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GreatWest ENGINEERING

Final Design Report

EASTERN IDAHO REGIONAL SOLID WASTE DISTRICT

Regional Municipal Solid Waste Landfill

July 2023

Client Commitment Empowered Employees Quality Solutions

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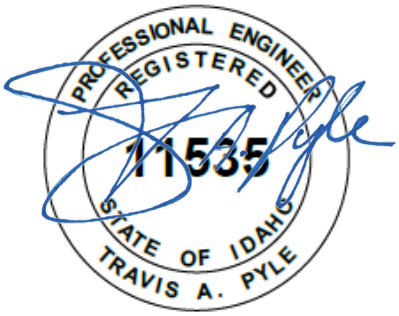

07/06/2023

This document was prepared under the direct supervision of Travis A. Pyle, a registered Professional Engineer in the State of Idaho, employed at Great West Engineering, Inc.

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List of Abbreviations

ADC	Alternative Daily Cover
bgs	Below Ground Surface
CDN	Composite Drainage Net
CFR	Code of Federal Regulations
C&D	Construction and Demolition
CF	Cubic Feet
cm	Centimeter
cm/sec	Centimeter(s) per Second
CY	Cubic Yard(s)
DEQ	Idaho Department of Environmental Quality
EIRSWD	Eastern Idaho Regional Solid Waste District ("District")
EG	Emission Guidelines
EPA	United States Environmental Protection Agency
ET	Evapotranspiration
FPS	Feet per Second
FML	Flexible Membrane Liner
ft	Foot/Feet
GCCS	Gas Collection and Control System
GCL	Geosynthetic Clay Liner
GP	Gas Probe
GPM	Gallons per Minute
H	Horizontal
HDPE	High-Density Polyethylene
HELP	Hydraulic Evaluation of Landfill Performance
in	Inches
Inc	Incorporated
ITRC	Interstate Technical & Regulatory Council
LandGEM	Landfill Gas Emissions Model
lbs	Pound(s)
lbs/cy	Pounds per Cubic Yard
lbs/person/day	Pounds per Person per Day
LCRS	Leachate Collection and Removal System
LEL	Lower Explosive Limit
LFG	Landfill Gas
m^3	Cubic Meter(s)
Mg	Megagram
Mg/yr	Megagram per Year
mil	One-thousandth of an Inch
MSW	Municipal Solid Waste
MSWLF	Municipal Solid Waste Landfill
NESHAP	National Emission Standards for Hazardous Air Pollutants
NMOC	Non-Methane Organic Compound
NOAA	National Oceanic and Atmospheric Administration
NSPS	New Source Performance Standard
NSWI	Nonhazardous Solid Waste Impoundments
pH	Potential of Hydrogen (standard pH unit)

ppmV	Parts Per Million by Volume
SCFM	Standard Cubic Feet Per Minute
SDR	Standard Dimension Ratio
sec	Second
RCRA	Resource Conservation and Recovery Act
USCS	Unified Soil Classification System
V	Vertical
w.c.	Water Column
yr	Year

1.0 Introduction

In the State of Idaho, a municipal solid waste landfill (MSWLF) must comply with Title 39, Chapter 74, Idaho Code (*Idaho Solid Waste Facilities Act*), which incorporates by reference the Federal regulations – 40 CFR Part 258 (*Criteria for Municipal Solid Waste Landfills*). These regulations contain requirements for siting, design, environmental monitoring, operating, closure / post-closure, financial assurance, and corrective action for MSWLFs. The state of Idaho obtained authority to oversee the municipal solid waste landfill program from the U.S. Environmental Protection Agency (EPA) in September 1993.

The *Idaho Solid Waste Facilities Act* establishes a system of approvals and conditions for permitting MSWLFs in Idaho. The first of these approvals is site certification by the Idaho Department of Environmental Quality (DEQ). The *Site Certification Application for the EIRSWD Regional Landfill* was submitted to the DEQ in October 2021, to satisfy the state and federal siting requirements for MSWLFs. This application was subsequently approved by the DEQ in December 2021, with the following three conditions:

(1) Submit to DEQ, verification of the property transfer to the District, including copies of the recorded warranty deed showing the District as the owner.

(2) Ensure the accuracy of the Critical Habitat species list every 90 days as recommended by the U.S. Fish and Wildlife service and report any changes.

(3) Submit to the DEQ, verification of the site stability and adequate landfill engineering design regarding seismic activity. Include an analysis of the landfill slope stability when using native soil(s).

The next phase of the permitting process was to submit findings and a tentative design plan, including a preliminary schematic design of environmental monitoring systems to the DEQ, as a result of the preliminary design investigation. Additionally, the three conditions of the site certification listed above were addressed. The purpose of the Tentative Design Report (also referred to herein as the "Preliminary Design Report") was to present these findings and tentative design for the proposed Eastern Idaho Regional Solid Waste District (EIRSWD or "District") regional MSWLF in compliance with the Idaho Solid Waste Facilities Act, 39-7411 *Design Review Procedure*. This report also included the groundwater monitoring system as it applies to a 'no migration demonstration' approach. Tas required by Idaho Code §39-7411, a notice was published that the tentative design report was submitted to the DEQ and provided an opportunity for public comment. DEQ provided comments in the form of a letter sent to Mr. Todd Smith, President of EIRSWD on February 21, 2023. Responses were sent back to DEQ by Great West Engineering on March 28, 2023. A meeting was held with representatives of the design team (Forsgren Associates and Great West Engineering), EIRSWD, and the DEQ. The DEQ was in agreement with our responses. The DEQ letter and Engineer response letter are provided in **Appendix A** for reference.

This final design report presents the project design approach and includes changes or modifications that were previously approved as part of the preliminary design process. This design report focuses solely on the first phase of the landfill development (Cell A and associated infrastructure) and is accompanied by engineered plans ("Drawing Sheets") and Technical Specifications for the DEQ approval process, as provided in **Appendix B** and **Appendix C**, respectively. It is understood that the final designs for the future phases (Cells B-D) will be submitted separately for future permitting. With this final design report, the District is requesting an approval to construct from the DEQ.

The final phase of the regulatory review process is the approval of the record drawings by the DEQ and the operations plan and closure / post-closure plan (and financial assurance) by the Health District. These documents and approvals will follow once the construction is complete and before the landfill is opened for operation.

1.1 Report Organization

This Final Design Report is organized into the following ten sections:

- **Section 1.0 – Introduction:** Presents the purpose of this Final Design Report, report organization, background information, and solid waste generation estimates for the member counties of the District.
- **Section 2.0 – Existing Site Conditions:** Presents the regional information about the site, including soils, geology, and groundwater.
- **Section 3.0 – Design Criteria:** Summarizes the design criteria and basis for the final design work to satisfy the regulations.
- **Section 4.0 – Base Grading and Bottom Liner System:** Presents the proposed base grading plan for the full build out of the landfill and the first cell (Cell A) along with the proposed bottom liner system to meet regulatory requirements.
- **Section 5.0 – Fill Staging and Life Expectancy:** Presents the estimated life cycle of the proposed regional landfill, and the development plan for build out of the landfill.
- **Section 6.0 – Leachate Management Plan:** Presents the leachate control and management features for the proposed regional landfill, an overall leachate water balance, and the final design of the leachate pond system to meet the leachate storage demand.
- **Section 7.0 – Landfill Gas Management Plan:** Presents the landfill gas control and management system for the proposed regional landfill with gas production rate projections.
- **Section 8.0 – Final Cover System Design:** Presents the features of the final landfill cover system for the final cover details and grades.
- **Section 9.0 – Stormwater Management Plan:** Presents the stormwater management system for the landfill associated with the final cover system with ditches, retention ponds, and other system features.
- **Section 10.0 – References:** Presents the documents referenced in this Final Design Report.

Supporting information is provided at the end of the report as appendices and is organized alphanumerically. Refer to the Table of Contents for the list of appendices.

1.2 Background

1.2.1 Formation of the District

When the Resource Conservation and Recovery Act (RCRA) Subtitle D was enacted in the early 1990s, the eastern Idaho counties of Madison, Fremont, and Teton formed the Upper Valley Waste District. At that time, they had to close their dumpsites and come up with an alternative for solid waste management. The District wanted to develop their own landfill, but the member counties could not afford it at the time. The consensus was to build transfer sites in their individual counties and haul their waste to the Circular Butte Landfill in Jefferson County, which was a reasonable solution at the time given the low cost of fuel and the rural character of the counties.

The EIRSWD was formed on June 23, 2010, under Title 31, Chapter 49 of Idaho Code, which enables counties to establish regional solid waste districts for the purpose of providing a regional solution to solid waste disposal through the operation and maintenance of a regional solid waste system. Again, the counties joined forces to look at alternatives for waste management. The members considered entering

into an agreement with a private investing group to build a waste-to-energy facility but ended up falling through. Fast forward to today, each of the counties have continued to operate their individual transfer sites (and collection sites) and haul garbage to Circular Butte. Fuel costs are skyrocketing and all counties in eastern Idaho are experiencing a huge amount of growth. The growth is adding additional burden on Circular Butte as well as other landfills in the region for capacity and shared disposal with out-of-county partners. The District's purpose is finding a long-term solution for its member counties to be able to manage solid waste efficiently and as cost effectively as possible.

Waste management alternatives were considered as an option to the current operational practice of using an out of District landfill (i.e., the Circular Butte Landfill) to dispose of waste, building a waste to energy plant, or maintaining the status quo. The option of developing a new landfill provides benefits for the communities in the District, and the whole region.

1.2.2 Developing a New Regional MSW Landfill

Today, the EIRSWD is comprised of four counties – Clark County, Fremont County, Madison County, and Teton County. The boundaries of the regional solid waste district are coterminous with the boundaries of the four participating counties. Counties within a district need not be contiguous to each other. The EIRSWD serves a total population of 78,721 (2020 United States Census) and covers an area of 4,585 square miles. Refer to **Exhibit 1** for an Idaho counties map of the south part of Idaho.

Exhibit 1 – Idaho Counties Map (South Part of Idaho)

Clark County is the most rural of the three member counties with an area of 1,765 square miles and a population of only 790 people (2020 census). The County seat is Dubois with a population of just over 600 people. It also includes the town of Spencer, and the unincorporated areas of Humphrey and Kilgore.

Fremont County is the second largest member county in terms of population with 13,388 (2020 census) but is the largest in terms of area occupying 1,896 square miles; of which, 1,864 square miles are land, and 32 square miles (1.7%) are water. Fremont County includes the City of St. Anthony, the County seat, with a population of 13,242 and is also the largest city in the county. The County also includes the towns of Ashton, Drummond, Island Park, Newdale, Parker, Teton, and Warm River, and the unincorporated communities of Big Springs, Chester, Egin, Lake, Macks Inn, Squirrel, and Wilford.

Madison County is the largest of member counties in population and occupies 473 square miles; of which, 469 square miles are land, and 4.0 square miles (0.8%) are water. As of the 2020 U.S. census, the population was 52,913 people. Madison County includes the City of Rexburg, the County seat, and most populous community in the County with approximately 29,000 full-time residents. Rexburg also is the home of BYU-Idaho with approximately 20,000 students. The County includes the town of Sugar City along with several unincorporated communities.

Teton County is the smallest of the member counties in terms of area with 451 square miles but has the third largest population of 11,630 (2020 census). Of the 451 square miles, 449 are land (>99%) and 1.1 (<1%) are water. Driggs is the County seat. The County also includes the towns of Victor and Tetonia.

The District will be hauling waste from each of the member counties' waste transfer sites to the new landfill as part of membership with the District. This service will reduce the requirement for private company contracting and / or counties self-performing this service while also controlling the number and types of vehicles accessing the landfill. Like the landfill, the funding for the haul service will require upfront capital but will be self-supporting once it is up and running by charging the member counties a fee per mile. The landfill tipping fee will subsidize a portion of hauling cost at a rate of $2 per ton.

The construction of the first landfill cell (Cell A) and supporting infrastructure is slated to begin in the spring / early summer of 2023. Anticipating a winter shutdown, the landfill is expected to be completed in mid-summer 2024, barring any supply chain issues or other major challenges.

This project will be funded, in part, by a $3 million grant gifted by the DEQ and a low-interest loan from the United States Department of Agriculture (USDA) Rural Development (RD). Both funding sources will allow the District to maintain a level of affordability and service to the member counties, while simultaneously creating an enterprise fund for future needs and operations of both the landfill and the hauling service.

1.3 Solid Waste Generation Rates

1.3.1 Current Generation Rates

Waste generation in the solid waste industry is typically determined on a per capita basis (in terms of pounds of waste per person per day (lbs/person/day). The national average per capita waste generation rates are published by the United States Environmental Protection Agency (EPA) (refer to **Exhibit 2**). Overall, the national generation rates have increased since the beginning of the reporting period (1968), peaking at 4.74 lbs/person/day in 2000. Since then, the generation rates have been relatively steady around 4.5 lbs/person/day, with the last reported year of 2018 climbing to 4.9 lbs/person/day.

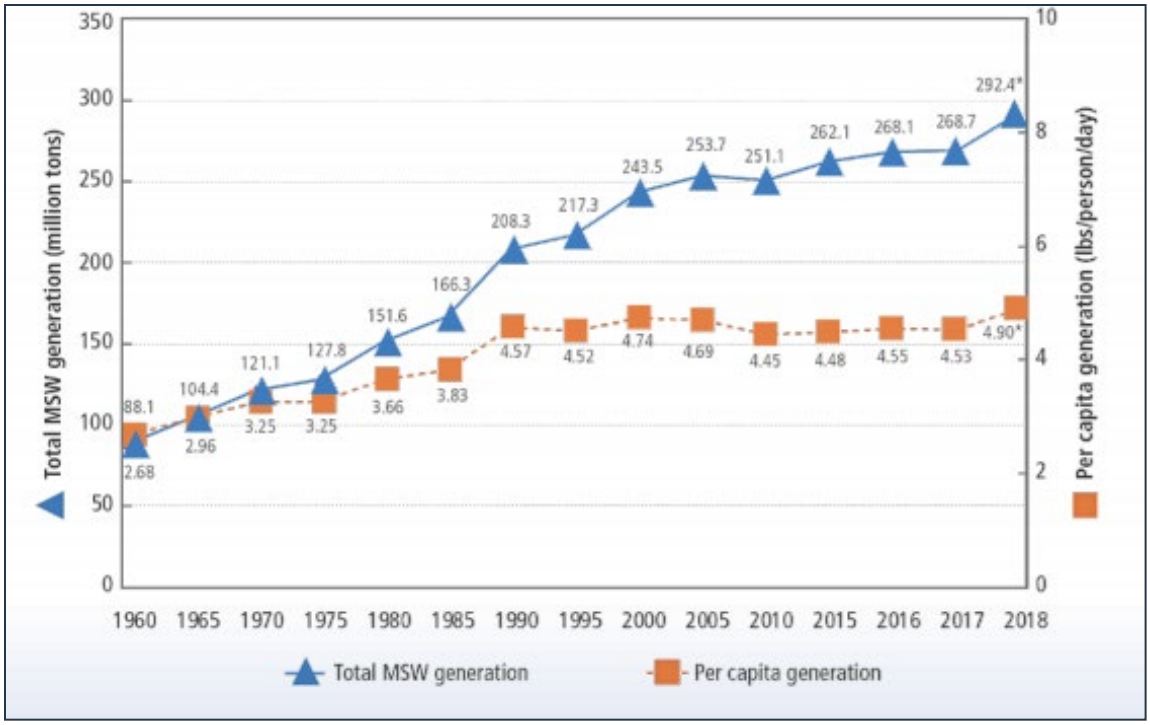

Exhibit 2 – Total MSW and Per Capita Generation Rates in the United States 1960-2018 (EPA, 2020)

For each of the member counties, the per capita generation rates were calculated based on the 2020 population census data and the reported 2020 waste tonnages, to arrive at the pounds per person per day (lbs/person/day) that are being generated (**Table 1**).

Table 1 – Member Counties Per Capita Waste Generation Rates

County	2020 Base Year Population (1)	2020 Solid Waste Generation (tons) (2)	Per Capita Generation (lbs/person/day) (3)
Clark	790	500	3.47
Fremont	13,388	7,500	3.07
Madison	52,913	32,000	3.31
Teton	11,630	10,000	4.71
Total/Ave.	**78,721**	**50,000**	**3.48 (4)**

Notes:

1. Published United States Census Bureau figures (https://www.census.gov/quickfacts/fact/table/US/PST045219).
2. Reported tonnage by each of the counties in 2020.
3. Per Capita Generation = tons x 2,000 lbs/ton ÷ population÷ 365 days/year = lbs/person/day.
4. This per capita generation value is the weighted average of the individual member counties, which is the per capita generation rate for each county x the county's population ÷ the sum total of all counties' populations.

The average per capita generation rate for the member counties is 3.48 lbs/person/day based on 2020 figures. The generation rate is well below the 2018 national average of 4.9 lbs/person/day (refer to **Exhibit 2**). The difference between the national average and the District member counties can be attributed to various reasons. The District's waste numbers are only for MSW that is being hauled to the Circular Butte Landfill and does not include other wastes such as construction and demolition (C&D)

waste that is diverted from the primary waste stream and disposed in non-municipal solid waste landfills (NMSWLs), which is common practice by each of the member counties. Other reasons might be attributed to better recycling programs in some of the member communities as compared to average communities in the U.S.

1.3.2 Projected Future Generation Rates

Using the population projections and the 2020 per capita generation rates (with no change through the forecasting period) and the weighted average per capita generation rate as discussed above, the combined waste generation quantities was calculated for the member counties. **Table 2** presents the tonnages for the base (2020 census) year, and 25- and 50-year waste projections. Note the 40-year average annual census growth rates from 1980 to 2020 were used for all counties except for Clark County where it was assumed to be 0% growth rather than a slightly negative growth rate.

Table 2 – Member Counties Future Waste Generation Rates

Year	Member Counties Waste Generation Estimates (tons)
Base Year (2020) (1)	50,000
25-Year Projection (2045)	93,000
50-Year Projection (2070)	179,000

Notes:

1. Teton County's contribution to the new landfill will not occur until July 1, 2025, when their contract expires with their waste hauler who in the meantime will haul garbage to the Jefferson County Circular Butte Landfill.

Based on this forecast, the waste tonnages will almost double in 25 years and then will almost double again in 50 years. There are several considerations that need to be made when it comes to predicting waste generation. For example, this estimate does not account for increased waste diversion and recycling rates that may occur in the future. There is a strong likelihood that more waste diversion and recycling will happen in the coming years as these types of programs become more available, and therefore, would reduce the amount of waste generation on a per capita basis. Conversely, the influx of people into these communities may be higher than predicted over the long-term counteracting the effects (reductions from) waste diversion and recycling. In the end, these estimates are predictions that will need to be updated to recalibrate the waste generation of the District's member counties and the associated long-term impacts on the landfill's life expectancy.

2.0 Existing Site Conditions

The location for the proposed regional landfill is shown in **Exhibit 3** (location map) and **Exhibit 4** (vicinity map). The landfill will be located off Long Hollow Road nearest to the town of Newdale, Idaho and approximately 12 miles east of Rexburg, in Madison County, Idaho.

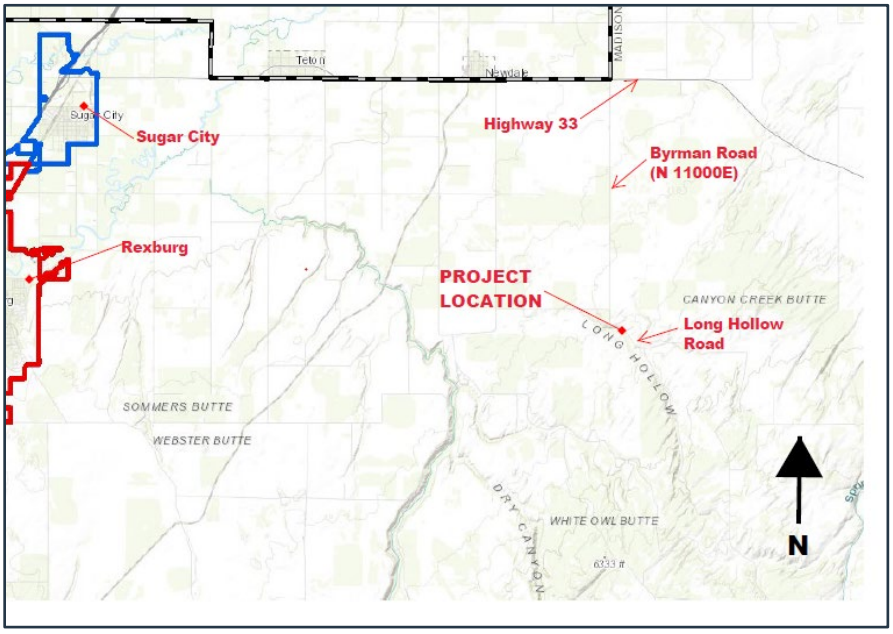

Exhibit 3 – Project Location Map for the Proposed District Landfill

This property is owned by the District and is leased as non-irrigated farmland. The property was acquired from private landowners and a land swap with the Idaho State Department of Lands in 2021, which netted a total of approximately 983.5 acres. The site is situated in Madison County and is in part of Sections 19, 29, and 30 of Township 6N, Range 42E, BM.

Exhibit 4 – Vicinity Map for the Proposed District Landfill

2.1.1 Regional Physiography and Topography

The proposed landfill site consists of non-irrigated farmland. Road and utility access to the landfill would come directly from Long Hollow Road. Neighboring land uses are also non-irrigated farmland with interspersed patches of forest in areas with steep topography. North of the proposed landfill site is irrigated farmland that extends northward to Highway 33. monitoring system.

The site is accessed from Highway 33, Byrman Road, and then Long Hollow Road (refer to **Exhibit 3**). When the landfill is constructed, an access road will take off from Long Hollow Road through a main gate where a future scale house and scale(s) will be located. The road will continue from there to the landfill disposal cells or to one of several support facility areas.

2.1.2 Regional Geology and Soils

The predominant soil types in the vicinity of the proposed landfill site are Tetonia silt loam (0 to 4 percent slopes) and Tetonia-Ririe silt loams (4 to 12 percent slopes), according to the USDA Natural Resources Conservation Service (NRCS) soils mapping website. Tetonia silt loam is derived from silty glaciolacustrine sediments from mixed sources, and windblown loess. Typically, the surface layer is grayish brown, neutral silt loam about 2 inches thick. The upper portion of the subsoil is yellowish brown, slightly acidic silt loam about 9 inches thick. The lower layer is mottled, gray, medium acidic silt about 12 inches thick. The Selle series surface layer is generally brown and light yellow-brown, fine sandy loam about 15 inches thick. The subsoil is a brown loamy fine sand about 25 inches thick. Refer to the Eastern Idaho Regional Solid Waste District Regional Municipal Solid Waste Landfill – Alternative Liner Demonstration and No Migration to Groundwater Demonstration Report (Appendix D).

2.1.3 Regional Surface and Hydrogeology

The existing surface and hydrogeologic conditions were found primarily from a review of published geologic mapping of the surrounding area by Idaho Geologic Survey (Lewis et al., 2012) (Phillips, 2016) and from lithology via nearby boring logs accessed in the site vicinity from the Idaho Department of Water Resources Well Log Viewer (www.idwr.idaho.gov/wells). The following formulates the generalized understanding of site hydrogeologic conditions: (1) The proposed landfill site lies approximately 7 miles to the east and outside the boundary of the eastern Snake River Plain aquifer as mapped from the Idaho Department of Water Resources (IDWR); (2) There are several wells identified from the IDWR mapping tool located within several miles of the site. From a review of these logs, the depth to groundwater is variable depending on location but suggests uppermost groundwater may be encountered on the order of 400 to 600 ft below ground surface (bgs); and (3) There is insufficient subsurface data for the site to know actual depth to groundwater and/or groundwater flow direction for uppermost groundwater. In concept, regional and localized groundwater flow characteristics are typically influenced from surface topography, orientation of surface drainages, and from the recharge (typically higher elevations) and discharge areas (typically lower elevations).

Based on nearby wells and the beforementioned generalized concepts, the depth to uppermost groundwater beneath the study area was speculated to be between 400 and 600 feet below ground surface. The flow direction was anticipated to be toward the west (or away from the higher elevation to the east/southeast) and might generally mimic or honor surface topography and flow towards the regional discharge area associated with the Snake River Plain (both the Snake River, and the Snake River aquifer to the west, etc.).

The existing site plan is shown on **Drawing Sheet 3**. Included are the various explorations (test pits and borings) that were conducted as part of the subsurface investigation work.

3.0 Design Criteria

The following are general design criteria used for sizing and grading the proposed regional landfill:

- Utilize the natural topography to the extent possible for layout the proposed landfill staying within the confines of the south ridgeline with the necessary 200-ft minimum setbacks and with natural drainage to the north off the low point in the northwest corner.
- Satisfy all locational restrictions (as approved in the Site Certification).
- Provide an access road around the full perimeter of the landfill (full buildout).
- Target a minimum of approximately 7 million cubic yards (cy) of airspace with an assumed (minimum) effective (in-place) waste density of 1,200 pounds per cubic yard (lb/cy) to provide a minimum of 40-50 years of life expectancy for the District members.
- Assume a waste to soil ratio of 4:1 of the airspace is taken up by daily and intermediate soil cover (commensurate with the assumed 1,200 lbs/cy effective density).
- Optimize earthwork for landfill construction to have a surplus of soil for use as daily / interim cover and final cover. Any shortage of soil material will need to be supplemented with onsite borrow or use of an alternative daily cover (ADC), such as tarps or a spray-on cover; use of ADCs will also increase the in-place effective density and provide more overall landfill life.
- Assume the landfill will be completed and ready for operations no sooner than the summer of 2024.
- Provide 4H:1V (25%) exterior slopes for seismic stability of the waste fill and final cover with a finish grade of no less than 2% on the top deck to provide positive drainage; however, design for 5+% on the top deck to account for future settlement.
- Interior waste fill (holdback) slopes between cells with slopes no steeper than 3H:1V (33%).
- Maximum of 3H:1V (33%) slopes for the interior floor side slopes of the landfill (for veneer stability) of the materials resting on the liner without buttressing. Also, maximum of 3H:1V (33%) for the exterior slopes of the toe embankment fill berms.
- Control stormwater during construction, operations, and final closure of the landfill using a series of stormwater ditches (run-on and run-off), stormwater detention ponds (permanent and temporary), swales, and culverts.
- Stormwater management on the cover will be by run-off control berm/ditches that wrap around the final grades of the cover system and discharge into the perimeter roadside ditches. The access road from the perimeter to the top of the landfill will also be provided to break-up flow and intercept it in roadside ditches.
- Provide no more than 6% grades for the perimeter roadways for truck access.
- Provide a minimum of 2% compound cell floor grades sloping toward the sump(s) for in-cell leachate removal above the liner.
- Provide leachate collector pipes on the floor with side slope cleanouts and inspection accesses.
- Provide in-cell leachate pumping using a series of downslope riser pipes and pumps.
- Provide a double liner with leak detection in the in-cell leachate sump(s) of the landfill cells and the leachate ponds.
- Provide double containment for the leachate force main after leaving the side slope (housing pipe) for all below ground pipe (except through vault sections for inspections and mounting pipe appurtenances).

Additionally, the landfill facility is designed to provide the following:

- Perimeter fence and gate(s), main entrance road, scalehouse (office) near the entrance gate of the facility, septic system, domestic water well with storage tank and truck filling station, and a maintenance shop building with covered storage.
- Space for a future 80-ft scale and landfill gas flare station (and / or other control or conversion plant).

3.1.1 Site Survey and Mapping

The Record of Survey for the entire property was performed by Teton View Surveying. The bearings provided by Teton View Surveying are based on the Idaho State Plane Coordinate System, East Zone, NAD 83 Datum, and distances shown are ground distances using an average project elevation of 5800 feet. Of the total 983.5 acres, the proposed landfill facility will occupy approximately 50 to 55 acres, which includes the landfill cells, leachate ponds, roads, stormwater ponds, and other supporting infrastructure. The development area was mapped by drone survey (Forsgren, 2021) and supplemental survey(s) in 2023 also by Forsgren. The design was prepared using AutoCAD and the Civil3D software application.

3.1.2 Geotechnical Evaluations and Recommendations

Xcell Engineering, LLC performed the geotechnical engineering evaluations for the proposed landfill site. The purpose of the evaluation was to assess the general soil and geological conditions of the site and provide geotechnical and soil related construction recommendations. There were two field investigations events. The first was in February 2022 and consisted of 31 test pits (labeled 100-series). An additional 12 test pits were dug as part of the Phase I exploration in late June and early July of 2022, for a total of 43 test pits. The depths of the test pits ranged from 5 to 16 feet deep and averaged just over 12 feet deep. As part of Phase I explorations, 12 shallow borings (labeled SB-1 through SB-12) with depths of approximately 100 feet deep and 3 deep borings (one boring 400 feet deep and two borings 700 feet deep) were advanced. The locations of the test pits and borings are shown on **Drawing Sheet 3**. The soil was visually classified and described referencing ASTM D-2487 and D-2488, Unified Soil Classification System (USCS). Data also provided by Xcell included subsurface profiles and boring / test pit logs and laboratory test results.

In summary, Xcell Engineering reported subsurface conditions were relatively uniform across the site. Soil conditions in test pits and borings typically consisted of 10-15 feet of light brown, loose, sandy silt covering Rhyolite. Xcell Engineering recommends stripping the top 2 to 3 inches to remove crops, grass, and trees. Where the entire sandy silt layer is going to be removed, it can be excavated with the top layer of vegetation and set aside (stockpiled) to use a “topsoil.” In areas where the sandy silt material will remain in place, Xcell Engineering recommends over-excavating by 24 inches below footing subgrade and the upper 12 inches of the exposed silt be compacted in place to at least 95% Relative Compaction (Standard Proctor – ASTM D698) prior top placement of structural fill. The over-excavated material should be replaced with compacted structural fill as recommended by Xcell Engineering. Further recommendations are foundations for proposed buildings be supported by at least 24 inches of compacted structural fill over 12 inches of compacted native subgrade.

Xcell Engineering described the rhyolite as being closely to moderately fractured and can be excavated using conventional excavation equipment, including larger excavators and dozers equipped with rippers. In a follow-up meeting by conference call with Xcell Engineering on November 2, 2022, they also recommended processing of the rhyolite soil for structural fill and bedding (liner foundation) material. For building general embankments, the rhyolite can be placed and mechanically broken up with heavy equipment such as dozers and compacted with smooth drum rollers in lifts. Once the cell bases are excavated to grade, they can be over-excavated by 6 inches, mechanically compacted in-place (similar to the general embankment fill) and then backfilled with a 6-inch-thick layer of native sandy-silt material (or processed rhyolite). This same sandy-silt material (or processed rhyolite) can be used as the 24-inch-thick operations layer on the interior, lined side slopes of the cells. If required, processed rhyolite could be manufactured using an onsite crusher with a mesh size of 1-inch minus. Surplus rhyolite could also be processed and stockpiled to use for daily and interim soil cover as part of landfill operations should it be required.

Xcell Engineering also performed a seismic stability evaluation for the proposed landfill and concluded that the proposed 4H:1V exterior fill slopes of the landfill will provide an adequate factor of safety against seismic failure. The report is provided in **Appendix D**.

3.1.3 Hydrogeology Conditions

Exploration of the subsurface was performed by a combination of test pits and borings (shallow and deep) conducted over two different events (refer to **Drawing Sheet 3**). Deep borings were advanced in the study area up to 700 feet below ground surface without discovering groundwater as part of the summer (July 2022) field investigation work. With this excessively deep groundwater table, the District decided to pursue a “No Migration to Groundwater Demonstration.” The assessment is provided in **Appendix E**.

4.0 Base Grading Plan and Bottom Liner System

This section presents the base grading plan for Cell A and the proposed bottom liner system. Refer to **Drawing Sheet 3** for the Existing Site Plan.

4.1 Base Grading Plan

The overall site plan for Cell A development is shown on **Drawing Sheet 4**. The base grading plan for Cell A is shown on **Drawing Sheet 5** with cross-sections shown on **Drawing Sheet 6**. The base grades (floor and interior side slopes) for the proposed landfill cell are inset on the order of 50 to 70 feet below existing ground surface. The base grades also make use of the natural topography of the site (generally sloping north) while maintaining minimum drainage slopes and maximum road grades for access. As a standard, the cell interior floor side slopes are designed with 3H:1V slopes (horizontal to vertical). Construction experience during the development of other landfills has shown that earthwork and construction on side slopes of 3H:1V can be reasonably accomplished with proper equipment and care. Furthermore, with low seepage head buildup on the sideslopes, veneer stability can also be accomplished with textured geomembrane liner and normal shear strengths of geosynthetics and cover material. Should there be intense seismic activity, the veneer stability of interior side slopes could be compromised; however, this would apply to periods when only the select native cover material is exposed without waste placement and buttressing at the toe of the slope. Should the native cover material layer slide, it can be easily reset / replaced and visually inspected for acceptance.

4.2 Bottom Liner System

Per Idaho Code 39-7409, *Standards of Design*, the bottom liner shall be a composite liner design under the requirements of 40 CFR 258.40(b) and shall include a leachate collection system as provided under 40 CFR 258.40(a)(2). The rules state that the leachate collection system shall be designed and constructed to maintain less than a 30-cm (12-inch) depth of leachate over the liner.

A *composite liner* means a system consisting of two components; the upper component must consist of a minimum 30-mil flexible membrane liner (FML), and the lower component must consist of at least a two-foot layer of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} cm/sec. FML components consisting of high-density polyethylene (HDPE) shall be at least 60-mil thick. The FML component must be installed in direct and uniform contact with the compacted soil component.

In accordance with 39-7409(b) – *Alternative Liner Design*, a site-specific design based upon environmental performance, as allowed under 40 CFR 258.40(a)(1) which will ensure that the concentration values listed in Table 1, 40 CFR 258.40, or as amended, will not be exceeded in the uppermost aquifer at the relevant point of compliance. The design shall demonstrate consideration of site-specific factors as provided in 40 CFR 258.40(c) and shall include a leachate collection system as provided under 40 CFR 258.40(a)(2).

The proposed composite bottom liner system (floor and side slopes) for the landfill Cell A is as follows (from top to bottom):

- Leachate collection layer to allow no more than 12 inches of leachate buildup over the liner; the floor will consist of 15 inches of drain gravel and the side slopes will consist of 24 inches of select native soil supplemented with strip drains (strip drains buried on top of the geotextile layer – see below).

- 16-ounce cushion geotextile (non-woven fabric)
- 60-mil HPDE geomembrane (AGRU Microspike – textured both sides)
- Geosynthetic clay liner (GCL) (Bentomat DN)
- Foundation Layer – 6-inch-thick soil base layer prepared from select native materials, compacted to 95%, and placed over prepared subgrade[1].

Details 1 and 2 / Drawing Sheet 15 show the bottom liner systems for the floor and side slopes.

As a matter of convention, GCL is proposed in lieu of a two-foot-thick layer of compacted clay liner (CCL) soil with a hydraulic conductivity of no more than 1×10^{-7} cm/sec. The use of a GCL is standard industry practice especially in areas where clayey soils are not naturally occurring and available. An alternative liner demonstration between the proposed and the prescriptive liners is provided in **Appendix E** along with the 'no migration to groundwater demonstration'.

4.3 Final Closure Grades

Final closure grades for the landfill will provide a top deck area that is sloped no less than 5% with a manageable size for final filling and grading (contouring). The side slopes will be no steeper than 4H:1V per the seismic stability analysis. A general description of the final cover system is presented in **Section 8.0**.

4.4 Soil Balance

Explorations of the subsurface conditions from two rounds of investigations revealed that native soils typically consist of the following three horizons. Refer to **Section 3.1.2** for an explanation of the different soil types and the geotechnical recommendations.

- **Topsoil:** There is a shallow root depth of grasses and crops in sandy silt material noted in the investigation logs. The depth is on the order of 2 to 3 inches below the surface. For purposes of constructability, the top 6 inches are assumed to be "topsoil" for the project stripping and preparation.
- **Sandy Silt:** Soil below the vegetative horizon and above the rhyolite that can be set aside for select fill material, foundation material under the lined areas where rhyolite is exposed, and future interim soil and final cover soil for the landfill.
- **Rhyolite:** This material is generally fractured and can be excavated using normal, large heavy equipment. Once removed, it comes out as "chunky" blocks of material. It can be used for embankment fill with in-place mechanical crushing and compaction. The material can also by crushing and screening to 1-inch minus. If processed, the rhyolite can be used for the soil base layer (foundation layer), operations layer (placed over the liner on the interior side slopes) and stockpiled for future soil cover (daily and interim cover soil).

[1] Prepared subgrade depends on the exposed native material. In the native "chunky" rhyolite horizons, the material is specified to be over-excavated by 6 inches (minimum) and then prepared by mechanically crushing the material in place using heavy equipment and recompacting to create a firm and unyielding and relatively smooth surface for which to place a 6-inch-thick layer of select native soil. The select soil layer is specified to be compacted to 95%. If the exposed native material is sandy silt, no over-excavation is necessary, and the native material can be prepared by scarifying the top 6 inches and recompacting to 95%.

Table 4 presents a summary of the estimated cut/fill numbers for Cell A. The table does not include import materials for construction such as road surfacing and drain gravel for the leachate collection system.

Table 3 – Soil Balance Summary (Cell A)

Landfill Development Phase	Cut Volume (cy)			Stockpile Volume (cy)		
	Topsoil	Silty Sand	Rhyolite	Topsoil	Silty Sand (1)	Rhyolite
Cell A (2)	31,500	454,500	740,000	20,500	404,000	740,000

Notes:
1. Sandy Silt will be used for general embankment fill (~29,000 cy) and to construct the foundation layer (~7,500 cy) and use as the Select Native Cover (Operations Layer) (~14,000 cy) on the side slopes, which accounts also for 15% shrinkage for the embankment fill and the foundation layer (no shrinkage assumed for the ops layer).
2. Cell A development includes the Cell A landfill area, the two leachate ponds, stormwater ponds, and the roads. Additional incidental areas will be included for the construction of the support facilities including the scalehouse / office, shop building, septic system, and the water well and storage tank with fill station.
3. Topsoil will be used for general site soil stabilization on fill slopes (outside of liner) and to cover stockpiles. An estimated 65% will be unused and stockpiled.

Overall, there will be a surplus of material left over from the development of Cell A. It is estimated that 404,000 cy of sandy silt material will be available for daily soil cover material. With an airspace in Cell A of approximately 720,000 cy, the District will use on the order of 144,000 cy for daily cover (assuming 20% of the airspace is taken up by daily cover).

As noted in the Tentative Design Report the overall landfill development will provide more than 7 million cubic yards of overall airspace in the landfill (Cells A-D). Assuming 20% is occupied by cover material, approximately 1.5 million cy of silty sand material would be needed for daily cover for Cells A-D. There is an anticipated shortage of silty sand for this purpose; however, the shortfall can be made up in several ways. The first and preferred method is to use an alternative daily cover (ADC) instead of soil, such as tarps and spray-on materials. Not only will this save in soil use but will increase the effective density of the waste and extend the life of the landfill. ADCs tend to be more expensive than using soil but in the end the value of preserving airspace more than makes up for the additional operating costs.

Another option is for the District to process the rhyolite by crushing and screening operations. The rhyolite could then be stockpiled and used for daily soil cover. Likely, this will be more expensive than using an ADC. The economics of the alternatives should be further explored during operations to decide the preferred alternative. It is noted that daily cover material (and interim cover) can be harvested from the excavation of next cell as part of operations, which is customary. Nonetheless, there is a predicted shortfall of suitable soil (silty sand) for daily and interim cover which will need to be addressed as part of future operations.

