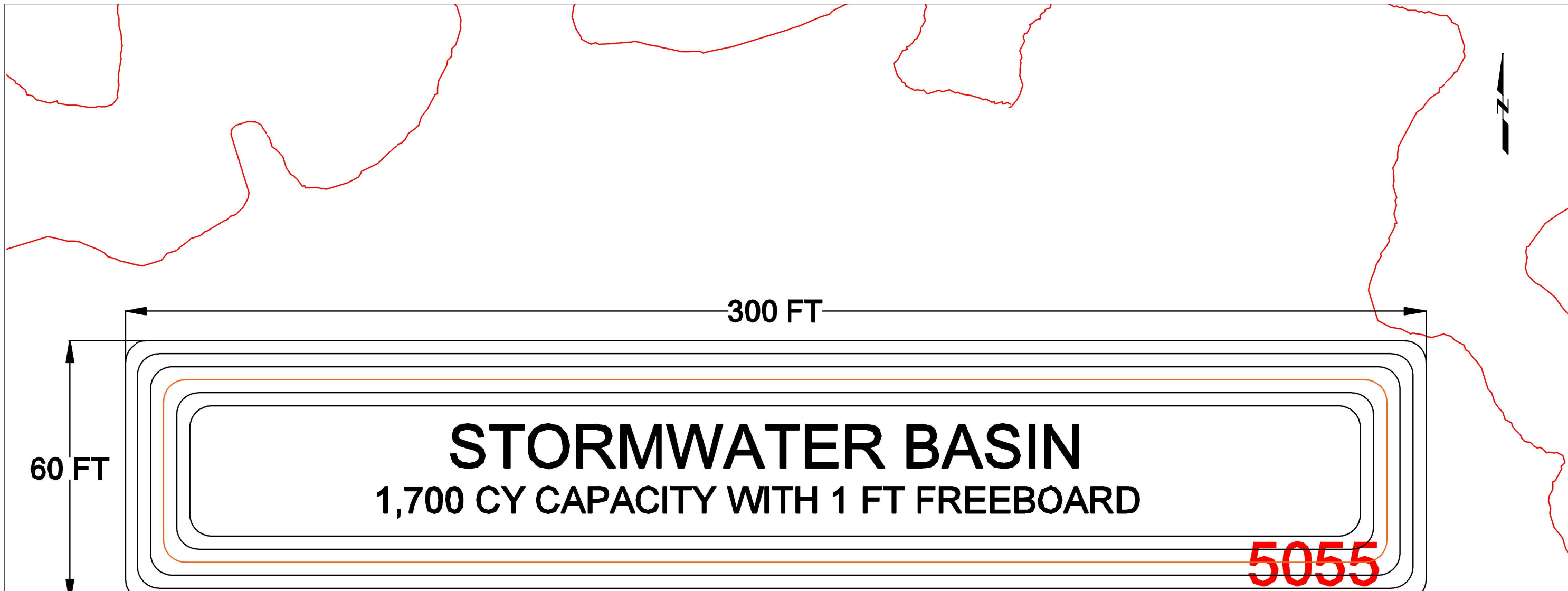
LOCATION	WWS Sand Pass Landfill	B-5
PROJECT	WWS Landfill Permit Application	
TITLE	Berm Detail	NO



REV	DATE	BY	DESCRIPTION
A	11/9/18	BER	FOR PERMITTING USE ONLY

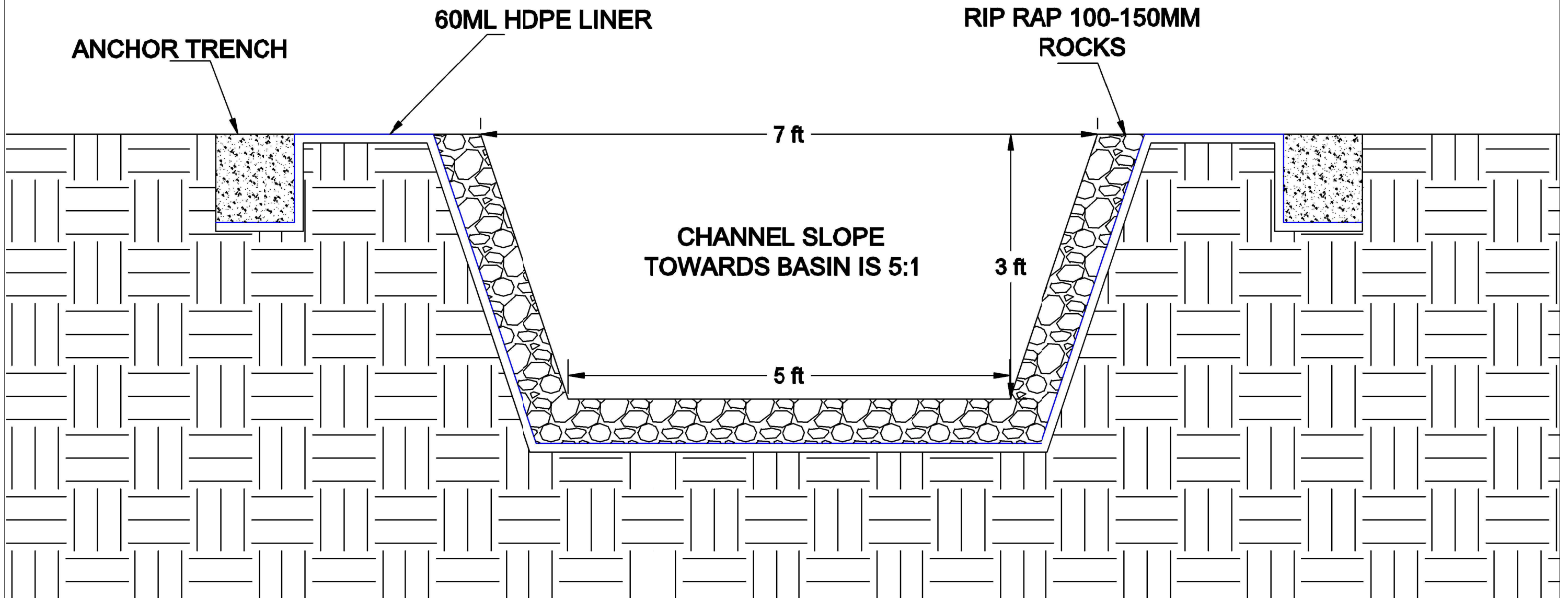


LOCATION	WWS Sand Pass Landfill	B-6
PROJECT	WWS Landfill Permit Application	
TITLE	Leachate Detail	NO



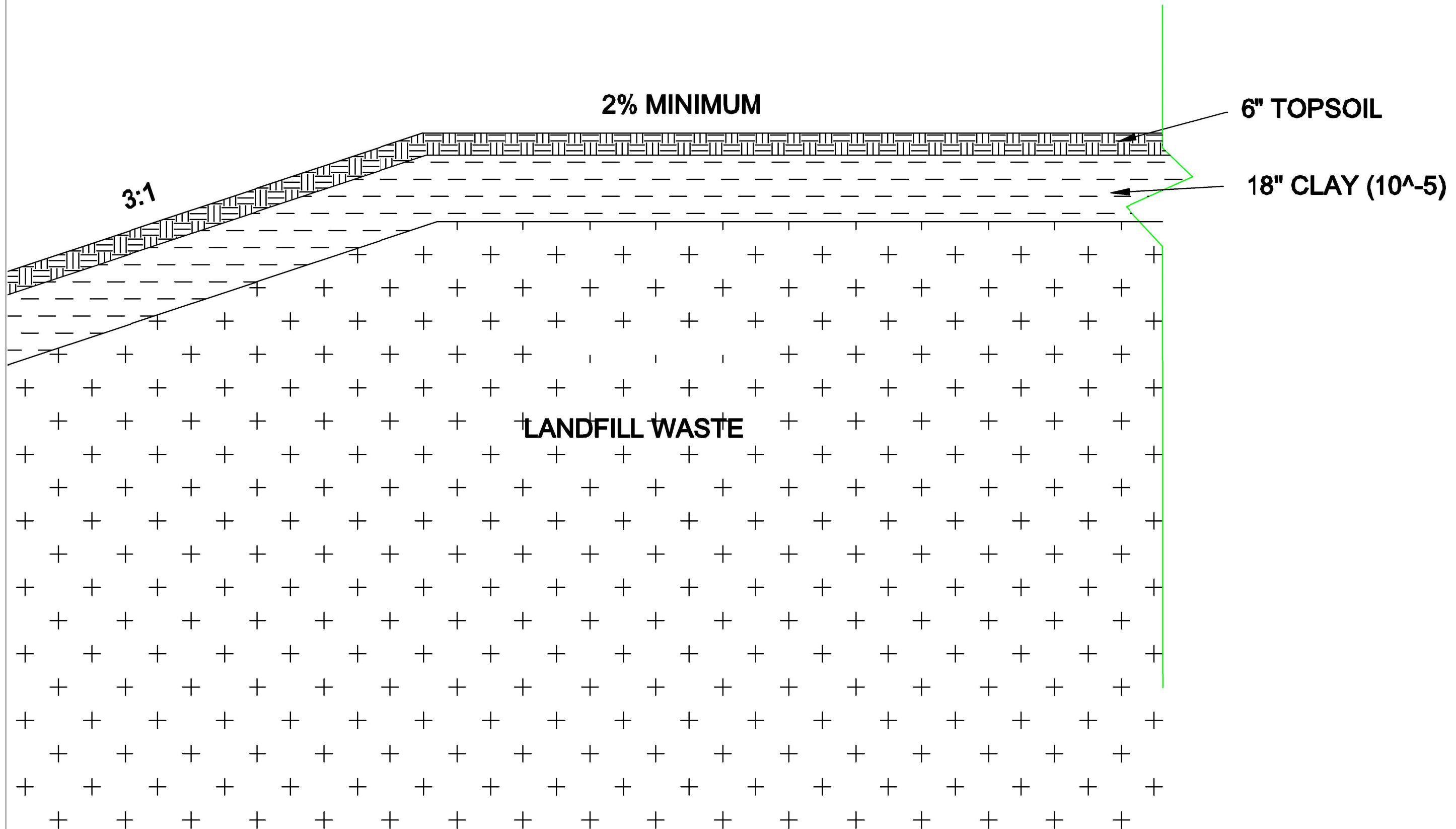
				 BLUFFDALE, UTAH	LOCATION WWS Sand Pass Landfill	
A	11/9/18	BER	FOR PERMITTING USE ONLY		PROJECT WWS Landfill Permit Application	B-7
REV	DATE	BY	DESCRIPTION		TITLE Storm Basin Detail	NO

RUNOFF DURING A 24HR 25YR STORM FOR SITE AREA IS APPROXIMATELY 1,700 CY, FLOWING AT A RATE OF APPROXIMATELY 135 CFS. THE DESIGNED CHANNEL CAN WITHSTAND 373 CFS.



REV	DATE	BY	DESCRIPTION
A	11/9/18	BER	FOR PERMITTING USE ONLY

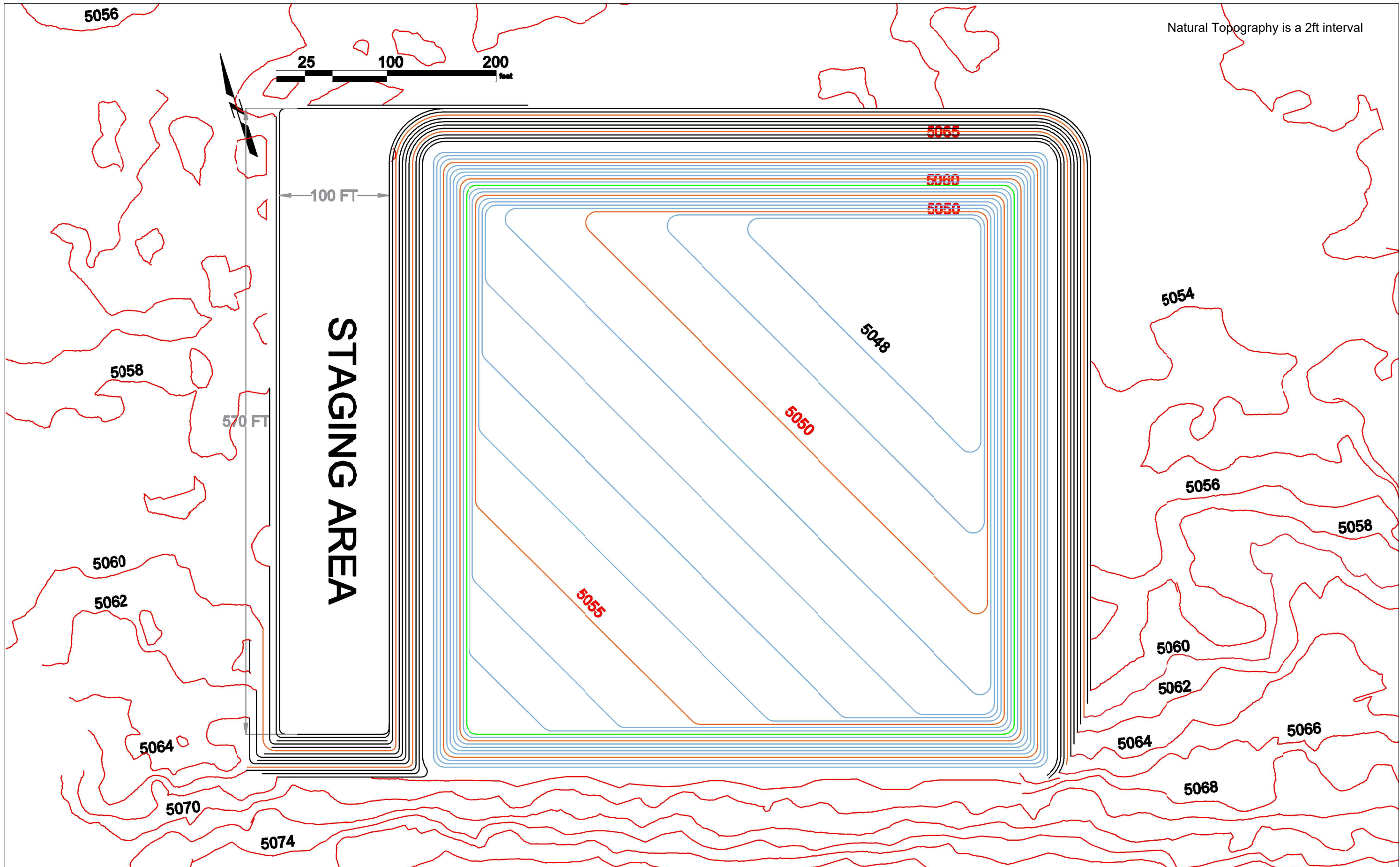
LOCATION	WWS Sand Pass Landfill	B-8
PROJECT	WWS Landfill Permit Application	
TITLE	Storm Drain Detail	NO



REV	DATE	BY	DESCRIPTION
A	11/9/18	BER	FOR PERMITTING USE ONLY



LOCATION	WWS Sand Pass Landfill	B-9
PROJECT	WWS Landfill Permit Application	
TITLE	Final Cover Detail	NO



Natural Topography is a 2ft interval



STAGING AREA

100 FT

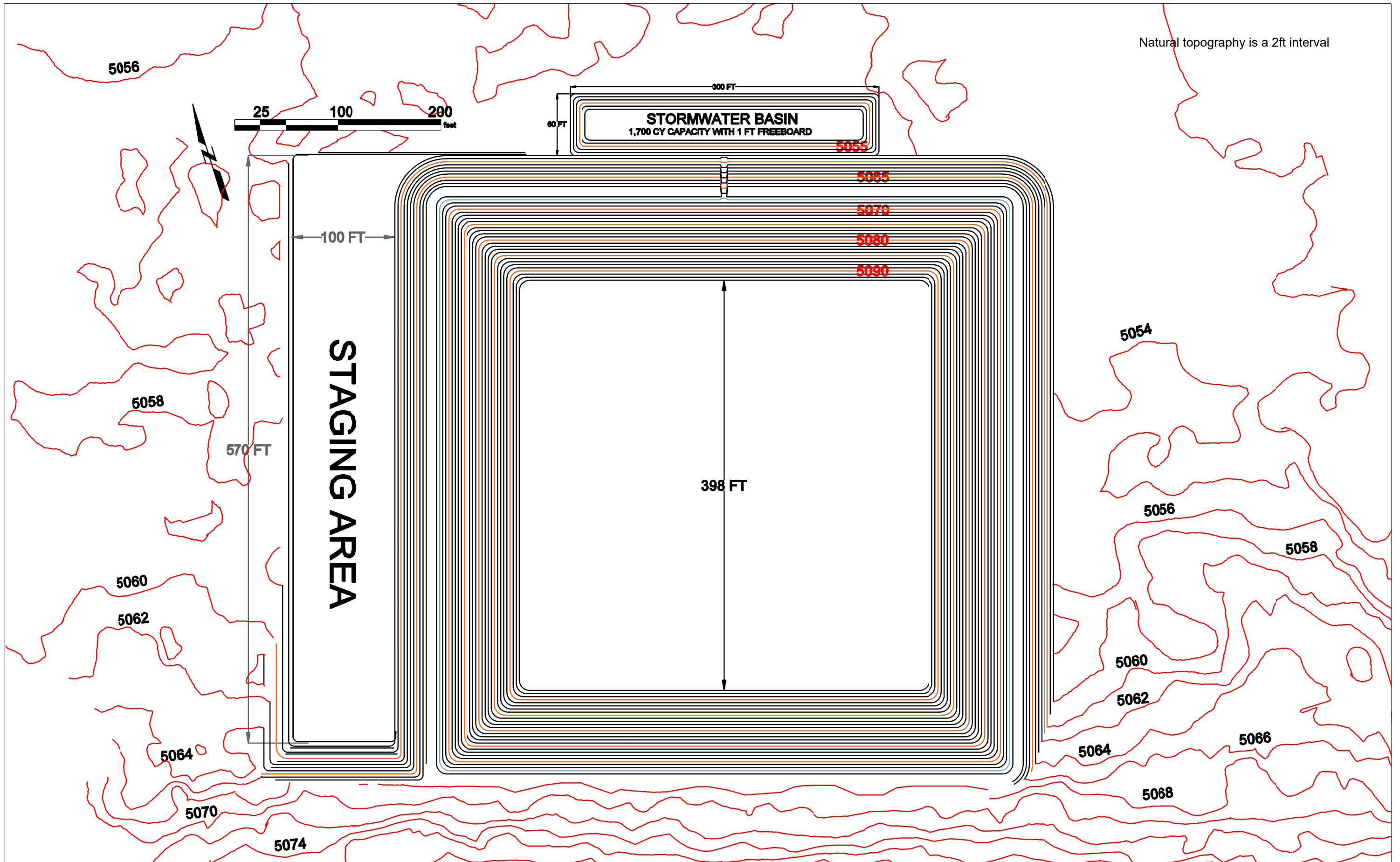
570 FT

REV	DATE	BY	DESCRIPTION
A	11/9/18	BER	FOR PERMITTING USE ONLY



LOCATION	WWS Sand Pass Landfill	B-10a
PROJECT	WWS Landfill Permit Application	
TITLE	Excavated Topo	NO

Natural topography is a 2ft interval



REV	DATE	BY	DESCRIPTION
A	11/9/18	BER	FOR PERMITTING USE ONLY



LOCATION	WWS Sand Pass Landfill	B-10b
PROJECT	WWS Landfill Permit Application	
TITLE	Completed Topo	NO

RN Industries
Proposed Bluebell Landfill
Alternative Closure Cap Equivalency to Standard Design prescribed by Rule R315-303-3

Alternative Closure Cap Equivalency to Standard Design prescribed by Rule R315-303-3(4)(c)
Infiltration and Erosion Equivalency

Integrated Water Management (IWM) proposes a six-inch thick Alternative Final Cover in place of Standard Design specified in Rule **R31**. Because Rule **R315-303-3(4)** does not provide a quantitative erosion standard, the equivalency of proposed Final Cover erosion will be demonstrated by showing geotechnical testing for and calculating annual erosion of the Alternative Final Cover Design. The following uses mathematical model based on the geotechnical testing to demonstrate equivalency as required in **R315-303-3(4)(d)**. This model will demonstrate that the alternative cover achieves an equivalent infiltration rate and protection from erosion as required in **R315-303-3(4)(c)(i and ii)**.