4.5 Cell A Development Overview

Cell A will be the first of the phased development cells and will be situated in the northwest quadrant of the proposed landfill with an area of approximately 11.4 acres (true area); which consists of about 3.8 acres of interior side slope and 7.6 acres of floor. The plan view of Cell A is shown on **Drawing Sheet 5**. Excavation and fill volumes based on the design model predict a net surplus of materials as shown in **Table 4**. Surplus material will be separated (topsoil, sandy silt, and rhyolite) and stockpiled onsite. Stockpile areas are shown on **Drawing Sheet 14**. (These locations are subject to change.)

The topsoil and sandy silt will be set aside for future cover material and operations (daily cover) while the rhyolite will be stockpiled permanently with no intention of reuse at this time.

The landfill is accessed from the main frontage road by the landfill entrance road, which connects to other access roads onsite and the perimeter road around the landfill. For the Cell A development, a portion of the perimeter road will be constructed on the north and west sides of the landfill along with an access road into Cell A on the east side. Refer to **Drawing Sheet 4** for an overall plan view of the roads and **Drawing Sheet 7** for a plan and profile of the entrance road, **Drawing Sheets 8 and 9** for plans and profiles of the perimeter road, and **Drawing Sheet 10** for a plan and profile of the Cell A access road. The cross-section details for each of the road types are provided on **Drawing Sheet 20**.

Lined leachate ponds, utilities, scalehouse (office) and maintenance shop, stormwater ponds, and other supporting infrastructure will be developed to operate the landfill. Run-on diversion berms and ditches will be provided upgradient of the cell (and future landfill expansion phases) to divert stormwater around it and into natural drainages. Permanent and temporary stormwater ponds will be provided for stormwater run-off from non-waste fill areas such as roads and soil covered waste fill slopes. Refer to **Section 9.0** for Stormwater Management. The constriction contractor for the project will be responsible for developing a Stormwater Pollution Prevention Plan under the State NPDES requirements and filing a Notice of Intent (NOI) for a Construction General Permit. All temporary erosion and sediment controls will be the responsibility of the Contractor.

The south and east liner edges of Cell A will be terminated and protected in a shallow anchor trench with plywood and visqueen plastic to protect the liner edge. The bottom liner system will also be protected from traffic and heavy equipment by providing additional cover over the leachate / operations layers where necessary for operations.

5.0 Fill Staging Plan and Life Expectancy

This section presents the overall fill staging plan for the landfill (Cells A-D) and life expectancy analysis for the proposed regional landfill.

5.1 Fill Plan

The fill plan generally consists of the following seven (7) stages for the overall landfill (Cells A-D) development:

- **Stage 1** – Once Cell A is built, fill it to elevation of 5,845 feet; before reaching this grade, design, permit, and construct Cell B.
- **Stage 2** – Fill Cell B elevation 5,845 feet to match the grade of adjacent Cell A.
- **Stage 3** – Fill Cells B and C to elevation of 5,870 feet; before reaching this grade, design, permit, and build Cell C.
- **Stage 4** – Fill Cell C to the elevation 5,830 feet to match the grade of adjacent Cell A; before reaching this grade, design, permit, and build Cell D.
- **Stage 5** – Fill Cell D to 5,830 feet matching adjacent Cell C.
- **Stage 6** – Fill Cells C and D to elevation of 5,870 feet matching adjacent Cells A and B.
- **Stage 7** – Fill all cells together to the final closure grade of 5,970± feet; before reaching the final grade, design and permit the final cover system. Also, at this stage if the District plans to build an adjacent landfill area, this area will need to be site certified and the first cell permitted, designed, and built before Cells A-D reach the final closure grade.

The overall final closure grades (top of waste / contouring surface) were provided in the Tentative Design Report. **Table 5** presents the airspace volumes for each of the anticipated seven (7) fill stages. These volumes represent the total volume between the top of the bottom liner system above the leachate collection / operations layer (native soil cover) and the underside of the final cover system (top of waste) / contouring layer and, therefore, includes the volume consumed by waste, daily cover, and interim cover soil. Note this is also accounted for in the assumed 1200 lb/cy of effective waste density. The total airspace volume for all four (4) cells and the seven (7) fill stages is approximately 7,333,000 cy.

Table 4 – District Landfill Fill Sequencing and Airspace Availability

Fill Stage	Fill Stage Volume (cy)	Cumulative Airspace (cy)
Stage 1 – Open Cell A	720,000	720,000
Stage 2 – Open Cell B	1,003,000	1,723,000
Stage 3 – Fill Cells A and B	441,000	2,164,000
Stage 4 – Open Cell C	696,000	2,860,000
Stage 5 – Open Cell D	1,017,000	3,877,000
Stage 6 – Fill Cells C and D	1,397,000	5,274,000
Stage 7 - Fill Cells A – D to Final	2,059,000	**7,333,000**

5.2 Life Expectancy Analysis

The expected life of the landfill (also commonly referred to as the “life cycle”) is dependent on several factors, namely the total airspace volume and the waste acceptance rate (that is, the amount of waste generated by each of the member counties and hauled to the landfill for disposal). The airspace capacities for each of the fill stages are presented above. **Section 1.3** of this report presents the forecasted waste generation rates from each of the member counties. This is the projected amount that the landfill will accept each year.

Another crucial factor in the life expectancy is the waste density, commonly referred to as the “effective waste density” (also known as the airspace utilization density). Effective waste density measures the mass of waste that can be placed in a unit volume of airspace inside the landfill. This measurement considers the volume of airspace lost through daily and interim soil cover, and the volume gained through settlement and waste decomposition. This density ratio is termed “effective” because it gives the landfill operator / owner an understanding of how much waste has been placed in a given volume (airspace), even though other materials such as soil cover can be present within the same volume.

The effective density is calculated taking the weight of waste that is delivered to the landfill site over a known period of time (typically in tons), converting it to pounds by multiply the tons by 2,000 pounds per ton, and then dividing that value by the volume the waste has taken up in cubic yards for that same period of time, resulting in a measure of pounds per cubic yard. The weight of waste is typically measured by scale while the volume is measured by survey between the known periods.

The effective density will increase as the waste ages. This change is primarily a result of waste consolidation and biological decomposition of the organic fraction of the waste. Effective density may also increase with changes in operations, such as a reduction in soil cover material, use of alternative daily covers (ADCs) or inducing higher compaction rates with heavier compactors and improved compaction operations. The composition of the waste stream can also change the density of the waste. For example, aggressive recycling and organics diversion programs could lead to denser waste materials being placed in the landfill and a subsequent increase of density.

The density is expected to fluctuate from year to year as new waste areas open and as the waste settles. The first lift of waste (commonly referred to as the “fluff” layer) is loosely placed to protect the bottom liner system, resulting in a relatively lower waste density. As the waste fill depth increases, the rate of compaction increases. “Normal” waste compaction occurs when the waste settles due to it compressing under its own physical weight and the waste decomposes, which also condenses the waste and fills in void spaces. Eventually, these actions will level-off as the landfill stabilizes.

For purposes of life expectancy planning, the effective waste density is assumed to be 1,200 lbs/cy. This is an achievable density for an arid landfill with a moderate level of compaction effort while using best operating practices. Best practices consist primarily of placing the waste in layers of no more than 12 to 16 inches thick and compacting each layer in a crisscross pattern with four passes using a modern piece of equipment such as a CAT 826K Landfill Compactor, which has an operating weight of over 90,000 pounds. Details on operating the landfill will be provided separately as part of the Operating Plan.

The landfill is anticipated to begin receiving waste in fiscal year 2024 (around August 2024). The life expectancy of the landfill (Cells A-D) is approximately 45 years, with final filling to occur in fiscal year 2068.

Table 6 presents the approximate timelines for having the cells online and ready to accept waste, providing 1 year for design (and permit approval) and 1 year to construct before waste filling needs to occur. Refer to **Appendix F** for the life cycle summary table.

Table 5 – Predicted Cell Development and Landfill Closure Timelines

Fill Stage/Activity	Date
Cell A Construction	Fall 2023 – Summer 2024
Begin Filling Cell A	~August 2024
Design / Permit Cell B	2030
Construct Cell B	2031
Begin Filling Cell B	2032
Design / Permit Cell C	2041
Build Cell C	2042
Begin Filling Cell C	2043
Design / Permit Cell D	2045
Build Cell D	2046
Begin Filling Cell D	2047
Final Closure (1) - Design/Permit - Construct	 2067 2068/2069

Notes:

1. If the District decides to develop another landfill on the existing property, the permitting for that area should be done concurrent with (or before) the final closure system is designed and permitted for Cells A-D. It is assumed that interim closure (soil cap) will occur in areas where the landfill will not be filled for several years.

6.0 Leachate Management Plan

This section presents the leachate management. The system is designed to collect leachate from the base of the landfill and drain it by gravity to a central sump where it will be pumped to leachate ponds. Accompanying this design is leachate generation modeling and a leachate water balance for leachate pond sizing.

6.1 Design Basis

The design assumptions and criteria for the leachate management system lined ponds are as follows.

- Provide a two-pond leachate storage / evaporation system for redundancy and maintenance.
- Provide a double liner with leak detection system for the leachate ponds.
- Locate ponds on the north side of the proposed landfill facility. Leachate that is collected in the landfill will be pumped from in-cell leachate sumps to the ponds for storage and evaporation.

6.1.1 Regulatory Requirements

The design of the regional landfill requires compliance with Idaho Code §39-7409, Standards for Design. Municipal solid waste landfills must contain a composite bottom liner and a leachate collection system that is designed and constructed to maintain less than 30 centimeters (or approximately 12 inches) of leachate over the liner[2]. The proposed bottom liner system is presented in **Section 4.2**.

6.1.2 Design Criteria

The key design criteria (and assumptions) that were used for the development of the final design of the leachate management system are as follows:

- Maintain less than 12 inches of leachate over the bottom liner system to meet the regulations. (As described under the HELP modeling section, the floor drainage layer uses 15 inches of drain gravel and interior side slopes uses a 24-inch-thick native soil supplemented with strip drains.)
- A series of leachate collector trenches (central collector pipes and toe collector pipes) will be positioned along the floor to direct leachate to the in-cell collection sump.
- Provide sufficient leachate storage / evaporation capacity using double-lined leachate ponds. Pond sizing to be based on a leachate water balance model that tracks leachate inputs and outputs through different weather scenarios for the landfill development.
- Provide the new leachate pond system with two ponds to allow management by pond, where practical, during the phased development of the landfill.

6.1.3 Leachate Generation

Leachate generation was estimated using U.S. Army Corps of Engineer's *Hydrologic Evaluation of Landfill Performance, Version 3.07* (HELP)[3], a quasi-two-dimensional, DOS-based deterministic computer

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[2] It is common practice in the industry to provide a deeper "trough" within the sump for where the in-cell pumps will rest to maintain submergence and cooling of the pump motors while localizing the leachate head to a smaller footprint.

[3] The current version of HELP (version 4.01) is a beta version using a Microsoft Excel platform. This version continues to use datafiles generated by the DOS-based version 3.07. Version 4.01 does not provide monthly output files that are needed for water balance modeling and leachate pond sizing calculations. As a result, the older DOS-based 3.07 version was used for this project.

model. This model is designed to calculate a water balance for solid waste landfills over a simulation period, using site-specific climatological and design data. Input data required includes climatological data representative of the site (precipitation, temperature, solar radiation, and evapotranspiration) and soil and landfill design data.

Climatological Data

The HELP program has a database of standard climatic data for several U.S. cities, including nearby Pocatello, Idaho. The model's default weather generator for Pocatello (nearest default city to the site) was used for this project except for precipitation. Precipitation data from the Western Regional Climate Center (WRCC) for the "Rexburg BYU Idaho" (Station ID 107644) was used instead of the default precipitation data for Pocatello as it was closer to the project site. The WRCC station reported an average annual precipitation of 13.03 inches (period of record from 07/01/1977 to 06/08/2016) for the nearby Rexburg BYU Idaho station while the 20-year simulator in the HELP model generated average monthly values totaling 12.00 inches, which were deemed "average year" conditions while those with one standard deviation (also HELP simulated) were considered a "storm year." **Table 7** summarizes the precipitation values simulated by the HELP model.

Table 6 – Monthly Precipitation Data

Month	Average Monthly Precip (inches) (1)	HELP Simulated Monthly Precip (inches) (2)	One Standard Deviation (inches) (3)	HELP + 1 Standard Dev. "Storm Year" (inches) (4)
January	1.11	1.12	0.54	1.66
February	0.96	0.87	0.32	1.19
March	0.99	0.98	0.45	1.43
April	1.20	1.02	0.55	1.57
May	1.77	1.86	0.96	2.82
June	1.45	1.31	0.80	2.11
July	0.79	0.64	0.59	1.23
August	0.70	0.75	0.64	1.39
September	0.84	0.62	0.63	1.25
October	1.16	0.97	0.69	1.66
November	0.99	0.89	0.43	1.32
December	1.07	0.97	0.40	1.37
Total	**13.03**	**12.00**	**7.00**	**19.00**

Notes:

1. The "Average Monthly Precip" values are those from the Rexburg BYU Idaho WRCC station (Station ID 107644).
2. "HELP Simulated Monthly Precip" values (the mean values) are those generated by the HELP model after entering in the WRCC monthly values for the Rexburg BYU Idaho weather station.
3. The "One Standard Deviation" values are HELP generated.
4. The "Storm Year" is considered an average year plus one standard deviation above the average year values (or mean values).

The peak day precipitation value in the modeled-generated data set for the average precipitation year was 1.4 inches. This peak day rainfall is equivalent to approximately a 25-year/6-hour storm event, or a 2-year/24-hour storm event based on the National Oceanic and Atmospheric Administration (NOAA) isopluvial map for the project area. For comparison, the 25-year/24-hour storm is 2.4 inches and is what is used for stormwater management (run-on/run-off) systems at landfills per §258.26 of the Federal Code.

Soil Landfill Design Data

As previously described, the leachate collection system will consist of a 15-inch-thick layer of drain gravel on the cell floor. On the side slopes, leachate will be recovered by draining to the floor off a 24-inch-thick

operations layer of select native soil. If leachate infiltrates this side slope soil layer, it will drain to strip drains that are embedded in the native soil operations layer. The strip drains terminate at the toe of slope in the toe collectors (see below) at the floor of the landfill.

Representative properties of materials were selected from the HELP model, which provides an extensive database of recommended typical soil and MSW properties cross referenced to the Unified Soil Classification System (USCS) and MSW characteristics. Classification / parameters most closely matching the anticipated or actual layer type were selected from the HELP model's soil matrix options.

In order for the HELP model to run properly, a thin MSW layer is assumed of 6-inches-thick to provide a vertical infiltration layer over the lateral (leachate) drainage layers of the gravel on the floor and the operations material on the side slopes.

Other Modeling Parameters

Other relevant data include slope steepness and drainage lengths. The floors of the landfill cells will have a central slope of approximately 2.5% and a compound slope (geometric sum of longitudinal and transverse slopes) of approximately 3.0%. The interior slide slopes of the cells are sloped at 33% (3H:1V).

A minimum slope of 3.0% was used in the HELP modeling for the lateral drainage layer along the cell floor. The drainage length is the distance that the leachate needs to travel within the leachate collection layer to a leachate collector line, strip drain, or sump. The drainage length varies along the landfill floor from cell to cell. The maximum drainage length is on the order of 600 feet while the average is closer to 200 to 300 feet. On average, the drainage length on the floor of the cells will be 350 feet and 50 feet along the side slopes (supplemented with strip drains spaced on 100-foot centers, perpendicular to slope).

Modeling Scenarios and Results

The HELP model requires that the two cell bottom liner areas (3H:1V side slopes and the 3.0% floor) be modeled independently to predict leachate production rates and drainage layer leachate heads. Drainage layer leachate head is the level of leachate buildup on the bottom liner system.

In accordance with 40 CFR 258.40(a)(2b), leachate head buildup on the liner system shall be maintained less than 12 inches (30 centimeters) over lined areas. As a matter of practice, head buildup greater than 12 inches is permitted in localized areas such as sump areas. In-cell sumps are designed to provide liquid level over the pumps for operation and cooling. This pool depth will typically be on the order of 18 to 24 inches. Additionally, to localize the head buildup, a trough can be provided within the sump area to increase the pool depth more for submergence over the pumps.

The estimated maximum leachate head buildup on the floor (peak daily values) based on the HELP modeling is 3.4 inches on the floor and 8.5 inches on the side slopes, meeting the maximum threshold of 12 inches. Note the worst-case scenario was modeled assuming a 6-inch-thick layer of garbage covering the drain gravel on the floor and operations layer on the side slopes. In reality, this will not be sustained as waste filling will continue. After the first couple lifts of garbage are place, there will be a significant reduction in leachate generation and subsequent head buildup over the liner.

6.1.4 Leachate Collection System

As previously described, the leachate collection system will consist of a 15-inch-thick layer of imported drain gravel on the floor and a 24-inch-thick layer of select native soil on the side slopes supplemented with buried strip drains lying on top of the bottom liner system. Collector trenches (central collector pipe

and toe collector pipe) will be provided to direct leachate to the in-cell collection sump[4] (individual sumps for Cells A/B and Cells B/C). **Drawing Sheet 5** presents the overall layout of the base grades and leachate collection system for Cell A. The central leachate collector is shown in **Detail 1 / Drawing Sheet 16**, and the toe leachate collector is shown in **Detail 2 / Drawing Sheet 16**.

The cell floor grades generally slope from south to north. Cleanouts for the leachate collector pipes are positioned around the perimeter of the cell for routine cleaning (flushing) and can also be used to access the cell floor areas during leachate recirculation activities, to ensure that less than 12 inches of leachate head builds up over the cell floor. A typical cleanout riser is shown in **Detail 3 / Drawing Sheet 16**.

The in-cell sump houses submersible pumps with integral pressure transducers in each of the two side slope riser pipes. Inside the risers are HDPE pump discharge pipes where they terminate at the crest of the landfill at the riser cleanout accesses (blind flanges). Immediately inside of the blind flanges of the side slope risers are the pitless adapters and pump retrieval cables. The discharge line transitions from HDPE to stainless steel at the pitless adapter. Before diving below ground, a pressure / vacuum combination valve provides a means to release air and allow air into the line when the pumps turn off and drain back into the sump. The exposed pipe above ground and to the frost line is encased in rigid foam insulating and metal cladding. Also, all buried forcemain piping is sleeved in a second HDPE pipe for double containment. The two pump discharge lines are manifolded together in a buried vault with isolation and check valves and then leave the vault where the line transitions from stainless steel to HDPE and is routed to the leachate ponds. **Drawing Sheets 17-19** show the in-cell leachate sump with pump and forcemain to the crest of the landfill.

Leachate Collection Pipe Sizing

Cell A will have two types of leachate collectors. The central collector will run generally south to north along the centerline of Cell (and future Cell B). A cleanout will be provided at the northside crest of Cell A with a temporary termination (blind flange) on the south end for future extension into Cell B. Leachate toe collectors will be provided where the side slope and the floor of the landfill intersect around in the inside perimeter of the landfill. Like the central collector, cleanouts will be provided for the toe collector at the crest of the landfill.

Under a theoretical worst-case scenario, the central collector would need to carry the peak day event including both the cell floor area and the side slope with little to no waste, while the toe collector would only see maximum flows off the side slope. This case applies to both Cell A and Cell B which contribute to this line. However, note that when Cell B is developed, there will be waste in-place over Cell A which will absorb and attenuate leachate production from that Cell A. The majority of leachate would come from Cell B when there is little to no waste in that cell. Based on HELP modeling, the peak flow that the central collector pipe needs to carry is approximately 170 gpm while the toe collector will need to carry on the order of 115 gpm.

It is customary to oversize the collector pipes for two reasons. The first is to provide a safety factor in case there is clogging or some sort of obstruction. The second reason is for camera access and flushing. For these two reasons, the central collector is specified to be an 8-inch diameter SDR 11 HDPE pipe (inside diameter of 6.8 inches) and the toe collector is specified to be a 6-inch diameter SDR 11 HDPE pipe (inside diameter of 5.3 inches). The central collector has a slope of 2.4% while the toe collectors are 3%. Using a Manning's 'n' value for smooth pipe of 0.009, the flow capacities of the central collector and the toe collectors are 686 gpm and 356 gpm, respectively.

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[4] As described in the Tentative Design Report, Leachate Sump No. 1 will manage leachate from Cell A and future Cell B. Future Leachate Sump No. 2 will manage leachate from future Cells C and D.

With predicted maximum flows of 170 gpm and 115 gpm for the central collector and toe collector, respectively, the pipes have safety factors are 4.0 and 3.1. The central collector has a larger safety factor as it will be the primary conduit to the leachate sump should the toe collector not handle the leachate flows. Refer to **Appendix G** for the Manning's Calculation datasheets.

Collector Pipe Perforation Sizing

The leachate collection pipes are perforated within the leachate collection zone. The in-sump section of the side slope riser pipes housing the pumps in the sump are also perforated. The perforations are designed to collect and transmit the peak daily flows from designated portions of the cell while also being compatible with the adjacent drain gravel. That is, the gravel is specified to be big enough to not clog the perforation holes of the collector pipes.

The perforations are specified to be machined or drilled perpendicular to the HDPE collector pipe axis in parallel bands, forming rows. The total number of rows and total open area of the holes per foot of pipe is a function of the required pipe inflow design. The perforations for the 8-inch diameter SDR 11 HDPE central collector pipe are specified to be 0.5-inch diameter holes with 4 holes per row and the rows spaced 18-inches apart. The holes are required to be staggered every other row 45 degrees so that no two rows of perforations next to each other are directly inline. The total capacity of the approximate 600 feet of central collector with this perforation pattern is nearly 1,000 gpm of flow; assuming worst-case that 50% of the perforation holes are clogged, the flow capacity is 481 gpm and provides a safety factor of 3.

The perforations for the 6-inch diameter SDR 11 HDPE toe collector pipe are specified to be 0.5-inch diameter holes with 2 holes per row and the rows spaced 18-inches apart. The holes are required to be staggered every other row 90 degrees so that no two rows of perforations next to each other are directly inline. The total capacity of the approximate 1,000 feet of toe collector with this perforation pattern is approximately 800 gpm of flow; assuming worst-case that 50% of the perforation holes are clogged, the flow capacity is 400 gpm and provides a safety factor of over 7.

The perforations for the 18-inch diameter SDR 17 HDPE pump housing pipe is specified to be 1-inch diameter holes with 8 holes per row and the rows spaced 12-inches apart. The holes are required to be staggered every other row 22.5 degrees so that no two rows of perforations next to each other are directly inline. The total capacity of a 50-ft section of pipe in the sump with this perforation pattern will provide over 1,000 gpm of flow; assuming worst-case that 50% of the perforation holes are clogged, the flow capacity is 340 gpm and provides a safety factor of 4.

The size of the drain gravel / rock to be used for the leachate collection trenches and sumps also needs to be compatible with the perforation hole sizes of the collection pipes. The design criteria for sizing the drain gravel uses the following equation: d_{85} of the drain gravel $\geq$ 2.0 times the maximum perforation diameter (Sharma and Lewis, 1994). "d_{85}" is the diameter of which 85% of the particles are finer. The drainage materials were sized and checked for compatibility with the pipe perforations. The drain gravel for the collector pipe trenches is specified to be 1.5 to 2.0-inch rounded and washed or screened rock with less than 1% passing the #200 sieve and less than 5% passing the #10 sieve with 85% greater than 1.0 inch. The leachate sump gravel is similar to the general collector trench gravel but is required to be 2.0 to 2.5-inch rounded and washed or screened rock with less than 1% passing the #200 sieve and less than 3% passing the #10 sieve with 85% greater than 2.0 inches. Both are required to be free of calcite which could chemically react and fuse and harden whereby reducing drainage capacity.

Pipe Strength

There are two scenarios for which to typically assess pipe strength in a landfill – final closure and equipment loading. Under the final closure scenario, the leachate collection trench piping will be loaded with the entire MSW fill height. Such an evaluation requires calculation for pipe stability and deflection under a deep fill scenario (depth of cover greater than 50 feet) approach. The performance of plastic

pipes under stresses from large fill heights in landfills is relatively unknown as experience with plastic pipes in this situation is limited. The problem is further complicated by the fact that plastic pipe behavior is time dependent and that their performance is required as long as there is an opportunity for leachate to be generated in the landfill. In contrast, classical (typical) pipe strength calculations for highway and agricultural applications are generally for a design life that is relatively short and a depth of burial that is relatively small. Another limitation of applying the classical design methods is that the effect of arching (prism loads) in reducing loading on the pipe is not considered. Therefore, design by classical methods may be overly conservative (EPA, 2002).

The typical design follows the "Guidelines for HDPE Pipes in Deep Fills," authored by Larry J. Petroff (1998), employed at the Performance Pipe Division of Chevron. The report addresses one method for calculating pipe strengths in deep fill applications. This methodology is for a pipe lying on a relatively flat bottom surface with drainage rock backfill, which closely resembles the configuration of the leachate collection trench design for proposed regional landfill. Common practice is to use heavy-walled HPDE pipe in the floor of the landfill with a minimum SDR of 11. Oftentimes with shallower fill heights over the side slope risers, an SDR of 17 is satisfactory.

Equipment loading is also important to verify that the vertical pressures induced by large landfill equipment will not damage the leachate pipes. The typical calculation evaluates the worst-case scenario of operating the equipment directly over the pipe that is situated in the leachate drainage layer. However, to help protect the pipe under this scenario, the operations plan will require a select fill "fluff" layer of MSW (typical thickness of 4+ feet) to protect the bottom liner system from equipment traffic before the material is compacted, which will also provide additional pipe protection. The design analysis follows standard of practice to calculate factors of safety against wall crushing, wall buckling, and short- and long-term pipe deflections. Standard design criteria consider safety factors between 2 and 3 (minimum) for wall crushing and buckling, and limits short- and long-term deflections to between 5% and 7.5%.

Cell Sump / Pump Design

The leachate sump is positioned near the centerline of Cell A at the low point where leachate drains by gravity from the central and toe collector pipes positioned on the floor of the cell. The sump size provides adequate storage of leachate while not over cycling pumps during normal daily leachate flows. The sump is also equipped with a trough to centralize the leachate into a smaller footprint where there will be a constant head over the liner. The sump will be equipped with two pumps for redundancy and to provide backup in case of high leachate flows. The pumps are housed in the 18-inch diameter SDR 17 pump housing pipe within the trough of the sump to provide liquid over the pumps for cooling and to reduce cavitation. The pump sizes provide redundancy for the expected average daily flow of leachate under the general worst-case condition of little to no waste in the landfill. Of course, the landfill will continue to be filled which will reduce and attenuate leachate production.

Under normal operating conditions, the pumps will alternate between ON/OFF cycles. The operating set points will be established during installation to maintain the minimum submergence per manufacturer's recommendations while also providing ON/OFF set points for the effective operating volume and storage capacity.

Each of the pressure lines (force mains) from the pump discharges will be housed in the riser pipe. The lines will pass through flow meters inside the housing pipes up to the crest of the slope where the lines connect (manifold) inside a vault accompanied by a leachate monitoring station. The station is equipped with the control panels for the pump operation, flow meters, and pressure transducer (to monitor head build-up over the sump pump/liner and turn the pumps ON/OFF), valves, and electrical controls. The station will also provide the control panel for the pressure transducer that will be placed in the housing pipe for the leak detection system.

The anticipated average daily flow into Leachate Sump No. 1 is estimated to be around 3-5 gpm based on HELP modeling. Pump sizing calculations for the specified submersible pumps show the duty point around 27 gpm. As discussed for the pipe sizing calculations, a peak flow of 170 gpm is anticipated for Leachate Sump No. 1. The two specified pumps operating together (in parallel) will provide over 50 gallons per minute if required to be running together. Typically, the pumps will be alternating ON/OFF operations. The leachate sump (including the trough) provides over 500,000 gallons of leachate storage. Although not anticipated, in the case of a large storm (leachate generation) event, the floor of the landfill can also be used to provide additional leachate storage as long as it doesn't exceed more than 12 inches.

Under normal operating circumstances, ON/OFF set points established by the pressure transducer readings will operate the alternating pump system. If a high level is reached, the pumps will run together (in parallel) to remove the leachate from the sump and pump it to the leachate pond(s). With the large storage volume, it could take several days for the pumps to remove the leachate should there be a large storm event.

6.1.5 Leachate Pond System Design

The leachate pond system is approved as part of the landfill application process, but the pond approval process and technical design must meet the industrial wastewater lagoon requirements of IDAPA 58.01.16.401. These requirements include both siting and design regulations. Since the landfill has already been approved for siting, it is assumed the leachate ponds are also approved.

The leachate ponds are intended to be storage and evaporation. Although leachate ponds are considered "industrial lagoons" under the wastewater IDAPA rules as noted above, for this project they will be designed and operated as Tier III facilities under the rules and regulations of IDAPA 58.01.01.013.13.c. The DEQ determined the leachate collection system requirement, as it pertains to Nonhazardous Solid Waste Impoundments (NSWI) facilities, is satisfied by installing, monitoring, and maintaining a leak detection system since the waste is in liquid form and contained in an impoundment. Additional information regarding impoundments can be found in the "Guidance for Siting, Design, and Operation of Nonhazardous Solid Waste Impoundments in Idaho," (DEQ, February 2020).

To achieve leak detection monitoring in the leachate ponds, a double liner system with an interstitial space and a collector and riser pipe are provided. The proposed overall bottom liner system for the leachate ponds (consists of from top to bottom):

- 60-mil HPDE geomembrane – Primary Liner (AGRU MicroSpike®)
- 60-mil HDPE Geomembrane – Secondary Liner (AGRU MicroDrain®)
- Foundation Layer – 6-inch-thick soil base layer prepared from processed native materials and compacted to 95% placed over prepared subgrade[5]. In the leachate pond area, it is anticipated that the majority, if not all, of the subgrade will be in the sandy silt material where native material can be used as the base layer for the liner rather than being in the rhyolite and needing to over-excavate and install the processed rhyolite material for a foundation layer.

[5] Prepared subgrade depends on the exposed native material. In the native "chunky" rhyolite horizons, the material shall be over-excavated by 6 inches (minimum) and then prepared by mechanically crushing the material in place using heavy equipment and recompacting to create a firm and unyielding surface for which to place a 6-inch-thick processed rhyolite (1 inch minus) foundation layer material on top. If the exposed native material is sandy silt, no over-excavation is necessary, and the native material can be prepared by scarifying the top 6 inches and recompacting to 95%.

Each pond will provide 18-inches of freeboard for emergency storage. If a pond needs to be free of leachate for cleaning or maintenance, a mechanical pump system (portable) can be placed at the low point of one pond to transfer the liquid to the other pond.

If the ponds need to be aerated to keep them from going septic, surface aerators can be added in the future.

6.1.6 Leachate Water Balance

A water balance model was developed to determine the required storage volume needed for sizing the leachate ponds. This evaluation consists of a budgeting process in spreadsheet form where pond inputs and deductions (losses) are tracked monthly.

Exhibit 5 presents a comprehensive water balance showing all the potential inputs and outputs from the landfill and the leachate evaporation ponds. Leachate recirculation (or liquids addition) is shown in this schematic but is not planned for the EIRSWD regional landfill.

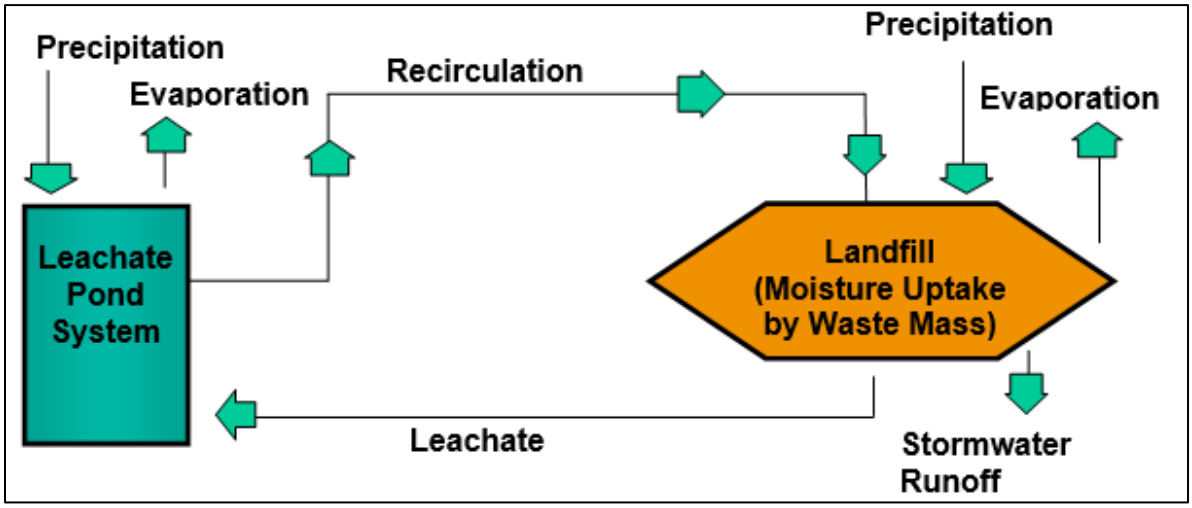

Exhibit 5 – Leachate Water Balance Schematic

Pond Inputs (Adds)

The HELP model accounts for the water balance components around the landfill (precipitation, evaporation, and stormwater runoff) and predicts the amount of net leachate generated to feed into the leachate pond system. Other modeling input assumptions include the following:

- Direct precipitation into the lined leachate ponds were calculated using average year and storm year precipitation estimates generated by the HELP model.
- The rainfall catchment area was assumed to be the maximum lined surface area of the top of the ponds.
- The potential quantity of condensate from the landfill gas control system was not considered as an input source for this evaluation. It is anticipated that this volume will be insignificant as compared to the leachate production rates.

Pond Outputs (Losses)

Pond surface evaporation losses were calculated using average conditions. The average monthly evaporation rates from the leachate pond were determined by using a free water surface (FWS)

evaporation rate of 40 inches per year for the project area. The annual evaporation value was obtained from a map of mean annual FWS evaporation rates in Idaho. The annual FWS value of 40 inches was distributed over the year using monthly shallow lake evaporation percentages for Region 4 (Molnau et al., 1992), as shown in **Table 8**.

Evaporation rates from leachate ponds are lower than freshwater bodies due to the presence of salts. The liquid stored in the leachate pond will increase in salinity as the water evaporates and the salts remain. A practical maximum concentration for mixed salt salinity (as sodium chloride) was assumed to be approximately 17% (by weight), which lowers the vapor pressure of water by approximately 10% (Harbeck, 1955). The lowering of the vapor pressure corresponds to a 10% decline in the rate of evaporation. Therefore, a salinity correction coefficient of 0.9 was applied to account for the effects that various salts have on leachate evaporation rate.

Applying the correction factor of 0.9 (ratio of saline to freshwater evaporation) to the shallow lake evaporation rate of 40 inches yields an effective annual average evaporation value of 36 inches for the leachate pond system. The pond volume evaporation is based on the pond surface area at half of the maximum water depth of the ponds. The monthly evaporation rates are summarized in the water balance input datasheets (**see Appendix G**).

Table 7 – Monthly Leachate Pond Evaporation Rates

Month	Monthly Shallow Lake Evaporation (%) (1)	Effective Monthly Evaporation (inches) (2)	Design Pond Evaporation (inches) (3)
January	1.0%	0.4	0.4
February	2.0%	0.8	0.7
March	4.0%	1.6	1.4
April	7.0%	2.8	2.5
May	12.0%	4.8	4.3
June	15.0%	6.0	5.4
July	19.0%	7.6	6.8
August	16.0%	6.4	5.8
September	11.0%	4.4	4.0
October	6.0%	2.4	2.2
November	4.0%	1.6	1.4
December	3.0%	1.2	1.1
Total	**100.0%**	**40**	**36**

Notes:

1. Region 4 monthly free water surface (FWS) lake evaporation percentages (Molnau et al., 1992)
2. The "Effective Monthly Evaporation" is calculated by multiplying the shallow lake values for each month provided by Molnau et al. by the total FWS 40 inches of annual total FWS evaporation.
3. The "Design Pond Evaporation" rates are calculated by multiplying the effective monthly evaporation rates by a factor of 0.9 to correct for potential salinity

The amount of moisture uptake by the waste mass is another loss component that can be accounted for in the water balance model. When waste is received at the landfill, the moisture content is typically less than its field capacity. Field capacity is defined as the soil water storage/volumetric content after a

prolonged period of gravity drainage from saturated conditions. As a conservative measure for this project, the waste is assumed to be saturated upon arrival at the landfill and does not have additional capacity to absorb moisture. This adds to the level of conservativeness in the pond volume sizing calculations.

Water Balance Modeling Scenario

The water balance model simulates a 5-year timeframe under a single benchmark scenario where there is a thin, 6-inch-thick layer of MSW over the entire bottom liner system (both side slopes and floor). Note that this is a conservative approach since the landfill will continue to be filled over this 5-year period adding more waste and reducing the amount of leachate production by moisture absorption and attenuation.

The ponds are assumed to be square with 3H:1V interior slopes, 3.5 feet of active storage depth, and 1.5 feet of emergency storage depth (total of 5 feet deep). The model assumes two back-to-back storm years (or other unplanned conditions).

Water Balance / Leachate Pond Sizing Results

The results of the water balance calculation indicate two 285 feet by 285 feet square ponds (top area dimensions), or approximately two 1.9-acre ponds are needed with a combined, active storage volume of 3.7 million gallons. The “active storage volume” is from the clean pond bottom to the top of the high fill line (18 inches below the top of the pond). The emergency storage volume is the top 18 inches of the two ponds which is about 1.1 million gallons on the minimum pond size, for a total volume of nearly 4.9 million gallons.

A plan view of the proposed leachate ponds is shown on **Drawing Sheet 12**, and the cross-section is shown on **Drawing Sheet 13**. With the designed geometry, the two leachate ponds provide approximately 4.5 million gallons of active storage. This storage volume is more than the water balance model requiring no less 3.7 million gallons, and therefore, satisfies the minimum sizing requirements. In addition, the 18 inches of freeboard in the ponds provide another approximate 1.9 million of emergency storage, for a total combined storage volume of approximately 6.5 million gallons.

The District will need to remove as much leachate as possible from the ponds during the dry summer seasons and spray on the roads and waste fill areas (over lined areas) to control dust and reduce pond volumes. When ponds are dried, they should be cleaned (remove all sludges) and inspected on a routine basis. Use of leachate for dust control over lined areas is a common practice at landfills. This will provide additional source removal of the leachate. To further reduce leachate amounts, apply rainsheet covers to new areas of the landfill that have not yet received waste.

If the District is successful in using the leachate and significantly reducing the volume during the dry season, there is a chance that they will not need to use the second pond and can alternate ponds between years to provide redundancy. If so desired, one pond can be left “clean” and used for clean water collection and removal for general dust control at the site.

HELP modeling and the water balance calculations and assumptions used to estimate leachate volumes (and corresponding leachate pond sizing calculations) are engineering approximations and may not reflect actual conditions. The HELP model comes with inherent limitations and uncertainties in terms of accuracy as it applies to actual field conditions while also approximating climatological and soils data. This will result in actual water balance quantities different from those predicted by the model. Actual operations and conditions such waste placement, waste type, waste moisture content and field capacity, cover techniques and exposed areas, and other factors will also affect the actual leachate storage needs. For these reasons, contingency measures such as hauling leachate to a local wastewater treatment plant should be put into place as part of landfill operations.

7.0 Landfill Gas Management Plan

Landfills naturally produce landfill gas. Landfill gas is created by decomposing waste in an anaerobic atmosphere, such as a landfill, where waste is compacted and covered. The gas is generated by microbes in the waste which then generate the gases.

7.1 Explosive Gases

As part of the Operations Plan (to be prepared and approved prior to commencing landfill operations), the facility is required to monitor for explosive gases. According to 258.23, the concentration of methane gas generated by the facility cannot exceed 25% of the lower explosive limit (LEL) for methane in any facility structure (excluding gas control or recover components) and the concentration of methane cannot exceed the LEL at the facility property boundary. To ensure that these limits are not exceeded, a routine methane monitoring program is required. The types and frequency of monitoring depend on the soil conditions, the hydraulic and hydrogeologic conditions surrounding the facility, and the proximity of the facility structures and the property boundary.

To determine if landfill gas is migrating through the landfill liner system, landfill gas probes will be installed between the landfill and the property boundary. The depth of the probes will be at or slightly below the bottom liner elevation projected back to the location of the probes and screened up to the surface seal.

Drawing Sheet 4 shows the proposed locations for the three gas probes that are proposed around the perimeter of Cell A. As noted in the Tentative Design Report, two more are scheduled to be installed as the landfill expands into those areas. The details for the probe are provided on **Drawing Sheet 23**.

7.2 Air Quality

Landfill gas falls under the New Source Performance Standards (NSPS), the National Emission Standards for Hazardous Air Pollutants (NESHAP) for MSW landfills (subpart AAAA), and the associated Title V (parts 70/71) regulations, also known as Tier 1 in Idaho.

Landfills, with a design capacity exceeding 2.5 million MG, and 2.5 million cubic meters, or 2.76 million US tons, and 3.3 million cubic yards are regulated under these rules. Additionally, it must be determined if the landfill is required to have an active gas collection and control system under NSPS. If the non-methane organic compound (NMOC) mass emissions are 34 megagrams per year (Mg/yr.) or greater, the landfill is required to install and have an operational gas collection system within 30 months of when the NMOC threshold is exceeded. This is determined through regular monitoring of the landfill using Landfill Gas Emissions Model (LandGEM) v3.02 (USEPA, 2005)

The District landfill falls well within these parameters. The landfill is designed with 6.9 million cubic yards and 4.2 million tons. This put the need for landfill gas management systems as a requirement for the development of the landfill.

The landfill will not see any significant landfill gas for the first decade or more of operation; however, when Cell B construction begins, the need to build a flare station will be added to the design of the cell.

Gas management systems typically consist of wells, buried in the landfill, also known as horizontal gas wells, or wells that are drilled into the waste, also known as vertical wells. These wells are equipped with

wellheads to monitor and control gas collection rates. The wellheads are connected to a piping network to convey the gas to a biogas processing system. The end of this system is most often fed into a landfill gas flare. A system that burns the landfill gas, leaving clean emissions from the burned landfill gas flares requires remote monitoring and a control system. Landfill gas flares are a cleaner alternative to allowing landfill gas to migrate to the atmosphere, as it consists of methane, hydrogen sulfide, and a variety of other volatile organic compounds.

Landfill gas is warm and saturated and condenses when removed from the landfill. The liquid removed from the gas is managed by condensate stations where the moisture is removed and pumped back into the landfill or to the leachate ponds.

For this landfill, it is anticipated that the gas processing system will be a flare station, with a blower skid and flare stack. Alternative systems could include landfill gas to energy gensets, microturbines, or other available and feasible technology at the time.

8.0 Final Cover System Design

According to Idaho Code 39-7415 – *Standards for Closure*, the final landfill cover shall include one of the following:

(a) A cover as provided under 40 CFR 258.60(a); or
(b) The cover material must be fine-grained with intrinsic permeability no greater than 1 x 10^{-3} cm/sec and a minimum thickness of twenty-four (24) inches; and (i) Have capillary holding capacity greater than the projected maximum accumulated volume of water as determined by utilization of accepted water balance methodology based on local or regional twenty-five (25) year climatic records; (ii) Annual precipitation is less than twenty-five (25) inches with net evaporative losses greater than thirty (30) inches annually; (iii) The top six (6) inches of the cover shall be capable of sustaining shallow rooted native plant growth; and (iv) This design shall demonstrate consideration of site specific factors as provided in 40 CFR 258.30(b); or
(c) As provided in 40 CFR 258.60(b).

The code also requires that the final grade of slopes shall be greater than 2% unless otherwise supported by the post-closure plan and uses approved by the health district. The side slopes must not be steeper than 33 percent, which equates to 3H:1V.

The final cover for the proposed regional landfill will be designed and constructed to meet the prescriptive requirements of 40 CFR 258.60(a), which states that the cover system must:

(1) Have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present, or a permeability no greater than 1 × 10^{-5} cm/sec, whichever is less, and
(2) Minimize infiltration through the closed MSWLF by the use of an infiltration layer that contains a minimum 18-inches of earthen material, and
(3) Minimize erosion of the final cover by the use of an erosion layer that contains a minimum of 6-inches of earthen material that is capable of sustaining native plant growth.

The proposed final cover system for the landfill will consist of (from top to bottom):

- 6 inches of vegetated topsoil
- 18 inches of native soil (sandy silt) as an anti-infiltration layer
- Drainage layer consisting of either soil and/or a geosynthetic such as a drainage net
- 60-mi HDPE geomembrane[6]
- Contoured, smooth and unyielding final soil layer (subgrade for the liner)

The DEQ may approve an alternative final cover design. It is common practice, especially in arid climates like eastern Idaho, to install an evapotranspiration (ET) cover according to 40 CFR 258.60(b). The District may propose in the future the use of an ET cover instead of the prescriptive, geosynthetic cover system.

[6] The District reserves the right to use linear low-density polyethylene (LLDPE) instead of HDPE should they decide to use a geosynthetic cover system. Alternatively, the District may choose to use either an evapotranspiration (ET) cover as outlined in option (b) or another alternative as stated in option (c). In any case, the proposed final cover system will be included in the Closure Plan to be approved by the DEQ / Health District.

According to the rules, the owner or operator must prepare a written closure plan that describes the steps necessary to close all MSWLF units at any point during their active life in accordance with the cover design requirements. This Closure Plan will be prepared under separate cover and submitted to the DEQ / Health District for approval as part of the permitting. The final cover system will be placed when the landfill has been filled to the permitted elevation and capacity. The final (top) grade will have a slope greater than 2% (designed with 5+% to account for future settlement) and the exterior side slopes will be no greater than 4H:1V for seismic stability. Stormwater will be managed on the cover system as described in **Section 9.0.**

9.0 Stormwater Management Plan

Stormwater retention ponds will be built to manage stormwater runoff from clean areas of the landfill (that is, non-contact water). The permanent ponds are sized to manage the maximum amount of runoff from the site under the final closure conditions. Temporary ponds along with berms and diches provide stormwater management during the phased development of the landfill. The ponds are design to retain stormwater from a 25-year, 24-hour storm event with emergency storage to handle up to an 100-year, 24-hour event. In the event of any overtopping, the permanent ponds are designed with emergency spillways to allow for controlled release of discharge into natural drainageways.

Stormwater run-on from uphill drainages will be intercepted by exterior ditches / berms and directed around the landfill into natural drainages (or ponds).

Details on the stormwater management system are provided in **Appendix H**.

10.0 References

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APPENDIX A

Tentative Design DEQ Comments / Responses

STATE OF IDAHO
DEPARTMENT OF
ENVIRONMENTAL QUALITY

1410 N Hilton Street, Boise, ID 83706
(208) 373-0502

Brad Little, Governor
Jess Byrne, Director

February 21, 2023

Eastern Idaho Regional Solid Waste District
Todd Smith, President
530 airport Road
Rexburg, ID 83440

Sent via e-mail: tsmith@co.madison.id.us

RE: Eastern Idaho Regional Solid Waste District
Municipal Solid Waste Landfill Tentative Design Report – Compiled Comments

Dear President Smith:

The Idaho Department of Environmental Quality (DEQ) has prepared this letter for the Eastern Idaho Regional Solid Waste District Municipal Solid Waste Landfill (Facility) Tentative Design Report pursuant to the Design Review Procedures of Chapter 74, Title 39, Idaho, "Idaho Solid Waste Facilities Act" (Idaho Code §39-74).

Idaho Code §39-7411 sets forth the procedure for applicants to obtain design approval. The design plans and specifications must comply with the design standards set forth in Idaho Code §39-7409 and Idaho Code §39-7410. The Facility submitted to DEQ the tentative design report, *Eastern Idaho Regional Solid Waste District – Regional Municipal Solid Waste Landfill – Preliminary Design Report*, stamped and signed on December 20, 2022.

As required by Idaho Code §39-7411, on December 27, 2022, the Facility published notice that the municipal solid waste landfill tentative design report had been submitted and provided an opportunity for public comment. No public comments were received by DEQ. Please provide a detailed written response to these comments and any other written public comment letters you may have received in the final design report.

Upon review of the above-mentioned tentative design report, DEQ is providing the following comments to the Facility:

I. General

A. The tentative design report appears to only provide municipal solid waste landfill unit details on the construction of Cell A. Is the Facility proposing to phase the design and construction of the landfill? Are additional cells being proposed for this phase of the design? If the Facility only proposes Cell A in the final design report, additional municipal solid waste landfill units will be required to go through the design procedures outlined in Idaho Code §39-74 prior to waste disposal in those units.

II. Landfill Liner System

A. There does not appear to be any discussion regarding the need for a protective soil/sand layer above the drainage layer. Is the drainage layer intended to be a protective layer as well? Will the proposed liner system provide enough protection from being impacted by waste compaction and settling?

B. There does not appear to be any discussion regarding additional protections provided for areas subject to traffic or other concentrated activities during construction or operation.

III. Leachate Collection System

A. The leachate collection vee-trenches are proposed to be 12 inches deep with side slopes of 2 horizontal to 1 vertical. Industry standard for leachate collection vee-trenches are typically 18 inches deep with side slopes no steeper than 3 horizontal to 1 vertical. Will the proposed 2 horizontal to 1 vertical provide the slope stability to ensure that the leachate collection pipes will perform as designed and be protected from waste compaction and settling? Will the proposed 12 inch deep leachate collection vee-trenches adequately concentrate leachate flow to the collection piping as to maintain less than approximately 12 inches of leachate over the liner while operating as intended?

B. The tentative design appears to propose an HDPE geomembrane lining the base and sidewalls of the leachate collection trenches. Industry standard typically uses a geotextile with a minimum weight of 12 oz/yd^2. Will the proposed HDPE geomembrane provide the grab and puncture strength necessary to ensure bottom liner integrity? Will the HDPE geomembrane resist damage due to impact and puncture when aggregate is placed over the HDPE geomembrane?

C. There appears to be a leachate collection pipe which terminates on the bottom liner of Cell B on Sheet 5 of the drawing sheets included in the tentative design report. Are leachate cleanouts being designed to allow access from both sides of the landfill for jetting and camera inspections?

D. The tentative design report doesn't appear to address secondary containment methods for leachate lines outside of the lined area. Will leachate lines outside of the liner be sleeved or provided with other secondary containment methods?

E. The tentative design report doesn't appear to address secondary containment systems for leachate collection manholes. How will the Facility prevent the discharge of leachate to ground surface and surface waters in the event of a leak from the leachate collection manholes? Will means be provided to monitor and detect leachate manhole leaks?

F. The tentative design report doesn't clearly illustrate or describe how the leak detection system for the proposed leachate collection ponds will be implemented into the pond design.

G. The tentative design report doesn't address venting and access control for enclosed structures and manholes for leachate and gas control systems.

IV. Final Cover System

A. The tentative design report appears to propose interim soil for the layer directly below the 60 mil HDPE geomembrane liner for the final cover system. Conventional final cover systems typically use between 18 and 24 inches of compacted clay. Please address how the proposed interim soil layer of the final cover system will have a permeability less than or equal to the permeability of the bottom liner system, or a permeability no greater than 1E-5 cm/sec.

V. Landfill Gas Extraction System

A. The tentative design report does not appear to propose vertical gas wells or horizontal gas collection pipelines for the entire landfill. Is there justification as to why vertical gas wells and horizontal gas collection pipelines aren't being proposed for the entire landfill?

B. If vertical gas wells will be proposed, what is the maximum radius of influence for the vertical gas wells.

C. If vertical gas wells will be proposed, what will their borehole diameters be? Will the proposed borehole diameter provide enough protection for the gas well pipe from being impacted by waste compaction and settling? Will the proposed borehole diameter, along with the media surrounding the perforated portion of the gas well pipe, allow for the gas well pipe to adequately collect landfill gas?

D. If vertical gas wells will be proposed, how far will vertical gas extraction wells extend above the leachate collection system?

E. If vertical gas wells will be proposed, what will be the minimum pipe diameter inside the boreholes? Will the proposed pipe diameter provide enough protection from being impacted by waste compaction and settling? Will the proposed pipe diameter provide the radius of influence coverage necessary in order to adequately collect landfill gas based on the proposed configuration? Will the proposed gas well pipe diameter, along with the media surrounding the perforated portion of the gas well pipe, allow for the gas well pipe to adequately collect landfill gas?

F. If vertical gas wells will be proposed, what percentage or portion of the pipe in the boreholes will be slotted or perforated?

G. If vertical gas wells will be proposed, what will the backfill material around the slotted or perforated pipe in the borehole consist of? Will the proposed material provide the void space required to adequately allow the gas well pipe to collect landfill gas?

H. If vertical gas wells will be proposed, will there be flow control valves and sampling access ports?

I. Will the gas collection system contain a looped gas header system?

J. Will the gas collection system contain a drip leg installed immediately before the blower to separate condensate from gas?

K. How will the Facility collection and manage landfill gas condensate?

VI. Stormwater Management

A. If the construction phase of this project is anticipated to disturb one acre or more of land, or is part of a larger project that disturbs one acre or more of land, the project may be subject to regulation under the Idaho Pollutant Discharge Elimination System (IPDES) program administered by DEQ. Stormwater events that occur during construction should be managed according to the site-specific Stormwater Pollution Prevention Plan and the other requirements of the general permit. Submittal of a Notice of Intent for permit coverage under the Construction General Permit can be completed here at the IPDES E-Permitting System: *http://www2.deq.idaho.gov/water/IPDES/*.

It is the project owner's responsibility to use appropriate stormwater BMPs to prevent ground and surface water contamination.

VII. Groundwater Monitoring and "No Potential for Migration"

A. **Page 2, Section 1.3, second paragraph, second sentence:** Remove the word "conservative." There is nothing provided within this section, nor otherwise referenced in the document, that the modeled results are conservative. Some assumptions may be and are appropriately called out (e.g. constant head source).

B. **Page 5, Section 2.2.1.2, first paragraph:** The conceptual model and analysis described here is not an accurate depiction of infiltration and percolation potential. The conclusion that the only potential for infiltration is during months with snow cover and average high temperatures below zero is inconsistent with conceptual models of percolation. Because of this, it's unclear how useful this analysis is for informing decisions.

The amount of percolation through the soil is also dependent on available storage in the soil layers. Simple calculations incorporating storage (and seasonal differences) that could be more useful can be found in Water Balance Covers for Waste Containment from Albright et al (2010).

Additionally, please provide support for any assumptions related to runoff. The cited value (47%) is higher than observed values at other covers in southeast Idaho in areas with greater amounts of precipitation. [Benson et al (2022) Hydrology of Final Covers for Overburden Piles and Pit Backfill at High Elevation Mine Sites in Southeastern Idaho. Proceedings in Tailings and Mine Waste 2022, 6-9 Nov 2022, Denver, Colorado.]

C. **Page 5, Section 2.2.1.4:** There are domestic wells in the vicinity of the site. Please describe the depth to water of these wells and corresponding aquifer units. Additionally, describe the general flow direction and potential direction of flow of any water leaving the site.

D. **Page 6, Section 2.2.1.5:** Please describe the results of the well log search and how depths and interpretation of well logs compare to the observations made at the site.

E. **Page 6, Section 2.2.2, DB-1:** Please describe why this well was terminated at 430ft while this was thought to be the likely minimum depth to groundwater.

F. **Page 6, Section 2.2.2, DB-1:** Please describe why this well was terminated at 430ft while this was thought to be the likely minimum depth to groundwater.

G. **Page 11, Section 3.2.1.3:** It's unclear how DB-3 was seen and modeled as the most 'fractured' sequence. Although significant fractured sequences exist, there is also nearly 350 feet competent rock which is nearly as thick as the known sequence of DB-1 (assuming 70 ft excavated) above the completed hole. It would be helpful to describe, conceptually, how contaminants migrate through these two different modeled layers to understand the uncertainty in model results due to the assumptions of unit thickness for a particular modeled sequence.

H. **Page 12, Section 3.2.1.3, second paragraph:** Please provide more detail on the sensitivity of the porosity estimates, particularly with regard to the differences in porosity and effective porosity in transport times and depth of diffusion. The uncertainty in these parameter estimates are rather large based on the cited source, which likely came from other sources cited within Fetter (1994).

I. **Page 12, Section 3.2.2.1, Darcy velocity:** Please evaluate the uncertainty around this parameter. Please describe how the depth of percolation or VOC contamination changes when water is allowed to flow at the permeability of the restrictive layers?

The Facility may submit the final design report which addresses standards established by Idaho Code §39-74, applicable federal regulations and other relevant provisions of state law. The final design report shall also address any public comments received, as well as comments from DEQ related to objective standards. DEQ will review the Facility final design report in accordance with the procedures set forth in Idaho Code §39-7411.

Should you have any questions or require additional information, please do not hesitate to contact me at (208) 528-2620 or via e-mail at amanda.henderson@deq.idaho.gov.

Sincerely,

Amanda Henderson
Rules and Policy Coordinator

ec: Darby Pozenel, EIRSWD
Kevin Harris, Forsgren
Travis Pyle, GWE
Nathan Taylor, EIPH
Matt Beeter, DEQ SO
Rensay Owen, DEQ IFRO
Troy Saffle, DEQ IFRO
Taylor Enos, DEQ SO
Brady Johnson, DEQ SO

See what's possible.

GreatWest ENGINEERING

March 28, 2023

State of Idaho – Department of Environmental Quality
Attn: Amanda Henderson
900 N Skyline Dr.,
Idaho Falls, ID 83402
(transmitted electronically to Amanda.Henderson@deq.idaho.gov)

RE: EIRSWD Municipal Solid Waste Landfill Tentative Design Report – Compiled Engineer's Responses to DEQ's Comments

Dear Mrs. Henderson:

Thank you for your comments on the Tentative Design Report (also referred herein as the "Preliminary Design Report") for the proposed Eastern Idaho Regional Solid Waste District (EIRSWD) Regional Municipal Solid Waste (MSW) Landfill. Below are our responses to your comments (letter received by Todd Smith, President of the Eastern Idaho Regional Solid Waste District, on February 21, 2023).

I. General

A. The tentative design report appears to only provide municipal solid waste landfill unit details on the construction of Cell A. Is the Facility proposing to phase the design and construction of the landfill? Are additional cells being proposed for this phase of the design? If the Facility only proposes Cell A in the final design report, additional municipal solid waste landfill units will be required to go through the design procedures outlined in Idaho Code §39-74 prior to waste disposal in those units.

Response: The Preliminary Design Report follows suit with the Master Development Plan, which was attached to the Site Certification Application. The Preliminary Design Report includes and shows the development of all four proposed landfill Cells (A, B, C, and D). It then goes into additional detail for the first cell to be developed (Cell A), which will be followed by the Final Design Report for Cell A as part of the next steps of this regulatory approval process. Before the next cells are constructed in the future, Final Design Reports will be prepared for each of the cells (Cells B, C, and then D) for DEQ approval. This stepwise approach is what I have taken on other landfill projects in Idaho over the years with the DEQ. That is, approval of the entire landfill by the Site Cert and Preliminary Design Report and then paring it down to the development of each individual cell for DEQ approval of the Final Designs. Future designs may change over the course of the next 40-50 years depending on the technology for engineering and materials, and so is the reason we tend to not propose to go through Final Design for the future cells until they are needed for expansion.

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II. Landfill Liner System

A. There does not appear to be any discussion regarding the need for a protective soil/sand layer above the drainage layer. Is the drainage layer intended to be a protective layer as well? Will the proposed liner system provide enough protection from being impacted by waste compaction and settling?

Response: As shown in the plan sheet details, the lined side slope will be covered with 24" of select native soil as a protective layer. The floor will be covered by the 15" of drain gravel. Both the side slopes and floor will be protected with a 16-oz cushion geotextile (between these layers and the 60-mil geomembrane) as a matter of best practice to help avoid liner damage. The preparation of the engineered foundation layer (min 6-inch of compacted, select native soil) will provide a smooth, firm and unyielding base for the bottom liner system to be deployed. As a matter of standard practice, the first lift of MSW that is placed in the landfill is considered the "fluff" layer. This includes only standard household garbage (no C&D garbage) with close watch on any large materials or materials that could pierce through the 24" side slope soil or 15" gravel on the floor. It is also not heavily compacted when placed. The construction of the "fluff" layer will be included in the Operations Plan to be approved by the local health department.

B. There does not appear to be any discussion regarding additional protections provided for areas subject to traffic or other concentrated activities during construction or operation.

Response: Yes, as stated, this is a construction and operations matter. Placement of the soil and gravel will be done in such a manner as to protect the liner as per the technical specifications for the project (to be included as part of the Final Design package). Operations will include construction of an access into the landfill with additional cover and protection over the 15" gravel layer (to also be shown in the Final Design package). This will also be covered in the Operations Plan.

III. Leachate Collection System

A. The leachate collection vee-trenches are proposed to be 12 inches deep with side slopes of 2 horizontal to 1 vertical. Industry standard for leachate collection vee-trenches are typically 18 inches deep with side slopes no steeper than 3 horizontal to 1 vertical. Will the proposed 2 horizontal to 1 vertical provide the slope stability to ensure that the leachate collection pipes will perform as designed and be protected from waste compaction and settling? Will the proposed 12 inch deep leachate collection vee-trenches adequately concentrate leachate flow to the collection piping as to maintain less than approximately 12 inches of leachate over the liner while operating as intended?

See what's *possible*.

Response: As a matter of engineering best practice, these v-ditches can be any reasonable depth and side slope grade. A depth of 12 inches with 2H:1V slopes is satisfactory given that the leachate collection pipes will likely be 6" to 8" diameter perforated HDPE (SDR 11) pipe and will inset in the 12" deep v-notch of the trench. Long slopes of 2H:1V are not recommended for veneer stability reasons; however, this is a small impression in the floor of the landfill, which slopes at approximately 3% toward the leachate sump. The entire floor including this v-ditch will be filled / covered with gravel. This design will perform to manage leachate as required by the rules.

B. The tentative design appears to propose an HDPE geomembrane lining the base and sidewalls of the leachate collection trenches. Industry standard typically uses a geotextile with a minimum weight of 12 oz/yd2. Will the proposed HDPE geomembrane provide the grab and puncture strength necessary to ensure bottom liner integrity? Will the HDPE geomembrane resist damage due to impact and puncture when aggregate is placed over the HDPE geomembrane?

Response: As noted above, the entire floor, including the leachate collection v-ditches, will be lined with a 16-oz cushion geotextile. It is not recommended to "burrito wrap" the collection pipe and ditch gravel with geotextile.

C. There appears to be a leachate collection pipe which terminates on the bottom liner of Cell B on Sheet 5 of the drawing sheets included in the tentative design report. Are leachate cleanouts being designed to allow access from both sides of the landfill for jetting and camera inspections?

Response: Leachate cleanouts will be provided on each end of the collection lines for both the central collector and the toe collectors. I am not sure what you are referring to on Sheet 5 that indicates that leachate line will terminate on the bottom. Sheet 9 shows Cell A and where the central collector will temporarily terminate on the floor until Cell B is constructed; at which point, the central collector will be extended into Cell B and then up the side slope to a cleanout at the perimeter road. The cleanouts will allow for camera inspection and flushing / jetting as needed for maintenance of these lines.

D. The tentative design report doesn't appear to address secondary containment methods for leachate lines outside of the lined area. Will leachate lines outside of the liner be sleeved or provided with other secondary containment methods?

See what's *possible*.

Response: There is no regulatory requirement for providing secondary containment for systems outside of the landfill. We have not planned to include sleeves or double-containment pipes for leachate lines outside of the lined landfill. Leachate lines will be HDPE and will be tested for leaks before they go into service. They can also be tested periodically for leaks as part of the Operations Plan, if required.

E. The tentative design report doesn't appear to address secondary containment systems for leachate collection manholes. How will the Facility prevent the discharge of leachate to ground surface and surface waters in the event of a leak from the leachate collection manholes? Will means be provided to monitor and detect leachate manhole leaks?

Response: At this time, we don't plan on having any leachate manholes. The leachate will be pumped from the sumps in HDPE pipes to one or both of the leachate ponds. There will also be vault(s) along the alignment of the leachate line to the ponds. These will be detailed as part of the Final Design Report.

F. The tentative design report doesn't clearly illustrate or describe how the leak detection system for the proposed leachate collection ponds will be implemented into the pond design.

Response: The purpose of the Preliminary Design Report is to show that there will be secondary liners and leak detection for the two landfill leachate sumps and the two leachate ponds. The details of these will be provided in the Final Design package. The Operations Plan will cover the inspection of these systems and what is considered a reasonable leakage rate into these systems based on industry standards.

G. The tentative design report doesn't address venting and access control for enclosed structures and manholes for leachate and gas control systems.

Response: There are no gas control systems included in this design except for the proposed gas probes that will be placed around the perimeter of the landfill as shown and described in the Preliminary Design Report. Access control to structures, confined spaces, etc. will be covered in the Operations Plan.

See what's *possible*.

IV. Final Cover System

A. The tentative design report appears to propose interim soil for the layer directly below the 60 mil HDPE geomembrane liner for the final cover system. Conventional final cover systems typically use between 18 and 24 inches of compacted clay. Please address how the proposed interim soil layer of the final cover system will have a permeability less than or equal to the permeability of the bottom liner system, or a permeability no greater than 1E-5 cm/sec.

Response: The rules do not require 18 to 24 inches of a compacted clay liner. There is no clay in the area. Section 8 of the Preliminary Design Report summarizes the rules. The proposed final cover system includes the base contouring layer to provide a stable, unyielding, and smooth surface for the 60-mil HDPE geomembrane to be placed on top. This geomembrane has a k value no greater than 1x10-5 cm/sec as required by the rules (and matches the floor liner geomembrane). As noted, final covers typically use LLDPE instead of HDPE for purposes of better performance due to settling actions of the landfill waste. Included with the geomembrane will be some sort of water collection layer (drainage net for example) for stability and management of infiltrate. This is covered by the ant-infiltration layer of select, native soil (18 inches) and then the min 6-inch vegetated topsoil. Again, this a prescriptive cover section. The District would like to retain the possibility of substituting with an alternative ET cover in the future should they deem this reasonable and would need to be approved by the DEQ at that time.

V. Landfill Gas Extraction System

A. The tentative design report does not appear to propose vertical gas wells or horizontal gas collection pipelines for the entire landfill. Is there justification as to why vertical gas wells and horizontal gas collection pipelines aren't being proposed for the entire landfill?

Response: Landfill gas extraction is not required until the landfill triggers Title V (Tier I) and the NMOC mass emissions are greater than 34 Mg/yr as measured by either armchair modeling (LandGEM) or one of the other tiers of testing and calculations. Refer to Section 7.0 of the report. The District will be advised to install horizontal gas wells as they build the landfill as part of their Operations Plan, if they so desire. If they don't install horizontal wells, eventually the landfill will trigger the NSPS or EGs and will require vertical wells.

B. If vertical gas wells will be proposed, what is the maximum radius of influence for the vertical gas wells.

See what's *possible*.

Response: See above. Typically, we place vertical gas wells on 150-200' centers with a radius of influence of 200'-300' but ultimately depends on the timing of the well install(s) and the concentration of landfill gas in areas that need to be alleviated. That is, the spacing could be closer if there is a lot of gas in a particular area to meet surface emission monitoring requirements.

C. If vertical gas wells will be proposed, what will their borehole diameters be? Will the proposed borehole diameter provide enough protection for the gas well pipe from being impacted by waste compaction and settling? Will the proposed borehole diameter, along with the media surrounding the perforated portion of the gas well pipe, allow for the gas well pipe to adequately collect landfill gas?

Response: Typically, landfill gas wells are completed by a bucket-auger rig that advances 30-36" diameter boreholes. Vertical wells, if required, are recommended to be done once the landfill is completely filled as to not have to fill around them during operations.

D. If vertical gas wells will be proposed, how far will vertical gas extraction wells extend above the leachate collection system?

Response: The leachate collection system (cleanouts) act as gas collectors as well. It all depends on the layout and the need for the vertical wells on their proximity to the leachate collection system. The bottom of the vertical gas well will be at least 10' above the floor of the landfill cell to protect the cell from possible damage during boring operations.

E. If vertical gas wells will be proposed, what will be the minimum pipe diameter inside the boreholes? Will the proposed pipe diameter provide enough protection from being impacted by waste compaction and settling? Will the proposed pipe diameter provide the radius of influence coverage necessary in order to adequately collect landfill gas based on the proposed configuration? Will the proposed gas well pipe diameter, along with the media surrounding the perforated portion of the gas well pipe, allow for the gas well pipe to adequately collect landfill gas?

Response: Typically, the vertical wells are 4-6" diameter pipe. They are encased with gravel through the screen sections and then capped with bentonite or another low perm material to seal off the top.

F. If vertical gas wells will be proposed, what percentage or portion of the pipe in the boreholes will be slotted or perforated?

Response: It depends, but typically as a rule of thumb 2/3 of the length is perforated pipe and 1/3 is solid pipe.

See what's *possible*.

G. If vertical gas wells will be proposed, what will the backfill material around the slotted or perforated pipe in the borehole consist of? Will the proposed material provide the void space required to adequately allow the gas well pipe to collect landfill gas?

Response: Annular space backfill will consist of drain gravel. The size needs of the gravel will be designed to be compatible with the pipe perforations. Gravel is a standard media to allow enough void space for the landfill gas to transmit for collection in the well.

H. If vertical gas wells will be proposed, will there be flow control valves and sampling access ports?

Response: Standard of practice is to provide wellheads to control gas flow and measure flow rate and gas content.

I. Will the gas collection system contain a looped gas header system?

Response: It depends on the need and sizing of the gas header to induce proper vacuum and carry flow. This is a design decision.

J. Will the gas collection system contain a drip leg installed immediately before the blower to separate condensate from gas?

Response: As a standard of practice, condensate is managed as part of the gas system. Low points in the line (sags) will include condensate knockouts to collect and drain condensate to sumps for management.

K. How will the Facility collection and manage landfill gas condensate?

Response: As a standard of practice, it will be either collected in sumps along the gas header or will drain into the landfill leachate collection system or into the leachate pond system.

See what's *possible*.

VI. Stormwater Management

A. If the construction phase of this project is anticipated to disturb one acre or more of land, or is part of a larger project that disturbs one acre or more of land, the project may be subject to regulation under the Idaho Pollutant Discharge Elimination System (IPDES) program administered by DEQ. Stormwater events that occur during construction should be managed according to the site-specific Stormwater Pollution Prevention Plan and the other requirements of the general permit. Submittal of a Notice of Intent for permit coverage under the Construction General Permit can be completed here at the IPDES E-Permitting System: http://www2.deq.idaho.gov/water/IPDES/. It is the project owner's responsibility to use appropriate stormwater BMPs to prevent ground and surface water contamination.

Response: Required by the construction contract (between the Owner and Contractor), the Contractor will be required to prepare a SWPPP utilizing best management practices (BMPs) for erosion and sediment control for the duration of the project. They will be required to file an notice of intent (NOI) for the Construction General Permit and be the "operator" through the entire construction process until they file the notice of termination (NOT) upon completion and when it's all stabilized.

VII. Groundwater Monitoring and "No Potential for Migration"

*A. **Page 2, Section 1.3, second paragraph, second sentence:** Remove the word "conservative." There is nothing provided within this section, nor otherwise referenced in the document, that the modeled results are conservative. Some assumptions may be and are appropriately called out (e.g. constant head source).*

Response: The word 'conservative' will be removed in this section and a search will be done in the document to locate and remove other references. The assumptions are included in the report and the readers can interpret the model setup and related results accordingly.

See what's *possible*.

B. ***Page 5, Section 2.2.1.2, first paragraph:*** *The conceptual model and analysis described here is not an accurate depiction of infiltration and percolation potential. The conclusion that the only potential for infiltration is during months with snow cover and average high temperatures below zero is inconsistent with conceptual models of percolation. Because of this, it's unclear how useful this analysis is for informing decisions.*

The amount of percolation through the soil is also dependent on available storage in the soil layers. Simple calculations incorporating storage (and seasonal differences) that could be more useful can be found in Water Balance Covers for Waste Containment from Albright et al (2010).

Additionally, please provide support for any assumptions related to runoff. The cited value (47%) is higher than observed values at other covers in southeast Idaho in areas with greater amounts of precipitation. [Benson et al (2022) Hydrology of Final Covers for Overburden Piles and Pit Backfill at High Elevation Mine Sites in Southeastern Idaho. Proceedings in Tailings and Mine Waste 2022, 6-9 Nov 2022, Denver, Colorado.]

Response: This analysis uses the area climate data from the nearest weather station data and provides a general indication of timing for infiltration potential (months), and estimated infiltration potential for those months. It is intended as a general indication of infiltration potential considering area climate/weather and surface conditions; the analysis is not a quantitative subsurface flow model, nor does it attempt to simulate subsurface storage and related infiltration. The results from this analysis are not used as an input of the alternative liner, nor are the results from the analysis used in modeling for the no migration demonstration since the model and landfill leachate collection system assume a 'constant head source'.

The runoff coefficient assumed "rolling terrain" to match the site conditions (10% slopes) and approximated a type of cover of "Cultivated Land, Clay and Loam – Hilly" with a runoff coefficient (ROC) of 0.55. The value of 0.53 used in the analysis is based on a ratio of type of cover and percent land of that type for the planned facility; for example: 65% of the land is classified as Cultivated Land, Clay and Loam, Hilly with ROC of 0.6; 30% of land classified as Cultivated Land, Sand and Gravel, Rolling with ROC of 0.3; and 5% of land considered pavement and roads – flat with ROC of 0.9; these yield a ROC of 0.53 used in the analysis.

In summary, the analysis provides qualitative or semi-quantitative indication of temporal period of percolation potential, and the overall quantity of potential recharge, from a very simple approach. The output is not used to inform the analytical model or used for any substantive management decisions. If desired by DEQ, these clarifications could be included in the report; alternatively, the analysis could be removed from the document as it does not alter or inform the model setup and related results.

See what's *possible*.

C. ***Page 5, Section 2.2.1.4:*** *There are domestic wells in the vicinity of the site. Please describe the depth to water of these wells and corresponding aquifer units. Additionally, describe the general flow direction and potential direction of flow of any water leaving the site.*

Response: Section 2.2.1.5 provides a discussion of the well records found within a 2.5-mile radius of the site from the IDWR search tool; the actual logs are included in Appendix B.1.6. The report will be revised to provide a brief narrative of the information on these logs with respect to depth to water and geologic unit (types of subsurface units) as provided by the driller.

In addition, DEQ requests to… "describe the general flow direction and potential direction of flow of any water leaving the site."

Response: Based on the regional hydrogeology discussion, including topographic maps, surface water maps, maps of the SRPA, it would be inferred that the potential direction for groundwater flow would be away from recharge areas inferred to be higher elevations, and toward discharge areas inferred to be lower elevations. Given the site setting and features, and these inferred concepts on groundwater flow, it would be expected that potential groundwater flow may be to the west or northwest. However, since uppermost groundwater was not identified to at least 700 ft bgs at the site, the potential groundwater beneath the site cannot be compared to adjacent groundwater conditions, which are miles away. As such, any inference on potential (theoretical) groundwater flow direction at the site is not provided in the report.

D. ***Page 6, Section 2.2.1.5:*** *Please describe the results of the well log search and how depths and interpretation of well logs compare to the observations made at the site.*

Response: As noted above, the report will be revised in Section 2.2.1.5 (Well Log Search) to summarize the well log information from the map and well logs included in Appendix B.1.6 and will include hydrogeologic interpretation of how the well logs compare to observations of the deep borings drilled at the site.

E. ***Page 6, Section 2.2.2, DB-1:*** *Please describe why this well was terminated at 430ft while this was thought to be the likely minimum depth to groundwater.*

See what's *possible*.

Response: DB-1 was drilled first in sequence of the 3 deep borings. At a depth of approximately 455 ft, the driller indicated he thought he had encountered uppermost groundwater; he left the borehole open overnight and then re-assessed borehole conditions with recovery measurements the next morning. Drilling advancement in the rock formation required adding potable water for lubrication; from recovery measurements the driller confirmed the presence of borehole water was from the added potable water and not groundwater from the formation. The driller communicated this to the Forsgren Project Manager (Mr. Kevin Harris), and then there was a miscommunication which led to the driller abandoning DB-1 and moving to the next location, instead of continuing advancement at DB-1. In summary, this was a miscommunication and the intent was to continue deeper at DB-1.

Note that the logic for 3 wells in the Work Plan was in consideration that 3 locations, positioned in a triangular arrangement, could yield information with respect to both the depth to uppermost groundwater (if encountered) and insight on the potential groundwater flow direction, which would require borehole and groundwater level information from at least 3 points. This logic is reasonable if all 3 wells encounter uppermost groundwater unit. One or two deep borings advanced to depths of 700 ft bgs is considered sufficient for the scale of the site to determine presence of, or depth to, uppermost groundwater. Drilling DB-1 to 455 ft bgs, and the other two borings to 700 ft bgs is not considered a significant deviation from Work Plan with respect to the identification of the depth to uppermost groundwater at the site.

Clarification to DEQ, note that DB-1 was advanced to 455 ft bgs, which is noted on the log, and consistent with Table 1, Figure 5, Figure 6. The report narrative in Section 2.2.1.5 notes 430 ft and is incorrect (editorial typo) in Section 2.2.1.5. This section will be updated in the final report to cite DB-1 total depth at 455 ft bgs.

F. ***Page 11, Section 3.2.1.3:*** *It's unclear how DB-3 was seen and modeled as the most 'fractured' sequence. Although significant fractured sequences exist, there is also nearly 350 feet competent rock which is nearly as thick as the known sequence of DB-1 (assuming 70 ft excavated) above the completed hole. It would be helpful to describe, conceptually, how contaminants migrate through these two different modeled layers to understand the uncertainty in model results due to the assumptions of unit thickness for a particular modeled sequence.*

See what's *possible*.

Response: As described in the report in Section 3.2.1.3, the field observations of the primary rhyolite unit were transferred onto the boring logs, and then the logs were used to generate the cross-section A-A' (Figure 6). The rhyolite was inferred to be categorized as either more fractured, or more competent, based on field observations. As shown in cross-section, DB-3 is the most fractured sequence of the drilled depth for each of the 3 deep borings. For example, at DB-3, at depths below 70 ft (excavated depth for liner construction) and at depths less than 530 ft, there was a sequence of 273 ft (257-530 ft) of 'fractured' rhyolite, which is more fractured (greater thickness) than the other two borings to that same depth. As described in the report, the model profile was setup according to the most fractured boring to simulate potential migration through the liner and into the underlying attenuation layers, to support alternative liner and no migration demonstration. Conceptually, the more fractured 'media' the greater migration potential with respect to either liquid phase contaminate migration, or via chemical diffusion. Less fractured, or more competent rock, would be inferred to provide more of a protective "barrier" to potential contaminant migration. The model setup to account for the two different types of layers (fractured or more competent) noted that in-situ porosity and density are virtually impossible to obtain but can be approximated from published values of 'igneous rocks' for both variables. See additional response below as additional sensitivity runs will be performed to demonstrate the sensitivity of porosity on model results.