The Alternative Final Cover will be constructed from compacted soil native available in sufficient quantity at the Bluebell Disposal Site.

The following summary of soil test lab results, tables and narrative outline various geotechnical and agronomic characteristics of the Alternative Final Cover Design. These characteristics were chosen because they are parameters used both for geotechnical design of the Landfill and for USEPA/NRCS/USDA Revised Universal Soil Loss Equation.

References

- 1 EPA Stormwater Phase II Final Rule - EPA has updated its Rainfall Erosivity Factor Calculator to correct known problems and to use updated data from the Natural Resources Conservation Service's (NRCS) Revised Universal Soil Loss Equation, Version 2 (RUSLE2) database, 2012-09-26
- 2 Wischmeier, W. H., and Smith, D.D. 1978. Predicting rainfall erosion losses -- a guide to conservation planning. U.S. Department of Agriculture, Agriculture Handbook No. 537.
- 3 Renard, K.G., G.R. Foster, G.A. Weesies, D.K. McCool, and D.C. Yoder, coordinators. 1997. Predicting Soil Erosion by Water: A Guide to Conservation Planning With the Revised Universal Soil Loss Equation (RUSLE). U.S. Department of Agriculture, Agriculture Handbook No. 703, 404 pp.

Qualitative and Quantitative Effect of Erosion Computation Parameters Affecting RN Industries Alternative Landfill Cap Design					
Line	Erosion Computation Parameter	Alternative Design Final Cover			
1	ASTM D4647, Standard Test Methods for Identification and Classification of Dispersive Clay Soils Tests was not performed on this sample				
2	ASTM D698 - 12e2, Standard Test Methods for Laboratory Compaction Characteristics.	Proctor optimum is 102.2 lb/cf at 19.5% moisture.			
3	ASTM D5084 - Method C, Standard Test Methods for Measurement of Hydraulic Conductivity. Lab measured Conductivity 4.15 X 10 ⁻⁸ cm/sec	Soil used to construct the Alternative Design was selected and compacted to its Standard Proctor Optimum Density. It had a lab measured K value of 4.15 X 10 ⁻⁸ cm/sec. The lab measured conductivity is over four times lower than 3.33 X 10 ⁻⁶ cm/sec required for Alternative Design infiltration equivalency. This meets the requirement of R315-303-3(4)(c)(i) .			
4	ASTM C117 - Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve.	Classification	Sieve Size	Sieve Size (in)	Passing (%)
Cobble		100.0 mm	4"	100	
		75.0 mm	3"	100	
Very Coarse Gravel		50.0 mm	2"	100	
		37.5 mm	1.5"	99	
Coarse Gravel		25.0 mm	1"	99	
		19.0 mm	3/4"	99	
Medium Gravel		12.5 mm	1/2"	99	
		9.5 mm	3/8"	99	
Fine Gravel		4.75 mm	No. 4	98	
	2.36 mm	No. 8	98		
Very Fine Gravel	2.00 mm	No. 10	98		
	1.18 mm	No. 16	98		
Coarse Sand	0.60 mm	No. 30	97		
	0.43 mm	No. 40	97		
Medium Sand	0.60 mm	No. 30	97		
	0.43 mm	No. 40	97		

RN Industries
Proposed Bluebell Landfill
Alternative Closure Cap Equivalency to Standard Design prescribed by Rule R315-303-3

		Fine Sand	0.30 mm	No. 50	96
		Very Fine Sand	0.15 mm	No. 100	93
		Silt & Clay	0.08 mm	No. 200	91

RN Industries
Proposed Bluebell Landfill
Alternative Closure Cap Equivalency to Standard Design prescribed by Rule R315-303-3

5	Five Wettest Year Total Precipitation & Average Annual Precipitation from USU Climatological Center for Altamont Station. Data used as required in R315-303-3(4)(d)(i) and (ii)			Ratio of Wettest Year to Average Year = 15.44 Inches / $\frac{15.44}{9.29}$ = 1.66 To adjust Rainfall-Runoff Factor for the five wettest years, multiply Rainfall-Runoff Factor from NRCS Iso Erodant map by 1.66	
	9.29 Inches-Avg Annual Precip	Rank	Year		Precip
		1	1957		15.44"
		2	1983		14.68"
		3	1965		13.67"
		4	1997		13.33"
5	1980	12.58"			
6	The following calculation uses procedures and data from USDA Handbooks No. 537 and its later revisions used by EPA and NRCS. NRCS has updated the original research for Handbook No. 537 and 703. The equations are now listed as Revised Universal Soil Loss Equation or RUSLE. Both the original and ongoing research to update, calibrate and automate RUSLE calculations were performed by University of Indiana, College of Agriculture staff over the past 40 years.				
7	Rainfall/Runoff Factor (EI Parameter NRCS Fig 1)	= 28 from Fig 1, Isoerodant Map	R = 1.66 * 28 = 47 for 5 wettest Years		
8	Erodability Factor (NRCS Fig. 3 Nomograph)	using ASTM Gradation results	K = 0.67		
9	Topographic Factor (NRCS Slope-Length Nomograph)	Cap Slope = 3 on 1 or 33%	LS = 14		
10	Cover & Management Factor (NRCS Table 6)	using no cover and 80% mulch	S = 0.10		
11	Support Practice Factor (NRCS P Value limits for Contouring)	using 250 Ft slope length	C = 1.0		
12	Annual Soil Loss	A = R * K * LS * C (Tons/ Year)	A = 43.7 Ton/ Yr		
13	Erosion Equivalency				
	Soil erosion equivalency is demonstrated by the applying the standard model for erosion assessment used by US EPA It is based on the empirical Revised Universal Soil Loss Equation.				
14	Calculated Annual Soil Erosion				
	Annual soil volume loss				
	a.	The soil density determined by ASTM D4647 lab test is 102 Lb per CF			
	b.	The RUSLE equation estimates an annual soil loss of 43.7 Tons / Yr			
	c.	The corresponding volume of soil loss will be 854 CF / Yr			
	d.	Each proposed Landfill cap has a finished surface area of 292,000 SF			
	e.	The annual uniform soil loss over each entire cap will be 0.04 Inches			
15	Allowance for non-uniform soil loss and a reasonable Factor of Safety				
	Applying a Factor of Safety of 10				
	The estimated uniform soil loss over the entire cap will increase to 0.4 Inch / Yr				
	Unattended & unrepaired, the top half of the 6" thick cap has a life of about 10 Years				
16	Conclusions				
	GeoStrata engineers submits that the above geotechnical tests showing non-dispersive soils and the subsequent erosion calculations support the claim of the equivalency of the proposed Alternative Design for Bluebell Landfill Cap to the Standard Cap Design prescribed in Rule R315-303-3(4)(a)(i and ii) . The infiltration rate in Line 3 and Erosion rate in Line 15 of this model demonstrate that the cover design meets the requirements of R315-303-3(4)(c)(i and ii) . Line 3 demonstrates that the infiltration rate is less than the standard design. Line 15 shows that the cover after 10 years without any maintenance will have only lost 6 inches of soil. The post closure plan will have cover soils replaced.				

Appendix E

Landfill Capacity

307,000 CY

Average Daily Volume*

	Years									
Annual Growth %	1	2	3	4	5	6	7	8	9	10
10	50.0	55.0	60.5	66.6	73.2	80.5	88.6	97.4	107.2	117.9

Cumulative Volume over 10 Years

	Years									
Annual Growth %	1	2	3	4	5	6	7	8	9	10
10	18250	38325	60407	84698	111418	140809	173140	208705	247825	290858

* - Assumes Mixing Ratio: 0.5 Cubic Yards of soil to 1 Cubic Yard of waste for a total of 50 Cubic Yards of waste per day.

Volume – Year that cumulative volume of waste reached max capacity.



Copyright GeoStrata , 2019

Projected Landfill Life – Soil/Waste Mix

Western Water Solutions
 Sand Pass Landfill Permit Application
 Duchesne, UT
 Project Number: 705-011

**Plate
E-1**

WASTE SHIPMENT RECORD

Date: _____

Departure Time from Origin: _____

Load ID No.: _____

Arrival Time at Landfill: _____

Generator of Waste: _____

Origin: _____

Quantity (cubic yards):
Estimated Tons (based on unit weight):
Type of Waste:
Description of Waste:

Name of Trucking Company:
Truck Number:
Truck Driver's Name:
Truck Driver's Signature:

COMMENTS:

DATE : _____ TIME : _____

DAILY PERMANENT RECORD

ITEM	YES	NO	COMMENTS
SITE SECURITY			
Perimeter fence and security gate are in good condition?			
Lock functioning and in place?			
ROADS			
Do roads require watering? If so, record in the operator's log the volume of water used and the section of road watered.			
OPERATIONS			
Collect daily landfill gas monitoring levels and compare to Integrated Water Management Health and Safety Plan Action levels. Upgrade PPE if necessary.			
Estimated Weight in Tons of E&P waste received today			
Estimated Volume in Cubic Yards of E&P waste received today			
Estimated Weight in Tons of E&P waste that required treatment prior to disposal in the landfill cell			
Estimated Volume in Cubic Yards of E&P waste that required treatment prior to disposal in the landfill cell			
Estimated Weight in Tons of material added to treat the waste			
Estimated Volume of material added to treat the waste			
Estimated Total Weight in Tons of treated waste			
Estimated Volume in Cubic Yards of treated waste			
Record daily volumes and weights of wastes received, solidified, and placed in the landfill cell.			
Record volume and weight of solidification material used each day.			
Are slopes at which the waste is placed in accordance with the guidance provided by the Project Geotechnical Engineer? If not, contact the Waste Disposal Facility Manager.			
INSPECTION OF GEOCOMPOSITE AND HDPE LINER UNTIL FULLY COVERED			
Are geocomposite and HDPE anchors in place and in good condition?			
Is the geocomposite and/or HDPE systems free of rips, excessive weathering, or excessive tension? Monitor daily until the geocomposite layer is completely covered with waste or a protective layer of soil.			
SURFACE WATER MONITORING			
Check daily during March, April and May of each year. Is there water flowing in the ephemial stream near monitoring wells XXXX and YYYYY? If so, call the Waste Disposal Facility Manager by the end of the day to make arrangements for annual surface water sampling.			
EMBANKMENT			
Inboard Slope			
Has the geofabric material been covered by soil or water within two weeks of placement? If not, cover with at least 4 inches of soil by the end of the day.			
NOTES: (Record any other significant issues below. Fill out additional pages and attach if necessary.)			
If any checks appear in the "No" column, provide a detailed description of what you observed, including: accurate location, extent of affected area, and a description of the condition. Refer to the Operations Manual, initiate the prescribed corrective action and estimate time of completion. Inform the appropriate Integrated Water Management personnel (Supervisor, and/or Environmental Manager) per the Operations Manual and document the corrective action taken (notes, photos, etc.)			
Completed By:			
Name _____	Signature _____		

DATE: _____

TIME: _____

WEEKLY PERMANENT RECORD

ITEM	YES	NO	COMMENTS
SITE SECURITY			
Fire extinguisher is charged, not exceeding inspection deadline?			
Spill kits are stocked on site?			
Emergency eyewash stations are functioning properly and well stocked?			
Signage visible and in good condition?			
Warning signage every 250 feet of exterior fencing and at closest approach of gravel road?			
OPERATIONS			
If there is water in the leachate collection system? If so, remove and record volume transferred to Evaporation Pond 1.			
If there is water in the leak detection sump? If so, remove and record volume transferred to Evaporation Pond 1. Call the landfill Supervisor to inform him.			
Estimated Weight in Tons of E&P waste received this week			
Estimated Volume in Cubic Yards of E&P waste received this week			
Estimated Weight in Tons of E&P waste that required treatment prior to disposal in the landfill cell this week			
Estimated Volume in Cubic Yards of E&P waste that required treatment prior to disposal in the landfill cell this week			
Estimated Weight in Tons of material added to treat the waste this week			
Estimated Volume of material added to treat the waste this week			
Estimated Total Weight in Tons of treated waste this week			
Estimated Volume in Cubic Yards of treated waste this week			
Record weekly volumes and weights of wastes received, solidified, and placed in the landfill cell.			
Record volume and weight of solidification material used each week.			
GROUNDWATER MONITORING			
Check depth to groundwater from top of well casing weekly during March, April and May.			
Is there groundwater present in wells XXXX, YYYYY and ZZZZ?. If so, call the Waste Disposal Facility Manager by the end of the day to arrange for annual groundwater sampling. (Once sampling is completed, monitoring of groundwater levels can be discontinued for the year. Measure water levels from the top of well casing to the nearest 1/100 th of a foot)			
EMBANKMENT			
Crest			
Are there any signs of erosion gullies greater than 6 inches deep?			
Are there any signs of settlement, cracks slides, slumps, boils, sinkholes or other?			
Outboard Slope to 10 feet past the Toe			
Are there any signs of erosion gullies greater than 6 inches deep?			
Are there any signs of settlement, cracks slides, slumps, boils, sinkholes or other?			
Are ther any debris or weeds that prevent the inspection?			
Are there new signs of seepage (ie: flows of water, wet spots, or ponding)?			
Is there evidence of burrowing animals?			
Are the diversion channels serviceable and unobstructed?			
NOTES :			
(Record any other significant issues below. Fill out additional pages and attach if necessary.)			
If any checks appear in the "No" column, provide a detailed description of what you observed, including: accurate location, extent of affected area, and a description of the condition. Refer to the Operations Manual, initiate the prescribed corrective action and estimate time of completion. Inform the appropriate Integrated Water Management personnel (Supervisor, and/or Environmental Manager) per the Operations Manual and document the corrective action taken (notes, photos, etc.)			
Completed By:			
_____		_____	
Name		Signature	

WWS Emergency Response	
-------------------------------	--

WWS Incident Manager	Phone Number
Reece Jensen	801-518-9790

Local Emergency Contacts	
---------------------------------	--

Local Responders	Phone Number
Emergency Dispatch	435-738-2424
Duchesne Fire Department	435-738-2424
Duchesne County Sheriff	435-738-2015
Uintah Basin Medical Center	435-722-4691

Appendix F

07408

WHEN RECORDED MAIL TO:
Western Water Solutions, LLC

2230 N University Parkway
Provo UT 84604

Ent 435079 Bk A618 Pg 672
Date: 17-MAY-2011 2:58:51PM
Fee: \$19.00 Check
Filed By: CC
CAROLYNE MADSEN, Recorder
DUCHESNE COUNTY CORPORATION
for: EXPRESS TITLE

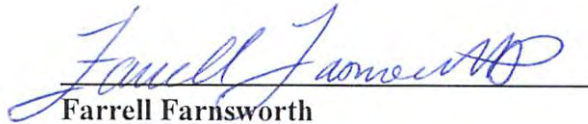
WARRANTY DEED

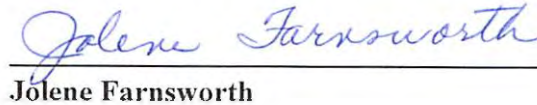
Farrell Farnsworth and Jolene Farnsworth, GRANTOR(S), of PO Box 111 , Duchesne UT 84021, hereby CONVEYS AND WARRANTS to: **Western Water Solutions, LLC**, , GRANTEE(S), of 2230 N University Parkway , Provo UT 84604 for the sum of, Ten and No/100 (\$10.00) DOLLARS and other good and valuable consideration, the following described tract(s) of land in Duchesne County(ies), Utah, to wit:

SEE EXHIBIT "A" ATTACHED HERETO FOR LEGAL DESCRIPTION.

Together with all improvements, appurtenances, and easements thereunto belonging.
SUBJECT TO: County and/or City taxes not delinquent; Bonds and/or Special Assessments not delinquent; Covenants, Conditions, Restrictions, Rights of Way, Easements, and Reservations of record or enforceable in law and equity.
EXCEPTING THEREFROM: all oil, gas and/or other minerals in, on or under said land.


WITNESS, the hand of said grantors, this 16 day of May, 2011.


Farrell Farnsworth


Jolene Farnsworth

STATE OF UTAH)
) ss.
COUNTY OF Duchesne)

On the 16 day of May, 2011, personally appeared before me **Farrell Farnsworth and Jolene Farnsworth**, the signer(s) of the within instrument, who duly acknowledged to me that he/she/they executed the same.

NOTARY PUBLIC: 

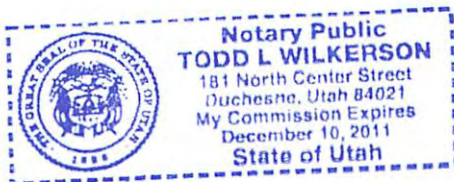


EXHIBIT "A"

Ent 435079 Bk A0618 Pg 0673

FILE NO: 07408

PARCEL 1:

TOWNSHIP 4 SOUTH, RANGE 1 WEST, UINTAH SPECIAL BASE AND MERIDIAN.

SECTION 3: The East half of the Southwest quarter; and the West half of the Southeast quarter; and the Southwest quarter of the Northeast quarter; and the West 16 rods of the Southeast quarter of the Northeast quarter; and the West 16 rods of the Northeast quarter of the Southeast quarter.

PARCEL 2:

TOWNSHIP 4 SOUTH, RANGE 1 WEST, UINTAH SPECIAL BASE AND MERIDIAN.

SECTION 9: The East half of the Northeast quarter.

PARCEL 3:

TOWNSHIP 4 SOUTH, RANGE 1 WEST, UINTAH SPECIAL BASE AND MERIDIAN.

SECTION 10: The Northwest quarter; and the West half of the Northeast quarter.

Together With: 1/4 of the water right #47-1351

Appendix G

BIOLOGICAL ASSESSMENT

Western Water Solutions Landfill Site
Duchesne County, Utah
Project Number: 705-009

Prepared by Lindsey Nesbitt, Ph.D.
March 9, 2018

Biological Assessment, Waste Water Solutions Landfill, Duchesne County, Utah

This report documents the proposed Western Water Solutions Landfill Facility (WWS) biological assessment. The report was conducted by Dr. Lindsey Nesbitt, on behalf of Jon Peadon and James Sage at GeoStrata. The land disposal facility, located at Latitude 40° 9'10.00" N, Long -109°58'57.99" W in Duchesne County, Utah, is on privately owned land and is being built by Western Water Solutions, (Figure 1).