G. ***Page 12, Section 3.2.1.3, second paragraph:*** *Please provide more detail on the sensitivity of the porosity estimates, particularly with regard to the differences in porosity and effective porosity in transport times and depth of diffusion. The uncertainty in these parameter estimates are rather large based on the cited source, which likely came from other sources cited within Fetter (1994).*

Response: Agree that porosity (voids) or in practice effective porosity (interconnected voids), whether in sediments (alluvial environment) or fractured rock, can vary substantially. The report and associated model used what is believed to be the most representative values for porosity for the observed rock types from published literature. The most representative method to respond to this question is to perform additional modeling and adjust the porosity value. The revised report will describe the additional sensitivity runs on adjusting the inputs for porosity and the related changes to model results.

H. ***Page 12, Section 3.2.2.1, Darcy velocity:*** *Please evaluate the uncertainty around this parameter. Please describe how the depth of percolation or VOC contamination changes when water is allowed to flow at the permeability of the restrictive layers?*

See what's *possible*.

Response: The Darcy Velocity is described in the report via 2 different applications of the predictive model. The first instance is in Section 3.2.2.1. In this application, the Darcy Velocity would be relevant if the model assumed mechanical dispersion (liquid flow) through the liner system; however, for a 'diffusion only' model, this K value is set to 0 and thus models the effects of chemical diffusion given the low permeability of the liner system. The second instance of Darcy Velocity is described in Section 3.2.2.2 under Boundary Conditions, and this K value establishes the groundwater flow (flux) in uppermost groundwater (i.e., saturated flow). For this second application, the report notes a value of 1 ft/day, which is a mid to higher K value, but is effectively irrelevant if contamination does not reach uppermost groundwater.

In summary, Darcy Velocity parameter is not a source of uncertainty in the way the model simulates potential contaminant migration through the liner system for a diffusion-based model, nor does it affect the transport in the vadose zone. Since the model did not predict source concentrations would travel entirely through the vadose zone and reach the inferred depth to uppermost groundwater assumed at 630 ft below the liner system, the 2nd application of Darcy Flow velocity is irrelevant for model output.

In closing, we would like to gain a consensus on our responses before we finish the Final Design Report. Please let me know when we can schedule a meeting to go over these responses and come to an agreement for the path forward.

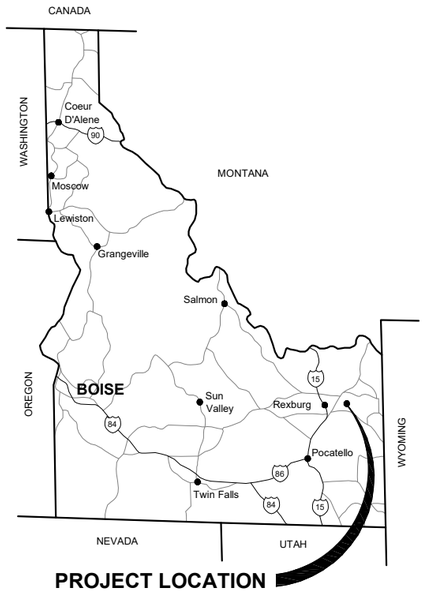
Sincerely,
Great West Engineering, Inc.

Travis Pyle, PE
Business Unit Manager

See what's *possible*.

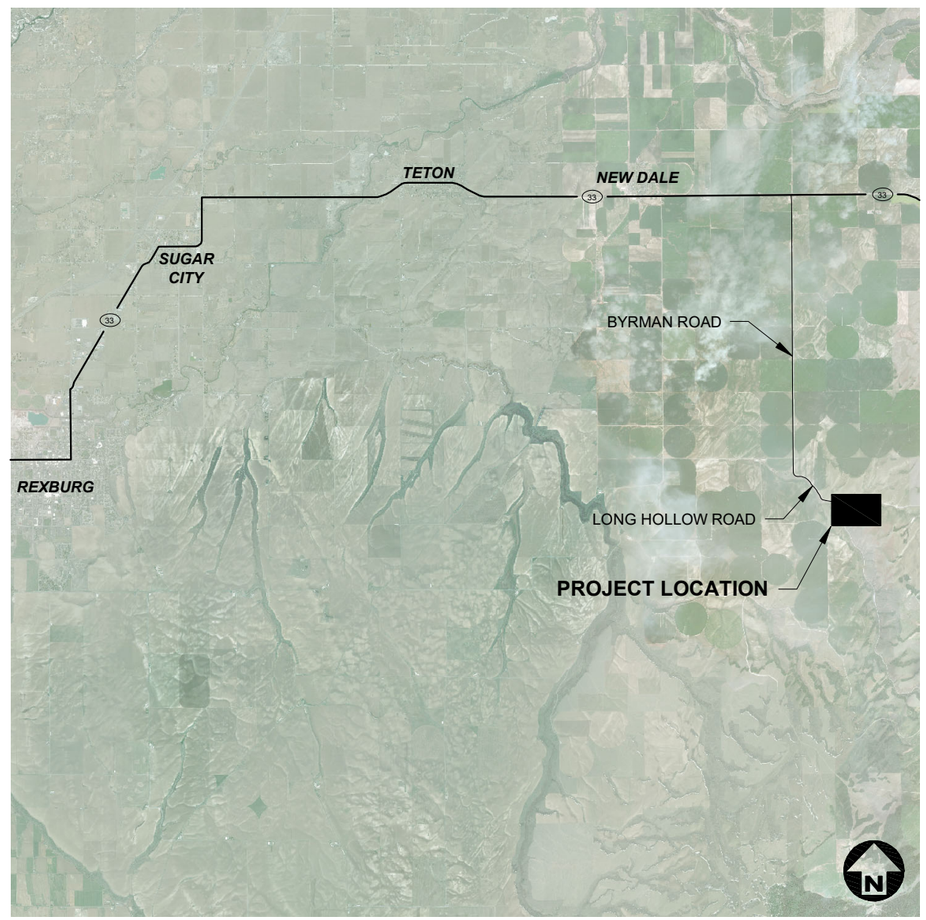
APPENDIX B

Design Drawings



EIRSWD
REGIONAL MSW LANDFILL
CELL A DEVELOPMENT

FOR PERMIT APPROVAL TO CONSTRUCT



NOT TO SCALE

SHEET INDEX

PROJECT: 4-20133
DATE: JUNE 30, 2023

SHEET 1	COVER
SHEET 2	LEGEND, ABBREVIATIONS, AND GENERAL NOTES
SHEET 3	EXISTING SITE PLAN
SHEET 4	SITE DEVELOPMENT PLAN
SHEET 5	CELL A BASE GRADING PLAN
SHEET 6	CELL A BASE GRADING SECTION
SHEET 7	ENTRANCE ROAD PLAN AND PROFILE
SHEET 8	PERIMETER ROAD PLAN AND PROFILE
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SHEET 23	DETAILS

PLANS PREPARED FOR:

EASTERN IDAHO REGIONAL
SOLID WASTE DISTRICT

APPROVED BY:

TRAVIS PYLE, P.E.
GREAT WEST ENGINEERING

PROFESSIONAL ENGINEER REGISTERED 11535 STATE OF IDAHO TRAVIS A. PYLE
6-30-2023

QA/QC BY:

STEPHANIE BECKERT, P.E.
GREAT WEST ENGINEERING

PLANS PREPARED BY:

BRET ANDERSON

GreatWest ENGINEERING
1921 E. OVERLAND ROAD
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(208)576-6646

NO.	REVISION DESCRIPTION	BY	DATE

SET NO.

SHEET NO.
1

Y:\Shared\Boise Projects\4-20133-E Idaho SW District Landfill Design And Engineering Support\CADD 4-20133-Cell A\Sheets\4-20133-CA-01-Cover.dwg

ABBREVIATIONS

@	AT
Δ	ANGLE OF DEFLECTION, DELTA ANGLE
<PT	ANGLE POINT
AB	ANCHOR BOLT
ABDN	ABANDON
AC	ASBESTOS CONCRETE
ADDN	ADDITIONAL
ADJ	ADJACENT
AFF	ABOVE FINISHED FLOOR
ALT	ALTERNATE
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
APPROX	APPROXIMATE
APVD	APPROVED
ARCH	ARCHITECTURE, ARCHITECTURAL
ASPH	ASPHALT
AVE	AVENUE
AVG	AVERAGE
BFV	BUTTERFLY VALVE
BLDG	BUILDING
BLK	BLOCK
BLVD	BOULEVARD
BM	BEAM, BENCHMARK
BOT	BOTTOM
BRG	BEARING
BRKT	BRACKET
BVC	BEGIN VERTICAL CURVE
C-C	CENTER TO CENTER
CHAN	CHANNEL
CHK	CHECK
CI	CAST IRON
CIPC	CAST-IN-PLACE CONCRETE
CIRC	CIRCULAR
CJ	CONSTRUCTION JOINT, CONTROL JOINT
℄	CENTER LINE
CLR	CLEAR, CLEARANCE
CMP	CORRUGATED METAL PIPE
CMU	CONCRETE MASONRY UNITS
CO	CLEANOUT
COL	COLUMN
CONC	CONCRETE
CONSTR	CONSTRUCTION
CONT	CONTINUE, CONTINUED, CONTINUOUS
CONTR	CONTRACTOR
COORD	COORDINATE
CP	CONTROL PANEL, CONTROL POINT
CPLG	COUPLING
CTR	CENTER
CTV	CABLE TELEVISION
CU	CUBIC, COPPER
CF	CUBIC FEET
CULV	CULVERT
CY	CUBIC YARD
DET	DETAIL
DI	DUCTILE IRON, DRAIN INLET
DIA, ø	DIAMETER
DIAG	DIAGONAL
DIM	DIMENSION
DR	DRIVE
DWG	DRAWING
E	EAST
EA	EACH
EL, ELEV	ELEVATION
ELB	ELBOW
ELEC	ELECTRIC, ELECTRICAL
ENCL	ENCLOSE
ENGR	ENGINEER
EOP	EDGE OF PAVEMENT
EQ	EQUAL, EQUALLY
EQ SP	EQUALLY SPACED
EQUIP	EQUIPMENT
EQUIV	EQUIVALENT
EVC	END VERTICAL CURVE
EW	EACH WAY
EXC	EXCAVATE
EXP	EXPANSION
EXP JT	EXPANSION JOINT
EXST	EXISTING
FCV	FLOW CONTROL VALVE
FD	FLOOR DRAIN
FDN	FOUNDATION
FES	FLARED END SECTION
FET	FLARED END TERMINAL
FF	FINISHED FLOOR
FG	FINISH GRADE
FHYD	FIRE HYDRANT
FJ	FLANGE JOINT
FL	FLOW LINE
FLEX	FLEXIBLE
FM	FORCEMAIN
FT	FOOT, FEET
FO	FIBER OPTIC
FTG	FOOTING, FITTING
G	NATURAL GAS
GA	GAGE, GAUGE
GAL	GALLON
GALV	GALVANIZED
GND	GROUND
GVL	GRAVEL
HB	HOSE BIB
HDPE	HIGH DENSITY POLYETHYLENE
HOR, HORIZ	HORIZONTAL
HWY	HIGHWAY
HYD	HYDRANT
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
IN	INCH
INV	INVERT
JB	JUNCTION BOX
JT	JOINT
K	RATE OF VERTICAL CURVATURE
LBS	POUNDS
LF	LINEAR FEET
LN	LANE
LPG	LIQUID PROPANE GAS
LT	LEFT
MAX	MAXIMUM
MD	MEASURE DOWN
MFD	MANUFACTURED
MFR	MANUFACTURE, MANUFACTURER
MH	MANHOLE
MIN	MINIMUM
MISC	MISCELLANEOUS
MJ	MECHANICAL JOINT
MOV	MOTOR OPERATED VALVE
MPWSS	MONTANA PUBLIC WORKS STANDARD SPECIFICATIONS
N	NORTH
NE	NORTHEAST
NG	NATURAL GAS
NIC	NOT IN CONTRACT
NO	NUMBER
NOM	NOMINAL
NTS	NOT TO SCALE
NW	NORTHWEST
OC	ON CENTER
OD	OUTSIDE DIAMETER
OF	OVERFLOW
OH	OVERHEAD
OHP	OVERHEAD POWER
OHT	OVERHEAD TELEPHONE
OPNG	OPENING
PC	POINT OF CURVATURE
PCC	POINT OF COMPOUND CURVATURE
PE	PLAIN END, POLYETHYLENE
PERP	PERPENDICULAR
PI	POINT OF INTERSECTION
PL	PROPERTY LINE
PNL	PANEL
PRC	POINT OF REVERSE CURVATURE
PREFAB	PREFABRICATED
PRELIM	PRELIMINARY
PREP	PREPARE, PREPARATION
PROP	PROPERTY
PRV	PRESSURE REDUCING VALVE
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PT	POINT, POINT OF TANGENCY
PVC	POLYVINYL CHLORIDE
PVI	POINT OF VERTICAL INTERSECTION
PVMT	PAVEMENT
R, RAD	RADIUS
RC	REINFORCED CONCRETE
RCP	REINFORCED CONCRETE PIPE
RD	ROAD
RDCR	REDUCER
REBAR	REINFORCEMENT BAR
REF	REFERENCE
REINF	REINFORCE
REQD	REQUIRED
RR	RAILROAD
RST	REINFORCING STEEL
RT	RIGHT
R/W	RIGHT-OF-WAY
S	SOUTH, SANITARY SEWER
SAN	SANITARY
SCH	SCHEDULE
SD	STORM DRAIN
SDWK	SIDEWALK
SE	SOUTHEAST
SECT	SECTION
SF	SQUARE FOOT
SHT	SHEET
SIM	SIMILAR
SLP	SLOPE
SPEC	SPECIFICATION
SQ	SQUARE
SSTL	STAINLESS STEEL
STA	STATION
SS	SANITARY SEWER SERVICE
STD	STANDARD
ST	STREET
STL	STEEL
STRUCT	STRUCTURE
SW	SOUTHWEST
SYM	SYMMETRICAL
TB	THRUST BLOCK
TBC	TOP BACK OF CURB
TBM	TEMPORARY BENCH MARK
TEL	TELEPHONE
TEMP	TEMPORARY
THRU	THROUGH
TYP	TYPICAL
UG	UNDERGROUND
UGP	UNDERGROUND POWER
UGT	UNDERGROUND TELEPHONE
UTIL	UTILITY
V	VALVE, VOLT
VB	VALVE BOX
VERT	VERTICAL
VOL	VOLUME
W	WEST, WATER
WTR	WATER
WD	WOOD
W/	WITH
W/O	WITHOUT
WL	WETLAND
WM	WIRE MESH, WATER METER
WS	WATERSTOP, WATER SURFACE, WATER SERVICE
WT	WEIGHT
WV	WATER VALVE
WWF	WELDED WIRE FABRIC
WWM	WELDED WIRE MESH
XFMR	TRANSFORMER
X-ING	CROSSING
XS	CROSS SECTION
YD	YARD

LEGEND

EXISTING	PROPOSED	DESCRIPTION	EXISTING	PROPOSED	DESCRIPTION
		MAJOR CONTOUR			STUMP
		MINOR CONTOUR			SHRUB/BUSH
OHT	OHT	OVERHEAD TELEPHONE			TREE-CONIFER
UGT	UGT	UNDERGROUND TELEPHONE			TREE-DECIDUOUS
CTV	CTV	CABLE TELEVISION			TREE LINE
FO	FO	FIBER OPTIC			COMMUNICATION MANHOLE
G	G	NATURAL GAS	C	C	COMMUNICATION VAULT
OHP	OHP	OVERHEAD POWER	T	T	TELEPHONE RISER
UGP	UGP	UNDERGROUND POWER	TV	TV	CABLE TV RISER
S	S	SANITARY SEWER			NATURAL GAS METER
SS SS SS	SS SS SS	SANITARY SEWER SERVICE	G	G	NATURAL GAS RISER
FM	FM	SANITARY SEWER FORCEMAIN			NATURAL GAS VALVE
SD	SD	STORM DRAIN			LIGHT POLE
		STORM CULVERT			STREET LIGHT POLE
W	W	WATER	P	P	POWER RISER
WS WS WS	WS WS WS	WATER SERVICE			PAD MOUNTED TRANSFORMER
		CHAINLINK FENCE	P	P	POWER VAULT
X X X	X X X	BARBED WIRE FENCE			UTILITY POLE
		WOOD FENCE			GUY WIRE
		PAVED ROAD	S	S	SANITARY MANHOLE
		GRAVEL ROAD	CO	CO	SANITARY CLEANOUT
		PROPERTY/LOT LINE			SANITARY LAMPHOLE
		PROPERTY EASEMENT	ST	ST	STORM MANHOLE
		PROPERTY SETBACK			STORM ROUND INLET
		RIGHT-OF-WAY			STORM SQUARE INLET
		CITY LIMIT/DISTRICT BOUNDARY			STORM CATCH BASIN
		RAILROAD			11.25° ELBOW
		DITCH			22.50° ELBOW
		WATER EDGE			45° ELBOW
WL		WETLAND			90° ELBOW
		BUILDING			TEE
		BENCHMARK			CROSS
		CONTROL POINT			CAP
		PROPERTY PIN			FIRE HYDRANT
		BORING			GATE VALVE
		MONITORING WELL			REDUCER
		TEST PIT			WATER METER
		BOLLARD	W	W	WELL
		MAIL BOX			CURB STOP
		SIGN			FROST FREE HYDRANT

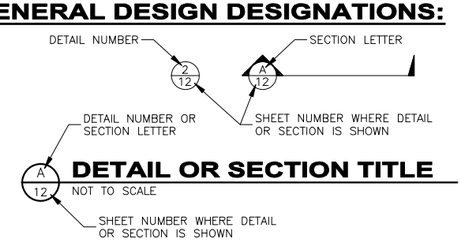
GENERAL NOTES:

1. THIS IS A STANDARD LEGEND AND ABBREVIATION LIST. THEREFORE, NOT ALL SYMBOLS AND ABBREVIATIONS MAY BE USED ON THIS PROJECT.

PROJECT NOTES:

1. TOPOGRAPHICAL SURVEY BY FORSGREN ASSOCIATES, INC., DATED OCTOBER 18, 2022. SUPPLEMENTAL TOPOGRAPHICAL SURVEY BY FORSGREN ASSOCIATES, INC., DATED MAY 30, 2023.
2. SURVEY BASED ON IDAHO STATE PLANE COORDINATE SYSTEM, EAST ZONE, NAD83.

GENERAL DESIGN DESIGNATIONS:



NO.	REVISION DESCRIPTION	BY	DATE

PROJECT: 4-20133
DESIGNED: ML / BAA
DRAWN: BAA
CHECKED: TP
APPROVED: SMB
DATE: JUNE 30, 2023

PROFESSIONAL ENGINEER — TRAVIS A. PYLE — STATE OF IDAHO — 11535 — 6-30-2023

GreatWest ENGINEERING
192 E. OVERLAND ROAD
MERIDIAN, ID 83642
(208)576-6848

EIRSWD
REGIONAL MSW LANDFILL
CELL A DEVELOPMENT
LEGEND, ABBREVIATIONS, AND GENERAL NOTES

SHEET NO.
2
OF 23

Y:\Shared\Boise Projects\4-20133-E Idaho SW District Landfill Design And Engineering Support\CADD 4-20133-Cell A\Sheets\4-20133-CA-02-General.dwg

SHEET NOTES:

1. TEST PITS SHOWN (100 SERIES) ARE FROM INITIAL SUBSURFACE EXPLORATIONS IN MARCH 2021 FOR THE SITE CERTIFICATION PERMIT AND FROM PHASE I EXPLORATION (200 SERIES) IN JULY 2022.
2. BORINGS SHOWN ARE FROM PHASE I DRILLING PERFORMED IN JULY 2022.

LEGEND

- TEST PIT LOCATION
- SHALLOW BORINGS
- DEEP BORINGS
- PROPERTY BOUNDARY
- PROJECT GRADING BOUNDARY

NORTH

0 150 300
SCALE IN FEET

NO.	REVISION DESCRIPTION	BY	DATE

PROJECT: 4-20133
DESIGNED: ML / BAA
DRAWN: BAA
CHECKED: TP
APPROVED: SMB
DATE: JUNE 30, 2023

PROFESSIONAL ENGINEER — STATE OF IDAHO — 11535 — TRAVIS A. PITTLE — 6-30-2023

GreatWest ENGINEERING
1921 E. OVERLAND ROAD
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(208)576-6646

EIRSWD
REGIONAL MSW LANDFILL CELL A DEVELOPMENT

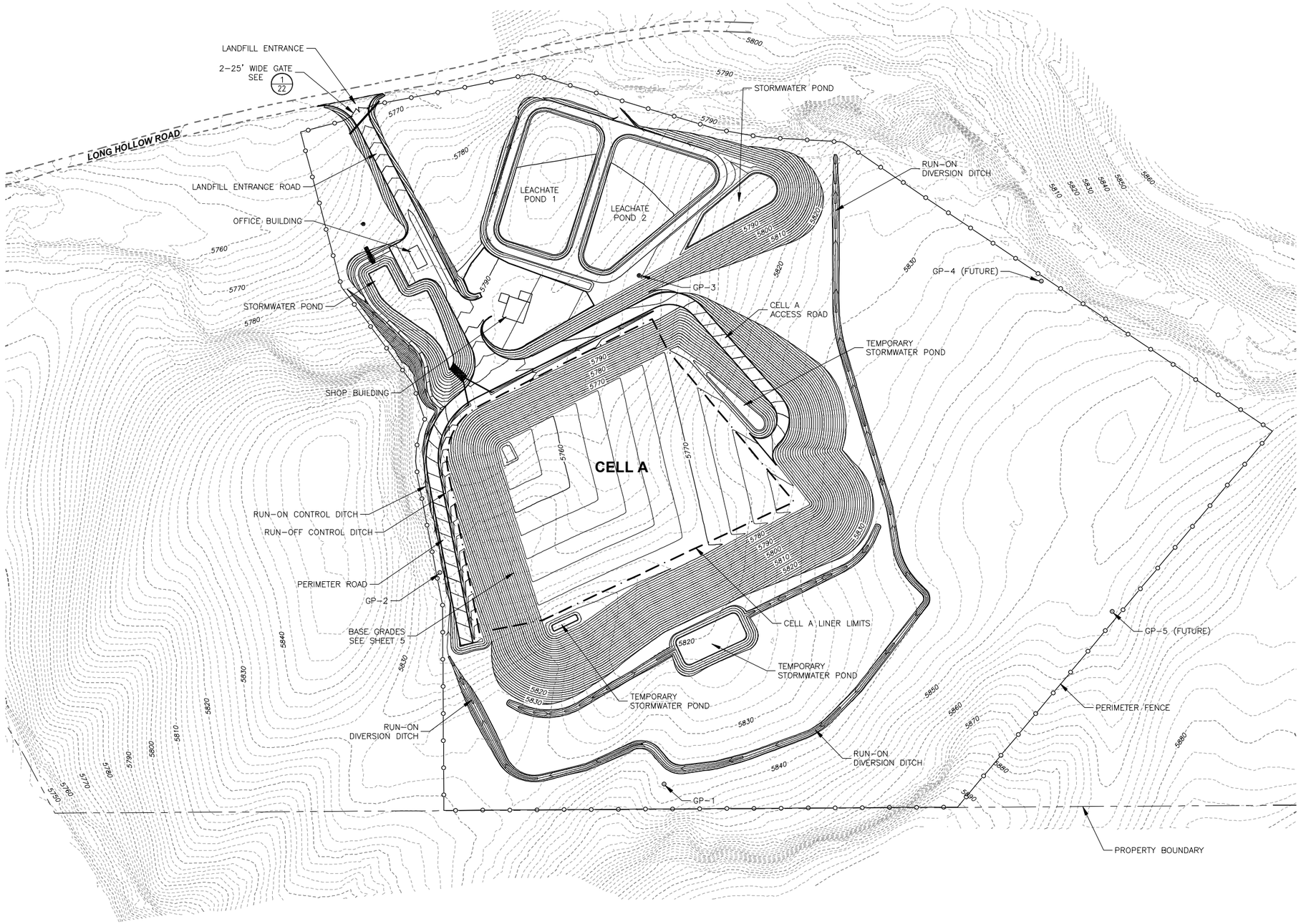
EXISTING SITE PLAN

SHEET NO.
3
OF 23

Y:\Shared\Boise Projects\4-20133-E Idaho SW District Landfill Design And Engineering Support\CADD 4-20133-Cell A\Sheets\4-20133-CA-03-SP.dwg

SHEET NOTES:

1. REFER TO SHEET 3 FOR SUBSURFACE EXPLORATION LOACATIONS



LEGEND

- GAS PROBE (GP)
- PROPERTY BOUNDARY
- PROJECT GRADING BOUNDARY

NORTH

0 150 300
SCALE IN FEET

NO.	REVISION DESCRIPTION	BY	DATE

PROJECT: 4-20133
DESIGNED: ML / BAA
DRAWN: BAA
CHECKED: TP
APPROVED: SMB
DATE: JUNE 30, 2023

PROFESSIONAL ENGINEER — STATE OF IDAHO — 11535 — TRAVIS A. PILE

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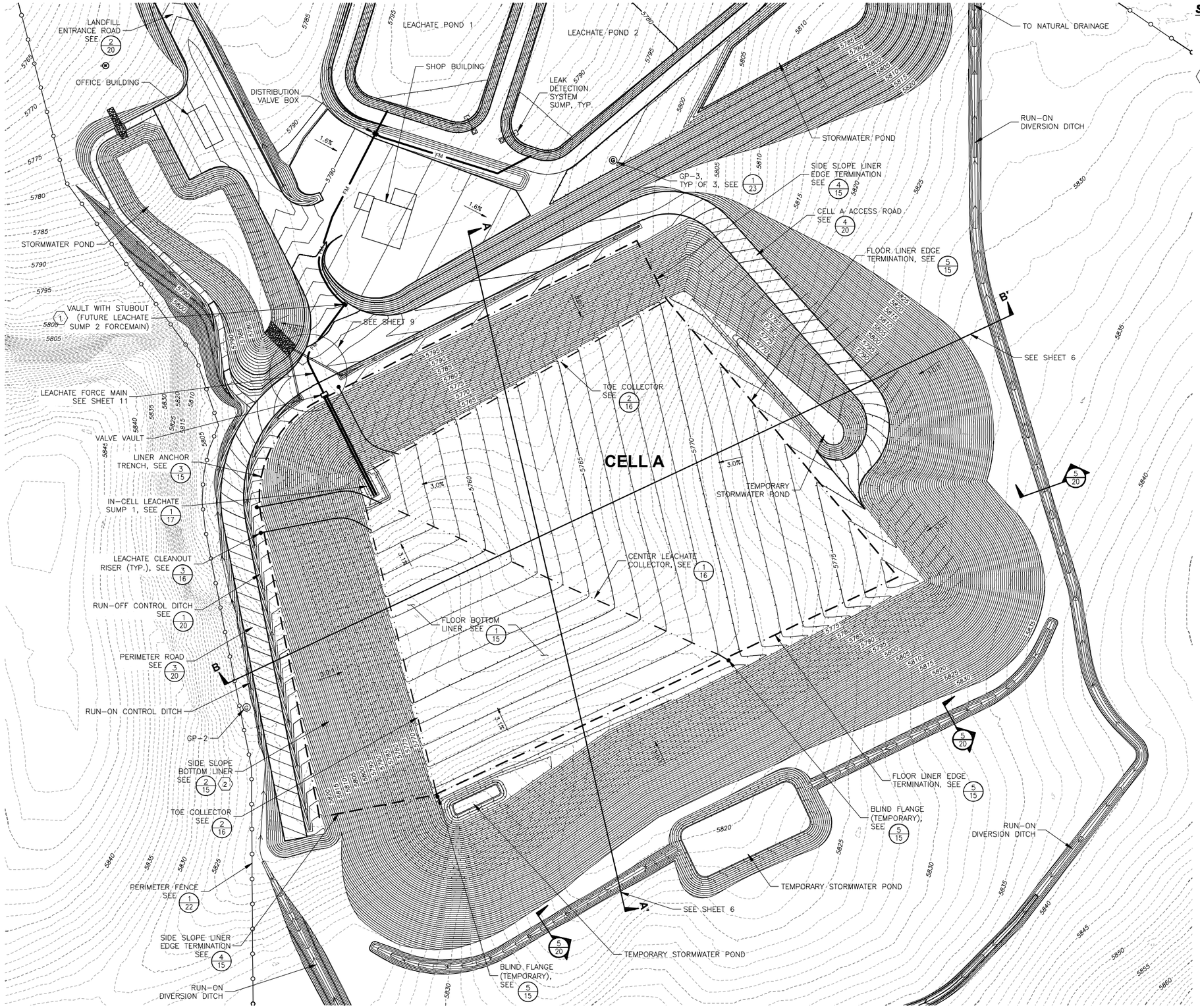
EIRSWD
REGIONAL MSW LANDFILL
CELL A DEVELOPMENT
SITE DEVELOPMENT PLAN

SHEET NO.
4
OF 23

Y:\Shared\Boise Projects\4-20133-E Idaho SW District Landfill Design And Engineering Support\CADD 4-20133-Cell A\Sheets\4-20133-CA-04-Site GP.dwg



SHEET NOTES:

1. GRADES SHOWN ARE ON TOP OF LINER.
2. INSTALL STRIP DRAINS ON LINER SLOPES SPACED ON 100-FT CENTERS.

KEYED NOTES:

1. INSTALL 3" SDR 11 HDPE TEE. EXTEND FUTURE CONNECTION AND BLIND FLANGE.
2. INSTALL STRIP DRAINS PERPENDICULAR TO SIDE SLOPE ALONG ENTIRE SIDE SLOPE AREA AT 100' O.C.

LEGEND

- GAS PROBE (GP)
- LEACHATE PIPE CLEANOUT
- LEACHATE COLLECTOR PIPE
- LEACHATE FORCE MAIN
- PROPERTY BOUNDARY
- PROJECT GRADING BOUNDARY

NO.	REVISION DESCRIPTION	BY	DATE

PROJECT: 4-20133
DESIGNED: ML / BAA
DRAWN: BAA
CHECKED: TP
APPROVED: SMB
DATE: JUNE 30, 2023

PROFESSIONAL ENGINEER — STATE OF IDAHO — 11535 — TRAVIS A. PITTLE

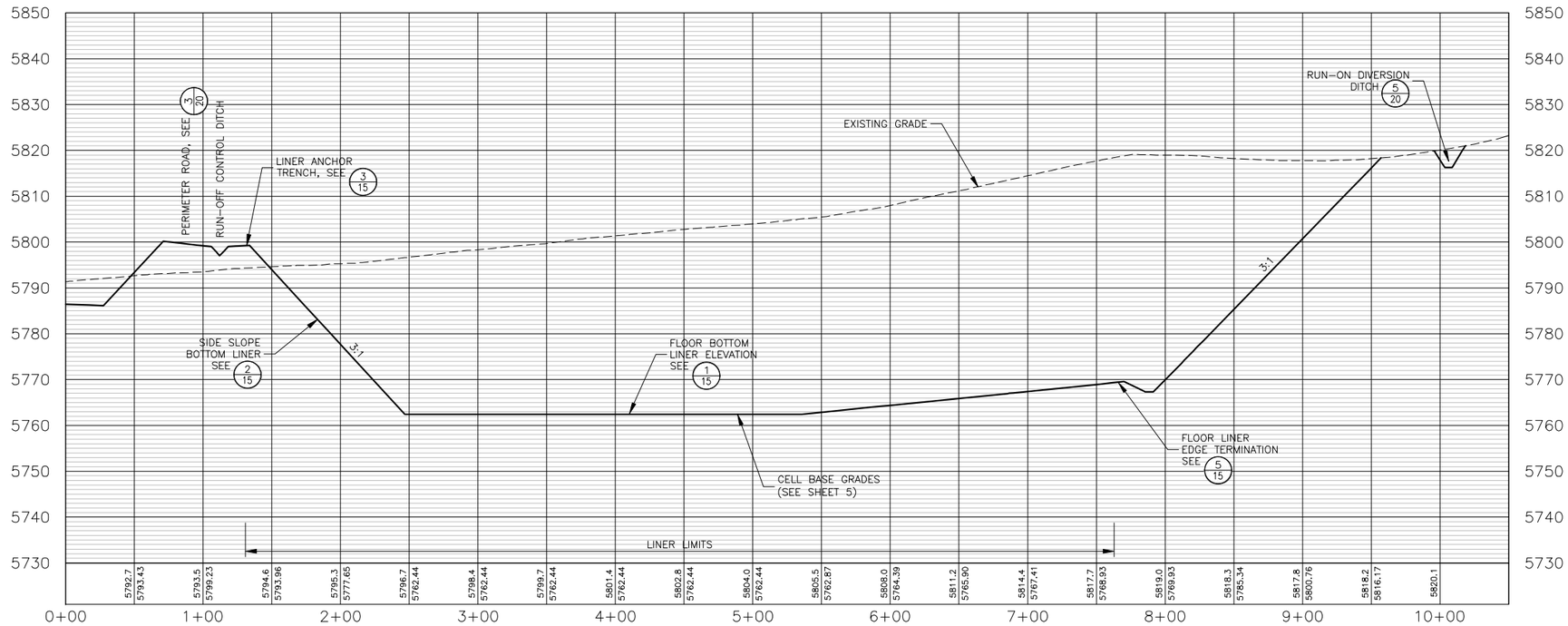
GreatWest ENGINEERING
1921 E. OVERLAND ROAD
MERIDIAN, ID 83642
(208)576-6848

EIRSWD
REGIONAL MSW LANDFILL
CELL A DEVELOPMENT

CELL A BASE GRADING PLAN

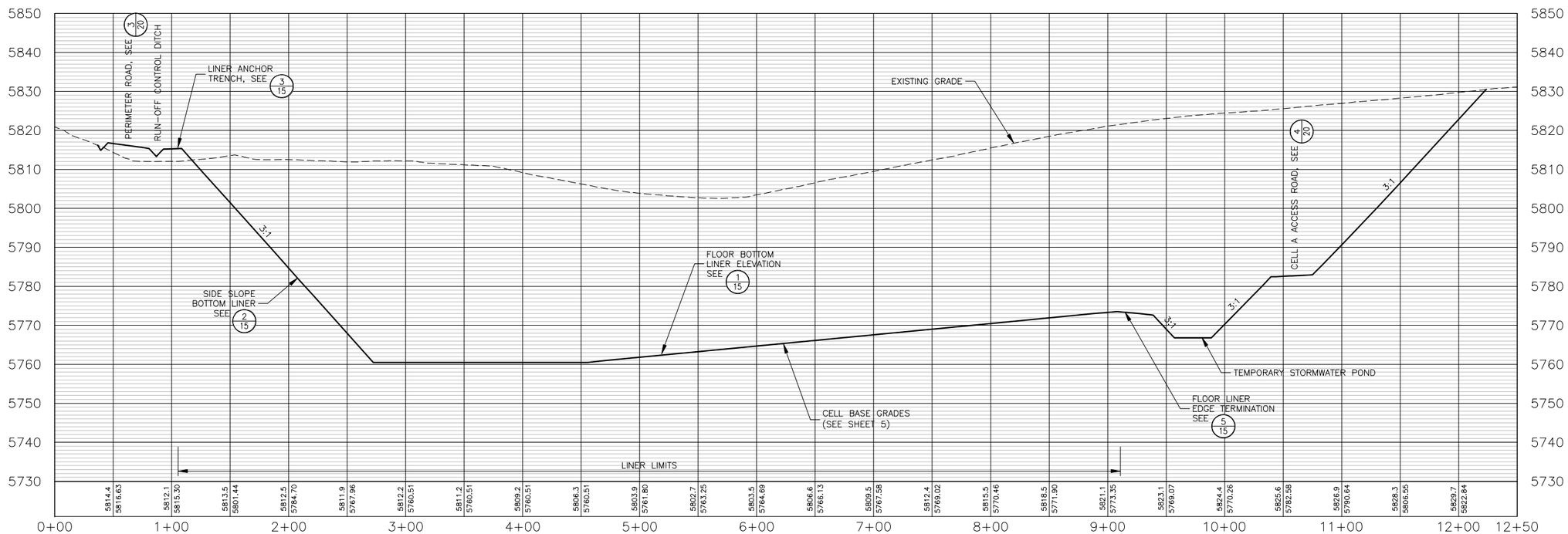
SHEET NO.
5
OF 23

Y:\Shared\Boise Projects\4-20133-E Idaho SW District Landfill Design And Engineering Support\CADD 4-20133-Cell A\Sheets\4-20133-CA-05-GP.dwg



SECTION A-A'

HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 30'



SECTION B-B'

HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 30'

NO.	REVISION DESCRIPTION	BY	DATE

PROJECT: 4-20133
DESIGNED: ML / BAA
DRAWN: BAA
CHECKED: TP
APPROVED: SMB
DATE: JUNE 30, 2023

PROFESSIONAL ENGINEER — STATE OF IDAHO — 11535 — TRAVIS A. PILE — 6-30-2023

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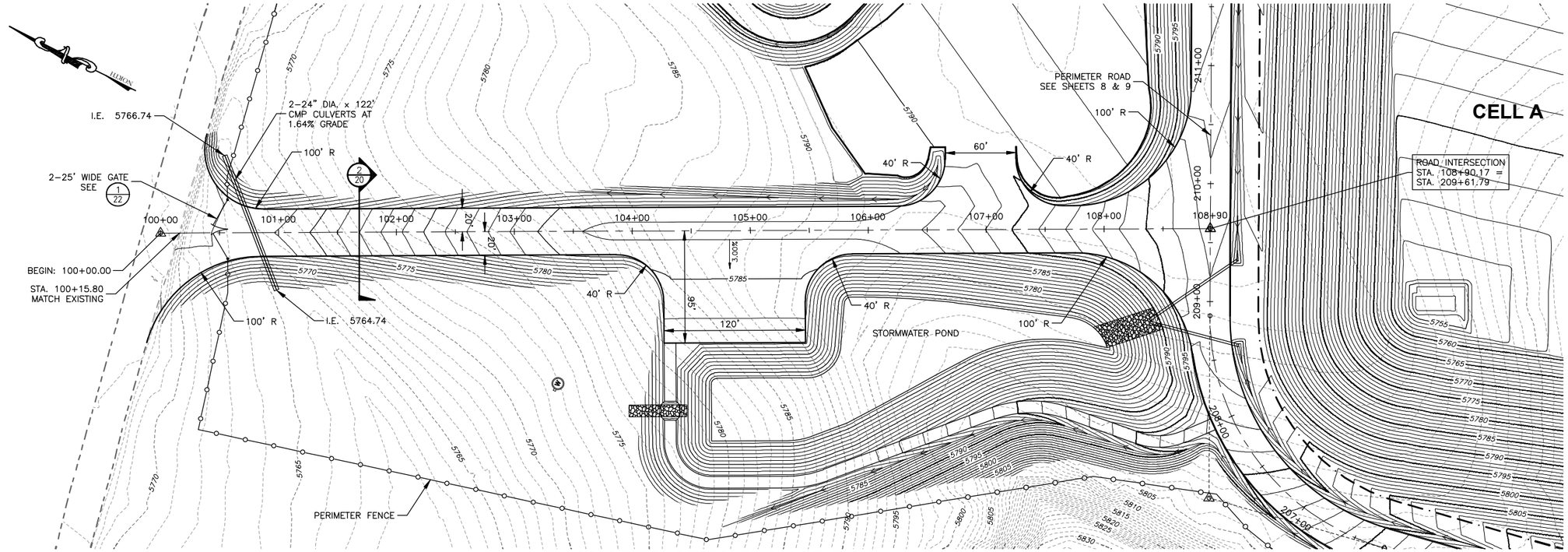
1921 E. OVERLAND ROAD
MERIDIAN, ID 83642
(208)576-6946

EIRSWD
REGIONAL MSW LANDFILL
CELL A DEVELOPMENT
CELL A BASE GRADING SECTION

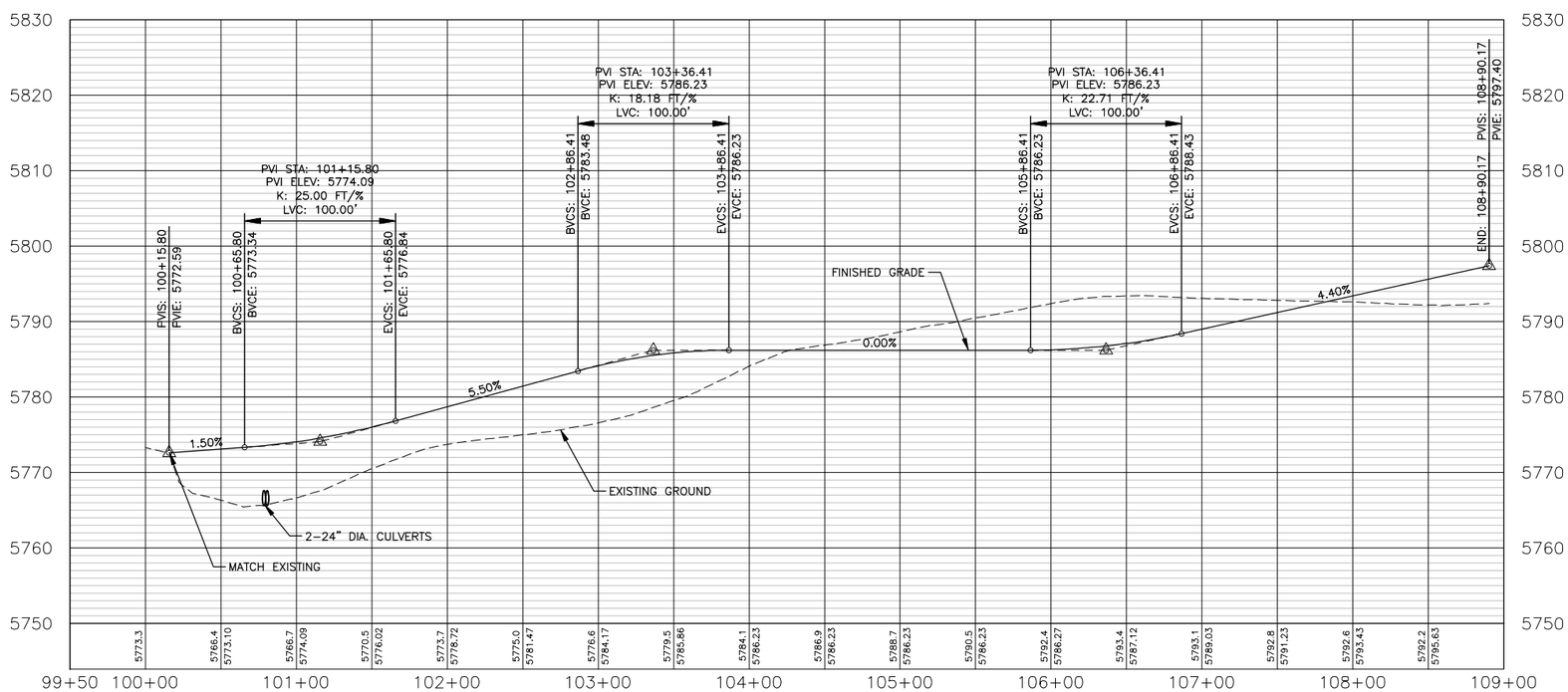
SHEET NO.
6
OF 23

Y:\Shared\Boise Projects\4-20133-E Idaho SW District Landfill Design And Engineering Support\CADD 4-20133-Cell A\Sheets\4-20133-CA-06-Section.dwg



PLAN VIEW OF ENTRANCE ROAD

0 50 100
SCALE IN FEET



PROFILE VIEW OF ENTRANCE ROAD - STA. 99+50 TO STA. 109+00

HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 20'

NO.	REVISION DESCRIPTION	BY	DATE

PROJECT: 4-20133
DESIGNED: ML / BAA
DRAWN: BAA
CHECKED: TP
APPROVED: SMB
DATE: JUNE 30, 2023

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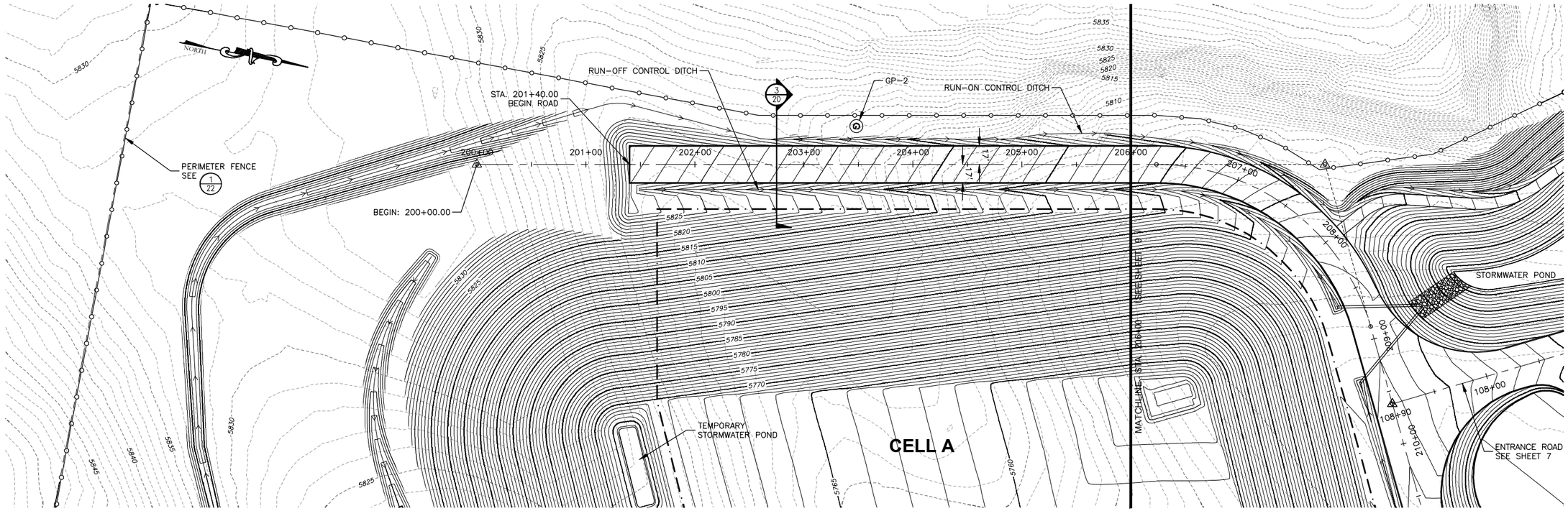
ENTRANCE ROAD PLAN AND PROFILE
STA. 99+50 TO STA. 109+00

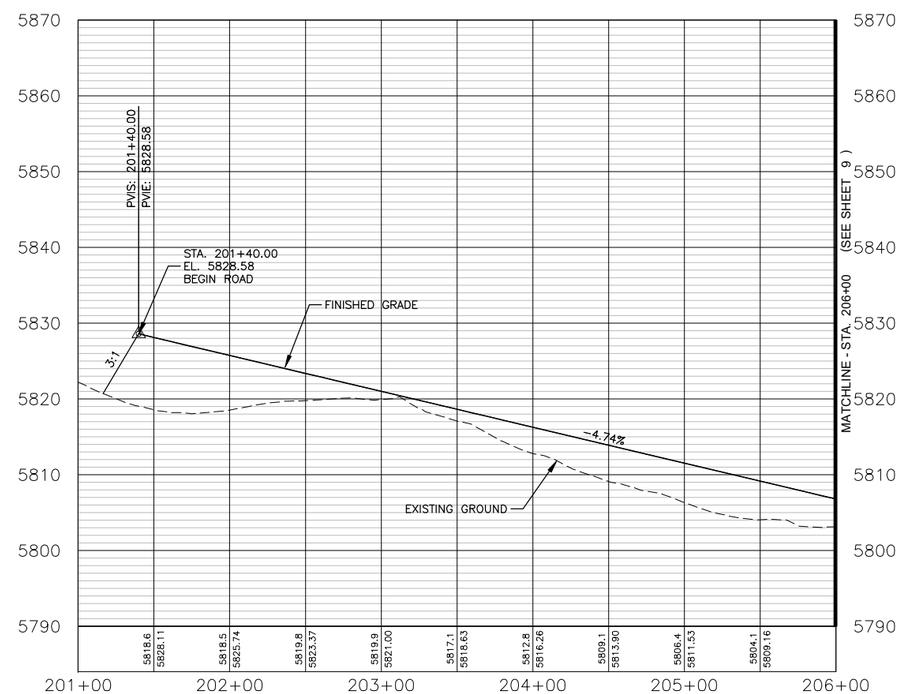
SHEET NO.
7
OF 23

Y:\Shared\Boise Projects\4-20133-E Idaho SW District Landfill Design And Engineering Support\CADD 4-20133-Cell A\Sheets\4-20133-CA-07-PP.dwg



PLAN VIEW OF PERIMETER ROAD

0 50 100
SCALE IN FEET



PROFILE VIEW OF PERIMETER ROAD - STA. 201+00 TO STA. 206+00

HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 20'

NO.	REVISION DESCRIPTION	BY	DATE

PROJECT: 4-20133
DESIGNED: ML / BAA
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STA. 201+00 TO STA. 206+00

SHEET NO.
8
OF 23

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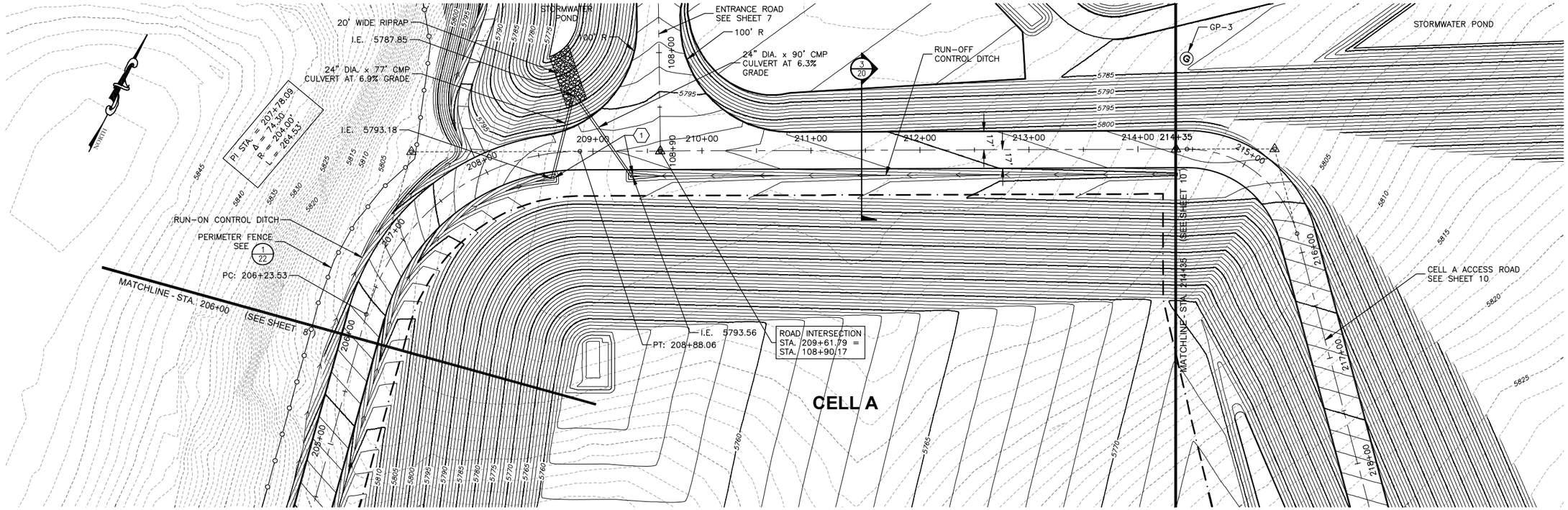
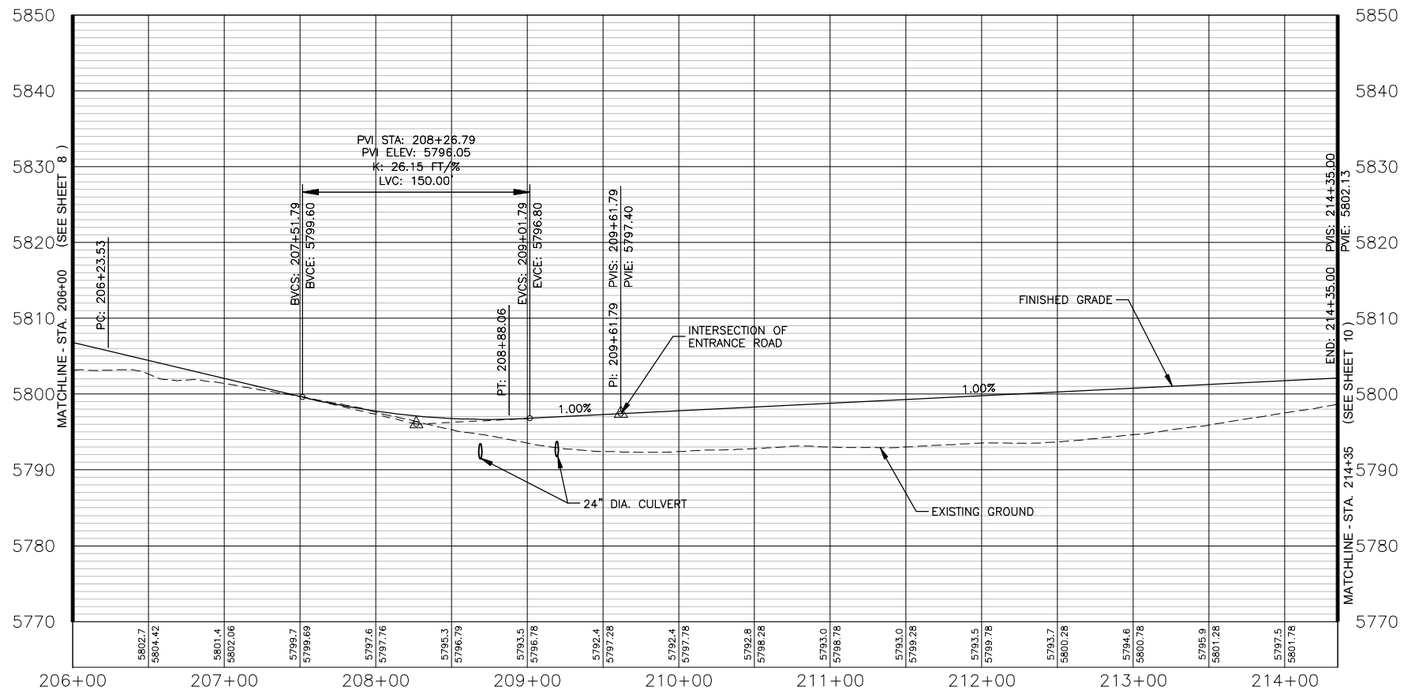


PLAN VIEW OF PERIMETER ROAD

0 50 100
SCALE IN FEET

KEYED NOTES:

1. ARMOR HEADWALL INLET FOR EACH CULVERT WITH FABRIC AND 8" MIN RIPRAP, 12" TO 16" THICK. TYPICAL OF BOTH CULVERTS.



PROFILE VIEW OF PERIMETER ROAD - STA. 206+00 TO STA. 214+35

HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 20'

NO.	REVISION DESCRIPTION	BY	DATE

PROJECT: 4-20133
DESIGNED: ML / BAA
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STA. 206+00 TO 214+35

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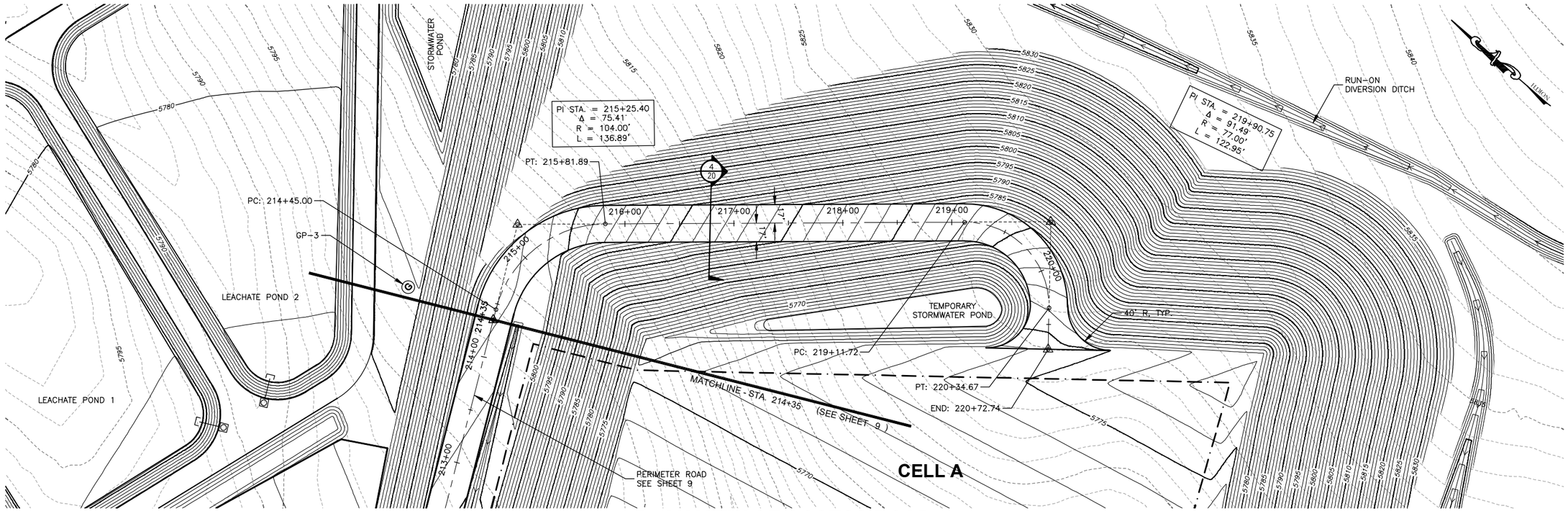
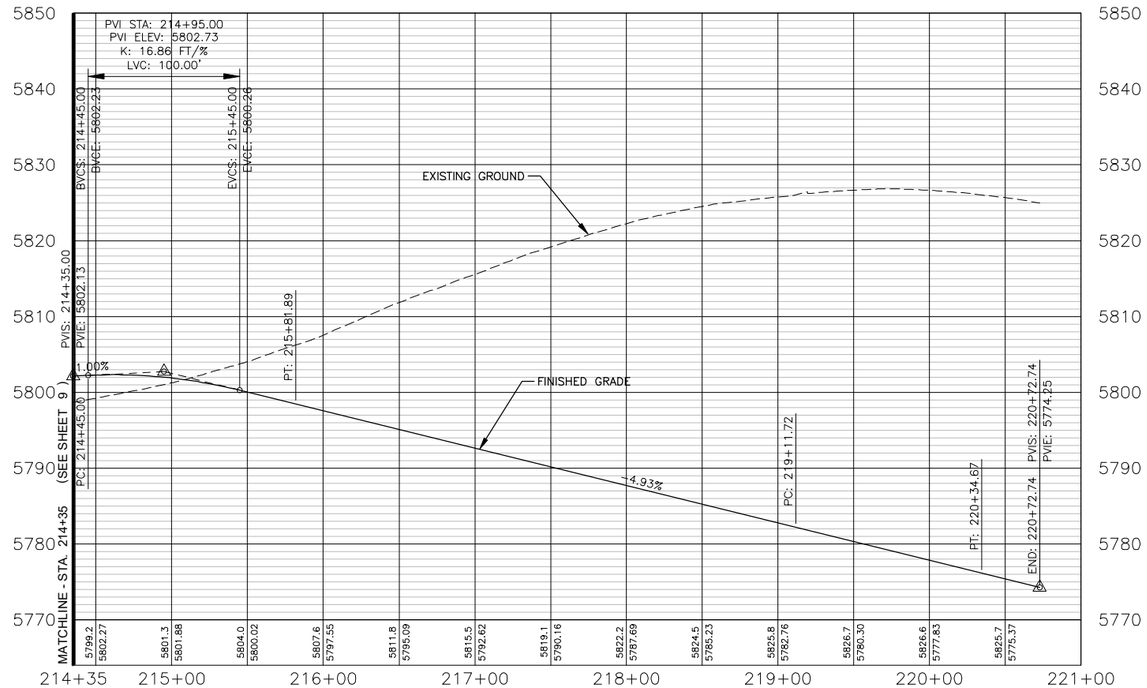
OF 23

Y:\Shared\Boise Projects\4-20133-E Idaho SW District Landfill Design And Engineering Support\CADD 4-20133-Cell A\Sheets\4-20133-CA-09-PP.dwg



PLAN VIEW OF ACCESS ROAD

0 50 100
SCALE IN FEET



PROFILE VIEW OF ACCESS ROAD - STA. 214+35 TO STA. 221+00

HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 20'

NO.	REVISION DESCRIPTION	BY	DATE

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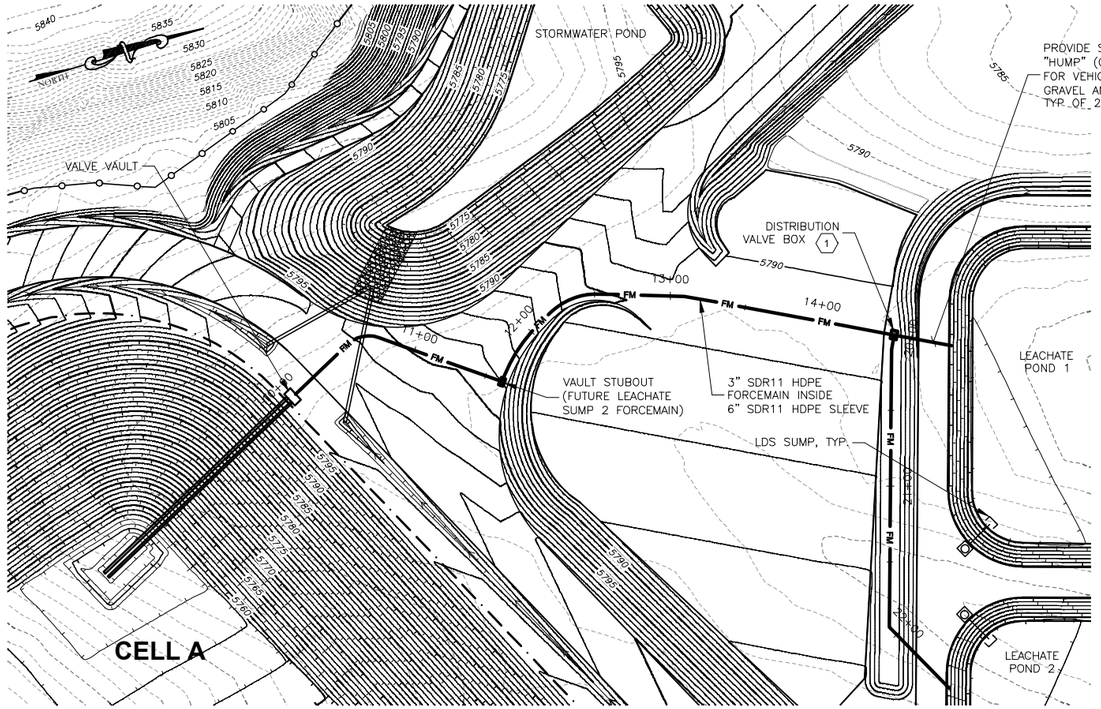
CELL A DEVELOPMENT
CELL A ACCESS ROAD PLAN AND PROFILE
STA. 214+35 TO STA. 221+00

SHEET NO.
10
OF 23

Y:\Shared\Boise Projects\4-20133-E Idaho SW District Landfill Design And Engineering Support\CADD 4-20133-Cell A\Sheets\4-20133-CA-10-PP.dwg



PLAN VIEW OF LEACHATE POND 1 FORCEMAIN

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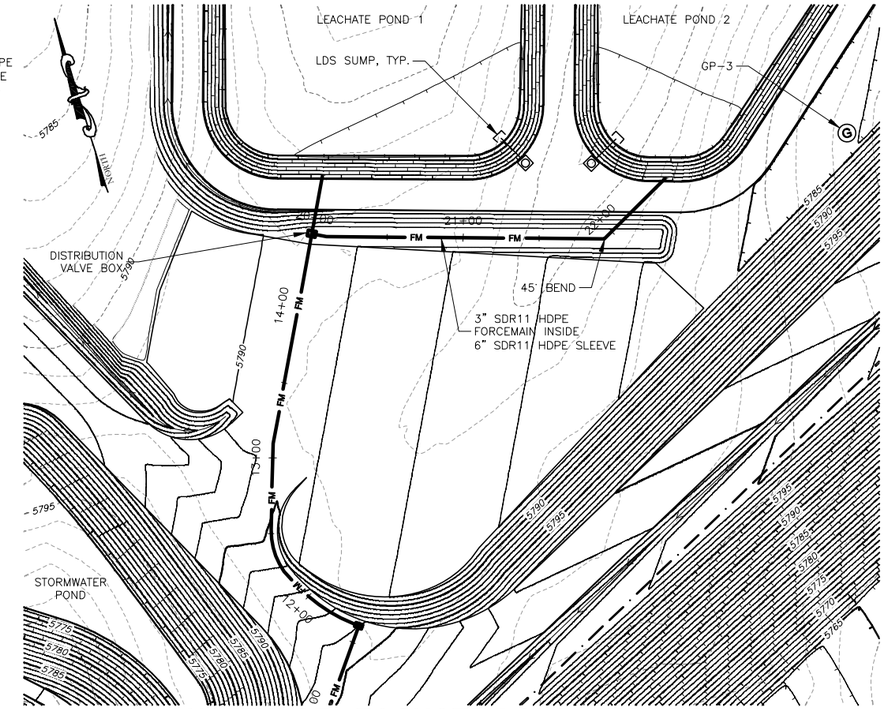
SCALE IN FEET



PLAN VIEW OF LEACHATE POND 2 FORCEMAIN

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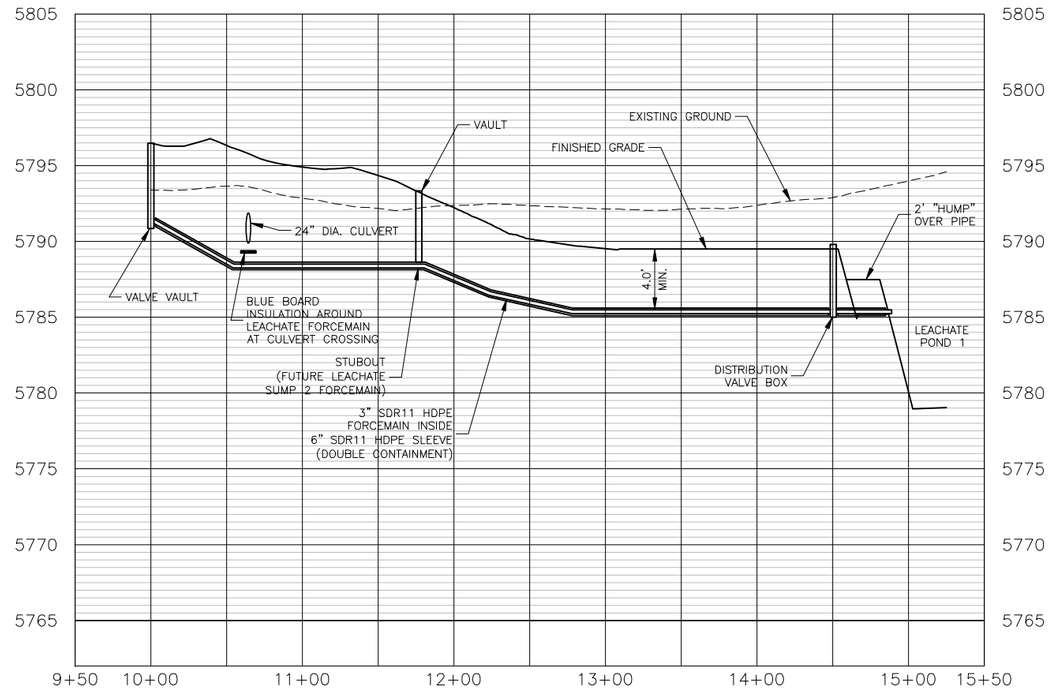
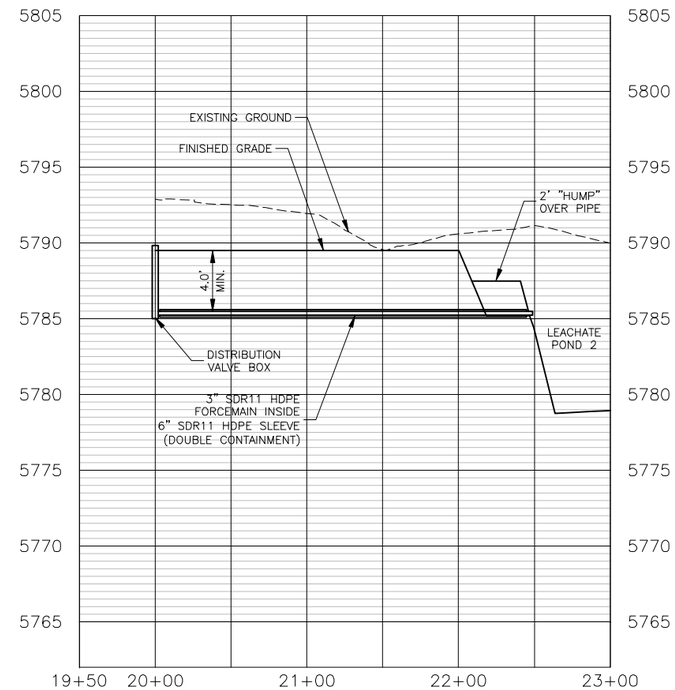
SCALE IN FEET



PROFILE VIEW OF LEACHATE POND 1 FORCEMAIN - STA. 9+50 TO STA. 15+50

HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 10'



PROFILE VIEW OF LEACHATE POND 2 FORCEMAIN - STA. 19+50 TO STA. 23+00

HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 10'

KEYED NOTES:

1. PROVIDE THREE (3) GATE VALVES ON EACH LEG OF PIPE INSIDE A PRECAST VAULT ACCESSIBLE BY OPENING NUT FROM SURFACE.

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CELL A DEVELOPMENT
LEACHATE FORCEMAIN PLAN AND PROFILE

SHEET NO.
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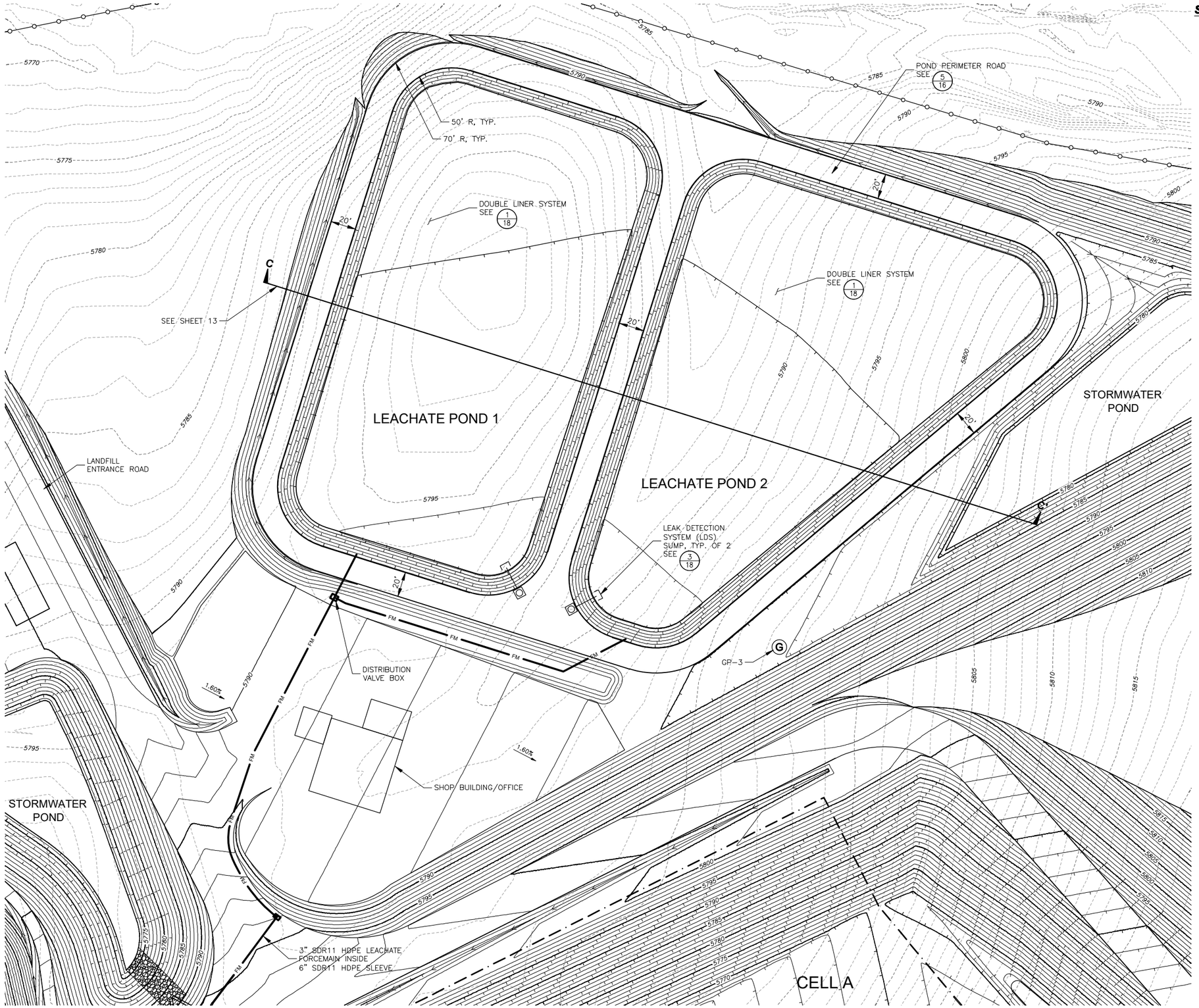
OF 23

Y:\Shared\Boise Projects\4-20133-E Idaho SW District Landfill Design And Engineering Support\CADD 4-20133-Cell A\Sheets\4-20133-CA-11-Leachate PP.dwg



SHEET NOTES:

1. GRADES SHOWN ARE ON TOP OF LINER.
2. PROVIDE SAND BAGS AROUND ENTIRE TOP OF INTERIOR SLOPE OF BOTH PONDS FOR BALLAST.

LEGEND

- FM — LEACHATE FORCE MAIN
- PROPERTY BOUNDARY
- PROJECT GRADING BOUNDARY

NORTH

0 40 80
SCALE IN FEET

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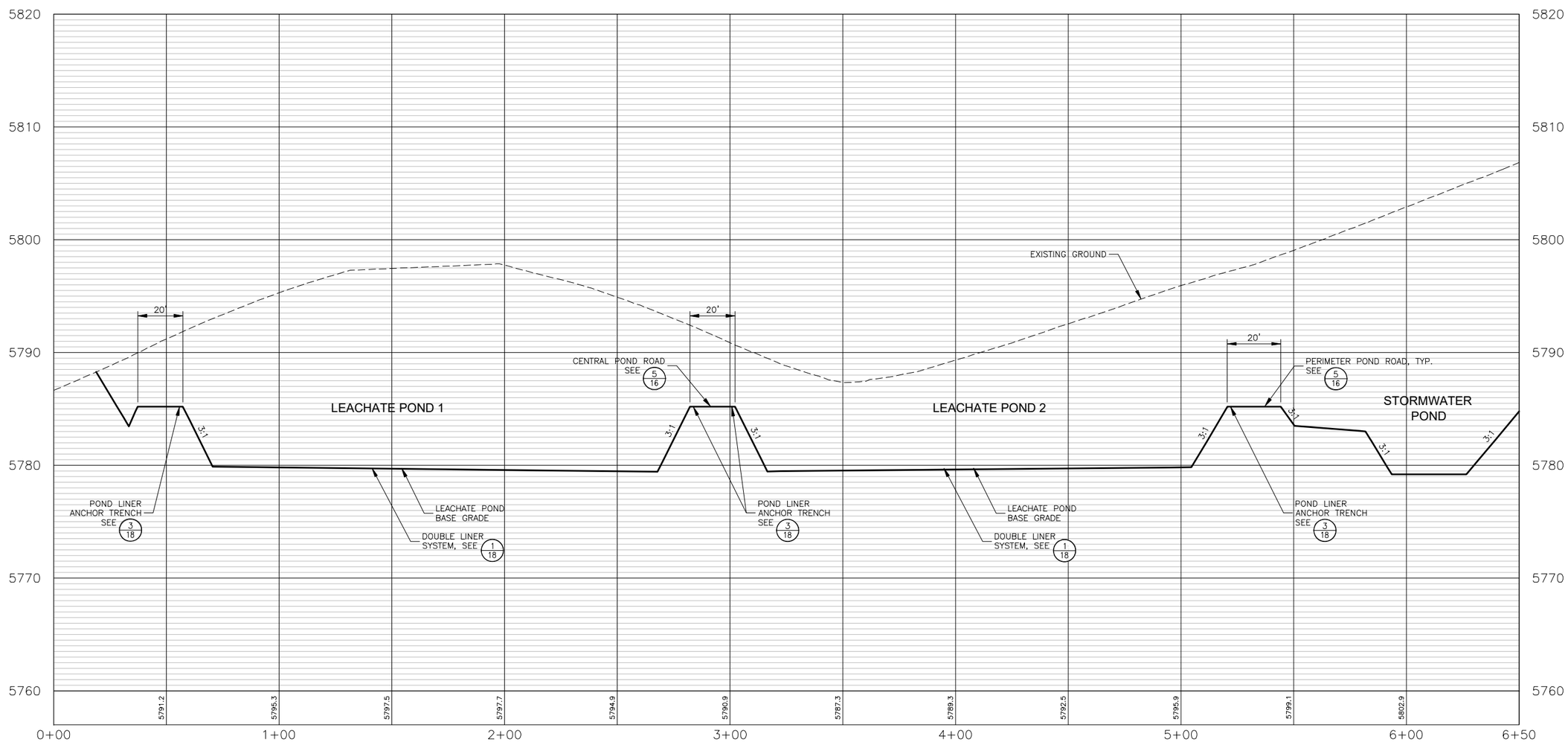
LEACHATE PONDS BASE GRADING PLAN

SHEET NO.
12
OF 23

Y:\Shared\Boise Projects\4-20133-E Idaho SW District Landfill Design And Engineering Support\CADD 4-20133-Cell A\Sheets\4-20133-CA-12-Leachate Pond GP.dwg



SECTION C-C'

HORIZONTAL SCALE: 1" = 50'
VERTICAL SCALE: 1" = 10'

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LEACHATE PONDS SECTION

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13
OF 23

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STATE OF IDAHO
11535
TRAVIS A. PILE

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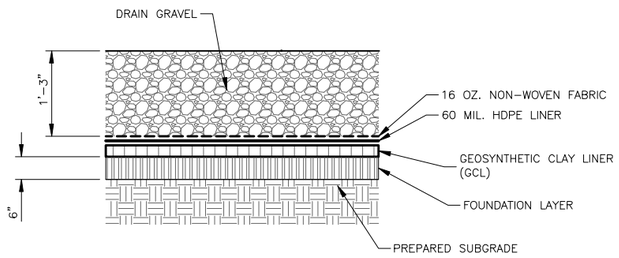
STOCKPILES

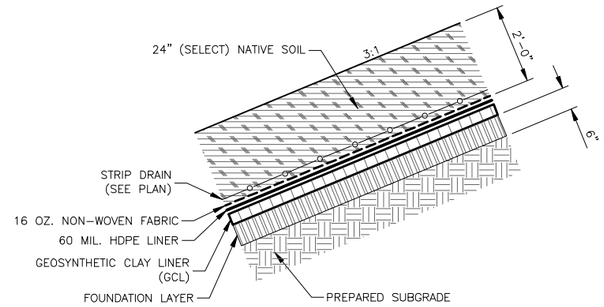
SHEET NO.
14
OF 23

Y:\Shared\Boise Projects\4-20133-E Idaho SW District Landfill Design And Engineering Support\CADD 4-20133-Cell A\Sheets\4-20133-CA-14-GP.dwg



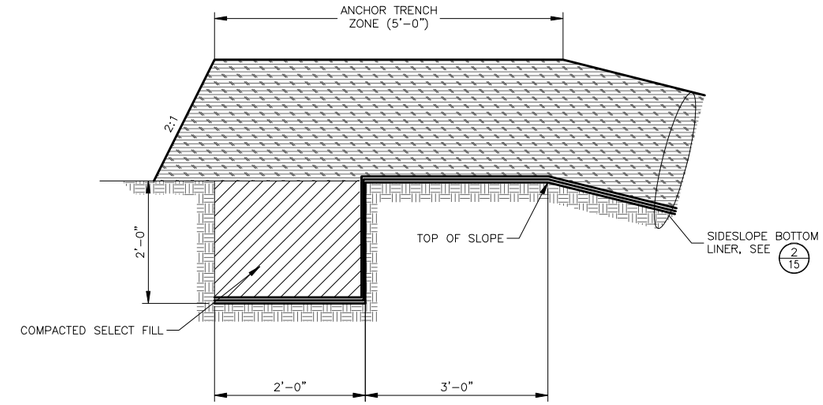
1/15 FLOOR BOTTOM LINER

NOT TO SCALE



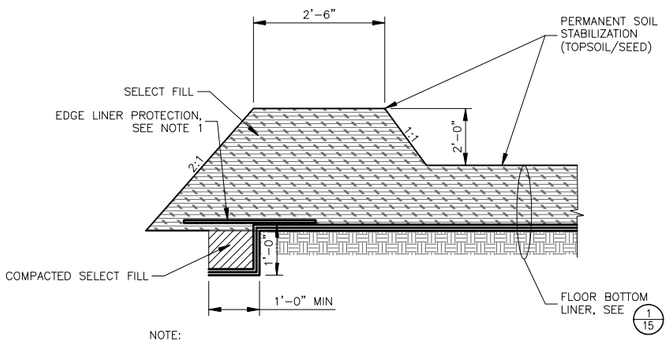
2/15 SIDE SLOPE BOTTOM LINER

NOT TO SCALE



3/15 LANDFILL CELL LINER ANCHOR TRENCH

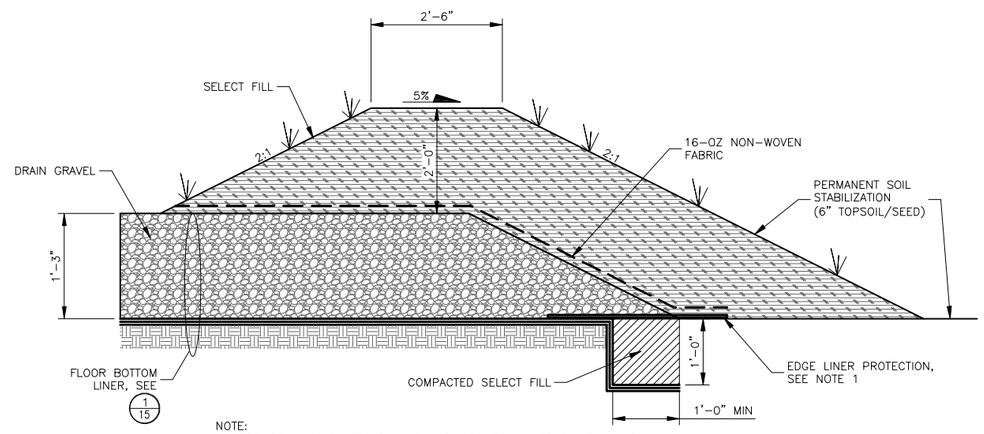
NOT TO SCALE



NOTE:
1. PROVIDE 4'x8' SHEETS OF OSB AND VISQUEEN – CONTINUOUS ALONG LINER EDGES.