WWS has proposed to build 4 connected landfills at one site. The area to be converted is previously undisturbed, with the exception of roadways that currently exist. Evaporation ponds exist nearby to the northwest.

a)



b)

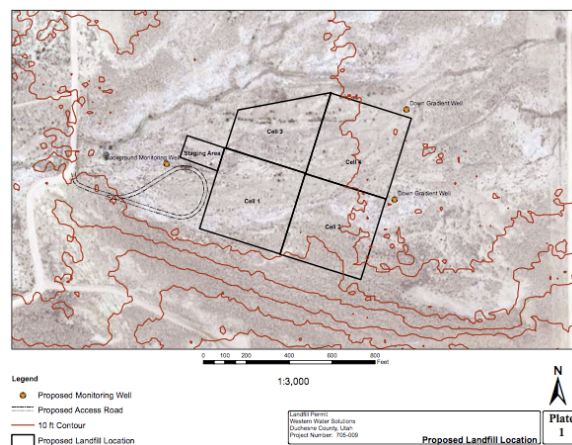


Figure 1. a) Location image of WWS landfill site, Duchesne County. Within Figure, a drainage area can be seen directly above and at the southwest corner. Landfill cells exist 100 feet from stream/drainage area. b) GeoStrata drawing of landfill proximity to small stream/drainage system can be seen in this photo, ~100 feet to the north.

METHODS

The biological assessment represents an offsite data review conducted for initial assessment of the WWS project site. Its purpose is to gather existing information and assist in the evaluation of the occurrence of protected natural resources within the project area. This document is created without knowledge of construction or facility plans of the site. The data review entails an evaluation of online resources, agency publications, and personal communication to determine the presence or potential occurrence of protected natural resources, including threatened and endangered species and critical habitat. These documents include:

- USFWS Federally listed and proposed endangered, threatened, and candidate species, species list for Duchesne County;
- Identification of critical habitat in Duchesne County;
- Review of Google Earth images and identification of habitat that could support species protected by the Bald and Golden Eagle Protection Act (BGEPA);
- Verification of threatened and endangered flora with US Fish and Wildlife Service lead botanist, fisheries biologist.
- Review of birds protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act (Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures).

RESULTS

The proposed site at the WWS Facility is located near the town of Myton, Utah, just southwest of Sand Pass. The site sits at approximately 5044 feet, below a small drainage system to the north (approximately 100 feet away), most likely being an ephemeral stream. A dirt road exists to the facility, but a small circle drive will be added to allow access to the four landfill cells. Roads on the west side are proposed to be used for construction. The project area is generally a uniform slope and habitat type. It contains no permanent water or wetlands, with a possible drainage pond (natural) southwest of the site and stream/drainage ~100 feet north of site.

Vegetation observed surrounding the proposed workspace is an upland vegetation community that includes greasewood and big sagebrush. Ephemeral and perennial streams are located ~1 (north) and 2 (south) miles, respectively of the site. While these areas are not listed as critical habitat areas, they could potentially be affected by dust. The list of federally listed, proposed, and candidate species, which occur in Duchesne county, are listed in Appendix A. Descriptions include status, habitat description, and the likelihood of occurrence. Migratory bird species are listed in Appendix B. An unofficial list is included (Appendix C). Neighboring critical habitat for threatened and endangered species, defined by the U.S. Fish and Wildlife Service, is greater than 8 miles away (Figure 2). There are ten listed threatened and endangered species. Eight of these do not occur at the WWS project site.

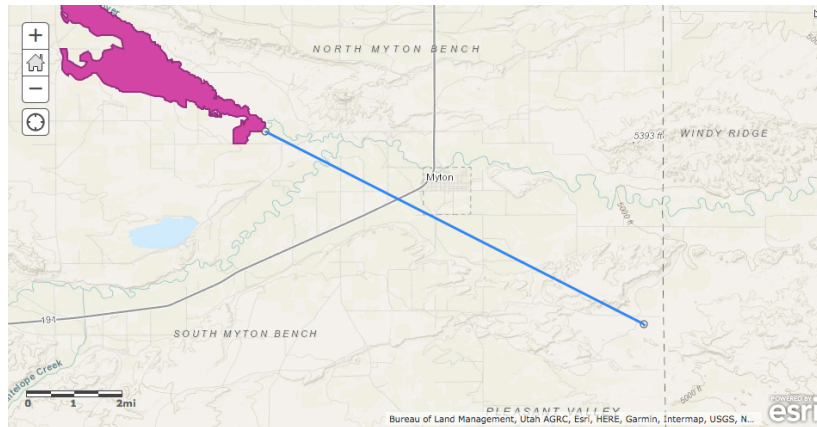


Figure 2: U.S.F.W.S./BLM map of critical habitat, shown highlighted in pink. This area is located ~9 miles from proposed site.

The likelihood of Canada Lynx (*Lynx Canadensis*), Bonytail chub (*Gila elegans*), Colorado pikeminnow (*Ptychocheilus lucius*), Humpback chub (*Gila cypha*), and Razorback sucker (*Xyrauchen texanus*) occurring at the site is none due to no suitable habitat at the site. The small drainage stream 100 feet to the north of the construction site is too small to contain the endangered fish species. There is no suitable nesting nor roosting habitat for the Mexican Spotted owl (*Strix occidentalis lucida*) or Yellow-Billed Cuckoo (*Coccyzus americanus*) at the site. Critical habitat for T&E species exists at 8.9 miles from the site (Figure 2). Construction at the site would not interfere. While the Mexican Spotted Owl uses canyons, riparian areas, and pinyon-juniper habitat for roosting and forage, this exists 2.5 miles away from site. Ute Ladies'-Tresses (*Spiranthes diluvialis*) occur in seasonally flooded river terraces yet discussion with the lead botanist for the species said it does not occur in this area. Critical factors to ensure protection of species from construction include 1) a minimum of a 300 feet barrier, and 2) the hydrology of the site with the threatened species is not altered. There are no waterways associated with habitat of the Utah Ladies'-Tresses that are affected by the proposed landfill site.

There are two threatened plant species whose range is at the construction site. Pariette Cactus (*Sclerocactus brevispinus*) and Uinta Basin Hookless Cactus (*Sclerocactus wetlandicus*) have been found in this area (Figures 3 & 4, respectively).

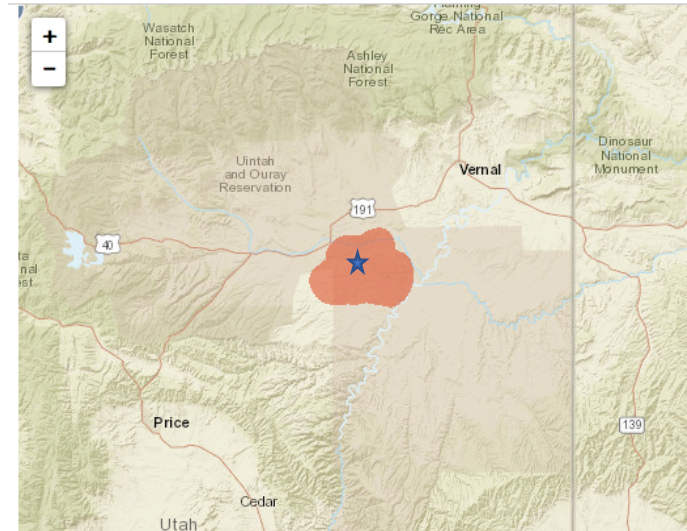


Figure 3: Fish and Wildlife defined habitat of Pariette Cactus (*Sclerocactus brevispinus*). This species has been observed in orange area. WWS site is located within the defined orange area.

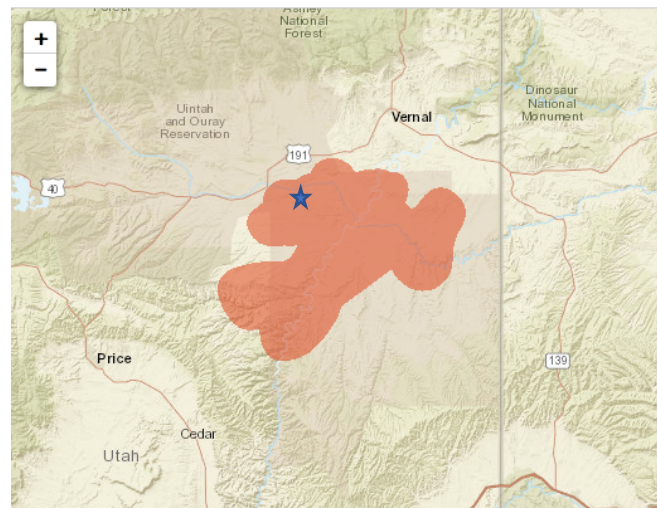


Figure 4: Fish and Wildlife defined habitat of Uinta Basin Hookless Cactus (*Sclerocactus wetlandicus*). This species has been observed in orange area. WWS site is located within the defined orange area.

Included in Appendix B is a list of migratory bird species that fly through this region. While these species are not threatened or endangered, they are birds of conservation concern. Probability and timing of occurrence is included in Appendix C is a list of the species and their habitat type so owners and developers of the landfill can be aware of their existence.

CONCLUSION

This project site is a new development on private land. There are two of the ten threatened and endangered species that have suitable habitat within the proposed site and have been cited in this area. Designated Critical Habitat for most of the species is located 8.9 miles away from proposed construction site. This initial report certifies two threatened species have been found within the site area.

Site-Visit, Proposed E&P Landfill Site
April 10th, 2018

We conducted an on-site visit at the Western Water Solutions Landfill Site to determine existence of two threatened species known to occur in the general area. This analysis was conducted because Pariette Cactus (*Sclerocactus brevispinus*) and Uinta Basin Hookless Cactus (*Sclerocactus wetlandicus*) have defined habitat in the broader area, as stated by the U.S. Fish and Wildlife Service.

Site:

The proposed landfill site is in an undisturbed area within WWS owned property dominated by mixed shrub/cactus. Vegetation is a mixed desert shrub habitat with areas of willow near ephemeral streams. The ephemeral stream is adjacent to the designated landfill on the north side.

Sampling:

Our field assessment took place on April 19th, 2018, the beginning of flowering season for Pariette and Uinta Basin Hookless cacti. This was a one day, two-man survey. Weather was sunny with minimal cloud cover.

Methodology:

We examined all four potential landfill sites, each measuring ~400 ft². Included in the analysis was a 300-foot buffer zone extending from the landfill site on north, east, and west sides, with a 100-foot buffer zone on the South side (this buffer is smaller due to a topographical increase leading to a road). The Biologist and Geologist simultaneously created and walked transect lines across the defined area, each transect was 10' apart which allowed for examiners to view vegetation 5' on either side of the transect line. Maprike, a mapping device for smart phones, was used to map transect lines to assure accuracy.

Conclusion:

Surveys found no Pariette Cactus (*Sclerocactus brevispinus*) and Uinta Basin Hookless Cactus (*Sclerocactus wetlandicus*) in the proposed landfill site and adjacent buffer regions.

Conducted by Lindsey Nesbitt and Jeremy Sage

Species	Status	Habitat Description	Likelihood of Occurrence
Mammal			
Canada Lynx (<i>Lynx canadensis</i>)	Threatened	Occurs in extensive tracts of dense coniferous forest, primarily Engelmann spruce and subalpine fir, with substantial understory with habitat for its prey, snowshoe hare.	None. No suitable habitat occurs within the site. Site is outside defined critical habitat.
Bird			
Mexican Spotted owl (<i>Strix occidentalis lucida</i>)	Threatened	Spotted owls are residents of old-growth or mature forests that possess complex structural components (uneven aged stands, high canopy closure, multi-storied levels, high tree density). Canyons with riparian or conifer communities are also important components. Owls are also found in canyon habitat dominated by vertical-walled rocky cliffs within complex watersheds, including tributary side canyons. Rock walls with caves, ledges, and other areas provide protected nest and roost sites. Canyon habitat may include small isolated patches or stringers of forested vegetation including stands of mixed-conifer, ponderosa pine, pine-oak, pinyon-juniper, and/or riparian vegetation in which owls regularly roost and forage. Owls are usually found in areas with some type of water source (i.e., perennial stream, creeks, and springs, ephemeral water, small pools from runoff, reservoir emissions).	None. No nesting, roosting, nor critical habitat on or near site.
Yellow-Billed Cuckoo (<i>Coccyzus americanus</i>)	Threatened	Inhabit large stands of cottonwood-willow habitat below 7,000 ft. Species is a riparian obligate and require low, dense, shrubby vegetation for nest sites, and restricted to closed-canopy, deciduous, riparian forests with a dense shrub understory.	None. No nesting, roosting, or critical habitat occurs on or near site.
Fish			
Bonytail chub (<i>Gila elegans</i>)	Endangered	Riparian habitat.	None: No suitable or critical habitat occurs within the site
Colorado pikeminnow (<i>Ptychocheilus lucius</i>)	Endangered	Riparian habitat.	None: No suitable or critical habitat occurs within the site.
Humpback chub (<i>Gila cypha</i>)	Endangered	Riparian habitat.	None: No suitable or critical habitat occurs within the site
Razorback sucker (<i>Xyrauchen texanus</i>)	Endangered	Riparian habitat.	None: No suitable or critical habitat occurs within the site
Plant			

Pariette Cactus (<i>Sclerocactus brevispinus</i>)	Threatened	This cactus grows on the clay badlands of the Pariette Draw, where the soil is quite saline and alkaline. It grows on hills and flats in sagebrush. Similar habitat is <i>S. wetlandicus</i> .	Likely. This species has been observed in this area (see Figure x). No critical habitat rules have been published for the Pariette cactus.
Uinta Basin Hookless Cactus (<i>Sclerocactus wetlandicus</i>)	Threatened	This cactus species grows on sparsely vegetated arid desert shrubland in association with shadscale (<i>Atriplex confertifolia</i>), rabbitbrush (<i>Ericameria nauseosa</i>) and horsebrush (<i>Tetradymia</i> spp.). Shares same habitat as <i>S. brevispinus</i> .	Likely. This species has been observed in this area (see Figure y). No critical habitat rules have been published for the Uinta Basin hookless cactus.
Ute ladies'-tresses (<i>Spiranthes diluvialis</i>)	Threatened	Known primarily from moist meadows associated with perennial stream terraces, floodplains, and oxbows at elevations between 4300-6850 feet (1310-2090 meters). Surveys since 1992 have expanded the number of vegetation and hydrology types occupied by Ute ladies'-tresses to include seasonally flooded river terraces, subirrigated or spring-fed abandoned stream channels and valleys, and lakeshores. In addition, 26 populations have been discovered along irrigation canals, berms, levees, irrigated meadows, excavated gravel pits, roadside barrow pits, reservoirs, and other human-modified wetlands. New surveys have also expanded the elevational range of the species from 720-1830 feet (220-558 meters) in Washington to 7000 feet (2134 meters) in northern Utah. Over one-third of all known Ute ladies'-tresses populations are found on alluvial banks, point bars, floodplains, or	None. Designated critical habitat 8.9 miles from site.

Migratory Bird Species *	Status	Habitat Description**	Likelihood of Occurrence
Bald Eagle <i>Haliaeetus leucocephalus</i>	Not of Bird of Conservation Concern (BCC)	Coasts, rivers, large lakes; in migration, also mountains, open country.	migrating
Black Rosy-finch <i>Leucosticte atrata</i>	BCC	Winters in open country, including mountain meadows, high deserts, valleys, and plains.	migrating
Black Swift <i>Cypseloides niger</i>	BCC	Limited in range by nesting site, they require shady, sheltered spots on vertical cliffs totally inaccessible to predators, and often nests on the damp rock behind waterfalls.	migrating
Brewer's Sparrow <i>Spizella breweri</i>	BCC	Sagebrush, brushy plains; also near treeline in Rockies; in winter, also weedy fields. In summer typically in open flats covered with sagebrush; sometimes in stands of saltbush, on open prairie, or in pinyon-juniper woodland.	migrating
Burrowing Owl <i>Athene cunicularia</i>	BCC	Open grassland, prairies, farmland, airfields. Favors areas of flat open ground with very short grass or bare soil. Prairie-dog towns once furnished much ideal habitat in west, but these are now scarce, and the owls are found on airports, golf courses, vacant lots, industrial parks, other open areas.	migrating
Clark's Grebe <i>Aechmophorus clarkii</i>	BCC	Breeding uncommon in this area	migrating
Golden Eagle <i>Aquila chrysaetos</i>	BCC	Open mountains, foothills, plains, open country. Requires open terrain. In the north and west, found over tundra, prairie, rangeland, or desert; very wide-ranging in winter, more restricted to areas with good nest sites in summer.	migrating
Grace's Warbler <i>Dendroica graciae</i> (Setophaga)	BCC	Pine-oak forests of mountains. During the breeding season, found mainly in the tops of pines, sometimes also in spruce, fir, and oak thickets in higher mountains of the Southwest. In winter in Mexico, inhabits pine-oak woods in the mountains.	migrating

Gray Vireo <i>Vireo vicinior</i>	BCC	Brushy mountain slopes, mesas, open chaparral, scrub oak, junipers. Breeds in dry thorn scrub, chaparral, pinyon-juniper and oak-juniper scrub, or sagebrush and mesquites of arid foothills and mesas, between 3,000-6,500' elevation.	migrating
Lesser Yellowlegs <i>Tringa flavipes</i>	BCC	Marshes, mudflats, shores, ponds; in summer, open boreal woods.	migrating
Lewis's Woodpecker <i>Melanerpes lewis</i>	BCC	Scattered or logged forest, river groves, burns, foothills. Because of aerial foraging, needs open country in summer, with large trees for nest sites and foraging perches.	migrating
Long-billed Curlew <i>Numenius americanus</i>	BCC	High plains, rangeland. In winter, also cultivated land, tideflats, salt marshes. Breeding habitat is mostly native dry grassland and sagebrush prairie; may favor areas with some damp low spots nearby, to provide better feeding area for the young.	migrating
Long-eared Owl <i>asio otus</i>	BCC	Woodlands, conifer groves. Favored habitat includes dense trees for nesting and roosting, open country for hunting.	migrating
Marbled Godwit <i>Limosa fedoa</i>	BCC	Prairies, pools, shores, tideflats. Breeds mostly on northern Great Plains, in areas of native prairie with marshes or ponds nearby.	migrating
Olive-sided Flycatcher <i>Contopus cooperi</i>	BCC	Conifer forests, burns, clearings. Breeds mostly in coniferous forest of the north and the higher mountains, especially around the edges of open areas including bogs, ponds, clearings.	migrating
Pinyon Jay <i>Gymnorhinus cyanocephalus</i>	BCC	Pinyon pines, junipers; ranges into sagebrush.	migrating
Rufous Hummingbird <i>Selasphorus rufus</i>	BCC	Forest edges, streamsides, mountain meadows.	migrating
Virginia's Warbler <i>Vermivora virginiae</i> (<i>Oreothlypis</i>)	BCC	Oak canyons, brushy slopes, pinyons. Breeds on dry mountainsides in scrub oak, chaparral, pinyon-juniper woods, or other low brushy habitats.	migrating

Willet <i>Tringa semipalmata</i>	BCC	Marshes, wet meadows, mudflats, beaches. migrating Eastern race nests in areas of extensive salt marsh along coast; western race nests inland, around fresh marshes in open country, especially native grassland.
Willow Flycatcher <i>Empidonax traillii</i>	BCC	Bushes, willow thickets, brushy fields, upland migrating copses. Breeds in thickets of deciduous trees and shrubs, especially willows, or along woodland edges. Often near streams or marshes (especially in southern part of range), but may be found in drier habitats than Alder Flycatcher.

* please see included graph in Appendix C for probability of presence.

** Habitat descriptions form Audubon.org (<http://www.audubon.org/bird-guide>)

IPaC Information for Planning and Consultation

U.S. Fish & Wildlife Service

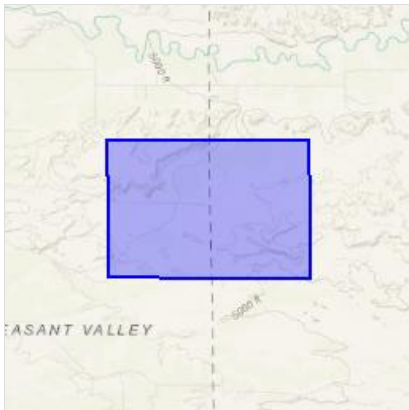
IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Duchesne and Uintah counties, Utah



Local office

Utah Ecological Services Field Office

☎ (801) 975-3330

📠 (801) 975-3331

2369 West Orton Circle, Suite 50
West Valley City, UT 84119-7603

<http://www.fws.gov>

<http://www.fws.gov/utahfieldoffice/>

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species¹ are managed by the [Ecological Services Program](#) of the U.S. Fish and Wildlife Service.

1. Species listed under the [Endangered Species Act](#) are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the [listing status page](#) for more information.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Canada Lynx <i>Lynx canadensis</i> There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/3652	Threatened

Birds

NAME	STATUS
Mexican Spotted Owl <i>Strix occidentalis lucida</i> There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/8196	Threatened
Yellow-billed Cuckoo <i>Coccyzus americanus</i> There is proposed critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/3911	Threatened

Fishes

NAME	STATUS
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Bonytail Chub <i>Gila elegans</i> There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/1377	Endangered
Colorado Pikeminnow (=squawfish) <i>Ptychocheilus lucius</i> There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/3531	Endangered
Humpback Chub <i>Gila cypha</i> There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/3930	Endangered
Razorback Sucker <i>Xyrauchen texanus</i> There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/530	Endangered

Flowering Plants

NAME	STATUS
Pariette Cactus <i>Sclerocactus brevispinus</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/2966	Threatened
Uinta Basin Hookless Cactus <i>Sclerocactus wetlandicus</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9037	Threatened
Ute Ladies'-tresses <i>Spiranthes diluvialis</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/2159	Threatened

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act¹ and the Bald and Golden Eagle Protection Act².

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described [below](#).

1. The [Migratory Birds Treaty Act](#) of 1918.

2. The [Bald and Golden Eagle Protection Act](#) of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern
<http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php>
- Measures for avoiding and minimizing impacts to birds
<http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php>
- Nationwide conservation measures for birds
<http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf>

The birds listed below are birds of particular concern either because they occur on the [USFWS Birds of Conservation Concern](#) (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ [below](#). This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see maps of where birders and the general public have sighted birds in and around your project area, visit E-bird tools such as the [E-bird data mapping tool](#) (search for the name of a bird on your list to see specific locations where that bird has been reported to occur within your project area over a certain timeframe) and the [E-bird Explore Data Tool](#) (perform a query to see a list of all birds sighted in your county or region and within a certain timeframe). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list can be found [below](#).

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
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Bald Eagle *Haliaeetus leucocephalus*

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

<https://ecos.fws.gov/ecp/species/1626>

Breeds Dec 1 to Aug 31

Black Rosy-finch *Leucosticte atrata*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

<https://ecos.fws.gov/ecp/species/9460>

Breeds Jun 15 to Aug 31

<p>Black Swift <i>Cypseloides niger</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8878</p>	Breeds Jun 15 to Sep 10
<p>Brewer's Sparrow <i>Spizella breweri</i> This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9291</p>	Breeds May 15 to Aug 10
<p>Burrowing Owl <i>Athene cunicularia</i> This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9737</p>	Breeds Mar 15 to Aug 31
<p>Clark's Grebe <i>Aechmophorus clarkii</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.</p>	Breeds Jan 1 to Dec 31
<p>Golden Eagle <i>Aquila chrysaetos</i> This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/1680</p>	Breeds Jan 1 to Aug 31
<p>Grace's Warbler <i>Dendroica graciae</i> This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA</p>	Breeds May 20 to Jul 20
<p>Gray Vireo <i>Vireo vicinior</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8680</p>	Breeds May 10 to Aug 20
<p>Lesser Yellowlegs <i>Tringa flavipes</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679</p>	Breeds elsewhere
<p>Lewis's Woodpecker <i>Melanerpes lewis</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9408</p>	Breeds Apr 20 to Sep 30
<p>Long-billed Curlew <i>Numenius americanus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/5511</p>	Breeds Apr 1 to Jul 31

<p>Long-eared Owl <i>asio otus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3631</p>	Breeds Mar 1 to Jul 15
<p>Marbled Godwit <i>Limosa fedoa</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9481</p>	Breeds elsewhere
<p>Olive-sided Flycatcher <i>Contopus cooperi</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3914</p>	Breeds May 20 to Aug 31
<p>Pinyon Jay <i>Gymnorhinus cyanocephalus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9420</p>	Breeds Feb 15 to Jul 15
<p>Rufous Hummingbird <i>selasphorus rufus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8002</p>	Breeds elsewhere
<p>Virginia's Warbler <i>Vermivora virginiae</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9441</p>	Breeds May 1 to Jul 31
<p>Willet <i>Tringa semipalmata</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.</p>	Breeds elsewhere
<p>Willow Flycatcher <i>Empidonax traillii</i> This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/3482</p>	Breeds May 20 to Aug 31

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in your project's counties during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is $0.25/0.25 = 1$; at week 20 it is $0.05/0.25 = 0.2$.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the counties of your project area. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (—)

A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information.



only in particular Bird Conservation Regions (BCRs) in the continental USA

Clark's Grebe
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Golden Eagle
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)



Grace's Warbler
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)



Gray Vireo
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Lesser Yellowlegs
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Lewis's Woodpecker
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Long-billed Curlew
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



SPECIES JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

Long-eared Owl
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Marbled Godwit
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

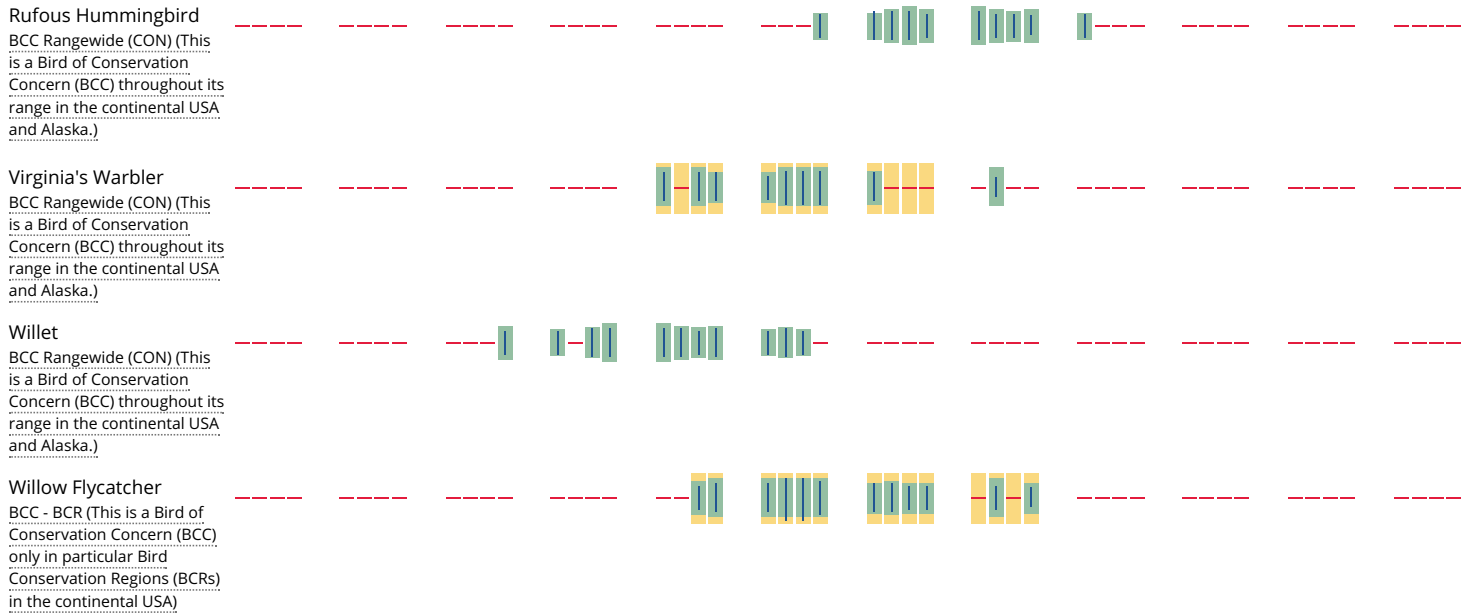


Olive-sided Flycatcher
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Pinyon Jay
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)





Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

[Nationwide Conservation Measures](#) describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. [Additional measures](#) and/or [permits](#) may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS [Birds of Conservation Concern \(BCC\)](#) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the [Avian Knowledge Network \(AKN\)](#). The AKN data is based on a growing collection of [survey, banding, and citizen science datasets](#) and is queried and filtered to return a list of those birds reported as occurring in the counties which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle ([Eagle Act](#) requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the [E-bird Explore Data Tool](#).

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the [Avian Knowledge Network \(AKN\)](#). This data is derived from a growing collection of [survey, banding, and citizen science datasets](#).

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The [The Cornell Lab of Ornithology All About Birds Bird Guide](#), or (if you are unsuccessful in locating the bird of interest there), the [Cornell Lab of Ornithology Neotropical Birds guide](#). If a bird entry on your migratory bird species list indicates a breeding season, it is probable that the bird breeds in your project's counties at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are [Birds of Conservation Concern](#) (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the [Eagle Act](#) requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the [Northeast Ocean Data Portal](#). The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the [NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf](#) project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the [Diving Bird Study](#) and the [nanotag studies](#) or contact [Caleb Spiegel](#) or [Pam Loring](#).

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to [obtain a permit](#) to avoid violating the BGEPA should such impacts occur.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the [National Wildlife Refuge](#) system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to [NWI wetlands](#) and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local [U.S. Army Corps of Engineers District](#).

This location overlaps the following wetlands:

FRESHWATER EMERGENT WETLAND

[PEMA](#)

[PEMCh](#)

FRESHWATER POND

[PUSAh](#)

[PABFh](#)

[PUSCh](#)

A full description for each wetland code can be found at the National Wetlands Inventory website:

<https://ecos.fws.gov/ipac/wetlands/decoder>

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tubercid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.



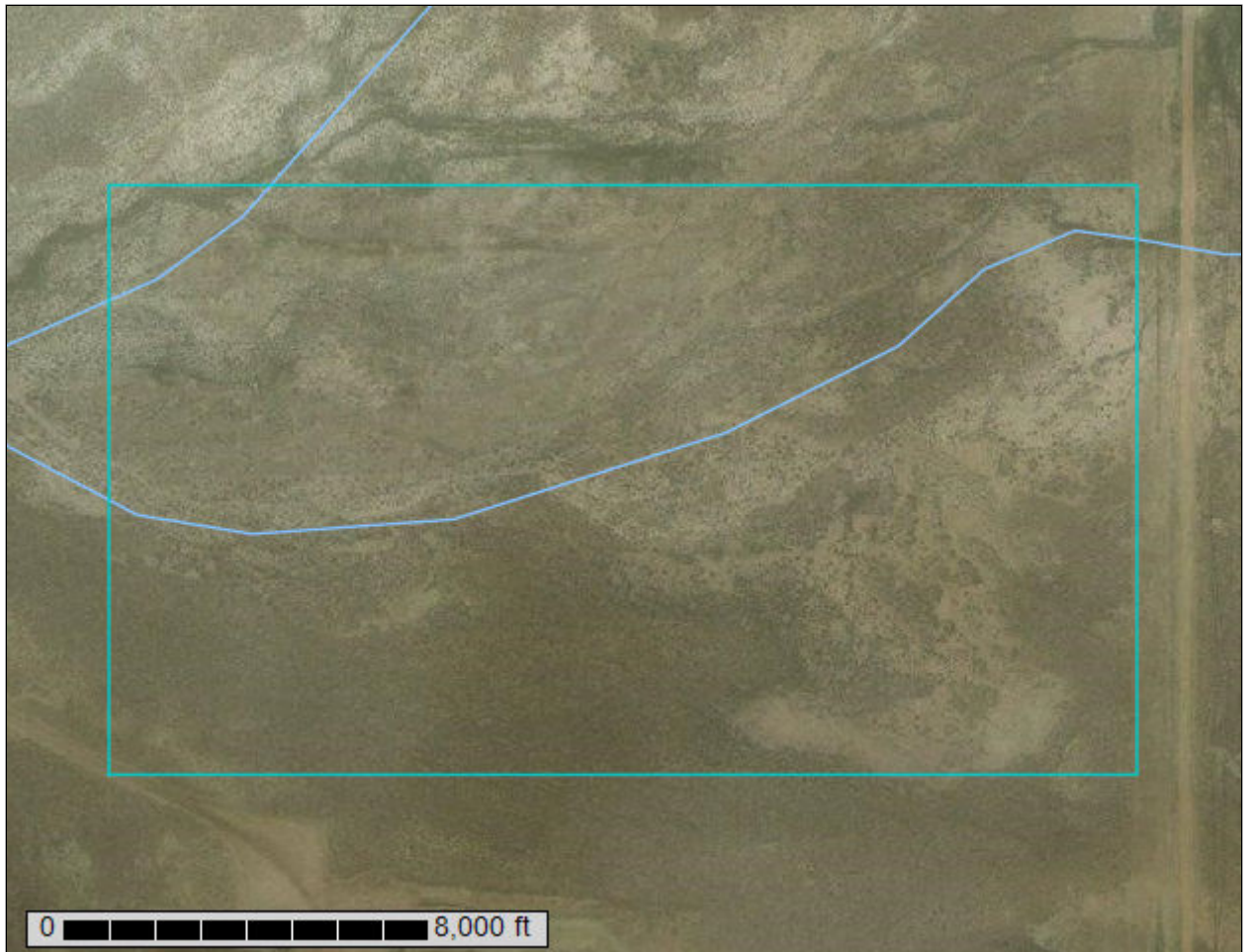
United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

A product of the National
Cooperative Soil Survey,
a joint effort of the United
States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for Duchesne Area, Utah, Parts of Duchesne, Utah, and Wasatch Counties



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

Custom Soil Resource Report

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

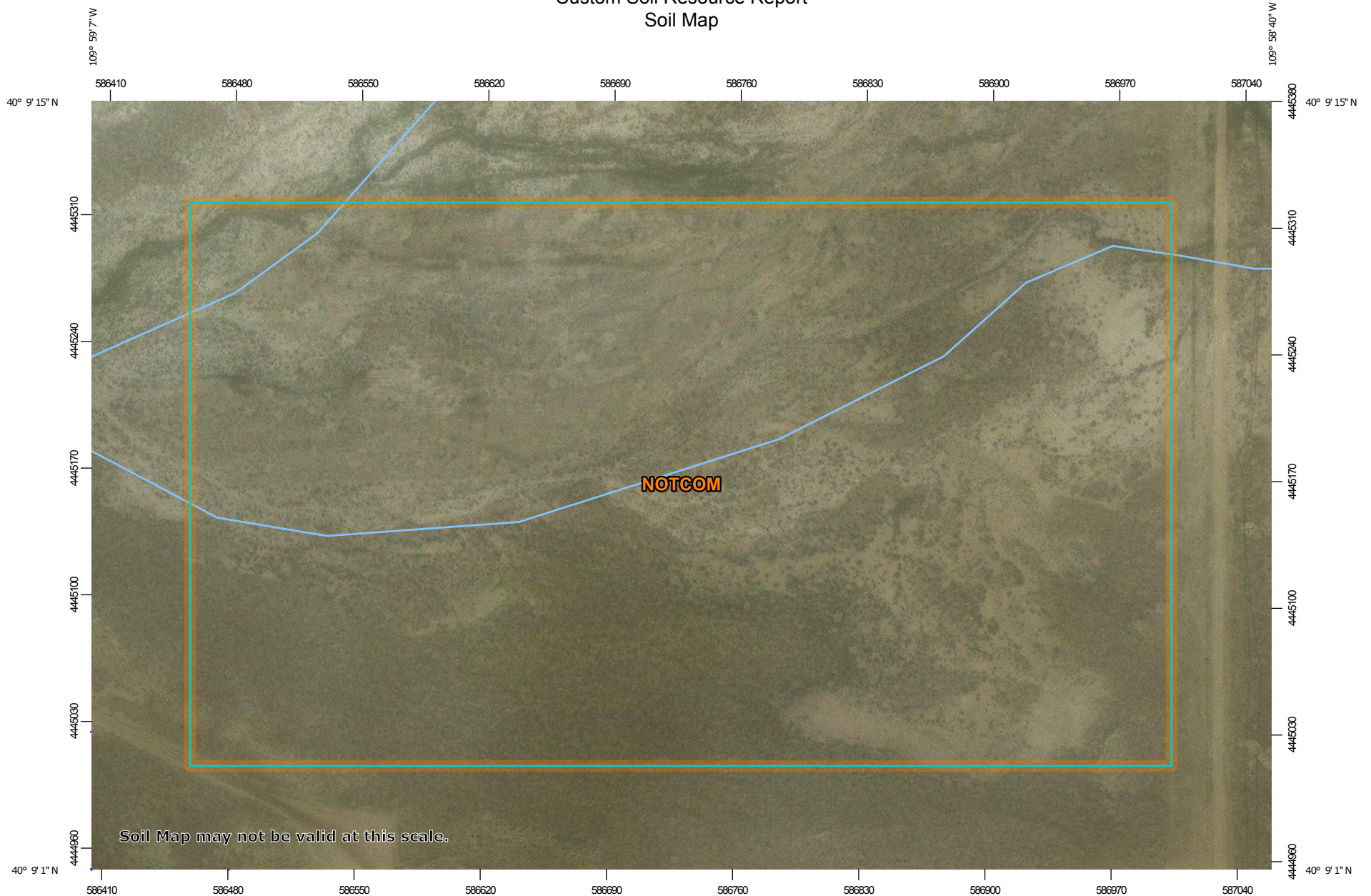
Custom Soil Resource Report

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

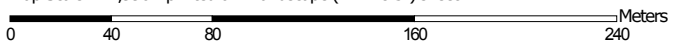
Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report Soil Map



Map Scale: 1:2,990 if printed on A landscape (11" x 8.5") sheet.




Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84




MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)




















Soils







 Soil Map Unit Polygons

 Soil Map Unit Lines


 Soil Map Unit Points

Special Point Features






-  Blowout
-  Borrow Pit
-  Clay Spot
-  Closed Depression
-  Gravel Pit
-  Gravelly Spot
-  Landfill
-  Lava Flow
-  Marsh or swamp
-  Mine or Quarry
-  Miscellaneous Water
-  Perennial Water
-  Rock Outcrop
-  Saline Spot
-  Sandy Spot
-  Severely Eroded Spot
-  Sinkhole
-  Slide or Slip
-  Sodic Spot

-  Spoil Area
-  Stony Spot
-  Very Stony Spot
-  Wet Spot
-  Other
-  Special Line Features


Water Features

 Streams and Canals

Transportation

-  Rails
-  Interstate Highways
-  US Routes
-  Major Roads
-  Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL:
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Duchesne Area, Utah, Parts of Duchesne, Utah, and Wasatch Counties
 Survey Area Data: Version 4, Sep 25, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Oct 15, 2013—Jan 17, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
NOTCOM	No Digital Data Available	42.1	100.0%
Totals for Area of Interest		42.1	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Custom Soil Resource Report

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Duchesne Area, Utah, Parts of Duchesne, Utah, and Wasatch Counties

NOTCOM—No Digital Data Available

Map Unit Composition

Notcom: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Notcom

Properties and qualities

References

- American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.
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- United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. <http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084>

Custom Soil Resource Report

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

Appendix H

Task	Description	Unit Cost	No. Units	Landfill #1	Unit Type	Total Cost	Details
Engineering	QCA (Laboratory/field Testing)	\$ 8,994.25	1		Estimate	\$ 8,994.25	15% of construction Cost, includes design, lab testing and field engineering support
	Construction Surveying	\$ 1,500.00	1		Estimate	\$ 1,500.00	Aerial drone imaging and processing
	As built survey	\$ 2,000.00	1		Estimate	\$ 2,000.00	GeoStrata As built survey and CAD drawing
	Letter of notification of closure	\$ 1,500.00	1		Estimate	\$ 1,500.00	Letter to DWMRC and County
Construction Cost	Topsoil Material	\$ -	5497		Cu Yd	\$ -	Topsoil is available on site
	Top Soil Testing	\$ 250.00	1		Estimate	\$ 250.00	Soil sampling and testing to ensure top soil is adequate
	Topsoil Graded	\$ 0.16	26444		Sq Yd	\$ 4,231.04	RS Means
	Trucking Topsoil	\$ 1.00	5497		Cu Yd	\$ 5,497.00	Top Soil is available on site
	Clay Liner Soils and Hauling	\$ 2.89	5495		Cu yd	\$ 15,880.55	Use of clay soils available on site Haul 0.5 Mile RS Means
	Clay Soils Compacted	\$ 0.80	5495		Cu Yd	\$ 4,396.00	RS Means
	Clay Soils Testing	\$ 500.00	1		Estimate	\$ 500.00	Soil sampling and testing to ensure Clay liner is adequate
	Hydro Seeding with mulch and fertilizer	\$ 62.00	238		1000 Sq ft	\$ 14,756.00	RS Means
	Mobilization /Demobilization	\$ 3,000.00	3		Each	\$ 9,000.00	\$1500 per mobilization per piece of quipment
Contingency	10% of constuction cost	\$ 5,451.06	1		Each	\$ 5,451.06	GeoStrata Estimate
TOTAL COST:						\$ 73,955.90	

Engineers opinion of probable Costs



Closure Cost Summary

Western Water Solutions
 Landfill Permit Application
 Project Number: 705-011

**Plate
H-1**

Task	Description	Unit Cost	No. Units	Unit Type	Total Cost	Total units 30 yrs.	Total cost 30 yrs.	Details/Source
Inspections	Quarterly 1st 2 years; Semiannually for 28 years	\$ 25.00	4	hours	100.00	64	\$ 6,400.00	4 inspections/year for the first 2 years and then 2 inspections/year for 28 years
Report	Quarterly 1st 2 years; Semiannually for 28 years	\$ 25.00	2	hours	50.00	64	\$ 3,200.00	4 reports/year for the first 2 years and then 2 reports/year for 28 years
TOTAL for 30 yrs							\$ 9,600.00	

Groundwater Monitoring	Groundwater Sampling labor	\$ 85.00	6	hour	510.00	13	\$ 6,630.00	Annual monitoring for first 5 years, biennial for next 10 years, then monitoring every 5th year for final 15 years. Sampling from 2 monitoring wells for 13 rounds of sampling
	GRO	\$ 130.00	2	sample	260.00	13	\$ 3,380.00	
	Heavy Metals	\$ 178.00	2	sample	356.00	13	\$ 4,628.00	
	Inorganic Constituents/other	\$ 234.00	2	sample	468.00	13	\$ 6,084.00	
	Groundwater sampling report	\$ 1,200.00	1	report	1200.00	13	\$ 15,600.00	
	Transport to lab	\$ 100.00	1	vehicle	100.00	13	\$ 1,300.00	
TOTAL for 30 yrs							\$ 37,622.00	

Maintenance	Re-grading top Soil	\$ 0.16	26444.444	Sq Yd	4231.11	1	\$ 2,432.01	Assumes 100% of topsoil of final cover of both cells will have to be replaced over 30 years
	Soil replacement	\$ 1.00	4661	Cu Yd	4661.00	1	\$ 4,661.00	
	Reseeding	\$ 62.00	238	1000 Sq Ft	14756.00	1	\$ 14,756.00	Assumes 1 total reseeding of final cover over 30 years
TOTAL for 30 yrs							\$ 21,849.01	

TOTAL for all tasks 30 yrs							\$ 69,071.01	
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Contingency	10% of total cost for all tasks						\$ 6,907.10	
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TOTAL POST CLOSURE COST							\$ 75,978.11	
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Engineers opinion of probable Costs

January 19, 2018

Chris Hansen, Preservation Planner
Utah State History
300 S. Rio Grande Street
Salt Lake City, Utah 84101
801-245-7239

Subject: Historical Preservation Survey

Dear Mr. Hansen,

GeoStrata is currently preparing a landfill permit on behalf of R.N. Industries (RNI) to be submitted to the Utah Division of Solid and Hazardous Waste (DSHW). RNI is a waste water disposal company in the Uinta Basin that services the Oil and gas industry. RNI is located in Duchesne County approximately 8.5 miles northwest of Roosevelt, Utah. DSHW requires a Historical Preservation Survey when permitting a new Utah Exploration and Production Waste Landfill (R315-304-4(2)(a)(iv)). At the request of RNI, GeoStrata conducted an evaluation of the proposed landfill site located on their property at 6878 Bluebell Road, Roosevelt Utah. A USGS 7.5 Minute Topographic map with the location of RNI and the proposed landfill is attached to the end of this letter as Attachment 1.

RNI takes waste water extracted during oil and gas exploration and production processes and stores the water in evaporation ponds. RNI is considering converting two of their evaporation ponds into a landfill utilized for the permanent disposal of oil and gas production and exploration solid wastes meeting the definition of RCRA-Exempt, Exploration and Production (E&P) Waste. There will be some minor alteration to the size and shape existing facilities when the pond is converted to the landfill pit however none of these alterations will affect any existing structures. The initial pond at RNI's Bluebell disposal facility was granted approval to operate by the Utah Division of Oil Gas and Mining (DOG M) in November of 1990. The original permit was for the construction of 7 evaporation ponds. Two of these original 7 ponds are intended for conversion to landfill and are identified as Ponds 6 and 7. They are the most easterly ponds of the original 7 evaporation ponds. All 7 of these were constructed between 1990 and 1997. Pond 6 was constructed in 1993 and Pond 7 was constructed in 1997. In 1998 a pond was added to the northern portion of the property and another pond was added in 2007.

Ponds 6 and 7 at the Bluebell facility are constructed with a single liner of 60 mil HDPE Geomembrane. These Ponds have been operating as a waste water pond since it was constructed. The ponds are currently drained of all waste water and the liner configuration will remain intact for the operational use of the landfill. To the west of both ponds there is a waste water sprinkler pad that was used to enhance evaporation. This pad was constructed using 60 mil HDPE liner and in welded to the evaporation basin liner. For each landfill cell this pad will be removed, and a waste staging area will be constructed. This staging area will be used for parking heavy equipment and equipment storage, waste inspection and truck

unloading. The staging area will also have a waste mixing area to stabilize any liquid wastes. Ramps will also be constructed to allow heavy equipment into the cell and to allow trucks to unload directly within the landfill. A set of plans for each landfill cell is provided in [appendix F](#).

The Area of Potential Effects for the proposed landfill will be minimal since there will be little to no construction associated with the conversion of the evaporation ponds to a landfill. This location has already been disturbed through previous construction on the site since 1990. Since the proposed landfill area is currently used for waste water disposal, we expect that the Area of Potential Effects will be limited to the area of the existing evaporation pond. The area of the ponds to be converted to a landfill is approximately 17.5 Acres, 8.0 acres at Pond 6 and 9.5 acres at Pond 7.

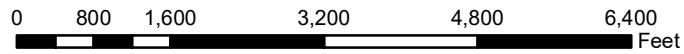
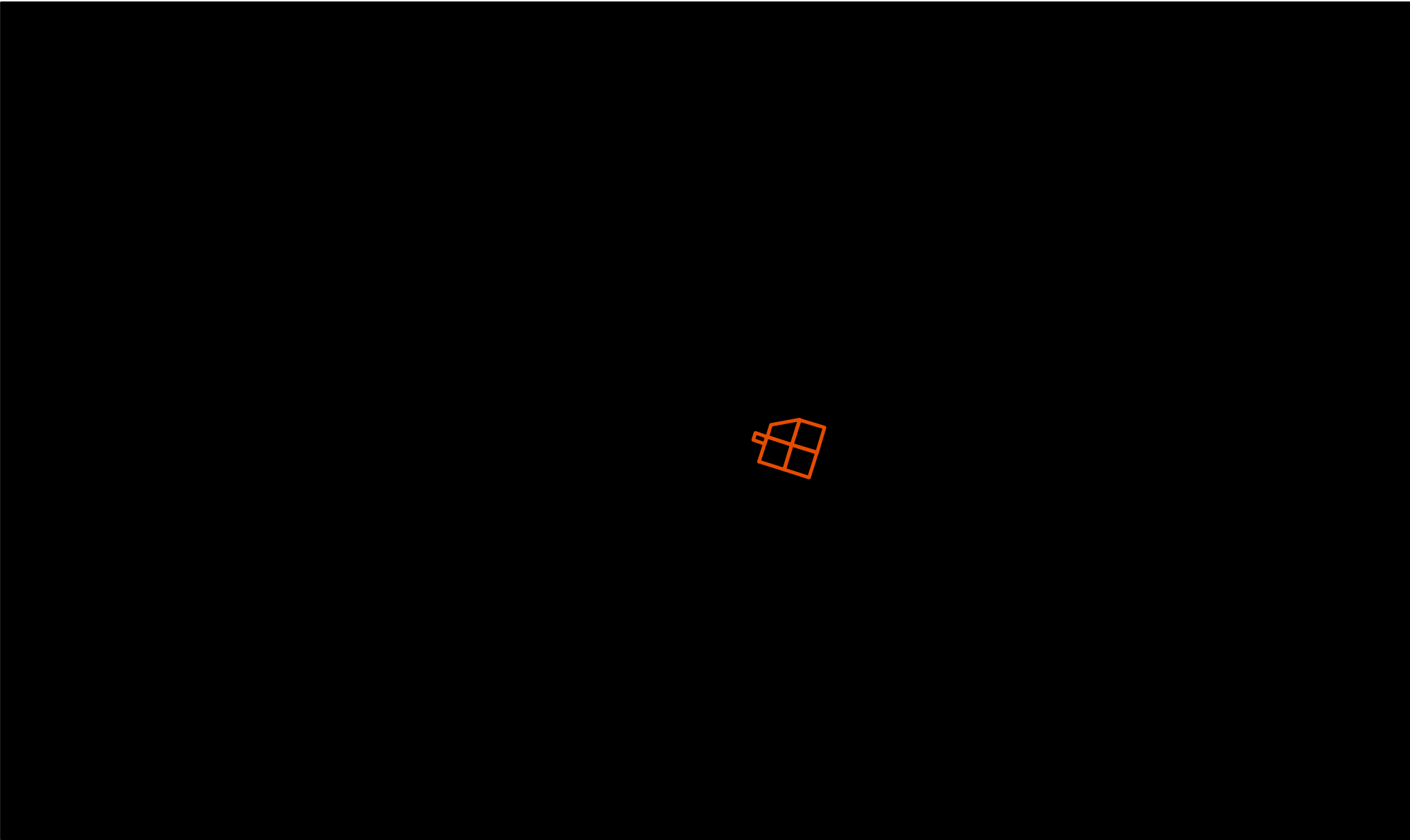
There are numerous buildings and structures located on the RNI facility, none of which are older than 50 years and none of the structures are potentially eligible to be listed on the National Registry of Historic Places. A list of all structures on the subject RNI property and their respective construction dates are provided in the following table:

Building/Structure	Construction Date
Office Trailer	1990
Maintenance Shop	1990
Twenty-two (22) Storage Tanks	1990-2006
Bio Reactor	2012
Filter Press Building	2012
Storage Shed	2012

Based on our evaluation of the site and Area of Potential Effects from the permitting of the new landfill, the site has no historical properties or structures. None of the above-mentioned buildings will be impacted by the construction of the proposed landfill. If you have any questions or need any other information about our historical evaluation of the RNI property, please contact us at (801) 501-0583.

Sincerely,



Jamey Sage
GeoStrata, LLC



1:24,000



Legend

-  Proposed Landfill Location
-  Property Boundary

Landfill Permit
 Western Water Solutions
 Duchesne County, Utah
 Project Number: 705-009

Proposed Landfill Location

**Plate
1**



GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

Jill Remington Love
Executive Director
Department of
Heritage & Arts



Brad Westwood
Director

January 31, 2018

James Sage

GeoStrata Engineering and Geosciences
14425 South Center Point Way
Bluffdale, Utah 84065

RE: Western Water Solutions Landfill, Duchesne County, Utah

For future correspondence, please reference Case No. 18-0258

Dear Mr Sage,

The Utah State Historic Preservation Office received your request for our comment on the above-referenced undertaking on January 31, 2018. We understand that you submitted this case on behalf of the Utah Division of Solid and Hazardous Waste. In the future we hope that the agency lead who is managing your project will conduct the consultation as specified in U.C.A. 9-8-404.

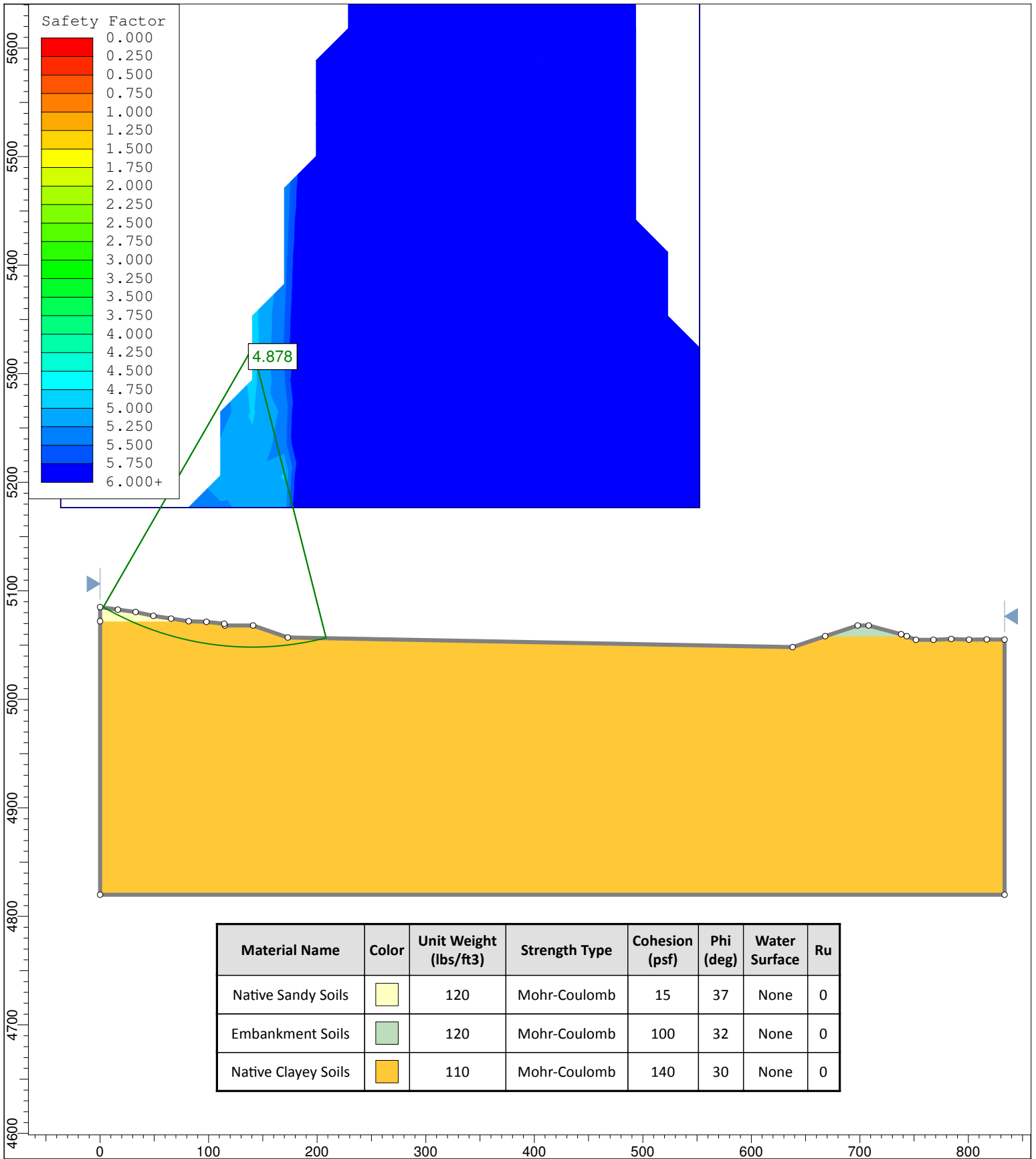
From the information provided it appears there is no potential for historic properties in your project area given past disturbances, thus we concur with your determination of effect for this undertaking.