4/15 SIDE SLOPE LINER EDGE TERMINATION

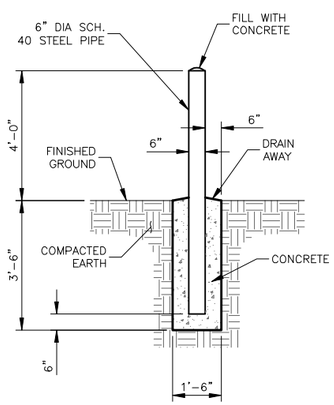
NOT TO SCALE



NOTE:
1. PROVIDE 4'x8' SHEETS OF OSB AND VISQUEEN – CONTINUOUS ALONG LINER EDGES.
2. AT LOCATION OF THE CENTRAL LEACHATE COLLECTOR AND TOE COLLECTOR, EXTEND THE COLLECTORS (SOLID WALL) THROUGH THE EDGE TERMINATION AND DAYLIGHT A MINIMUM OF 30" PAST EDGE OF SOIL STABILIZED AREA.

5/15 FLOOR LINER EDGE TERMINATION

NOT TO SCALE



NOTE: PAINT ALL EXPOSED STEEL WITH 2 COATS OF TRAFFIC YELLOW PAINT.

6/15 BOLLARD DETAIL

NOT TO SCALE

NO.	REVISION DESCRIPTION	BY	DATE

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DETAILS

SHEET NO.
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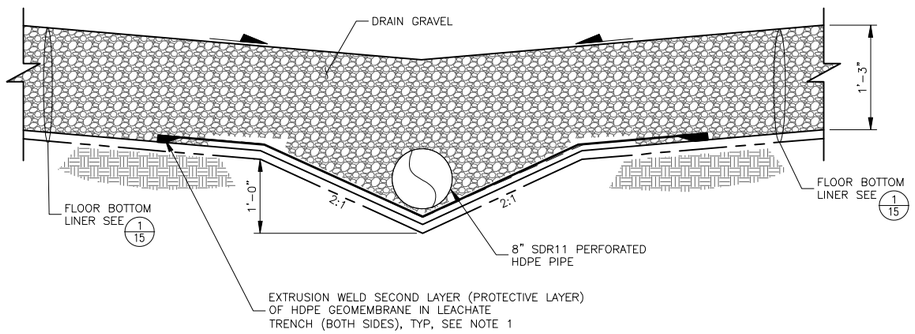
OF 23

Y:\Shared\Boise Projects\4-20133-E Idaho SW District Landfill Design And Engineering Support\CADD 4-20133-Cell A\Sheets\4-20133-CA-15-Details.dwg

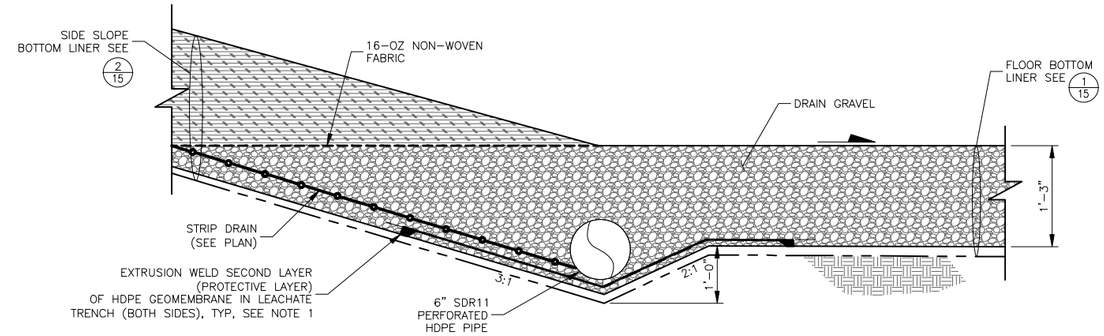


NOTES:

1. INSTALL SECOND LAYER OF HDPE GEOMEMBRANE LINER THROUGH ENTIRE CENTRAL COLLECTOR TRENCH FOLLOWING COMPLETION AND TESTING OF PRIMARY LINER. EXTEND SECONDARY LINER MIN 6" INTO FLOOR AREA BOTH SIDES AND EXTRUSION WELD TO PRIMARY LINER.

1/16 CENTRAL LEACHATE COLLECTOR

NTS

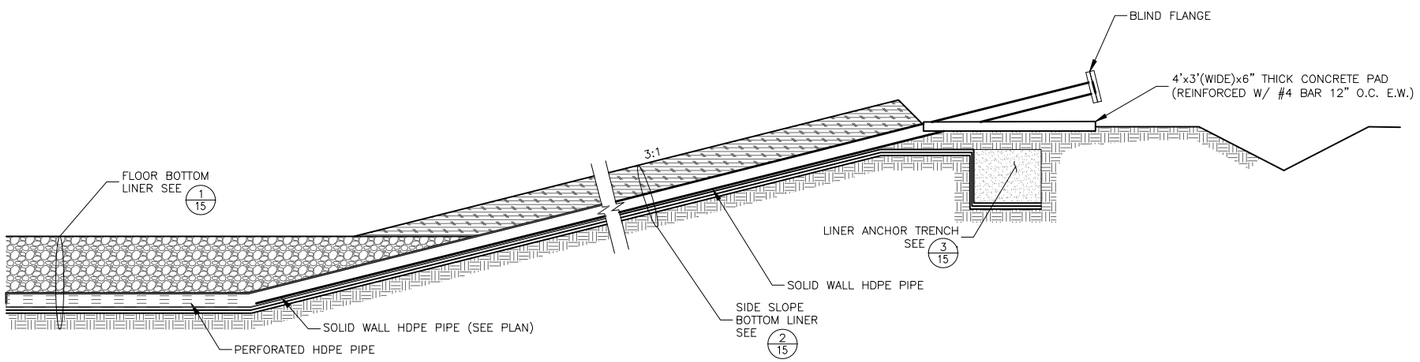


NOTES:

1. INSTALL SECOND LAYER OF HDPE GEOMEMBRANE LINER THROUGH ENTIRE TOE COLLECTOR TRENCH FOLLOWING COMPLETION AND TESTING OF PRIMARY LINER. EXTEND SECONDARY LINER MIN 6" INTO FLOOR AREA AND 3'-0" UP SIDE SLOPE AND EXTRUSION WELD TO PRIMARY LINER.

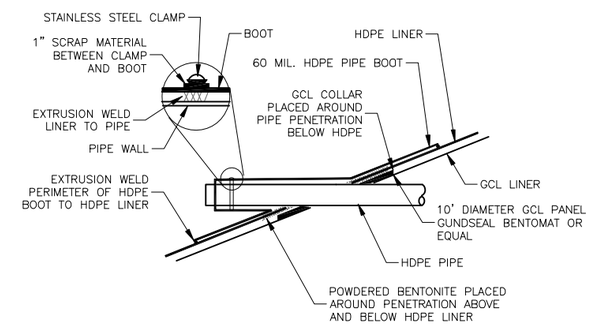
2/16 TOE LEACHATE COLLECTOR

NTS



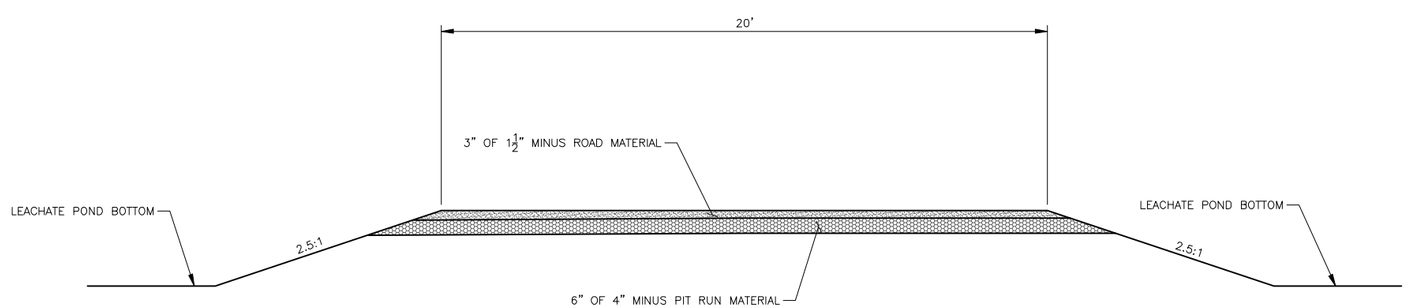
3/16 LEACHATE CLEANOUT RISER

NOT TO SCALE



4/16 PIPE BOOT LINER DETAIL

NOT TO SCALE



5/16 LEACHATE POND PERIMETER ROAD TYPICAL SECTION

NOT TO SCALE

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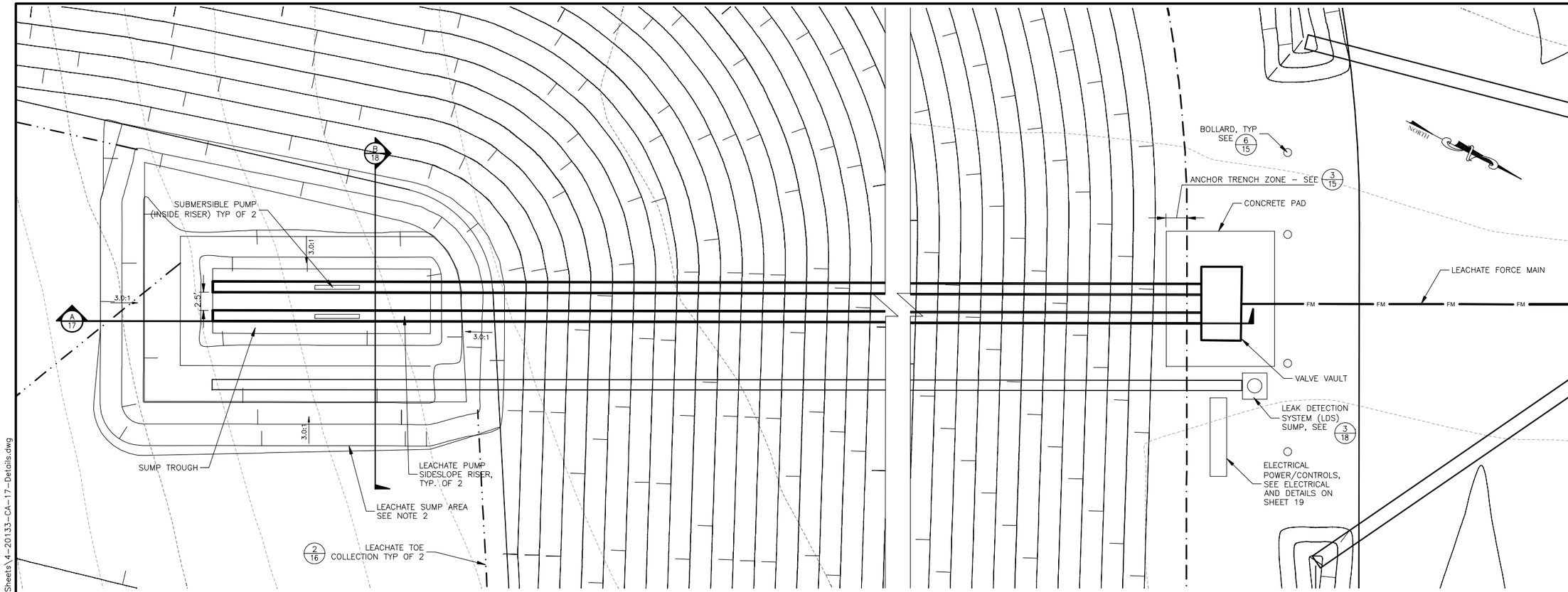
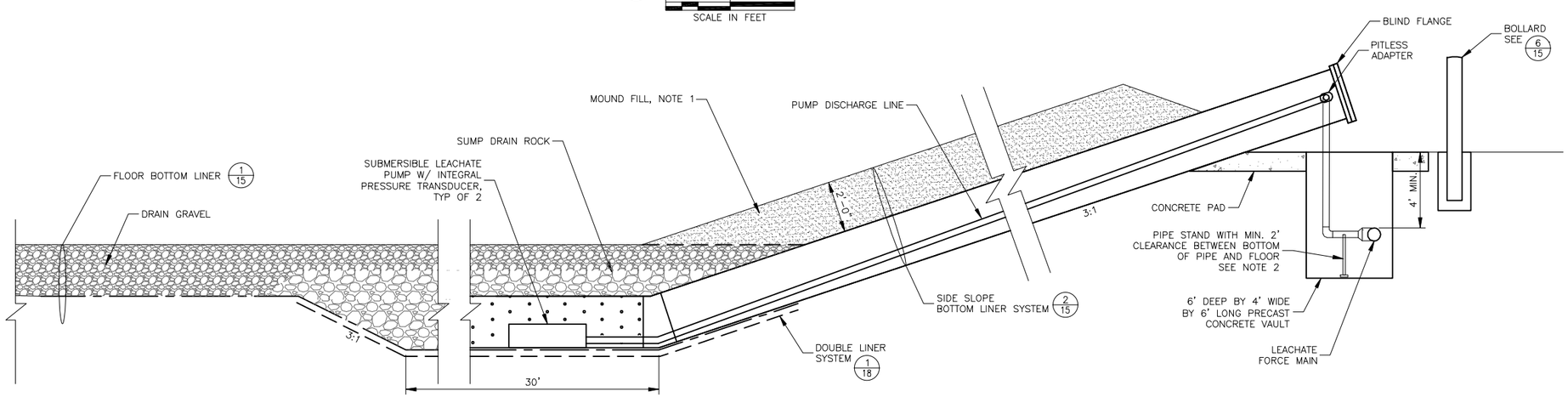
Y:\Shared\Boise Projects\4-20133-E Idaho SW District Landfill Design And Engineering Support\CADD 4-20133-Cell A\Sheets\4-20133-CA-16-Details.dwg



1. THE VALVE VAULT INCLUDES ISOLATION VALVE(S), A FLOW METER(S), AND A VACUUM BREAKER(S) TO ALLOW THE LEACHATE TO DRAIN BACK INTO THE IN-CELL SUMP WHEN NOT PUMPING TO AVOID FREEZING. HEAT TAPE WILL BE PROVIDED FOR ALL ABOVE GRADE PIPING.
2. THE ENTIRE SUMP AND TROUGH SHALL BE DOUBLE LINED. REFER TO DETAIL 1 ON SHEET 18.

1/17 IN-CELL LEACHATE SUMP PLAN

0 7.5 15
SCALE IN FEET



1. THICKEN AND MOUND FILL OVER RISER PIPES TO PROVIDE 2.5' OF COVER. USE SIDE SLOPE COVER MATERIAL.
2. PROVIDE PIPE AND VALVE STANDS TO SECURELY SUPPORT THE PIPING AND EQUIPMENT IN THE VALVE VAULT.

A/17 SECTION A - IN-CELL LEACHATE SUMP

NTS

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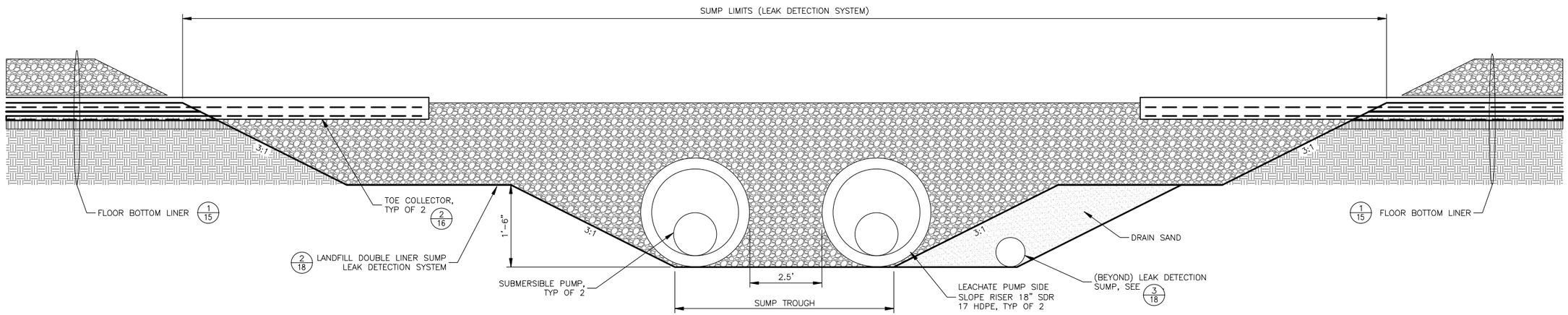
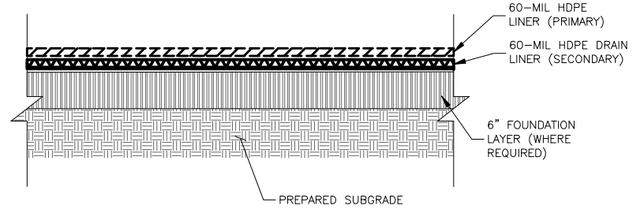


B/18 SECTION B - IN-CELL LEACHATE SUMP

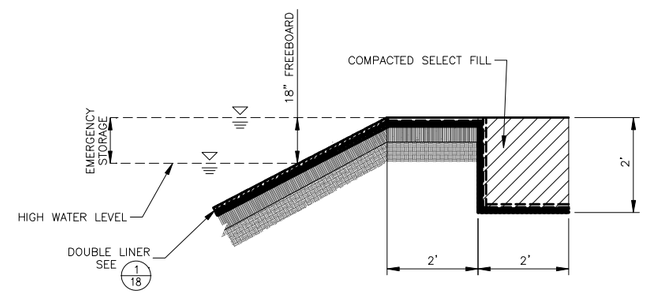
NTS



NOTES:
1. THE GCL FOR THE MAIN BOTTOM LINER SYSTEM SHALL BE CARRIED BELOW THE SECONDARY LINER IN THE LANDFILL SUMP (AND TROUGH).
2. SECURE THE PRIMARY AND SECONDARY LINERS TOGETHER OUTSIDE OF THE EDGE OF THE SUMP.
3. NO LINER WELDS ARE PERMITTED IN THE TROUGH.

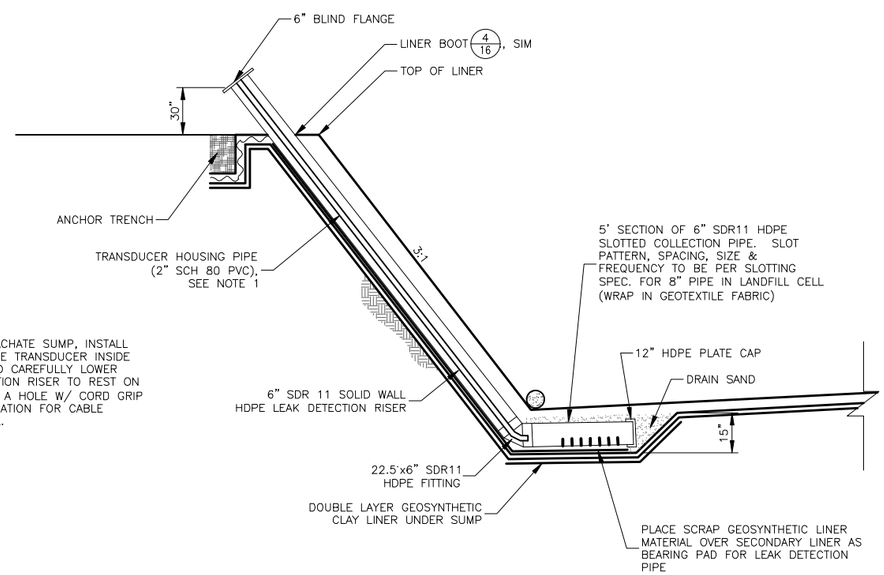
1/18 DOUBLE LINER SYSTEM

NTS



2/18 LEACHATE POND LINER ANCHOR TRENCH

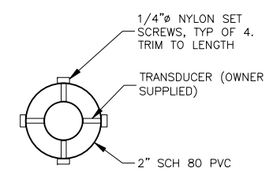
NOT TO SCALE



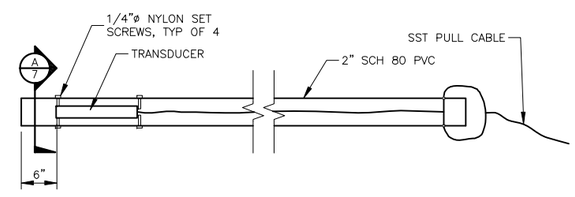
NOTES:
1. FOR THE LANDFILL LEACHATE SUMP, INSTALL AND SECURE PRESSURE TRANSDUCER INSIDE OF PROBE SLEEVE AND CAREFULLY LOWER INTO THE LEAK DETECTION RISER TO REST ON THE BOTTOM. PROVIDE A HOLE W/ CORD GRIP TO PREVENT GAS MIGRATION FOR CABLE CONNECTION TO PANEL.

3/18 LEAK DETECTION SYSTEM

NOT TO SCALE



SECTION A



4/18 TRANSDUCER MOUNTING IN HOUSING PIPE

NOT TO SCALE

NO.	REVISION DESCRIPTION	BY	DATE

PROJECT: 4-20133
DESIGNED: ML / BAA
DRAWN: BAA
CHECKED: TP
APPROVED: SMB
DATE: JUNE 30, 2023

PROFESSIONAL ENGINEER — STATE OF IDAHO — TRAVIS A. PYLE — 11535 — 6-30-2023

GreatWest ENGINEERING
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REGIONAL MSW LANDFILL
CELL A DEVELOPMENT
DETAILS

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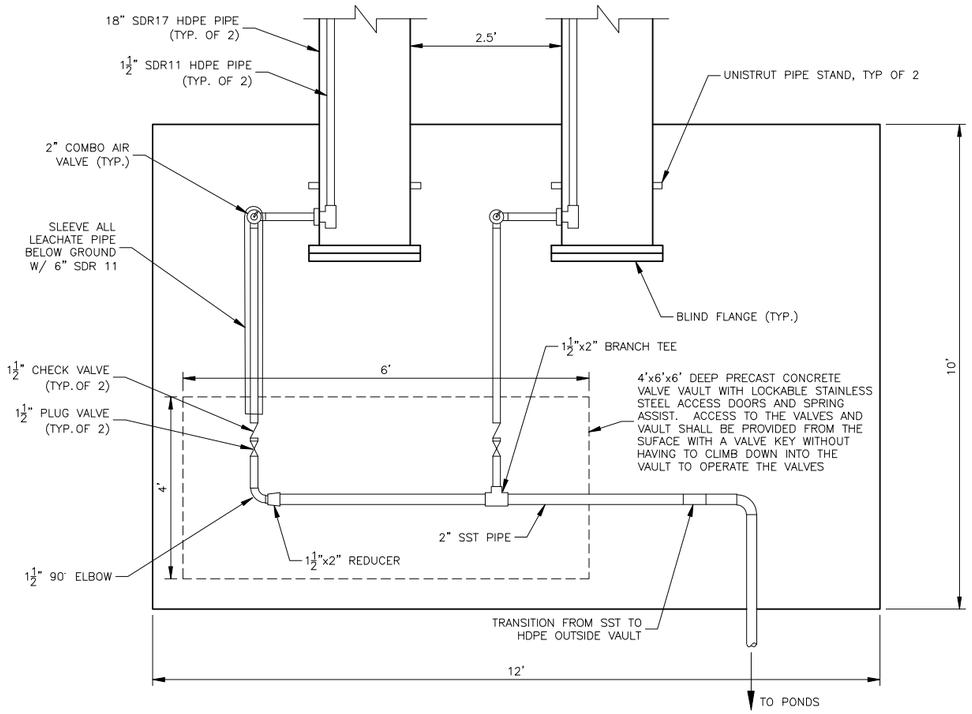
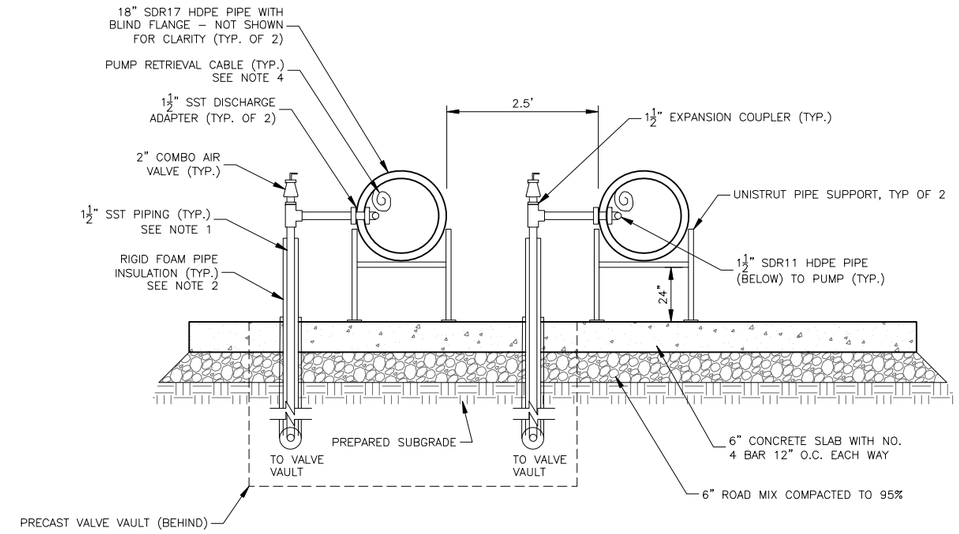


1/19 LEACHATE SUMP RISER PAD PLAN

NTS



NOTES:

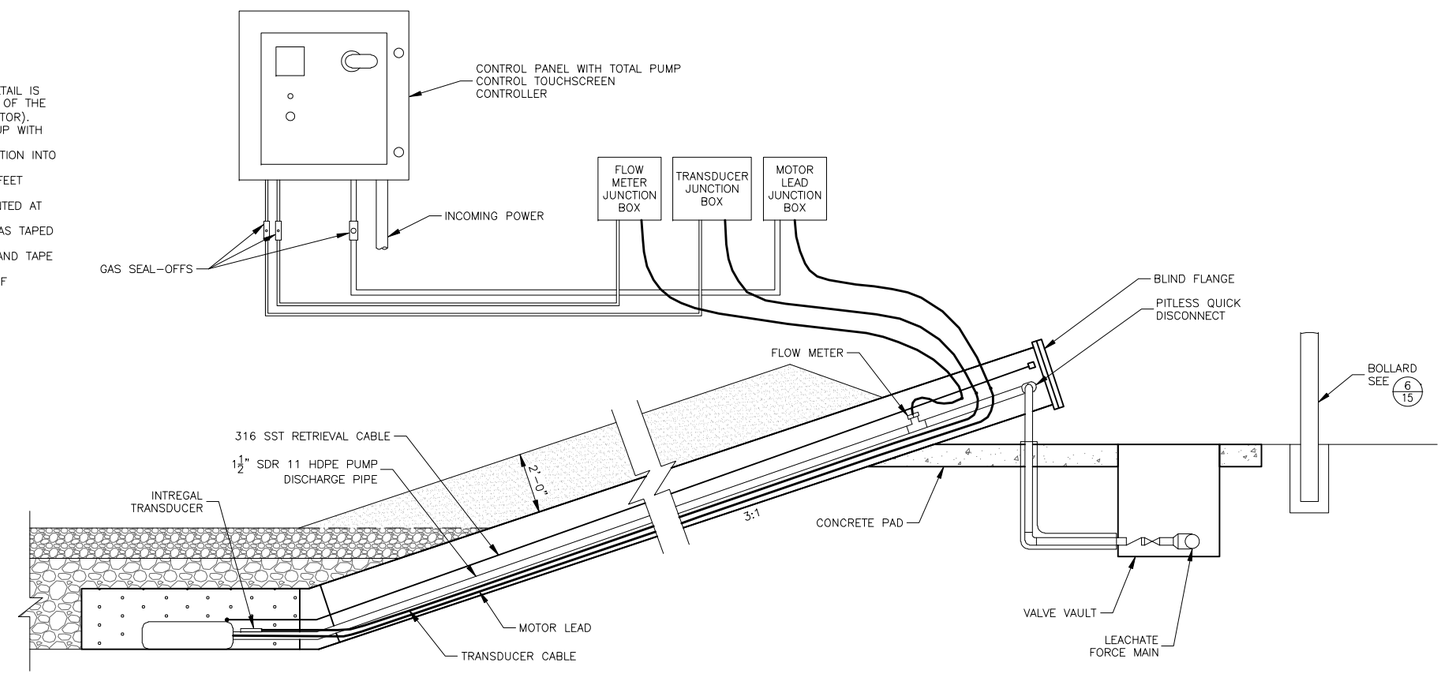
1. ALL PIPING OUTSIDE OF THE HDPE RISERS SHALL BE 316 SST. THE 316 SST PIPING SHALL CONTINUE BELOW GROUND AND THROUGH THE VALVE VAULT.
2. PROVIDE RIGID FOAM INSULATION WITH SST JACKETING AND FITTING BLANKETS FOR ALL ABOVE GROUND PIPE AND TO FROST DEPTH BELOW GROUND.
3. GENERAL: PROVIDE THREADED CONNECTIONS AND COUPLERS AS NEEDED TO JOIN ALL PIPE AND FITTINGS.
4. PROVIDE PUMP RETRIEVAL CABLE WITH 25' EXTRA COILED CABLE AND HOOK (ZIP TIE EXTRA CABLE AND SECURE TO HOOK).

2/19 LEACHATE SUMP RISER PAD ELEVATION

NTS

NOTES:

1. FOR PURPOSES OF CLARITY AND LEGIBILITY, THIS DETAIL IS DIAGRAMMATIC AND ILLUSTRATES THE DESIGN INTENT OF THE LANDFILL SUMP AND SIDE SLOPE RISER (ENCAPSULATOR).
2. EACH SIDE SLOPE RISER PUMP HAS THE SAME SETUP WITH CONTROLLER AND ACCESSORIES.
3. PROVIDE CORD GRIPS USED TO PREVENT GAS MIGRATION INTO JUNCTION BOXES.
4. CONTROL PANEL SHALL BE MOUNTED AT LEAST 15 FEET FROM RISER PIPES.
5. CONTROL PANEL AND JUNCTION BOXES TO BE MOUNTED AT LEAST 3 FEET ABOVE FINISHED GRADE.
6. MOTOR LEAD AND TRANSDUCER CABLE NOT SHOWN AS TAPED TO DISCHARGE PIPE FOR CLARITY.
7. TAPE MOTOR LEAD AND TRANSDUCER CABLE ONLY, AND TAPE ON OPPOSITE SIDES OF DISCHARGE PIPE.
8. TAPE TRANSDUCER TO DISCHARGE PIPE FOR EASE OF MAINTENANCE AND PROTECTION OF TRANSDUCER.