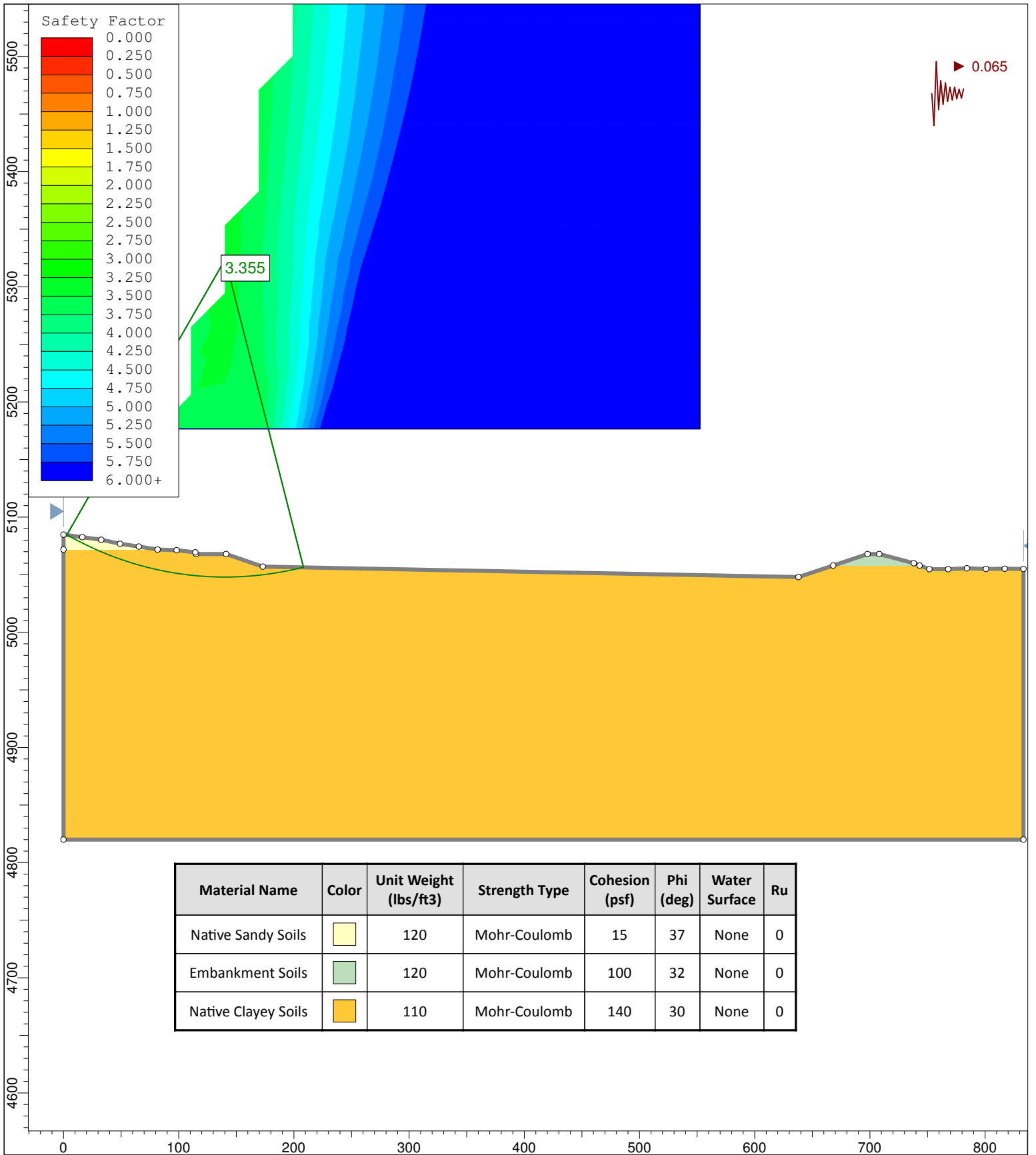
Utah Code 9-8-4-4(1)(a) denotes that your agency is responsible for all final decisions regarding cultural resources for this undertaking. Our comments here are provided as specified in U.C.A. 9-8-4-4(3)(a)(i). If you have questions, please contact me at (801)245-7241 or by email at ehora@utah.gov.

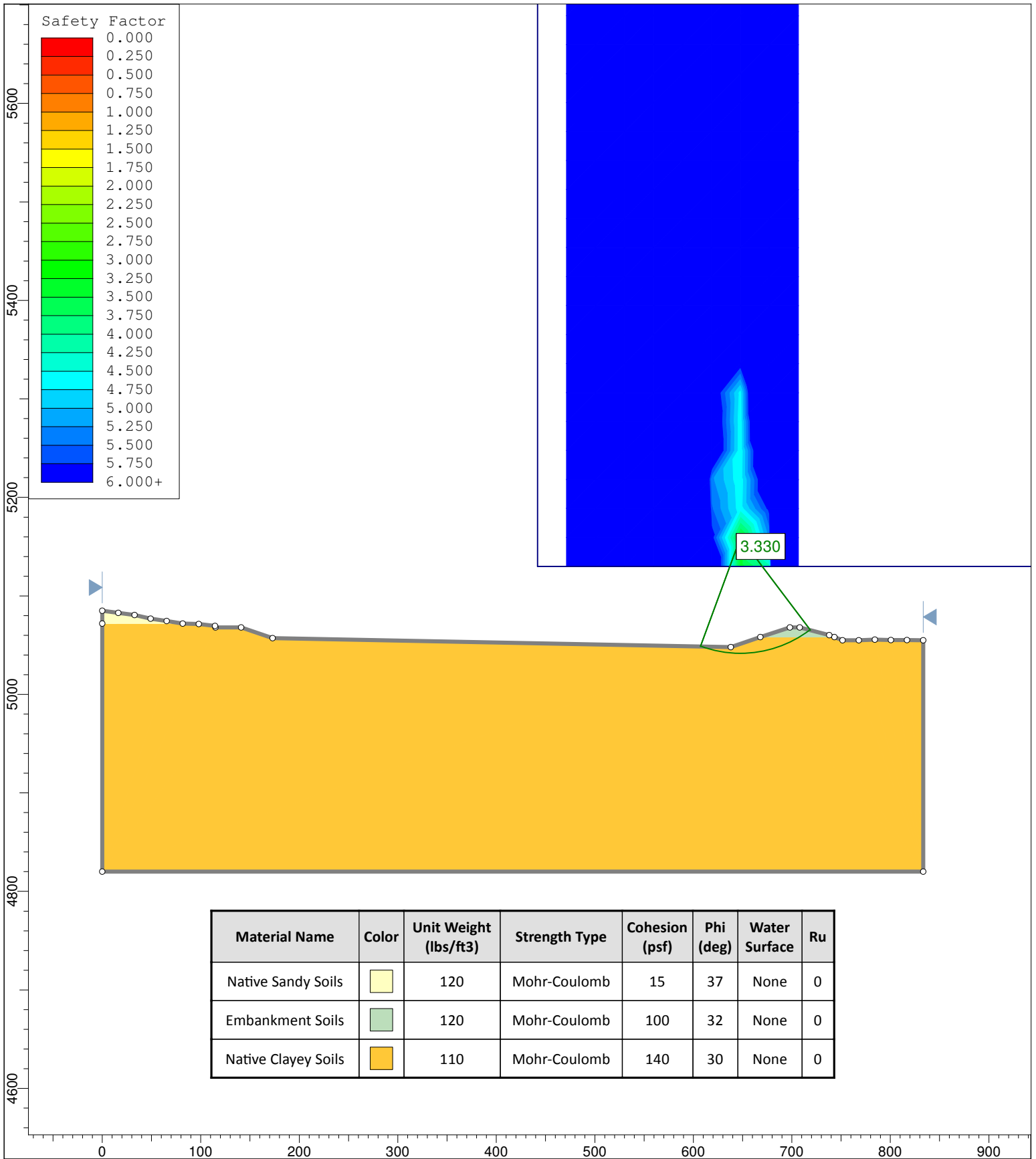
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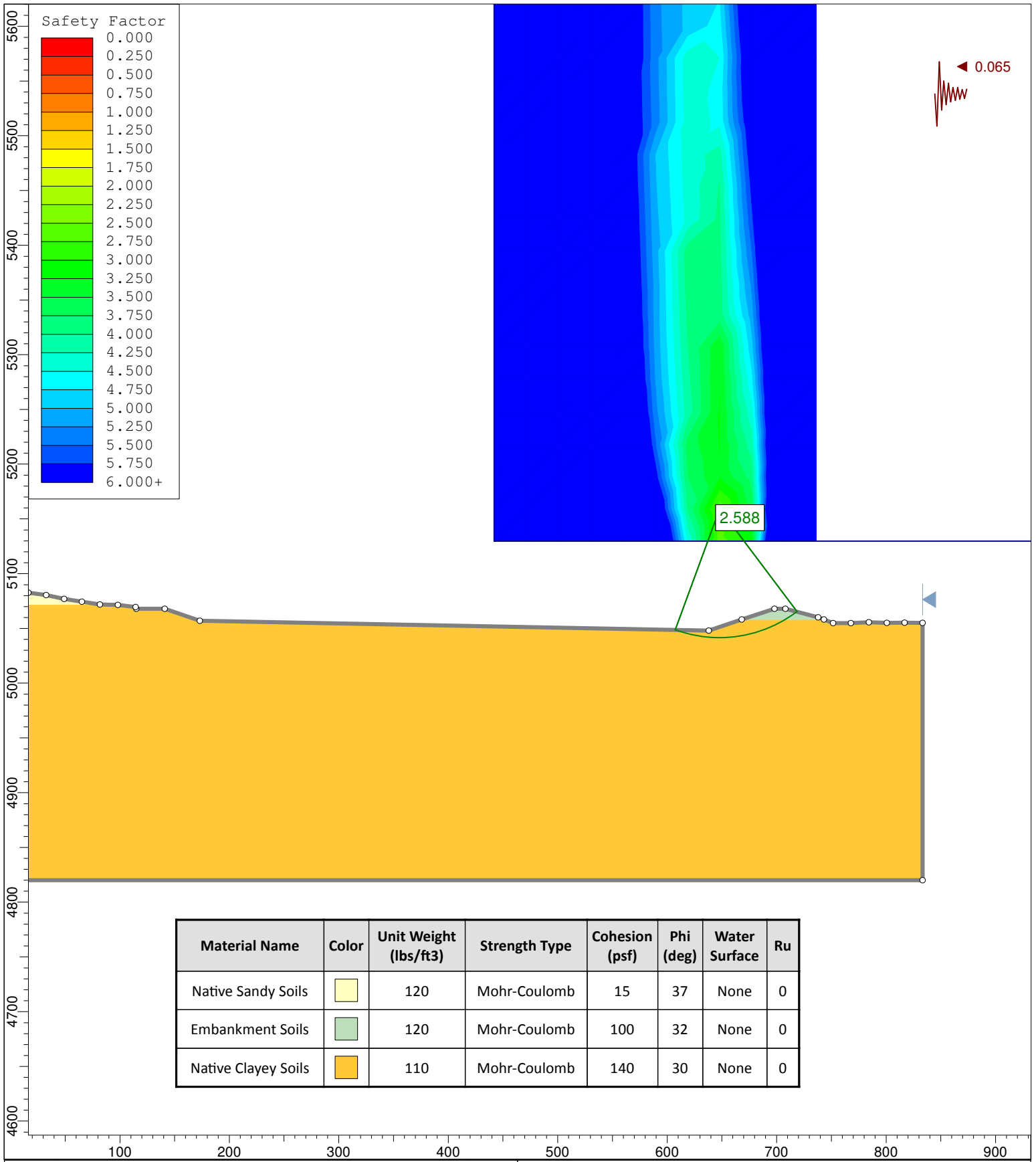
Christopher W. Merritt, Ph.D.
Deputy State Historic Preservation Officer

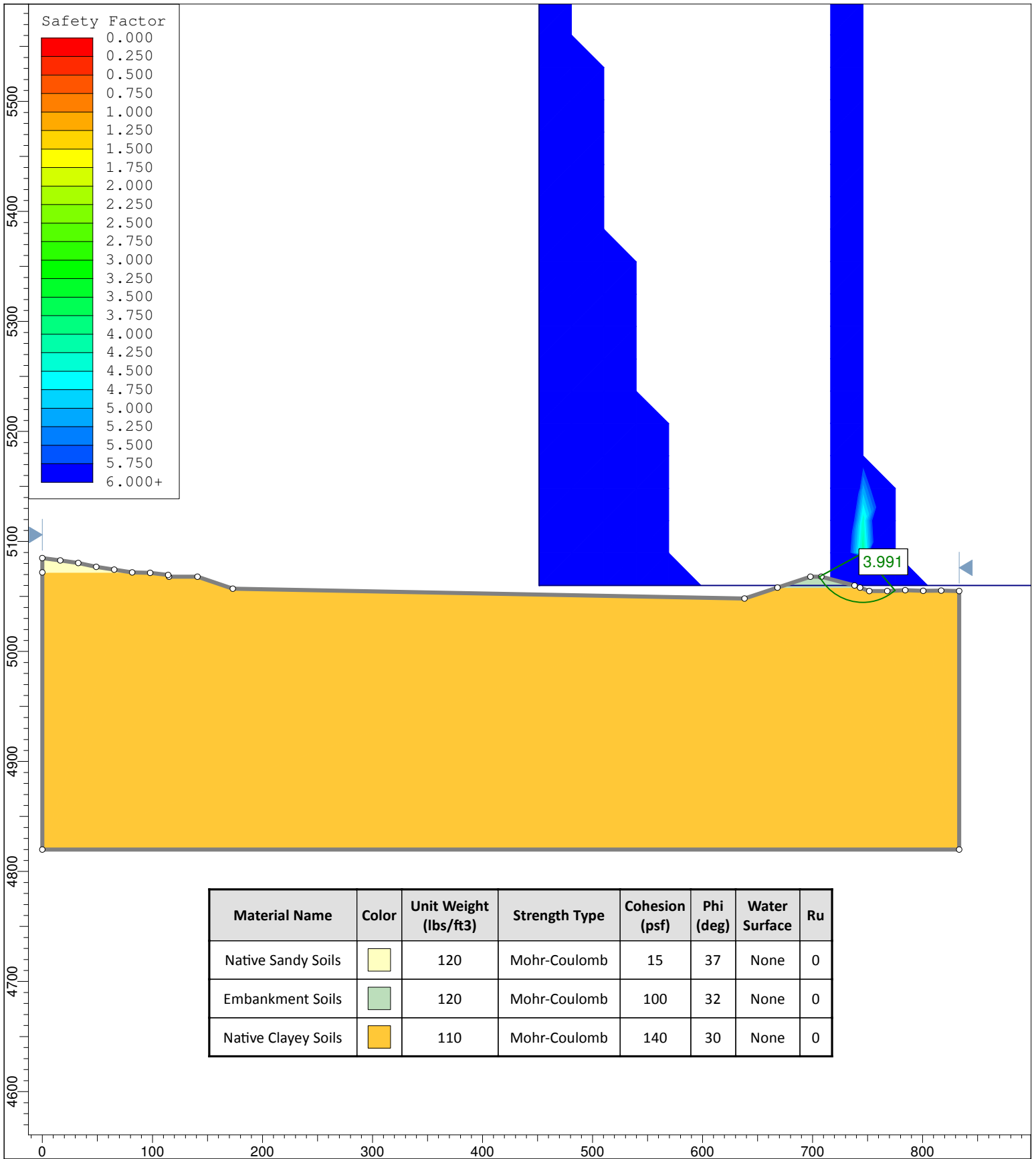
Appendix I



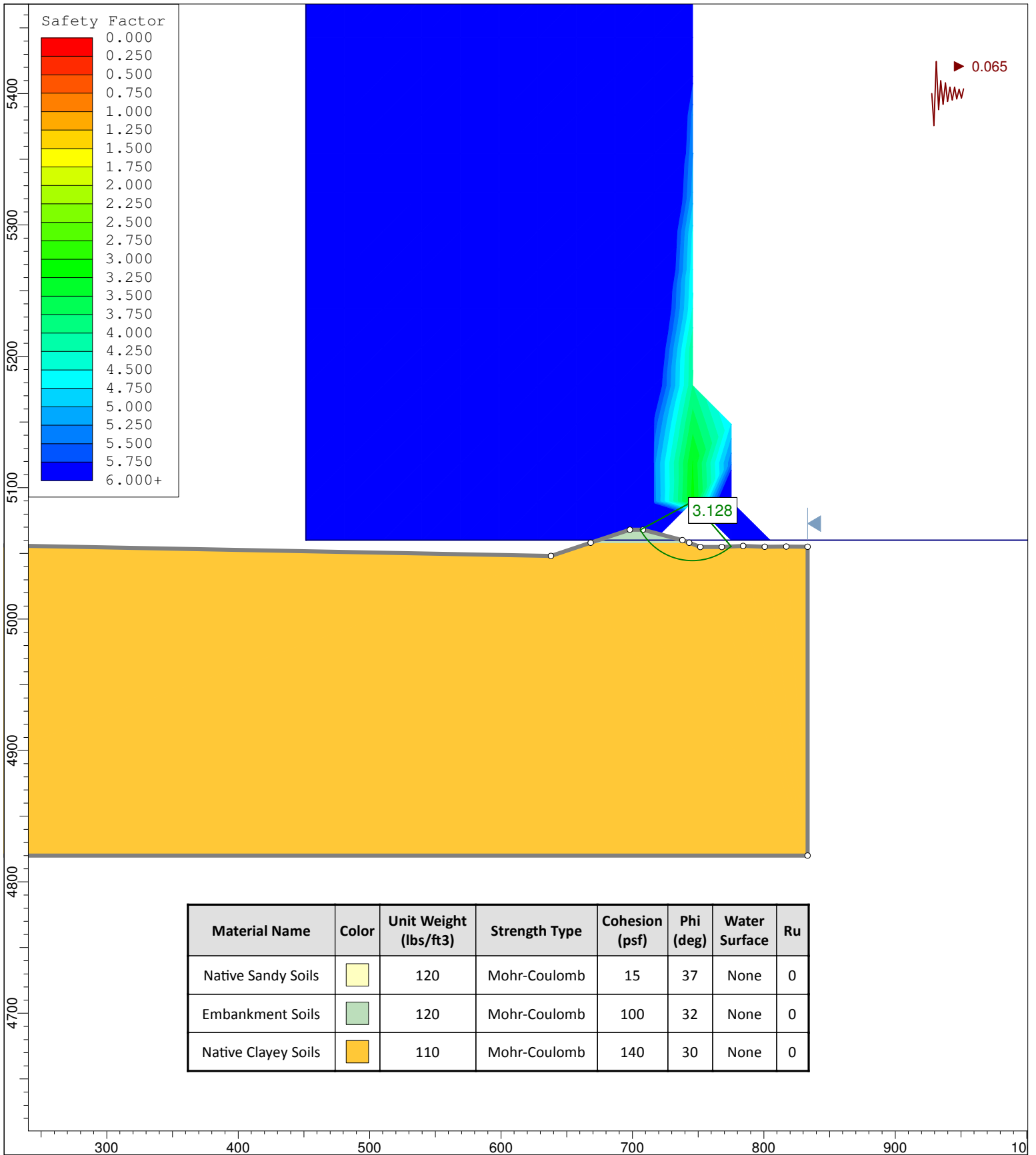


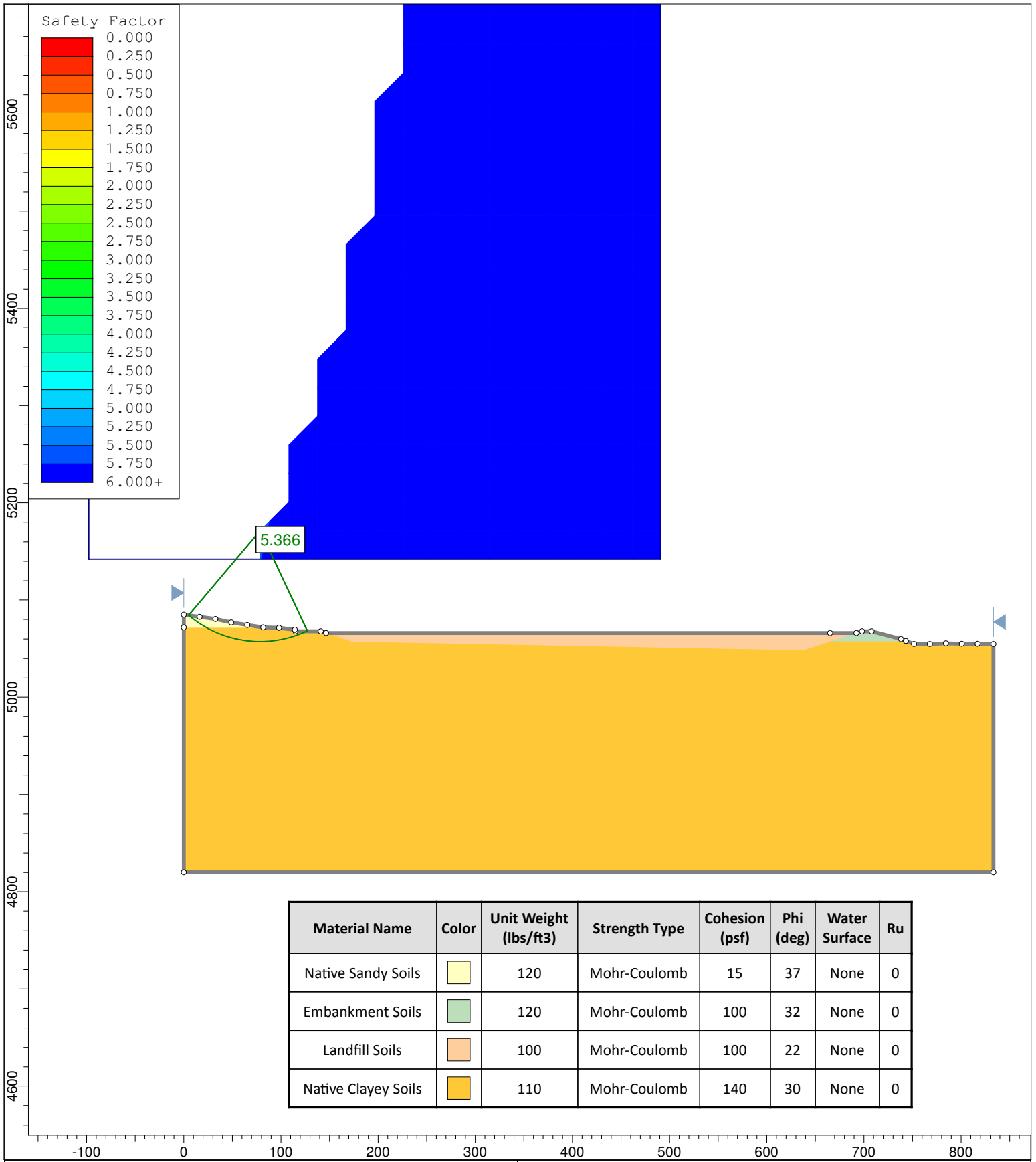


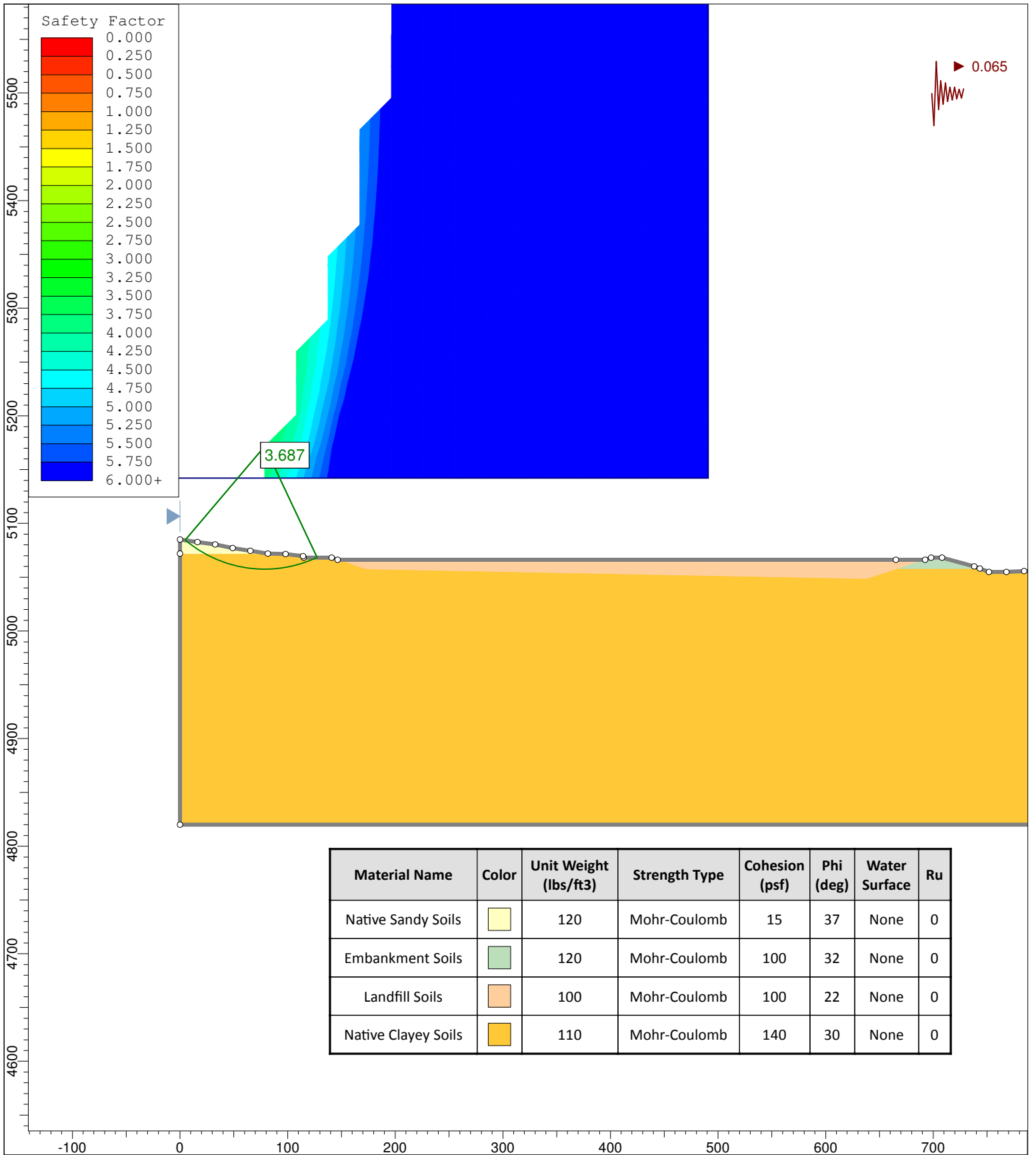




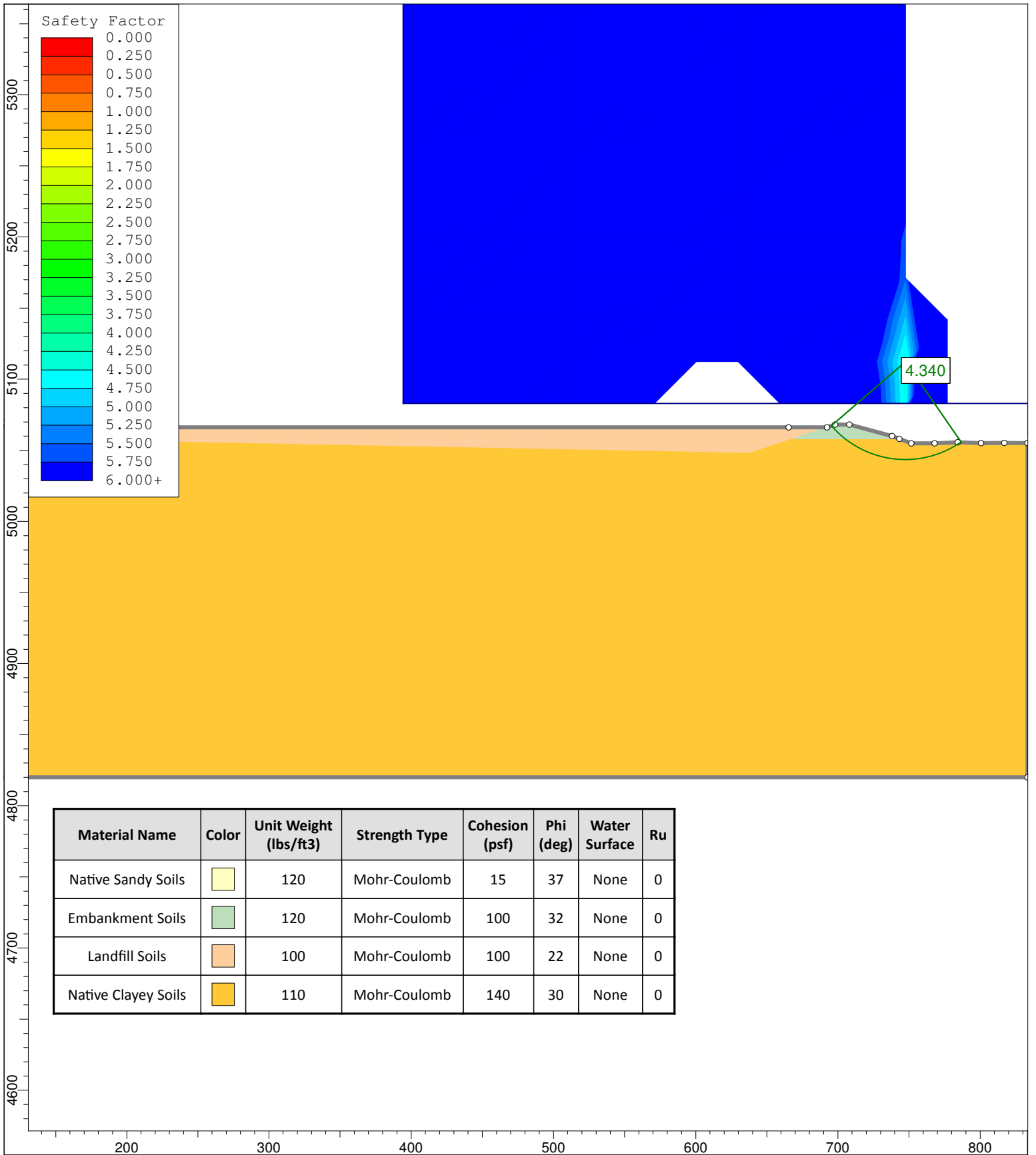
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Native Sandy Soils		120	Mohr-Coulomb	15	37	None	0
Embankment Soils		120	Mohr-Coulomb	100	32	None	0
Native Clayey Soils		110	Mohr-Coulomb	140	30	None	0