3/19 SUMP SLOPERISER DETAIL

NTS

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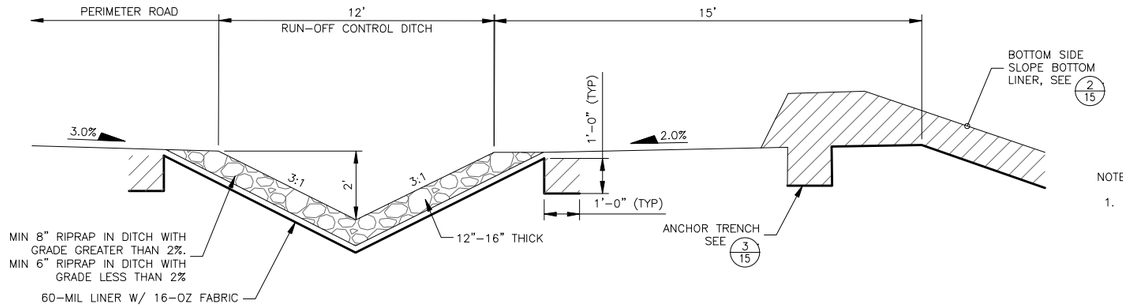
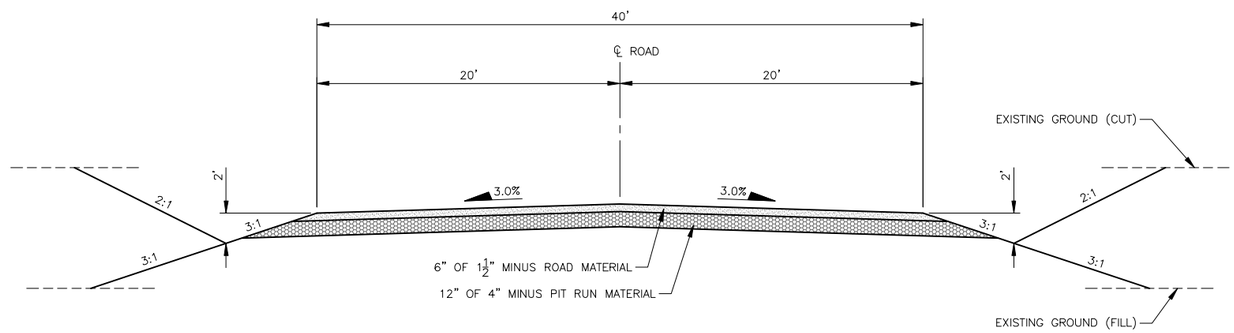


NOTES:

1. CAREFULLY PLACE RIPRAP ON LINER AND FABRIC TO NOT DAMAGE THE MATERIAL.

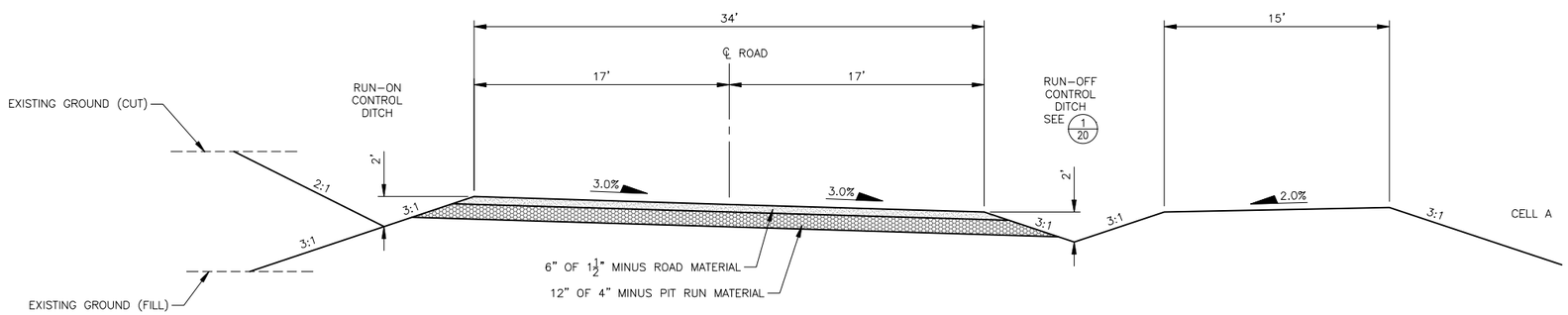
1/20 TYPICAL RUN-OFF CONTROL DITCH

NTS



2/20 ENTRANCE ROAD TYPICAL SECTION

NOT TO SCALE



3/20 PERIMETER ROAD TYPICAL SECTION

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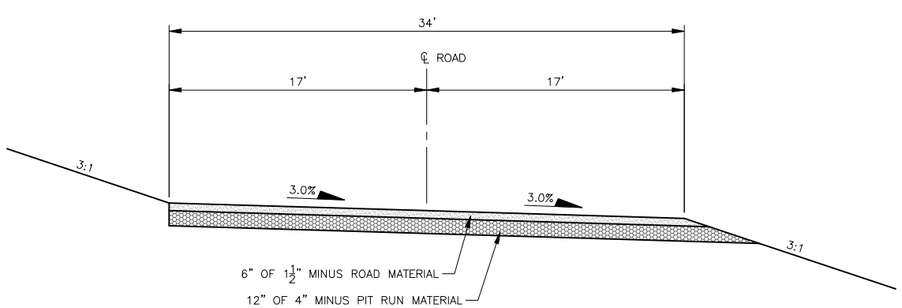
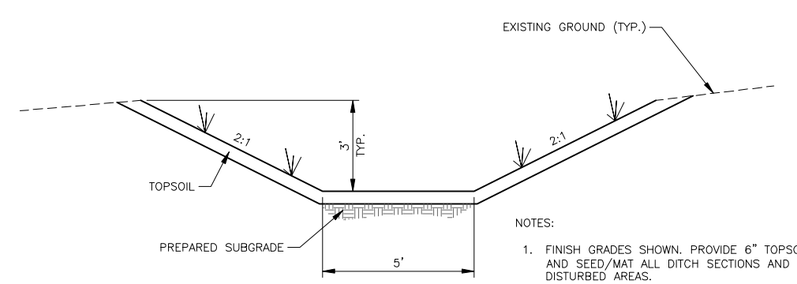


4/20 CELL A ACCESS ROAD TYPICAL SECTION

NOT TO SCALE



NOTES:

1. FINISH GRADES SHOWN. PROVIDE 6" TOPSOIL AND SEED/MAT ALL DITCH SECTIONS AND DISTURBED AREAS.

5/20 RUN-ON DIVERSION DITCH SECTION

NOT TO SCALE

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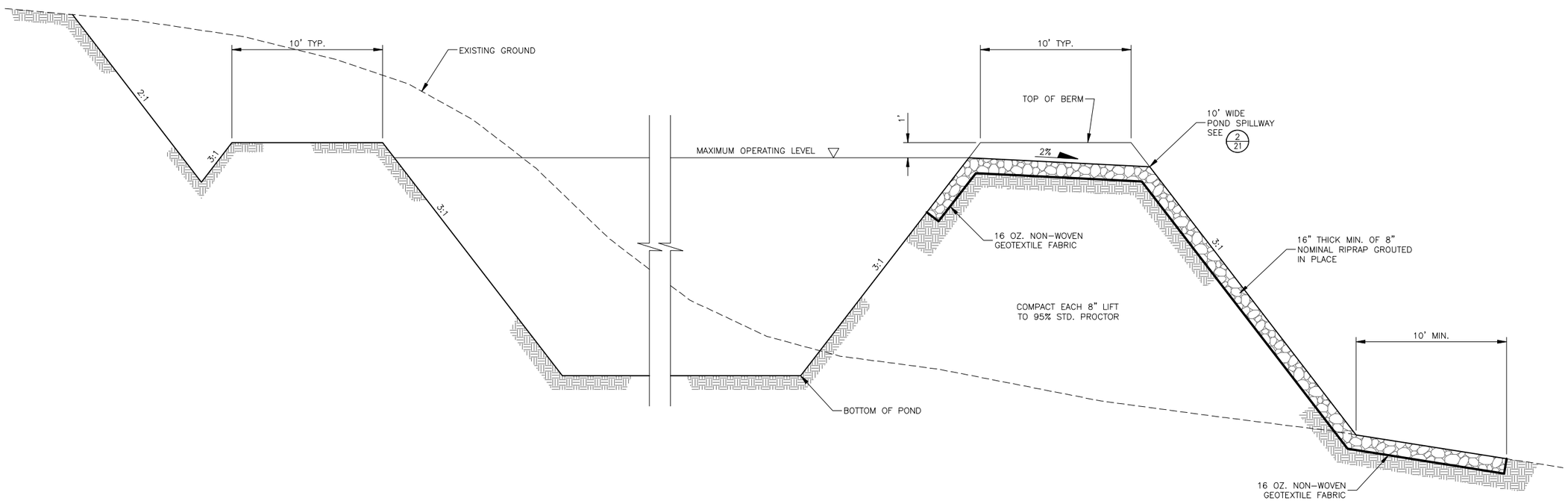
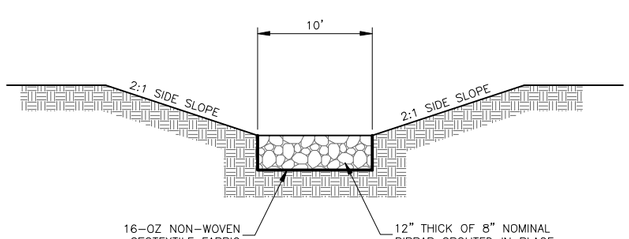


1/21 STORMWATER DETENTION POND SECTION

NOT TO SCALE



2/21 SPILLWAY DETAIL

NOT TO SCALE

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STATE OF IDAHO
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11535
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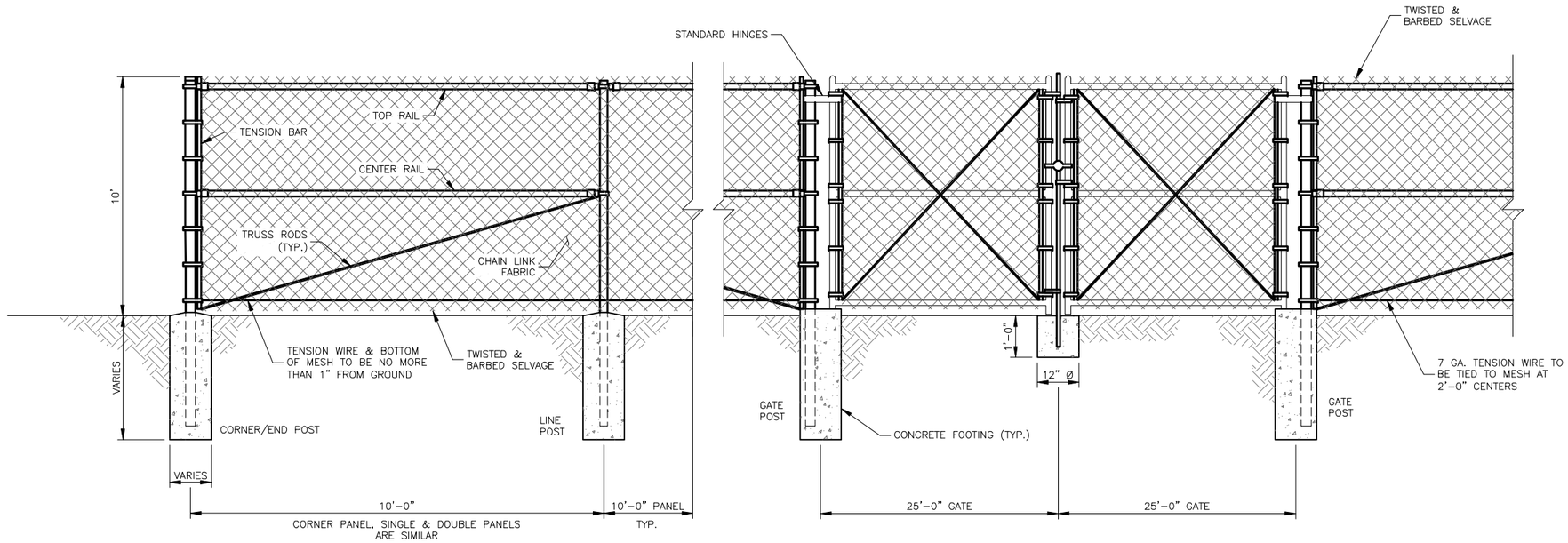

FENCE MATERIALS:
1. FABRIC TO BE 9 GAUGE 2" MESH
2. POST SPACING NOT TO EXCEED 10'-0"
3. POSTS, RAILS, BRACING, AND CONCRETE WILL BE SIZED BY FENCE MANUFACTURER BASED ON FENCE HEIGHT

NOTES:
1. PULL POST BRACING SHALL BE SAME AS CORNER BRACING
2. A DROP BAR LOCKING DEVICE IS REQUIRED FOR DOUBLE GATE. THE DROP BAR SHALL BE ABLE TO BE INSERTED INTO THE CONCRETE BLOCK AT LEAST 6".
3. AT LEAST ONE POST WILL BE EXTENDED 3' INTO GROUND FOR LIGHTNING PROTECTION
4. CHAIN LINK MESH TO BE TIED TO TOP & CENTER RAILS AT 2'-0" CENTERS.
5. GATE CHAIN LINK FABRIC SHALL MATCH FENCE CHAIN LINK FABRIC.
6. GATE FRAMES SHALL BE WELDED & BRACES FURNISHED AS REQUIRED.

1/22 PERIMETER FENCE AND GATE DETAIL

NOT TO SCALE

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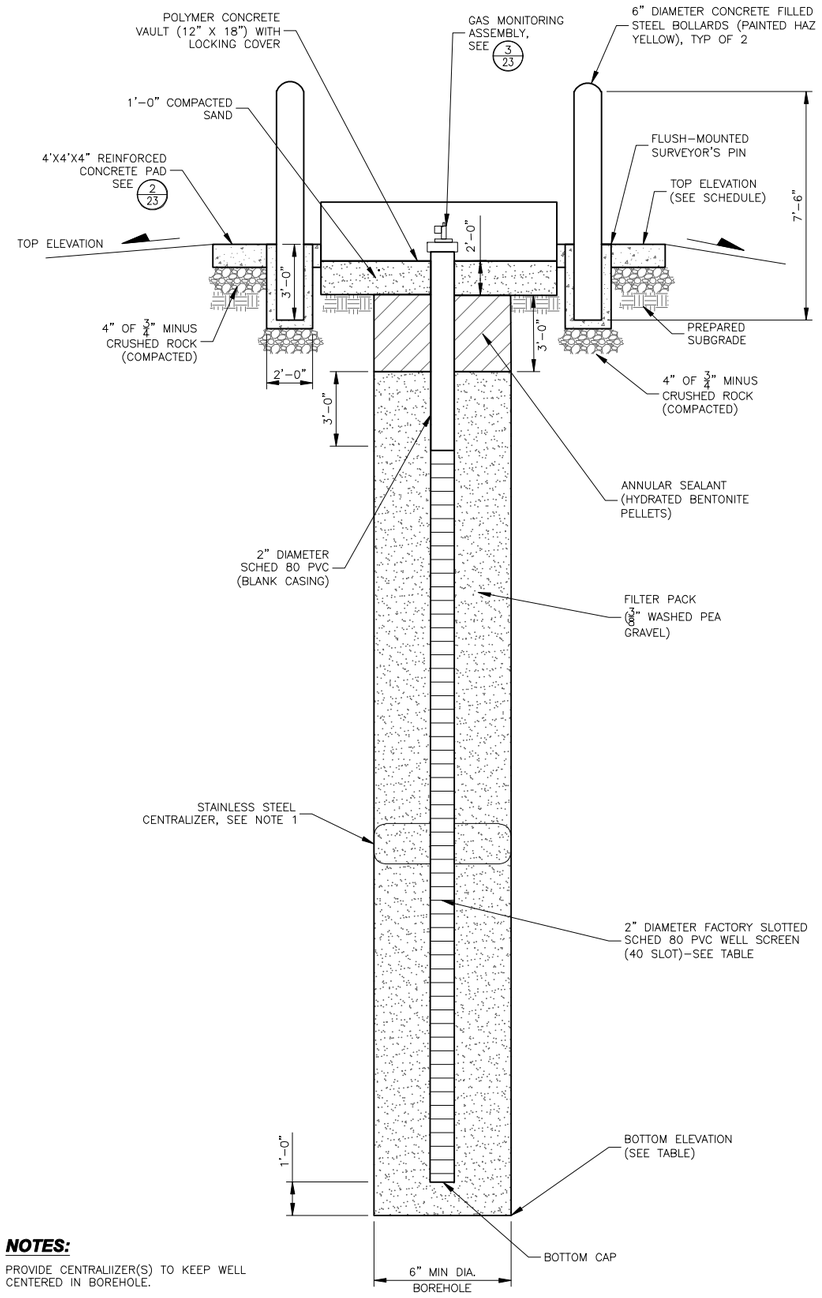
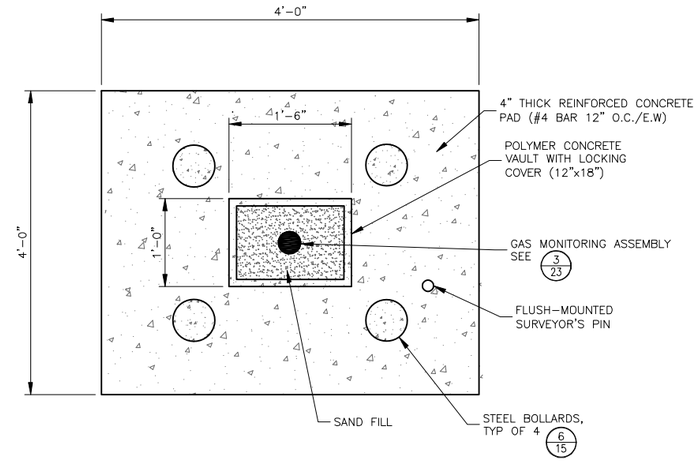


NOTES:

1. PROVIDE CENTRALIIZER(S) TO KEEP WELL CENTERED IN BOREHOLE.

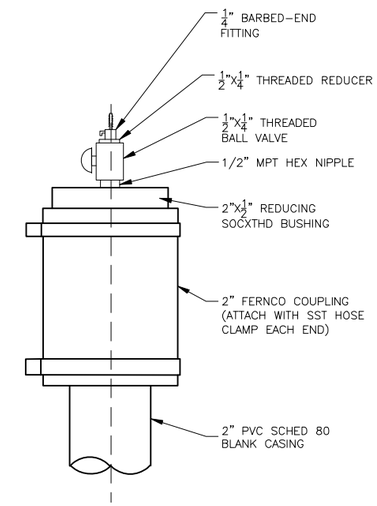
1/23 GAS PROBE DETAIL

NOT TO SCALE



2/23 PLAN VIEW OF METHANE MONITORING WELL

NOT TO SCALE



3/23 GAS MONITORING ASSEMBLY

NOT TO SCALE

GAS PROBE INSTALLATION SCHEDULE TABLE *

METHANE MONITORING WELLS	TOP ELEVATION	BOTTOM ELEVATION	BOREHOLE DEPTH (FT)	BLANK LENGTH (FT)	SCREEN LENGTH (FT)
GP-1	5837.6	5748	~90	8	81
GP-2	5819.1	5743	~76	8	67
GP-3	5784.1	5750	~35	8	26

* CONFIRM ALL GROUND ELEVATIONS AND DRILLING DEPTHS WITH ENGINEER BEFORE WELL INSTALLATION.

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APPENDIX C

Technical Specifications

EIRSWD Regional Landfill Technical Specifications (For Permitting)

DATE: June 30, 2023

CLIENT: EIRSWD

Section	Title
00910	Landfill Special Provisions
Division 2 – Site Work	
02232	Site Clearing
02275	Geosynthetic Clay Liner (GCL)
02303	Soil Stabilization
02320	Landfill Earthwork
02345	Geotextile Fabrics
02627	Leachate Collection System/Leak Detection System
02628	Alternating Duplex Leachate Extraction Pumping System
02644	Flexible Membrane Liner
02709	Topsoil
02821	Chain-Link Fences and Gates

The technical specifications listed above have been prepared under the direct supervision of the Professional Engineer Licensed in the State of Washington, whose seal and signature appear below:

LANDFILL SPECIAL PROVISIONS

SECTION 00910

LANDFILL SPECIAL PROVISIONS

SP-01 INCORPORATION OF THE ISPWC 1
SP-02 QUALIFICATIONS OF CONTRACTOR, SUBCONTRACTORS, SUPPLIERS, AND OTHERS 1
SP-03 SUBSURFACE AND PHYSICAL CONDITIONS 1
SP-04 PREBID EXPLORATION/SITE INFORMATION 2
SP-05 SPOIL 2
SP-06 BEST MANAGEMENT PRACTICES 2
SP-07 WATER FOR CONSTRUCTION 3
SP-08 EXPLORATORY EXCAVATION 3
SP-09 STAGING AREA 3
SP-10 TESTING 3
SP-11 PERMITS 5
SP-12 WORKING HOURS 5
SP-13 UNSCHEDULED EMPLOYMENT OF THE ENGINEER 5
SP-14 FIELD OFFICES 6
SP-15 PROGRESS MEETINGS 6
SP-16 LINER PROTECTION DURING CONSTRUCTION 7
SP-17 FINAL CLEANUP 7
SP-18 PROPERTY PINS, MONITORING WELLS, & GAS PROBES PROTECTION 7
SP-19 SAFETY 7
SP-20 TEMPORARY ACCESS ROAD 7
SP-21 GEOSYNTHETICS INSTALLER 7
SP-22 TOLERANCES 7
SP-23 BLUE BOARD INSULATION 7
SP-24 OWNER PROVIDED MATERIALS 8
SP-25 LUMP SUM BID QUANTITIES 9
SP-26 IDAHO PUBLIC WORKS CONTRACTOR EXEMPTIONS 10
SP-27 GAS PROBES 10

SP-01 INCORPORATION OF THE ISPWC

All provisions of the Idaho Standards for Public Works Construction, 2020 edition, hereafter collectively referred to as the ISPWC, apply to the project, except where portions of the ISPWC are modified or replaced by the Contract Documents.

Where a Standard Modification to ISPWC does not exist for a particular Section of ISPWC, it shall be assumed the work is to be completed in accordance with the appropriate ISPWC Section. When a Standard Modification to ISPWC does exist, the requirements of that modification supersede the related ISPWC requirement. Forms included in the Project Manual will be used in lieu of similarly titled forms in the ISPWC.

Delete STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT of the ISPWC. The standard EJCDC General Conditions and Supplemental Conditions are provided in the Contract Documents.

Delete PAY ITEMS sections of the ISPWC. Payment for an item will only be made if that item is listed as a Bid Item in Section 00400: Bid Form. If an item is listed as a Bid Item, administrative and procedural requirements will be listed in Section 01275: Measurement and Payment. If an item is not listed as a Bid Item, the item is not required or is considered an incidental cost to other Bid Items.

SP-02 QUALIFICATIONS OF CONTRACTOR, SUBCONTRACTORS, SUPPLIERS, AND OTHERS

Provide qualifications for the Contractor and all Subcontractors, Suppliers, or other persons or organizations identified in Technical Specifications per the guidelines in the respective specification sections.

Submit the evidence of qualifications listed in Article 3.01 of the Instructions to Bidders and the following additional information within seven (7) days of request by the Owner.

- Written evidence establishing the Contractor's qualifications such as financial data, previous experience, and present commitments.
- A list of at least three (3) jobs successfully completed within the last five (5) years by the Bidder similar in size and scope to the Work, including references for each project;
- The proposed Superintendent's name and resume; and
- The general availability of the Bidder to complete the Work within a reasonable timeframe.
- For each Subcontractor, Supplier, or other person or organization listed, include the primary contact and phone number, approximate anticipated monetary value of Work, and a list of similar projects over the past three (3) years.

SP-03 SUBSURFACE AND PHYSICAL CONDITIONS

In the preparation of Drawings and Specifications, the Engineer or Engineer's Consultants relied upon the following reports of exploration and tests of subsurface conditions at the Site:

1. *Geotechnical Engineering Evaluation, Newdale Landfill, Newdale, Idaho,* prepared by Xcell Engineering, LLC, August 29, 2022. Select bore logs from the project area are located in Appendix A of this Project Manual

These reports and drawings are not part of the Contract Documents, but the "technical data" contained therein upon which the Contractor may rely as identified and the above are incorporated therein by reference. Contractor is not entitled to rely upon other information and data utilized by Engineer and Engineer's Consultants in the preparation of Drawings and Specifications.

The majority of soils the Contractor will encounter up to a depth of approximately 14 feet will be fine-grained sandy silt. Over 14 feet the Contractor will encounter moderately fractured rhyolite. The Contractor shall be responsible for satisfying himself as to the nature of the soils before placing his bid. The Contractor is highly encouraged to read and understand the Geotechnical Report included in Appendix A.

SP-04 PREBID EXPLORATION/SITE INFORMATION

All Bidders are strongly encouraged to visit the site of the work and conduct all field investigations at their disposal to become acquainted with the nature of the work. Obtain written authorization from the Owner utilities and others who may be directly affected before entering the property, conducting field tests, drilling, boring, excavating, or test pumping.

If potential Bidders wish to excavate test pits, the excavations will be limited to the vicinity of those areas that appear on the Drawings to be excavated. Excavations must be backfilled in a reasonably uniform manner and graded to the original ground surface line and grade.

SP-05 SPOIL

The locations of spoil placement are shown on the site plan. The Contractor will be responsible for stockpiling excess soil and rhyolite from the cell excavation in the location shown on the plans. Soil and rhyolite shall be stockpiled in separate locations. T

No additional payment will be allowed to the Contractor for this work. Refer to Section 01275: Measurement and Payment for more information.

SP-06 BEST MANAGEMENT PRACTICES

Dust Control – Dust control is considered an integral part of the Work. Dust Control shall be provided from the start of construction until the Work is complete. Fugitive dust as a result of construction shall be controlled at all times within the subject property. The Contractor shall have a water truck available for dust control before beginning any construction tasks. Wetting shall be done a minimum of twice per day in dry conditions or at the direction of the Engineer or Owner as required until the final construction activities are completed. Contractor shall be prepared to provide dust control until the final surface restoration is completed. All costs incurred to meet dust control requirements are incidental to other items of the contract, and no separate payment shall be made.

Road and Parking Lot Cleaning – It shall be the sole responsibility of the contractor to keep all roads and parking lots free from mud, gravel, cobbles, or other contaminants generated as a result of construction activities. It shall be the responsibility of the contractor to clean all foreign matter from roads and parking areas in a reasonable amount of time as determined by the Owner & Engineer. All costs incurred to meet road and parking lot cleaning requirements are incidental to other items of the contract, and no separate payment shall be made.

Erosion Control Measures – Temporary erosion and sediment control measures include installing and maintaining temporary structural control measures to reduce or eliminate soil erosion and transport of

sediment offsite as a result of construction activities. This may include, but not be limited to, silt fences, ditch checks, sediment basins, erosion control mats, stabilized construction entrance, temporary diversions, inlet protection, sediment traps, and slope drains. If erosion control measures are required, it shall be the responsibility of the contractor to install and maintain them throughout the construction. All costs incurred to meet erosion control requirements are incidental to other items of the contract, and no separate payment shall be made.

Noxious Weed Control – Comply with the County Noxious Weed Management Act, Title 7, Chapter 22, Part 21, and all county and contract noxious weed control requirements. Determine the specific noxious weed control requirements of each county where the project is located before submitting a bid. Equipment and vehicles will be washed before entering the project site to remove vegetation to avoid the spread of weeds. All costs incurred to meet noxious weed control requirements are incidental to other items of the contract, and no separate payment shall be made.

Failure to Provide Service – If the contractor fails to provide adequate service on the above-listed items, the Owner reserves the right to contract these activities to a third party, the cost of which will be deducted from the contract amount at the time of the next pay request.

SP-07 WATER FOR CONSTRUCTION

Construction water is not available on-site. Contractor shall obtain their own water.

SP-08 EXPLORATORY EXCAVATION

Exploratory excavation is included in the construction contract. Exploratory excavation is for the convenience of the Owner and/or Engineer and will be used when a subsurface condition needs to be determined or verified. Payment for exploratory excavation will be authorized with documentation of Owner authorization (Engineer issued field order). Contractor initiated exploratory excavation that has not been Owner authorized will not be authorized for payment.

SP-09 STAGING AREA

Staging area locations will be determined at the preconstruction conference. Take care to protect, preserve and/or replace objects and structures encountered within the confines of the staging areas and restore all disturbed areas as close as possible to original condition as possible unless otherwise dictated in these specifications.

Storage of construction materials, equipment, and other items pertinent to the construction of the project will be allowed in the staging areas. However, bulk storage of petroleum-based products stored in tanks will not be permitted. At all times, spill kits must be available on-site for any accidental spills of petroleum.

No payment will be allowed to the Contractor for any work, including restoration, regarding the staging areas.

SP-10 TESTING

Complete testing of all components of the project will be required to the satisfaction of the Owner and the Engineer. Remedy all defects and performance problems revealed by the testing to the satisfaction of the Engineer by the Contractor at no additional expense to the Owner.

The Contractor will be responsible for conducting and paying for the following tests:

1. On-site moisture and density testing of liner foundation layer after the liner foundation layer has reached final elevations.
2. Gradations for gravels as specified.
3. Proctor test for embankment & liner foundation layer preparation.
4. Gradations and proctors for various gravels to be used for backfill, embankments, drain gravel, etc.
5. On-site moisture and density testing of anchor trench backfill, roadway materials, landfill cell embankment, leachate pond embankment, and other embankment required to complete the earthwork by a third-party testing firm.
6. Conformance testing of contractor provided geosynthetics in accordance with the Technical Specifications.
7. Liner destructive and non-destructive seam testing as outlined within the Specifications.
8. Factory quality assurance testing of all contractor provided gosynthetic materials as specified within the Specifications.
9. Pressure testing the leachate forcemain piping.
10. Start-up and testing of leachate pumping equipment.
11. Re-testing of failed tests that were conducted by the Engineer.
12. Other tests as outlined in the Technical Specifications.

All tests which are the responsibility of the Contractor must be conducted by an approved, certified testing laboratory or individual. Acceptance or rejection of materials will generally be determined from tests made in-place in the field.

The following is frequency testing table for soils:

Quality Control Frequency Table

SECTION	ITEM DESCRIPTION	TEST OR SUBMITTAL	FREQUENCY
GENERAL			
02320	Landfill Cell Foundation Layer	Field Density/Moisture Content	5 tests / acre
02320	Original Ground / Prepared Subgrade	Field Density/Moisture Content	1 test / 5,000 SF / lift
02320	Landfill Cell Embankment and Foundation Layer	Moisture-Density ASTM D698 (std)	1 min per material type
02320	Embankment	Field Density/Moisture Content	5 tests / lift
02320	Liner Anchor Trench Backfill	Field Density/Moisture Content	1 test / 200 lineal feet
02627	Drain Gravel	Sieve Analysis	1 test / 2,500 CY
GENERAL – ROADWAY			
Varies	All Materials	Sieve Analysis	Every New Material
Varies	All Materials	Atterberg Limits	Every New Material
Varies	All Materials	Lab. Max Density	Every New Material
02320	Borrow / Embankment Fill	Field Density/Moisture Content	1 test / 5,000 SF / lift
02320	Original Ground / Native Subgrade	Field Density/Moisture Content	1 test / 5,000 SF / lift
802	Base Course	Field Density	1 test / 2,000 SF / lift
802	Surface Course	Field Density	1 test / 2,000 SF / lift

SP-11 PERMITS

The Owner and Engineer will obtain the following permits at no expense to the Contractor. The Contractor will be required to carry out all provisions of these permits as part of this contract.

1. Solid Waste license and permit

The Contractor is responsible for obtaining all necessary permits, licenses, agreements, insurance, and approvals required by any government authority or agency for the performance of this work at his own expense. Owner will allow Contractor access, as appropriate and necessary, for obtaining data in regard to permits and, at its own discretion, may assist Contractor, when necessary, in obtaining such permits. These permits may include but are not limited to the following:

1. Electrical Permit
2. Stormwater Discharge Permit: The work requires a Construction General Permit for all sites disturbing one acre or more, and all discharges must be in accordance with the submitted Storm Water Pollution Prevention Plan (SWPPP). The Contractor is responsible for preparing and signing a SWPPP and submitting a complete Notice of Intent (NOI) package to the Idaho Department of Environmental Quality. The Contractor will be responsible for all fees associated with the permit application.

   Implement and comply with the provisions of the NOI and SWPPP throughout the construction period.. If the Contractor elects not to carry out the provisions of the NOI and SWPPP, he shall be responsible for any damages or fines the State of Idaho may assess for non-compliance. At the end of the project, the Contractor will be responsible for submitting and signing a completed Notice of Terminations (NOT) form to the Department of Environmental Quality. The Contractor will be responsible for paying annual SWPPP permit renewal fees until the NOT is issued.

SP-12 WORKING HOURS

Regular working hours are defined as an eight-hour period (plus 1 hour lunch allotment) within the bounds of 7:00 AM and 7:00 PM, Monday through Friday. Work during other hours may be permitted following written approval of the Owner. Contractor shall provide the Engineer a request at least three (3) days prior to working other hours, or in excess of 8 hours per day. Engineer shall provide a response to the request within 24 hours of receipt. Emergency work may be done without prior permission.

SP-13 UNSCHEDULED EMPLOYMENT OF THE ENGINEER

Examples of damages for unscheduled employment of the Engineer that will be assessed against the Contractor include, but are not limited to:

1) The Contractor working beyond the specified contract time.
2) The Contractor working more than 8 hours per day, (or 40 hours per week if four ten-hour shifts are run) or on Saturdays, Sundays, and Federal Holidays.
3) The Contractor utilizing material, supplies, or equipment that requires the redesign of the project.
4) The Contractor destroying or disturbing baselines benchmarks or reference stakes.
5) Failure of the Contractor to maintain acceptable as-built records.
6) The review of a fourth or subsequent submittal of a Shop Drawing, sample, or other item requiring approval.

7) Additional services required due to the Contractor's failure to pay subcontractors and/or suppliers.
8) Retests required by the Engineer of tests that have failed.
9) Additional construction administration required by the Engineer as a result of unacceptable work.

Damages for the unscheduled employment of the Engineer may be incurred by the personnel listed in section 4.05 of the Agreement and will be determined based on the hourly rates shown in section 4.05 of the Agreement.

The rates listed in section 4.05 of the Agreement are subject to changes on January 1st of each year.

Out of pocket expenses for materials, equipment, supplies, transportation, lodging, and subsistence will be billed at cost plus ten percent. Damages for unscheduled employment of the Engineer will be deducted from monthly progress payments and the final payment as the damages are incurred. Damages for unscheduled employment of the Engineer are independent from liquidated damages for delay as described in the agreement.

SP-14 FIELD OFFICES

Maintain a suitable field office at the site, which will serve as headquarters for the project Superintendent. All communications, drawings, instructions, and other articles will be delivered to the Contractor's field office or to the Contractor's main office as appropriate. Communications delivered to either location will be deemed to have been delivered to the Contractor.

Maintain copies of record drawings, specifications, shop drawings, submittals, and all communications pertinent to the performance of the work at the field office and make them available to the Owner or Engineer for use at all times.

All electrical and heating bills for the field office are the responsibility of the contractor. No separate payment will be made for field offices. The cost of field offices will be included in the mobilization Bid Item for the base bid.

The Contractor is responsible to provide sanitary facilities for all workers on site at no additional cost to the owner.

SP-15 PROGRESS MEETINGS

The Engineer will schedule and conduct progress meetings at regular intervals to discuss the status of the project. The meetings will be conducted at the project site, unless otherwise indicated.

In addition to representatives of Owner and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

Engineer shall record significant discussions and agreements achieved and shall distribute the meeting minutes to everyone concerned within 7 days of the meeting.

SP-16 LINER PROTECTION DURING CONSTRUCTION

Protect the liner from damage due to deer, or other hazards during liner installation and after liner completion and promptly repair any damage to the liner. This may require the installation of temporary measures such as fencing.

SP-17 FINAL CLEANUP

Excess material accumulated from construction, such as piles of gravel or soil, broken pipe or concrete, debris, papers, rejected materials, worn out equipment parts, waste liner material, etc. shall be picked up and disposed of at the Contractor's expense.

SP-18 PROPERTY PINS, MONITORING WELLS, & GAS PROBES PROTECTION

The Contractor shall take extreme caution to protect and preserve existing property pins, gas probes, and monitoring wells. Locations of gas probes, monitoring wells and property lines are shown on the plans. The Contractor shall replace, at his own expense, any property pins and/or monitoring wells that may be damaged during construction.

SP-19 SAFETY

The Contractor shall be responsible for identifying and meeting all safety standards that are applicable to this project. The Contractor shall hold harmless the Owner and the Engineer from any claims made as a result of the Contractor's responsibilities in this regard.

SP-20 TEMPORARY ACCESS ROAD

Any additional temporary roads needed by the Contractor to construct the project will be constructed by the Contractor at no additional cost to the Owner. Temporary access roads will need to accommodate surface run-off and drainage on-site. All temporary access roads will be approved by the Engineer prior to being constructed by the Contractor. Temporary roads will be reclaimed after the project unless otherwise approved by the Owner to remain in place.

SP-21 GEOSYNTHETICS INSTALLER

The geosynthetics installer shall meet the experience requirements outlined within the Technical Specifications. The Contractor shall use one qualified geosynthetics installer for all geosynthetics on this project including the geosynthetic clay liner, 60 mil HDPE liner, non-woven fabric, and drain liner. The installer will need to provide evidence of experience for each of the geosynthetics in order to be approved by the Engineer.

SP-22 TOLERANCES

Unless otherwise specified, the Contractor shall construct all earthwork and piping within a tolerance of ±2 inches in the vertical direction and one foot in the horizontal direction.

SP-23 BLUE BOARD INSULATION

Blue Board Insulation shall be installed around the leachate forcemain where the cover depth is less than 4 feet. Contractor shall furnish extruded polystyrene rigid foam insulation conforming to ASTM C578, Type IV, with a minimum thermal resistance (R Value) of 5.0 per 1-inch of thickness at 75° Fahrenheit

mean temperature. Water absorption for the insulation shall not exceed 0.10 by volume as measured by ASTM C272. Materials shall be delivered in their original unopened units, stored off the ground, protected from direct sunlight with a light-colored opaque polyethylene film and ventilated to prevent excessive temperature. Damaged or deteriorated materials shall be removed from the premises. Blue board shall be extruded polystyrene rigid foam insulation as manufactured by Owens-Corning (Foamular 250) or approved equivalent.

SP-24 OWNER PROVIDED MATERIALS

The Owner has procured the geosynthetic clay liner, 60 Mil HDPE liner, and non-woven fabric for the landfill cell. The Owner has procured the geosynthetic clay liner, and 60 Mil HDPE liner (microspike and microdrain) for the leachate ponds. The Owner has procured the HDPE piping for the leachate collection and pumping system. These materials are stored at Fremont County Road and Bridge located at 2317 E 400 N, St. Anthony, ID 83445.Tthe Contractor is responsible for transporting the materials from the Owner's storage location to the project area. Any materials damaged during transport shall be replaced by the Contractor at no additional expense to the Owner. The following table indicates the quantities of each material procured by the owner.

BID ITEM NO.	ITEM DESCRIPTION	QUANTITY	UNITS
6, 18	60 Mil. HDPE Liner (Microspike)	864,000	SF
18	60 Mil. HDPE Liner (Microdrain)	180,000	SF
5, 17	Geosynthetic Clay Liner (GCL)	684,000	SF
7	16 Oz. Non-Woven Fabric	504,000	SF
11	18" SDR 17 HDPE – Solid Wall	300	LF
11	18" SDR 17 HDPE – Perforated	150	LF
11	8" SDR 11 HDPE – Solid Wall	175	LF
11	8" SDR 11 HDPE – Perforated	600	LF
11	6" SDR 11 HDPE – Solid Wall	800	LF
11	6" SDR 11 HDPE - Perforated	1,000	LF
11	3" SDR 11 HDPE – Solid Wall	600	LF
11	2" SDR 11 HDPE – Solid Wall*	320	LF
11	1.5" SDR 11 HDPE – Solid Wall	500	LF

*May not be used in the project depending on other pipe allotments.

SP-25 LUMP SUM BID QUANTITIES

Bidder may receive electronic copies of the landfill cell, stormwater ponds, leachate ponds, and access road surfaces upon request before the bid is submitted. Bidder is wholly responsible for determining in-place quantities for earthwork, excavation, embankment, liner foundation layer, liner, liner cover, etc. prior to placing a bid. **The following estimated quantity table is for informational purposes only.**

BID ITEM NO.	ITEM DESCRIPTION	QUANTITY	UNITS
2	Excavation - Topsoil	31,500	CY
2	Excavation – Sandy Silt	454,500	CY
2	Excavation - Rhyolite	740,000	CY
4	Landfill Cell Liner Foundation Layer	491,100	SF
5	Landfill Cell Geosynthetic Clay Liner (GCL)	491,100	SF
6	Landfill Cell 60 MIL HDPE Liner (Microspike)	491,100	SF
7	Landfill Cell 16 Oz. Non-Woven Fabric	491,100	SF
8	Drain Gravel	16,000	CY
9	Select Native Cover	11,950	CY
12	Particle Board/Visqueen	1,590	LF
16	Leachate Pond Liner Foundation Layer	184,600	SF
17	Leachate Pond 60 Mil HDPE Liner (MicroSpike)	184,600	SF
17	Leachate Pond 60 Mil HDPE Drain Liner (MicroDrain)	184,600	SF
10	18” SDR 17 HDPE – Solid Wall	285	LF
10	18” SDR 17 HDPE – Perforated	65	LF
11	8” SDR 11 HDPE – Solid Wall	200	LF
11	8” SDR 11 HDPE – Perforated	575	LF
11	6” SDR 11 HDPE – Solid Wall	1,250	LF
11	6” SDR 11 HDPE - Perforated	960	LF
11	3” SDR 11 HDPE – Solid Wall	750	LF
11	1.5” SDR 11 HDPE – Solid Wall	150	LF

Note: Excavation and Embankment quantities are measured as in-place cubic yards and do not account for shrink and swell. Estimated liner quantities are provided to assist liner installer quantify the project scope. Estimated liner quantities do no include waste, liner materials in anchor trench, liner materials overlap, liner materials for run-off control ditches, or protective layer of liner in toe and central leachate collector ditches.

It is the responsibility of the Contractor to ensure enough liner and piping materials have been procured by the Owner to complete the project. If the Owner has not procured enough materials, the Contractor shall include the cost of furnishing additional materials in his bid.

SP-26 IDAHO PUBLIC WORKS CONTRACTOR EXEMPTIONS

Per Idaho Code 54-1903, Contractors performing work for a solid waste disposal site are exempt from Idaho Codes 44-1002 and 54-19.