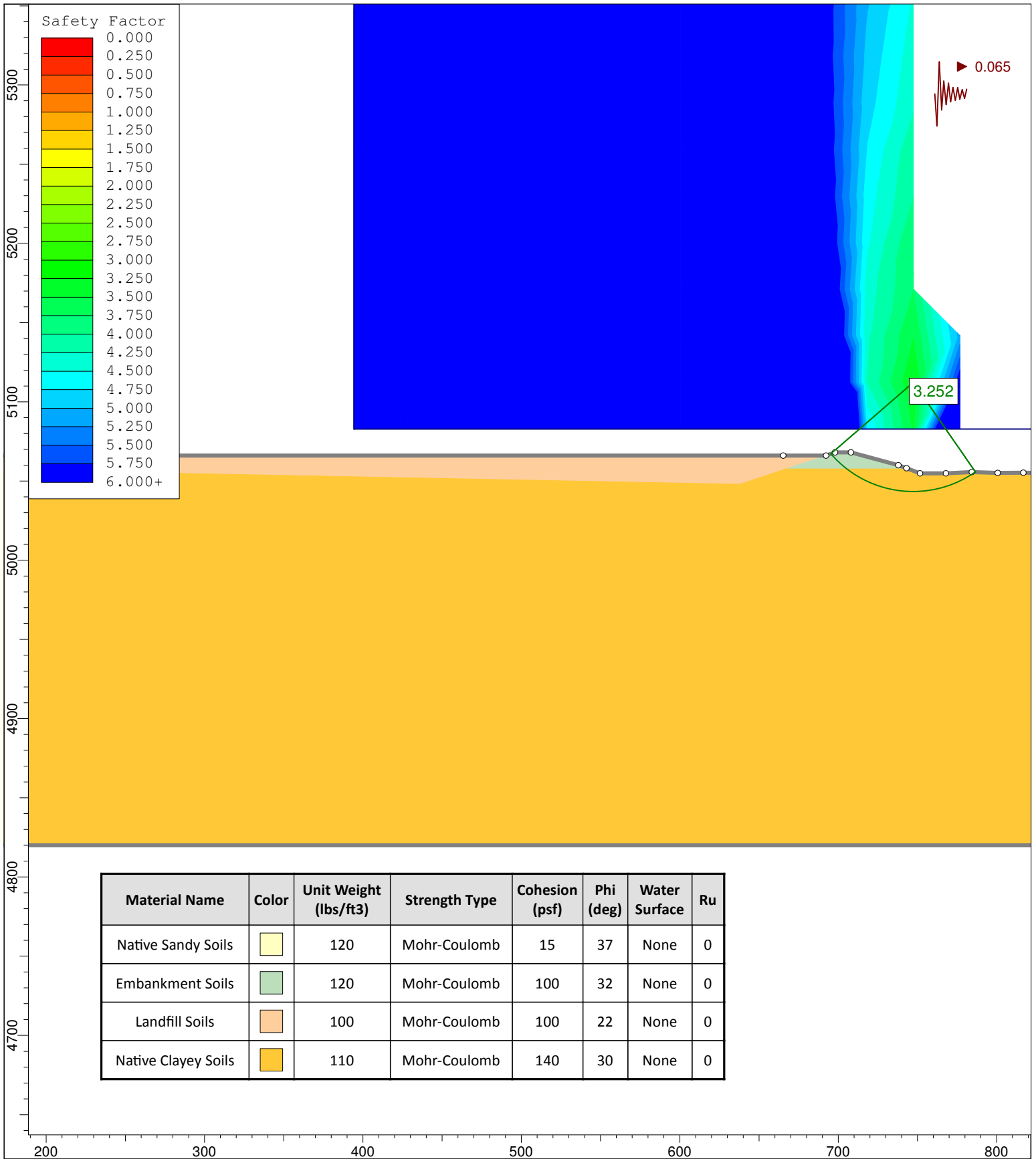


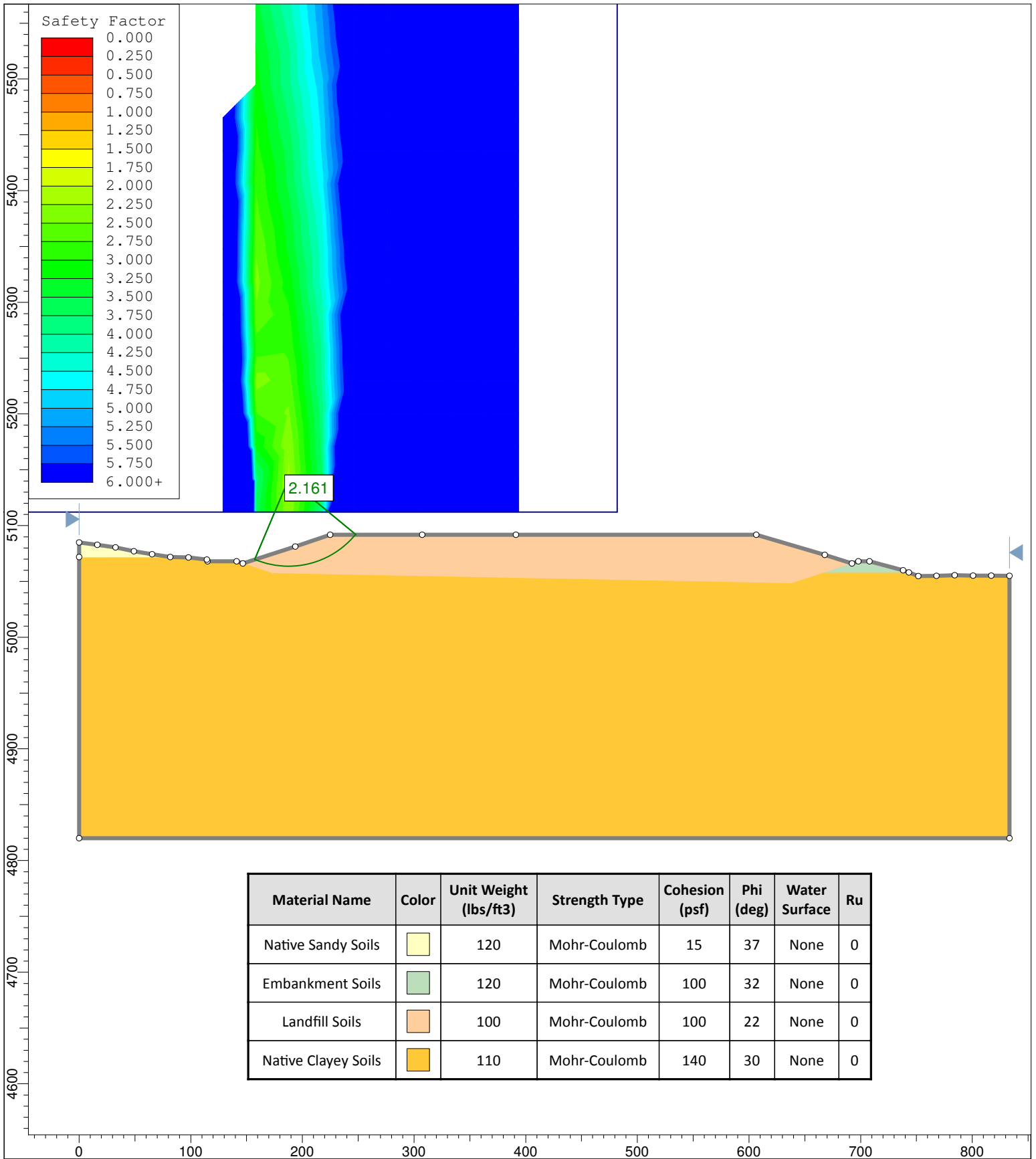


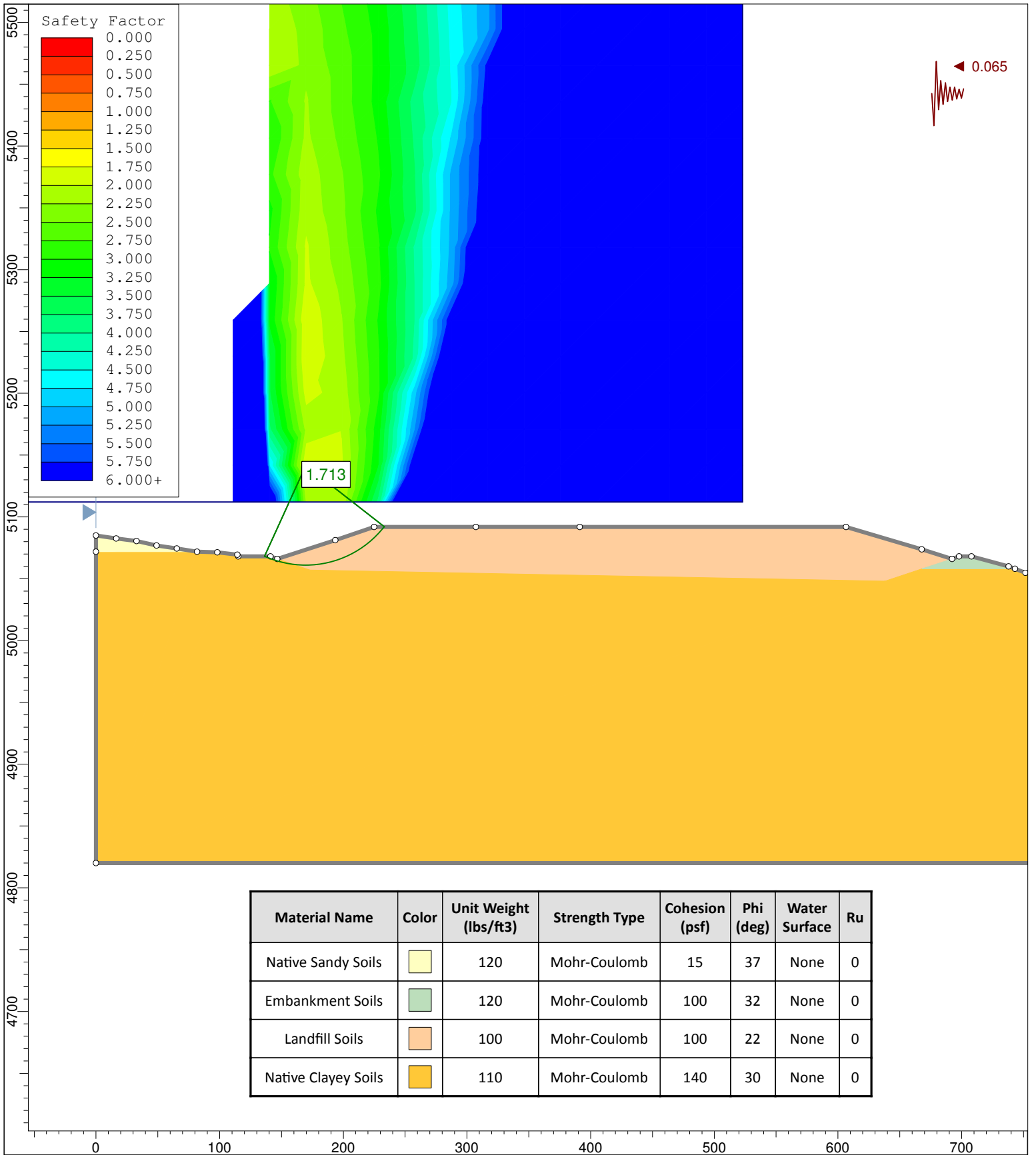
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Embankment Soils		120	Mohr-Coulomb	100	32	None	0
Landfill Soils		100	Mohr-Coulomb	100	22	None	0
Native Clayey Soils		110	Mohr-Coulomb	140	30	None	0

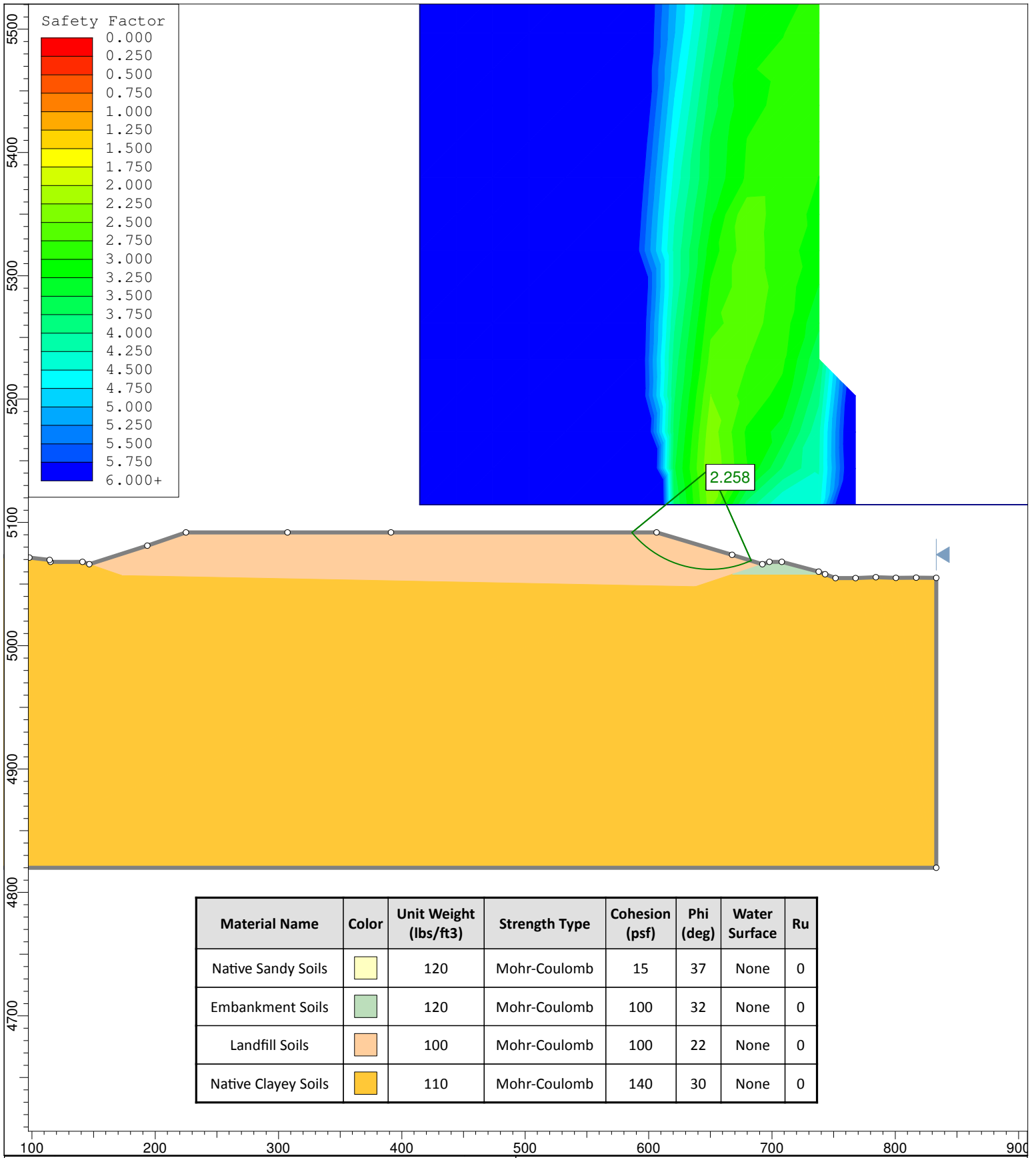


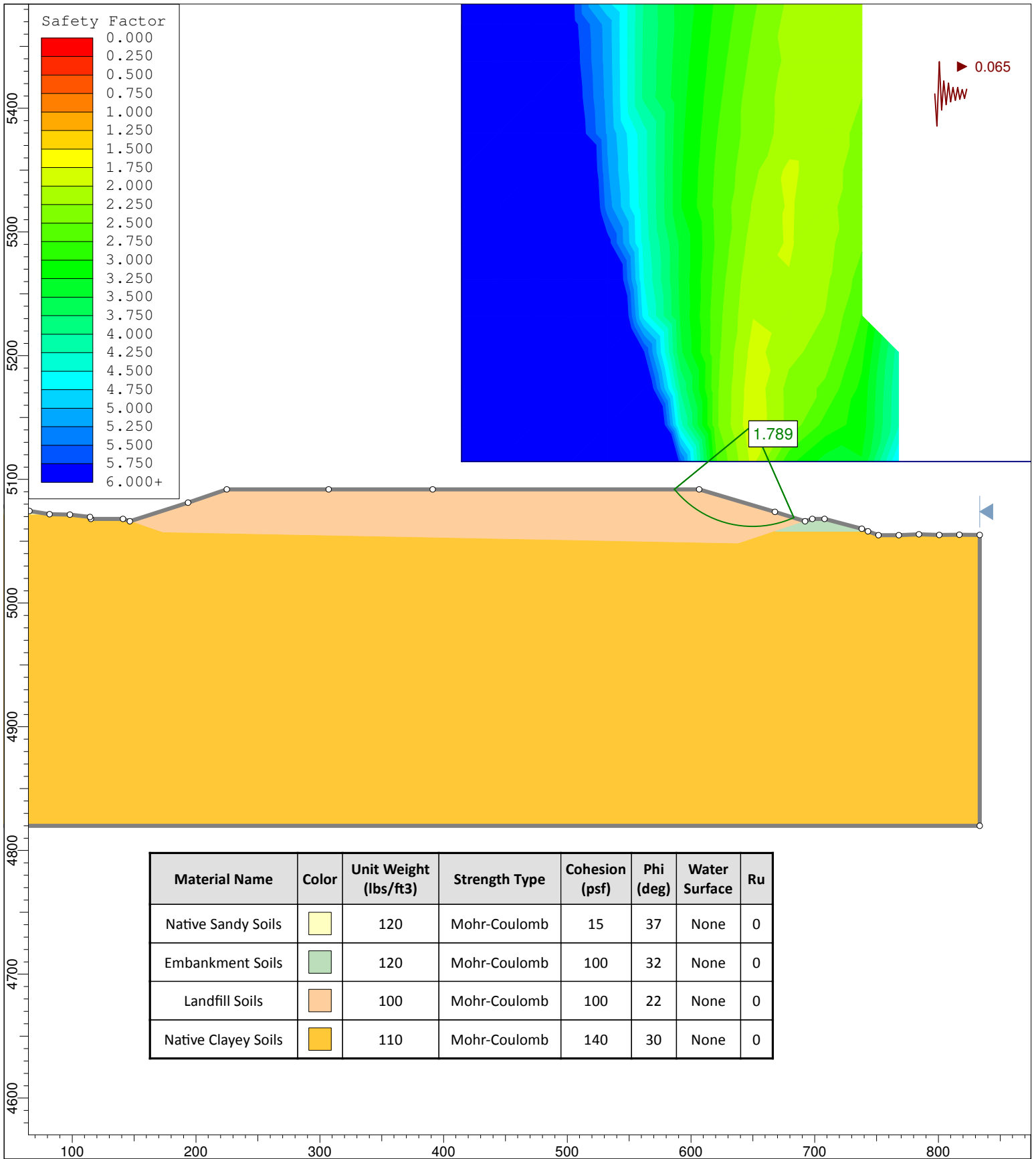
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Native Sandy Soils		120	Mohr-Coulomb	15	37	None	0
Embankment Soils		120	Mohr-Coulomb	100	32	None	0
Landfill Soils		100	Mohr-Coulomb	100	22	None	0
Native Clayey Soils		110	Mohr-Coulomb	140	30	None	0















Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Native Sandy Soils		120	Mohr-Coulomb	15	37	None	0
Embankment Soils		120	Mohr-Coulomb	100	32	None	0
Landfill Soils		100	Mohr-Coulomb	100	22	None	0
Native Clayey Soils		110	Mohr-Coulomb	140	30	None	0

Appendix J

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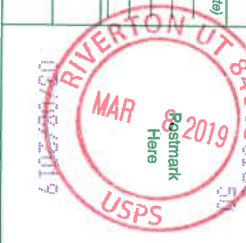
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Sent To **Bertha Cook Duke**
 Street and Apt. No., or PO Box No. **8501 E. East Dine**
 City, State, ZIP+4® **Brown TX 77602**
 PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

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 Certified Mail Restricted Delivery \$0.00
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 Postage \$0.55
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Sent To **Charles Gallery**
 Street and Apt. No., or PO Box No. **1103 S. Stewart**
 City, State, ZIP+4® **Parker AZ 85341**
 PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

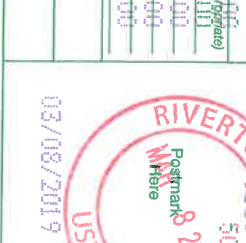
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 Certified Mail Restricted Delivery \$0.00
 Adult Signature Required \$0.00
 Adult Signature Restricted Delivery \$0.00
 Postage \$0.55
 Total Postage and Fees \$4.05



Sent To **John Red Investment Co. Ltd**
 Street and Apt. No., or PO Box No. **9445 S 1300 W**
 City, State, ZIP+4® **South Jordan UT 84095**
 PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7018 2290 0001 3095 5167

March 8, 2019

Bertha Cook Jenks
Property Owner
3801 E Crest Drive, Appt. 2212
Bryan, TX 77802

Subject: Notice of Intent – Exploration and Production Waste Landfill Permit Application

Dear Bertha Cook Jenks:

This letter has been prepared to inform you of Western Water Solutions' intent to apply for permit to operate an Exploration and Production Waste Landfill at their Sand Pass Facility located 6.5 miles southeast of Myton, Utah. This letter is prepared as required by the Utah Department of Environmental Quality regulations. The landfill cell to be permitted will be regulated by the Utah Division of Waste Management and Radiation Control (UDWMRC).

Western Water Solutions (WWS) currently operates a production water disposal facility located at 200 W 10000 S, Myton, UT 84052, which occupies the SW $\frac{1}{4}$ of Section 03, Township 3 South, Range 1 West; the NE $\frac{1}{4}$ of the NE corner of Section 09, Township 3 South, Range 1 West; and in the N $\frac{1}{2}$ of Section 10, Township 2 South, Range 2 West of the Uintah Baseline and Meridian. This facility is applying for a permit to operate a solid waste landfill under the UDSHW in addition to its currently permitted operations to dispose production water under the Utah Division of Oil Gas and Mining. You are receiving this letter of notification, as required by Utah Regulation R315-310-3(2)(a)(ii), because your property is located within 1000 feet of the proposed landfill.

The proposed landfill will occupy vacant WWS owned land in the N $\frac{1}{2}$ of Section 10, Township 2 South, Range 2 West of the Uintah Baseline and Meridian. The construction of new access roadway and the lined landfill cell will be built on WWS's Property. The solid waste landfill will be utilized for the permanent disposal of oil and gas production and exploration solid wastes meeting the definition of RCRA-Exempt, Exploration and Production (E&P) Waste.

After WWS submits their application to operate an E&P landfill to the UDWMRC, a draft permit will be prepared by the division and a 30-day comment period will follow that you may participate in. The division will also send a you a letter with information on how to request to be placed on a list to receive public information in relation to this proposed landfill facility. If you have any questions, please feel free to contact Reece Jensen with WWS at (801)518-9790.

Respectfully,



Mike Vorkink, P.G.
GeoStrata

March 8, 2018

Charles Gailey
Property Owner
1103 S. Stewart Pocket Cir
Payson, AZ 85541

Subject: Notice of Intent – Exploration and Production Waste Landfill Permit Application

Dear Charles Gailey :

This letter has been prepared to inform you of Western Water Solutions' intent to apply for permit to operate an Exploration and Production Waste Landfill at their Sand Pass Facility located 6.5 miles southeast of Myton, Utah. This letter is prepared as required by the Utah Department of Environmental Quality regulations. The landfill cell to be permitted will be regulated by the Utah Division of Waste Management and Radiation Control (UDWMRC).

Western Water Solutions (WWS) currently operates a production water disposal facility located at 200 W 10000 S, Myton, UT 84052, which occupies the SW $\frac{1}{4}$ of Section 03, Township 3 South, Range 1 West; the NE $\frac{1}{4}$ of the NE corner of Section 09, Township 3 South, Range 1 West; and in the N $\frac{1}{2}$ of Section 10, Township 2 South, Range 2 West of the Uintah Baseline and Meridian. This facility is applying for a permit to operate a solid waste landfill under the UDSHW in addition to its currently permitted operations to dispose production water under the Utah Division of Oil Gas and Mining. You are receiving this letter of notification, as required by Utah Regulation R315-310-3(2)(a)(ii), because your property is located within 1000 feet of the proposed landfill.

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Respectfully,



Mike Vorkink, P.G.
GeoStrata

March 8, 2018

Jay J Goodwin
Property Owner
PO Box 2153
Riverview, FL 33568-2153

Subject: Notice of Intent – Exploration and Production Waste Landfill Permit Application

Dear Jay J Goodwin:

This letter has been prepared to inform you of Western Water Solutions' intent to apply for permit to operate an Exploration and Production Waste Landfill at their Sand Pass Facility located 6.5 miles southeast of Myton, Utah. This letter is prepared as required by the Utah Department of Environmental Quality regulations. The landfill cell to be permitted will be regulated by the Utah Division of Waste Management and Radiation Control (UDWMRC).

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Respectfully,



Mike Vorkink, P.G.
GeoStrata

March 8, 2018

Jeff Henderson
Property Owner
896 W Cobble Hollow Dr
Roosevelt, UT 84066

Subject: Notice of Intent – Exploration and Production Waste Landfill Permit Application

Dear Jeff Henderson:

This letter has been prepared to inform you of Western Water Solutions' intent to apply for permit to operate an Exploration and Production Waste Landfill at their Sand Pass Facility located 6.5 miles southeast of Myton, Utah. This letter is prepared as required by the Utah Department of Environmental Quality regulations. The landfill cell to be permitted will be regulated by the Utah Division of Waste Management and Radiation Control (UDWMRC).

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Respectfully,



Mike Vorkink, P.G.
GeoStrata

March 8, 2018

John Reed Investment Co Ltd
Property Owner
9945 S 1300 W
South Jordan, UT 84095-0000

Subject: Notice of Intent – Exploration and Production Waste Landfill Permit Application

Dear John Reed Investment Co Ltd:

This letter has been prepared to inform you of Western Water Solutions' intent to apply for permit to operate an Exploration and Production Waste Landfill at their Sand Pass Facility located 6.5 miles southeast of Myton, Utah. This letter is prepared as required by the Utah Department of Environmental Quality regulations. The landfill cell to be permitted will be regulated by the Utah Division of Waste Management and Radiation Control (UDWMRC).

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Respectfully,



Mike Vorkink, P.G.
GeoStrata

March 8, 2018

Karl Lamb
Property Owner
PO Box 216 Myton,
UT 84052-0216

Subject: Notice of Intent – Exploration and Production Waste Landfill Permit Application

Dear Karl Lamb:

This letter has been prepared to inform you of Western Water Solutions' intent to apply for permit to operate an Exploration and Production Waste Landfill at their Sand Pass Facility located 6.5 miles southeast of Myton, Utah. This letter is prepared as required by the Utah Department of Environmental Quality regulations. The landfill cell to be permitted will be regulated by the Utah Division of Waste Management and Radiation Control (UDWMRC).

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Respectfully,



Mike Vorkink, P.G.
GeoStrata