~~Idaho Code Section 44-1002 requires the following: The Contractor must employ ninety-five percent (95%) bona fide Idaho residents as employees on any job under any such contract except where under such contracts fifty (50) or less persons are employed, the Contractor may employ ten percent (10%) nonresidents, provided, however, in all cases employers must give preference to the employment of bona fide residents in the performance of said work, and no contract shall be let to any person, firm, association, or corporation refusing to execute an agreement with the above mentioned provisions in it; provided, that, in contracts involving the expenditure of federal aid funds this act shall not be enforced in such a manner as to conflict with or be contrary to the federal statutes prescribing a labor preference to honorably discharged soldiers, sailors, and marines, prohibiting as unlawful any other preference or discrimination among citizens of the United States.~~

SP-27 GAS PROBES

The Contractor shall install three gas monitoring probes as shown on the drawings. The Contractor shall utilize an air-rotary rig or approved equivalent operated by an experienced driller licensed to drill wells in Idaho. The Contractor shall submit a drilling plan to the Engineer prior to beginning drilling activities. Gas probes shall be installed straight and plumb and provide adequate seals to prevent potential movement of surface water downward through the annular space. After achieving the target depth, the temporary steel casing shall be removed. The Contractor shall provide and install 2-inch diameter Schedule 80 flush-threaded PVC casing and screen conforming to ASTM D 1785. Well screen shall be 40-slot with estimated lengths shown on the drawings. The Contractor shall install stainless steel centralizers to properly orient and center the well-string assembly in the borehole. All casing and materials shall be new and delivered to the site by the Contractor in the original factory packaging.

END OF SECTION

DIVISION 2

Site Work

SECTION 02232

SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections and Landfill Special Provisions apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
1. Protecting existing trees and vegetation to remain.
2. Removing trees and other vegetation.
3. Clearing and grubbing.
4. Topsoil stripping.
5. Removing above-grade site improvements.
6. Disconnecting, capping or sealing, and abandoning site utilities in place.
7. Disconnecting, capping or sealing, and removing site utilities.

B. Related Sections include the following:
1. Division 2 Section 02320 " Landfill Earthwork" for soil materials, excavating, backfilling, and site grading.

1.3 DEFINITIONS

A. Topsoil: See Section 02709 “Topsoil”.

1.4 MATERIALS OWNERSHIP

A. Except for materials indicated to be stockpiled or to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from the site.

1.5 SUBMITTALS

A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.

B. Record drawings according to Division 1 Section "Closeout Procedures."
1. Identify and accurately locate capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

B. Improvements to Adjoining Property: Work on adjoining properties is not included in the scope of this project.

C. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

D. Notify utility locator service for area where Project is located before site clearing.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 2 Section "Earthwork."
1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Provide erosion-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Locate and clearly flag trees and vegetation to remain or to be relocated.

D. Protect existing site improvements to remain from damage during construction.
1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TREE PROTECTION

A. Erect and maintain a temporary fence around drip line of individual trees or around perimeter drip line of groups of trees to remain. Remove fence when construction is complete.
1. Do not store construction materials, debris, or excavated material within drip line of remaining trees.
2. Do not permit vehicles, equipment, or foot traffic within drip line of remaining trees.

B. Do not excavate within drip line of trees, unless otherwise indicated.

C. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.
1. Cover exposed roots with burlap and water regularly.

2. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.
3. Coat cut faces of roots more than 1-1/2 inches (38 mm) in diameter with an emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
4. Cover exposed roots with wet burlap to prevent roots from drying out. Backfill with soil as soon as possible.

D. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Engineer.
1. Employ a qualified arborist, licensed in the jurisdiction where Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.
2. Replace trees that cannot be repaired and restored to full-growth status, as determined by the qualified arborist.

E. Transplant trees and vegetation indicated to be relocated to the location designated by the Engineer, in a manner approved by Engineer.
1. Employ a qualified arborist or landscaping expert, licensed in jurisdiction where Project is located, to transplant trees and shrubs.
2. Operation shall be completed in such manner as to protect the root wad of the tree or other vegetation.

3.3 UTILITIES

A. Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing when requested by Contractor.
1. Verify that utilities have been disconnected and capped before proceeding with site clearing.

B. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.
1. Owner will arrange to shut off indicated utilities when requested by Contractor.
2. Arrange to shut off indicated utilities with utility companies.

C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. Notify Engineer not less than two weeks in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Engineer's written permission.

D. Excavate for and remove underground utilities indicated to be removed.

3.4 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots.
1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.

3. Completely remove stumps, roots, obstructions, and debris extending to a depth of 18 inches (450 mm) below exposed subgrade.
4. Use only hand methods for grubbing within drip line of remaining trees.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.
1. Place fill material in horizontal layers not exceeding 8-inch (200-mm) loose depth, and compact each layer to a density equal to adjacent original ground.

3.5 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.
1. Strip surface soil of unsuitable topsoil, including trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water.
1. Do not stockpile topsoil within drip line of remaining trees.
2. Dispose of excess topsoil as specified for waste material disposal.
3. Stockpile surplus topsoil and allow for respreading deeper topsoil.

3.6 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.

3.7 DISPOSAL

A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION

SECTION 02275

GEOSYNTHETIC CLAY LINER (GCL)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections and Landfill Special Provisions apply to this Section.

1.2 WORK INCLUDED

A. This specification is for the installation of Owner-supplied Geosynthetic Clay Liner (GCL) at the EIRSWD landfill. GCL shall be transported from the storage location and installed as shown on the Drawings and as required herein for proper installation and functioning of the liner system for the purpose of landfill leachate containment. If more GCL is required to complete the project than the Owner has purchased, additional material shall be purchased as part of this specification and meet Part 2 of this Specification.

1.3 REFERENCES

A. The following test methods shall be incorporated into this specification in their entirety, subject to the indicated test modifications:

1. GRI-GCL3, "Test Methods, Required Properties, and Testing Frequencies of Geosynthetic Clay Liners (GCLs)"
2. ASTM D 4632, "Standard Test Method for Grab Breaking Load and Elongation of Geotextiles"
3. ASTM D 5261, "Standard Test Method for Measuring Mass Per Unit Area of Geotextiles"
4. ASTM D 5887, "Standard Test Method for Measurement of Index Flux Through Saturated Geosynthetic Clay Liner Specimens Using a Flexible Wall Permeameter"
5. ASTM D 5888, "Standard Guide for Storage and Handling of Geosynthetic Clay Liners"
6. ASTM D 5889, "Standard Practice for Quality Control of Geosynthetic Clay Liners"
7. ASTM D 5890, "Standard Test Method for Swell Index of Clay Mineral Component of Geosynthetic Clay Liners"
8. ASTM D 5891, "Standard Test Method for Fluid Loss of Clay Component of Geosynthetic Clay Liners"
9. ASTM D 5993, "Standard Test Method for Measuring the Mass Per Unit Area of Geosynthetic Clay Liners"
10. ASTM D 6102, "Standard Guide for Installation of Geosynthetic Clay Liners"
11. ASTM D 6243, "Standard Method for Determining the Internal and Interface Shear Strength of Geosynthetic Clay Liner by the Direct Shear Method"

12. ASTM D 6496, “Standard Test Method for Determining Average Bonding Peel Strength Between the Top and Bottom Layers of Needle-Punched Geosynthetic Clay Liners”
13. ASTM D 6768, “Standard Test Method for Tensile Strength of Geosynthetic Clay Liners”
14. GRI GM13, “Test Methods, Test Properties, and Testing Frequency for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes”

B. Qualifications - The GCL Manufacturer and Installer shall all be skilled in accordance with the following experience requirements. Any exceptions must be approved by the project engineer prior to the project bid.

C. GCL Manufacturer - The GCL manufacturer selected for use on this project shall have successfully produced at least 10,000,000 square feet of needle punched GCL product.

D. GCL Installer - The installer shall provide to the engineer sufficient evidence of installation experience and competence with the specified geosynthetic materials. The GCL shall be installed by the lining contractor responsible for the installation of the overlying HDPE liner and non-woven geotextile. The GCL/FML/non-woven geotextile lining installer shall demonstrate a minimum of 1,000,000 square feet of successfully completed multi-component composite liner installation experience or shall provide sufficient evidence of the appropriate level of installation experience and competence with other geosynthetics.

1.4 SUBMITTALS

A. Four copies of the project submittals shall be forwarded to the project engineer as designated below:
1. Prior to Installation - The following information shall be supplied to the project engineer for review within 10 business days of the Contract Award to ensure that the materials and parties selected for use on the project meet the requirements of this specification.
   a. Statement of experience from the proposed GCL supplier.
   b. Statement of experience from the proposed GCL installer.
   c. Samples of GCL proposed for use on the project.
   d. Reference list supplied by GCL manufacturer indicating the appropriate experience level as required by the specification.
   e. Reference list supplied by the GCL installer indicating the appropriate experience level as required by the specification.
   f. Results of shear testing as specified in Paragraph 1.4.
2. Prior to Deployment - The following information shall be submitted by the Contractor to the Project Engineer prior to the deployment of any GCL material to ensure that the materials and subgrade preparation meet the requirements of this specification.
   a. GCL Manufacturer’s Quality Control Certifications.
   b. Results of Conformance Testing specified within Section 3.5.
   c. Certifications of subgrade acceptance for each area covered by GCL signed by the Installer, General Contractor and Engineer.

PART 2 - MATERIALS

2.1 GENERAL

A. The geosynthetic clay liner (GCL) shall be a needle-punched, reinforced GCL. The GCL shall consist of a composite consisting of granular sodium bentonite encapsulated between a woven geotextile and non-woven geotextile. The composite GCL shall be reinforced with needle-punching to provide shear strength with fully hydrated bentonite. The needle punched GCL shall be thermally locked. The thermal lock process must heat set the non-woven fibers where they protrude from the woven geotextile to more permanently secure the reinforcement in place. The GCL shall be Bentofix NSL or equivalent.

2.2 BENTONITE

A. General: Geosynthetic clay liner shall be factory-manufactured for the purpose of providing a hydraulic barrier. Bentonite shall be high-swelling sodium bentonite, first quality product mined and processed specifically for the purpose of manufacturing a geosynthetic clay liner. Bentonite shall meet the properties shown in Table 1.

B. Bentonite Certification and Testing: The bentonite supplier shall sample and test bentonite during processing to ensure product quality. The geosynthetic clay liner manufacturer shall sample and test bentonite for quality assurance. The Contractor shall submit certificates from the bentonite supplier and geosynthetic clay liner manufacturer to the Engineer for approval prior to deployment of geosynthetic clay liner at the site.

2.3 GEOSYNTHETIC CLAY LINER PROPERTIES

The geosynthetic clay liner shall meet or exceed the minimum average roll values for the physical and hydraulic properties on Table 1.

TABLE 1

PHYSICAL PROPERTIES			
MATERIAL PROPERTY	TEST METHOD	TEST FREQUENCY	REQUIRED VALUES
Bentonite Swell Index[1]	ASTM D5890	1 per 50 tonnes	24 mL/2g min.
Bentonite Fluid Loss[1]	ASTM D5891	1 per 50 tonnes	18 mL max.
Bentonite Mass/Area[2]	ASTM D5993	40,000 ft^2 (4,000 m^2)	0.75 lb/ft^2 (3.6 kg/m^2) min.
GCL Grab Strength[3]	ASTM D6768	200,000 ft^2 (20,000 m^2)	50 lbs/in (88 N/cm) MARV
GCL Peel Strength[3]	ASTM D6496	40,000 ft^2 (4,000 m^2)	3.5 lbs/in (6.1 N/cm) min.
GCL Index Flux[4]	ASTM D5887	Weekly	1×10^{-8} $m^3/m^2/s$ max.
GCL Hydraulic Conductivity[4]	ASTM D5887	Weekly	5×10^{-9} cm/s max.
GCL Hydrated Internal Shear Strength[5]	ASTM D5321 ASTM D6243	Periodic	500 psf (24 kPa) typical @ 200 psf

1 Bentonite property tests performed by bentonite supplier and GCL manufacturer.
2 Oven dried to zero percent moisture.
3 All tensile strength testing performed in the machine direction using ASTM D6768. All peel strength testing performed using ASTM D6496.
4 Distilled/deionized waster at 80 psi cell pressure, 77 psi headwater pressure, and 75 psi tailwater pressure.

[5] Peak value to be measured at 200 psf normal stress for a specimen hydrated for 48 hours.

A. A geotextile composite GCL shall be needle-punched to provide shear resistance when the bentonite is fully hydrated. The non-woven fibers shall be thermally locked. The GCL shall be Bentofix NSL or equivalent.

2.4 GEOSYNTHETIC CLAY LINER ROLLS

A. General: Geosynthetic clay liner shall be new, first quality and manufactured specifically for the purpose of this project. The geosynthetic clay liner shall have no holes, pinholes, bubbles, blisters, nicks, tears, cuts on edges, or contamination by foreign matter. Geosynthetic clay liner shall be supplied in rolls. Folding shall not be permitted.

B. Manufacturer Certification: The Contractor shall submit written manufacturer certification to the Engineer for approval that the geosynthetic clay liner conforms to the material requirements of these Specifications; is similar to and of the same formulation as that for which certification is submitted; and has been demonstrated by actual usage to be satisfactory for the intended application. Manufacturer certification shall include the minimum average roll values for material to be furnished on this project. The Contractor shall obtain Engineer's approval of the geosynthetic clay liner prior to shipment to the site. The Contractor will not be allowed to unload or store on site any material that is delivered prior to obtaining such approval.

C. Dimensions: The minimum acceptable dimensions for the GCL panels shall be 15 feet wide and 125 feet long. Short rolls (rolls less than 125 feet long) may be supplied, but at a rate not to exceed 5% of the total square footage produced for this project.

D. Overlap Markings: A minimum overlap guide-line and a construction match-line delineating the overlap zone shall be imprinted with non-toxic ink on both edges of the GCL panel to ensure the accuracy of the seam. These lines shall be used during CQA to ensure the minimum overlap is achieved. The minimum overlap guideline shall indicate where the edge of the panel must be placed in order to achieve a full twelve inches on panel edges and two feet on panel ends of bentonite overlap for each panel.

PART 3 - MANUFACTURING QUALITY CONTROL

3.1 ROLL IDENTIFICATION

A. Each roll shall be labeled or tagged with roll identification number, name of manufacturer, date of production, product type and grade, lot number, physical dimensions, and roll weight. The label or tag information shall be fixed or attached to the roll at all times during deployment of the roll. The product identification number, manufacturer name and lot number shall also be stenciled onto the start of each roll so that a positive verification can be made with label or tag information.

3.2 QUALITY CONTROL

A. Geosynthetic clay liner shall be monitored throughout the manufacturing process for project integrity and consistency. Manufacturer shall sample rolls for the physical properties and at the minimum frequency as detailed within Table 1 of this specification or per lot whichever results in the greatest number of tests.

Certified test results shall be submitted to and approved by the Engineer at least ten (10) working days prior to geosynthetic clay liner deployment at the site. The Contractor shall submit a list which indicates date of production, plant location, lot number, manufacturing liner number and identification number and square footage of each geosynthetic clay liner roll. Rolls shall be listed in the order of production with the status of the roll (approved or rejected for shipment). All rolls shall be included in the list whether or not approved for shipment to the project.

3.3 MANUFACTURER QUALITY CONTROL CERTIFICATION

A. Quality Control certificates shall be issued by the GCL manufacturer to the project engineer or other designated party for each delivery of material. The certifications shall be signed by the quality control manager of the GCL manufacturer or other responsible party and shall include the following information:

1. Shipment Packing List - A list indicating the rolls shipped on a particular truckload.
2. Bill of Lading - The shipping documents for the truck used for the shipment.
3. Letter of Certification - The letter indicating the material is in conformance with the physical properties specified.
4. Physical Properties Sheet - The material specification for the GCL supplied in accordance with this specification.

3.4 MANUFACTURER QUALITY CONTROL SUBMITTAL

A. Quality Control submittals shall be issued by the GCL manufacturer to the project engineer or other designated party for each lot of material. The submittals shall include the following information:

1. Bentonite Manufacturer Certification - Bentonite manufacturer quality documentation for the particular lot of clay used in the production of the rolls delivered.
2. Geotextile Manufacturer Certification - Geotextile manufacturer quality control documentation for the particular lots of geotextiles used in the production of the rolls delivered.
3. GCL Manufacturer Tracking List - Cross referencing list delineating the corresponding geotextile and bentonite lots for the materials used in the production of the rolls delivered.
4. Manufacturing Quality Control Data - The manufacturing quality control test data indicating the actual test values obtained when tested at the appropriate frequencies for the properties specified in Table 1.

B. Packaging - All GCL rolls shall be packaged in moisture resistant plastic sleeves. The cardboard cores shall be sufficiently strong to resist collapse during transit and handling.

C. Accessory Bentonite - any accessory bentonite used for sealing seams, penetrations, or repairs, shall be the same granular bentonite as used in the production of the GCL itself.

3.5 CONFORMANCE TESTING

A. The Contractor shall sample Contractor-supplied GCL materials before they arrive on-site for conformance testing. The Contractor will be responsible for forwarding conformance samples to a certified, third party, testing laboratory for testing. Conformance samples will be taken a minimum of each lot or every 100,000 square feet of material whichever results in more tests (Minimum of 2 samples). GCL samples will be tested for Swell Index, Moisture Content, Bentonite Mass Per Unit Area, Fluid Loss, Grab Strength, Index Flux, Internal Sheer Strength, and Peel Strength. Samples will be tested to ensure conformance with the specifications listed within Table 1 of this section.

PART 4 - SHIPPING STORAGE AND HANDLING

4.1 GENERAL

A. Geosynthetic clay liner shall be shipped, stored and handled in accordance with the manufacturer's recommendation and as specified herein. Contractor shall be completely responsible for shipping, storage and handling of all geosynthetic clay liner. The geosynthetic clay liner rolls shall be delivered to the site only after the Engineer receives and approves the required submittals.

4.2 SHIPPING

A. Contractor shall notify the Engineer at least twenty-four (24) hours prior to scheduled delivery. No materials shall be unloaded except in the presence of the Engineer or the Engineer's representative. Geosynthetic clay liner delivered to the site shall be inspected for damage and unloaded and stored with minimal handling.

Damaged rolls shall be separated from undamaged rolls until proper disposition of material is determined by the Engineer. The Engineer will be the final authority on the determination of damage.

4.3 HANDLING

A. No hooks, tongs or other sharp tools or instrument shall be used for handling geosynthetic clay liner. Contractor shall use manufacturer-approved methods for loading and unloading GCL rolls for deployment. The GCL must be supported during handling to prevent damage to the liner. Geosynthetic clay liner shall not be folded, dragged along the ground, lifted with only the forks of a lift truck, or pushed to the ground from the delivery vehicle.

4.4 STORAGE

A. Geosynthetic clay liner shall be protected from precipitation, moisture, soil, mud, dirt, debris, puncture, cutting or other damaging or deleterious conditions. The GCL shall be stored and stockpiled in accordance with the manufacturer’s recommendations.

PART 5 - SUPPORTING SURFACE PREPARATION

5.1 SURFACES

A. Surfaces to be lined shall be smooth and free of all rocks, sharp stones, sticks, roots, sharp objects, or debris of any kind. The surface shall provide a firm unyielding foundation for geosynthetic clay liner with no sudden, sharp, or abrupt changes or breaks in grade. All rocks greater than 2 inches shall be removed from subgrade. No abrupt changes greater than one inch shall be allowed in the subgrade such as that caused by a vehicle rut. The surface shall also be free of standing water, snow or ice.

5.2 ACCEPTANCE OF SOIL SUBGRADE

A. The Engineer will conduct a walkthrough of the subgrade (foundation layer) at which time the General Contractor and Installer shall both verify in writing that the soil subgrade is acceptable for installation of geosynthetics. The Contractor shall be responsible for maintenance of these areas to the accepted condition until completion of the project. If the subgrade is damaged during liner deployment it shall be repaired to the specification prior to liner installation. The subgrade shall meet the requirements of Technical Specification 02320.

5.3 MAINTENANCE

A. The Contractor shall maintain the surface suitability and integrity of the soil subgrade until the project is completed and accepted. Contractor shall repair rough areas, ruts and any other damage to the subgrade prior to geosynthetics deployment.

5.4 FINAL INSPECTION

A. No geosynthetic shall be installed until the supporting surface has been inspected and approved for geosynthetic installation by the Engineer and Contractor. The Contractor shall correct all deficiencies in the supporting surface that have appeared since the acceptance of soil subgrade at no additional cost to the Owner.

PART 6 - GEOSYNTHETIC CLAY LINER INSPECTION

6.1 Material Inspection: The Contractor shall visually inspect all geosynthetic clay liner for imperfections, faulty or suspect areas for possible damage prior to installation. All such defective liners shall be marked, repaired, and/or tested. Liners that cannot be repaired shall be removed from the work area and replaced at no additional cost to the Owner. Contractor shall replace faulty material that requires more than one patch per 5,000 square feet of geosynthetic clay liner at no additional cost to the Owner.

PART 7 - INSTALLATION

7.1 GENERAL

A. The number of panels deployed in one day shall be limited to the number of panels which can be installed, anchored, and protected from moisture on the same day.

7.2 PANEL LAYOUT

A. Contractor shall submit panel layout drawing to and obtain approval of the Engineer prior to commencement of any geosynthetic clay liner work.

7.3 PANEL IDENTIFICATION

A. Each panel shall be marked with an "identification code" (numeric or alphanumeric) consistent with the layout plan. The identification code shall be simple and logical and approved for use by the Engineer.

7.4 WEATHER CONDITIONS

A. The geosynthetic clay liner shall not be deployed during precipitation, in the presence of excessive moisture, in areas of ponded water, or in the presence of excessive winds. If the bentonite in the GCL becomes hydrated prior to coverage with the 60 mil HDPE liner, the Engineer will require that this material be removed from the installation.

B. Wind Protection: The Contractor shall protect the geosynthetic clay liner against adverse effects of high winds such as uplift. Sand bags may be used for this purpose. Sand bags shall be sufficiently close-knit to preclude fines from working the bottom, sides or seams. Sand bags that are split, torn or otherwise losing their contents shall be immediately removed from the work area and any spills immediately cleaned up.

7.5 GCL PLACEMENT

A. GCL Material shall be placed in accordance with the procedures specified below, or modified to account for site specific conditions.
   1. GCL Orientation - GCL panels should be placed with the woven side up.
   2. GCL Panel Position - Where possible, all slope panels should be installed parallel to the slope while panels installed in flat areas require no particular orientation.
   3. Panel Deployment - GCL materials shall be installed in general accordance with the procedures set forth in this section.

B. Reinforced GCL shall be used on both slopes as well as the flat areas to ensure the GCL withstands the rigors of the installation.
   1. Deployment should proceed from the highest elevation to the lowest to facilitate drainage in the event of precipitation.
   2. The GCL may be deployed on slopes by pulling the material from a suspended roll, or securing a roll end into an anchor trench and unrolling each panel as the handling equipment slowly moves backwards.
   3. Deployment on flat areas shall be conducted in the same manner as that for the slopes, however, care should be taken to minimize “dragging” the GCL. A slip-sheet may be used to facilitate positioning of the liner while ensuring the GCL is not damaged from underlying sources.
   4. Overlaps shall be a minimum of twelve inches on panel edges and two feet on panel ends and be free of wrinkles, folds or “fishmouths”.
   5. The Contractor shall only install as much GCL that can be covered at the end of the day. No GCL shall be left exposed overnight. The exposed edge of the GCL shall be covered by a temporary tarpaulin or other such water resistant sheeting until the next working day.

C. Anchoring - All GCL material installed on slopes shall be anchored per the plans to prevent potential GCL panel movement. The GCL shall be placed into and across the base of the excavated trench, stopping at the back wall of the excavation.

D. Seaming -
   1. Overlap seams shall be a minimum of 12 inches on panel edges and two feet on panel ends. Panel end overlaps shall not be located on slopes.
   2. Loose granular bentonite should be placed between panels at a rate of ¼ pound per lineal foot of seam.

E. Detailing - Detail work, defined as the sealing of the liner to pipe penetrations, drainage structures, spillways, and other appurtenances shall be performed as recommended by the GCL manufacturer.

F. Damage Repair - Prior to Geocomposite Drainage Flownet placement, damage to the GCL shall be identified and repaired by the installer. Damage is defined as any rips or tears in the geotextiles, delamination of geotextiles or a displaced panel.
   1. Rip and Tear Repair (Flat Surfaces) - Rips or tears may be repaired by completely exposing the affected area, removing all foreign objects or soil, and by then placing a patch cut from unused GCL over the damage (damaged material may be left in place), with a minimum overlap of 12 inches on all edges. Accessory bentonite should be placed between the patch edges and the repaired material at a rate of a quarter pound per lineal foot of edge spread in a continuous 6-inch fillet.
   2. Rip and Tear Repair (Slopes) - Damaged GCL material on slopes shall be repaired by the same procedures above, however, the edges of the patch should also be adhered to the repaired liner with a manufacturer-approved adhesive to keep the patch in position during backfill or cover operations.
   3. Displaced Panels - Displaced panels shall be adjusted to the correct position and orientation. The adjusted panel shall then be inspected for any geotextile damage or bentonite loss. Damage shall be repaired by the above procedure.
   4. Premature Hydration - If the GCL is subjected to premature hydration, the GCL shall be removed from the installation and replaced under the direction of the Engineer.

G. Contractor shall use equipment which does not damage geosynthetic clay liner or supporting subgrade surface.

H. No personnel shall be allowed to engage in activities that could damage geosynthetic clay liners.

I. Clamps and other metal tools used in the work area shall have rounded edges (no sharp) corners. Clamps and other metal tools shall not be tossed or thrown.

J. Panels shall be unrolled with a method that protects geosynthetic clay liner from scratches and crimps and protects the subgrade from damage.

K. Contractor shall place adequate temporary hold-downs to prevent uplift by wind. Hold-downs shall not damage geosynthetic clay liner and shall be continuous along edges to minimize risk of wind flow under panels.

L. Contractor shall protect geosynthetic clay liner in heavy traffic areas by geotextile, extra geosynthetic clay liner or other suitable materials. Materials used for protection shall be temporary and shall not be used as any part of the permanent installation. Contractor shall not allow vehicle traffic on geosynthetic clay liner surface.

PART 8 - CONSTRUCTION QUALITY CONTROL

8.1 GENERAL

A. The Contractor shall designate a full-time superintendent to be responsible for supervising construction of the GCL.

8.2 FINAL SEAM INSPECTION

A. For final seaming inspection, seams and surface of geosynthetic clay liner shall be checked for defects, holes, blisters, undispersed raw materials, or signs of contamination by foreign matter. The contractor shall distinctively mark, preferably with paint, repair areas, and indicate the required type of repair.

8.3 DRAWINGS AND DATA

A. Complete specifications, data and detailed drawings covering the material furnished under this section shall be submitted for approval in accordance with the procedure set forth in the General Conditions. Data and specifications shall include, but shall not be limited to the following:

1. Bentonite:
   a. Bentonite Supplier Certification
2. Geosynthetic Clay Liner Rolls:
   a. Roll Manufacturer Certification.
   b. Roll Manufacturer Certification and specified MQC testing.
   c. Manufacturer's quality control program description.
   d. Written instructions for geosynthetic clay liner shipping, handling and storage.
   e. Written instructions for geosynthetic clay liner installation and quality control procedures.
   f. Panel Layout.

END OF SECTION

SECTION 02303

SOIL STABILIZATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections and Landfill Special Provisions apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Seeding.
   2. Mulching
   3. Fertilizer.
   4. Matting.

B. Related Sections include the following:
   1. Division 2 Section 02320 "Landfill Earthwork" for soil materials, excavating, backfilling, and site grading.
   2. Division 2 Section 02709 “Topsoil” for topsoil material placement.

1.3 DEFINITIONS

A. Maintenance Period: Begin maintenance immediately after each area is planted and continue for a period of 8 weeks after planting under this section is completed.

B. Satisfactory Stand: Grass or section of grass of 10,000 square feet or larger that has:
   1. No bare spots larger than 3 square feet.
   2. Not more than 10% of total area with bare spots larger than 1 square foot.
   3. Not more than 15% of total area with bare spots larger than 6 square inches.

1.4 SUBMITTALS

A. Samples, product information, and datasheets for all specified equipment and products herein and shown on the plans.

B. Proposed seed, fertilizer mulch, and tackifier products and application rates to ensure satisfactory stand without noxious weeds or concerning vegetation from the neighboring farms.

C. Temporary Erosion and Sediment Control Plan (TESC) in accordance with the Standard Specifications.
   1. Seed Certifications
   2. Copies of delivery invoices or proof of quantities of products.
   3. Application rate for products to achieve a satisfactory stand.

1.5 DELIVERY, STORAGE, AND PROTECTION

A. Seed: Furnish in standard containers with seed name, lot number, net weight, percentages of purity, germination, and hard seed and maximum weed seed content, clearly marked for each container of seed.

B. Hydroseeding Mulch: Mark package of wood fiber mulch to show air dry weight.

1.6 SEQUENCING AND SCHEDULING

A. Retain all temporary erosion and sediment control features until such time that the soil is stabilized. Remove those that are no longer needed.

B. Prepare topsoil as specified in Section 02709, Topsoil before starting Work of this section.

C. Complete soil preparation, seeding, fertilizing, mulching, and matting within 10 days after final grades have been reached.

D. Notify Engineer at least 3 days in advance of:
   1. Materials delivery.
   2. Start of planting/seeding activity.

E. Seeding: Perform under favorable weather conditions during seasons that are normal for such Work as determined by accepted local practice.

1.7 APPLICATION AREAS

A. General: All disturbed areas not receiving surfaces.

B. All stormwater ponds, ditches, slopes, and permanent soil stockpiles.

1.8 MAINTENANCE

A. General:
   1. Perform during maintenance period to include:
      a. Watering: Keep seeded surface moist.
      b. Washouts: Repair by filling with topsoil, fertilizing, seeding, and mulching.
      c. Mulch: Replace wherever and whenever washed or blown away.
      d. Reseed unsatisfactory areas or portions thereof immediately at end of maintenance period if a satisfactory stand has not been produced.
      e. Reseed during next planting season if scheduled end of maintenance period falls after normal growing season.
      f. Reseed entire area if satisfactory stand does not develop by late spring of the following year.

B. Maintenance Service Agreement: Provide for period of 1 year from Substantial Completion.

PART 2 - PRODUCTS

2.1 FERTILIZER

A. Commercial, uniform in composition, free-flowing, suitable for application with equipment designed for that purpose.

B. Fertilizer shall have minimum percentages of plant food based on local standard practice to achieve satisfactory stand.

2.2 SEED

A. Fresh, clean new-crop seed that complies with tolerance for purity and germination established by Official Seed Analysts of North America.

B. Seed mix shall be provided using locally acceptable practices from a reputable seed applicator.

2.3 MULCH

A. Wood Cellulose Fiber Mulch:
   1. Specially processed wood fiber containing no growth or germination inhibiting factors.
   2. Dyed suitable color to facilitate inspection of material placement.
   3. Manufactured such that after addition and agitation in slurry tanks with water, material fibers become uniformly suspended to form homogenous slurry.
   4. When hydraulically sprayed on ground, material will allow absorption and percolation of moisture.

B. Straw:
   1. Clean salt hay or threshed straw of oats, wheat, barley, or rye, free from seed of noxious weeds. Suitable for spreading with mulch blower equipment.
   2. Average Stalk Length: 6 inches.
   3. Seasoned before baling or loading.

2.4 TACKIFIER

A. Derived from natural organic plant sources containing no growth or germination-inhibiting materials.

B. Capable of hydrating in water, and to readily blend with other slurry materials.

2.5 GEOSYNTHETICS

A. Erosion Control Matting:
   1. Sideslopes (steeper than 4H:1V):
      a. Excelsior mat or straw blanket; staples as recommended by matting manufacturer.
      b. Manufacturer and Product: North America Green, Evansville, IN; S150 Blanket, or equal.

2. Ditches (steeper than 2%):
   a. Long lasting and suitable for ditch applications, staples as recommended by the matting manufacturer.
   b. The blanket shall be covered on the top with heavy-weight photodegradable polypropylene netting having ultraviolet additives to delay breakdown.
   c. Manufacturer and Product: North American Green, Evansville, IN; P300, or equal.

B. Filter Fabric (for Silt Fences): ISPWC specification for temporary silt fence geotextile, per ISPWC Section 2050 – Construction Geotextiles.

PART 3 - EXECUTION

3.1 SOIL PREPARATION

A. Before beginning of any seeding and after surface has been graded, and lightly compacted to uniform grade, scarify soil surface to a minimum depth of 1 inch.

3.2 SEEDING

A. Prepare 1-inch-deep seed bed; obtain Engineer's acceptance prior to proceeding.

B. Apply seed on moist soil, but only after free surface water has drained away. Prevent drift and displacement of mixture into other areas.

C. Application rate shall be determined based on type of seed, time of year, and locally acceptable practices.

3.3 MULCHING

A. Apply uniformly on seeded areas. Do not apply mulch on seeded areas that will be immediately covered with erosion control matting.

B. Application: Sufficiently loose to permit penetration of sunlight and air circulation, and sufficiently dense to shade ground, reduce evaporation rate, and prevent or materially reduce erosion of underlying soil. Apply at locally acceptable rates.

3.4 EROSION CONTROL MATTING

A. Place on seeded area slopes greater than 4H:1V and along all ditches steeper than 2%; staple in place and overlap in accordance with manufacturer's instructions. Refer also to the Drawings for locations requiring matting.

3.5 TACKIFIER

A. Apply on all mulched areas; spray on after all mulch is in place; and apply at locally acceptable rates for materials, slopes, and conditions.

3.6 QUALITY CONTROL

A. Install all erosion and sediment control features with good workmanship, locally acceptable standards, and in accordance with manufacturer's instructions.

B. Upon completion of the maintenance period and written notification from the Contractor, Engineer will determine if a satisfactory stand has been established within 15 days of receipt.

C. If a satisfactory stand has not been established, Engineer will make another determination upon written notice from Contractor following the next growing season.

END OF SECTION

SECTION 02320

LANDFILL EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections and Landfill Special Provisions apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. New landfill cell, leachate pond, access road, perimeter road, drainage ditches, embankment, compaction, and grading.
   2. Foundation layer preparation and grading
   3. Subgrade preparation and grading.
   4. Protective soil cover for geomembrane liner.
   5. Backfill and compaction of geomembrane liner anchor trench.

B. Related Sections include the following:
   1. Section 301 of the ISPWC "Trench Excavation"
   2. Section 306 of the ISPWC "Trench Backfill"
   3. Division 2 Section 02345 "Geotextile Fabrics"
   4. Division 2 Section 02644 " Flexible Membrane Liner"
   5. Division 2 Section 02627 "Leachate Collection System / Leak Detection System"
   6. Division 2 Section 02709 "Topsoil"
   7. Division 2 Section 02821 "Chain Link Fences and Gates"

1.3 DEFINITIONS

A. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

B. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
   1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Engineer. Authorized additional excavation and replacement material will be paid for according to Section 01275 "Measurement and Payment" or Contract provisions for changes in the Work.
   2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be without additional compensation.

C. Embankment and Fill: Soil materials used to raise existing grades.

D. Native Soil: Soil material that is in-place or excavated from the project site.

E. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material 1 cubic yard or more in volume that exceed a standard penetration resistance of 100 blows/2 inches when tested by an independent geotechnical testing agency, according to ASTM D 1586.

F. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

G. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

H. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 SUBMITTALS

A. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
   1. Classification according to ASTM D 2487 of each on-site and borrow soil material proposed for fill and backfill.
   2. Laboratory compaction curve according to ASTM D 698 for each on-site and borrow soil material proposed for fill and backfill.

B. When, in the opinion of the Engineer, the field soil conditions differ from those represented by the material test reports, new samples shall be taken by the Contractor and delivered to the testing agency for classification and laboratory compaction curve testing. All testing shall be based on the appropriate soil test results.

1.5 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.

B. Field Survey and Construction Tolerances: The Engineer will provide horizontal and vertical control for earthwork as specified in the Special Provisions. The Contractor shall provide all additional surveys for line, grade and structural location. Construction tolerances shall be ± 2 inches vertically and ± 1-foot horizontally of line and grade.

1.6 PROJECT CONDITIONS

A. Materials for the landfill cell embankment, perimeter road subgrade, access road subgrade, and protective side slope cover embankments shall be obtained from excess excavation materials at the project site or on-site borrow areas.

B. Based upon a geotechnical investigation completed at the site, adequate quantities of soil materials meeting the liner subgrade specification will be encountered during excavation for the landfill cell.

C. Based upon a geotechnical investigation completed at the site, adequate quantities of soil materials meeting the protective side slope cover specification will be encountered during excavation for the new landfill cell or in the soil stockpiles located on site.

D. If materials meeting the liner subgrade specification are encountered in-place in landfill cell excavations, the liner subgrade can be compacted in-place.

E. Where unsuitable liner subgrade soil materials are encountered in the excavations, they shall be sub-excavated to a depth of 6 inches and replaced with material meeting the liner subgrade specification.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

2.2 SOIL MATERIALS

A. Satisfactory landfill cell embankment and protective side slope cover material: On-site soil material free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

B. Unsatisfactory soils include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

C. Liner Foundation Layer: On-site native or borrow soil material naturally or artificially graded mixture of soil. The particle size shall be less than 2 inches. All deleterious materials shall be removed from the loose lift prior to compaction. These include organic matter, construction debris, large particles, and frozen material. Topsoil and Rhyolite soil materials are not permitted.

D. Select Native Soil: Native or borrow soil material consisting of 2-inch minus soil material. Crushed material or native materials with fractured aggregate that could damage the liner will not be allowed. Topsoil and Rhyolite soil materials are not permitted.

E. Drain Gravel: The drain gravel shall consist of 2-inch washed rock material with less than 1.0% passing a #200 sieve and less than 5% passing a #10 sieve. The gravel shall be rounded gravel. Crushed or angular rock is not permitted on the liner. This material will need to be imported to the site. The Contractor will collect samples for gradation testing every 2,500 cubic yards of material. The Contractor will pay for laboratory testing of gravel gradation.

PART 3 - EXECUTION

3.1 GENERAL

A. Take precautions to protect all adjoining private and public property and facilities, including underground and overhead utilities, access roads, structures, and fences.

Restore or replace all disturbed or damaged facilities to their original condition at Contractor's expense.

B. Contact utility owners using the Idaho Digline System for utility locates at least 48 hours before staring work. Protect utilities exposed during the work and prevent damage to underground utilities adjacent to excavations. Immediately notify the utility owner of any construction damage. Repairs of damage to marked utilities are at the expense of the Contractor.

C. Protect existing site improvements from damage during construction. Protect existing water and sewer mains and water and sewer services from freezing at all times during construction. Restore damaged improvements to their original condition, as acceptable to Owner.

D. Prior to beginning excavation, backfilling, and grading operations, perform all necessary surveys for control of line and grade and establish firm and protected monuments for reference throughout the construction period. Provide a sufficient number of such monuments throughout the work to permit verification of the work within the tolerances specified. Protect and maintain benchmarks and survey control points from disturbance during construction.

E. The methods of construction will be the Contractor's responsibility. Utilize equipment appropriate for the work being performed and assure all methods and equipment used result in finished work meeting the construction tolerances specified.

F. No work may be performed beyond the construction limits.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
   1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
   2. If required, install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.3 EXPLOSIVES

A. Explosives: The use of explosives may be considered on this project. Contractor shall submit a blasting plan and health and safety plan to the Engineer for review. Any damage caused to existing infrastructure, or any neighboring property shall be repaired by the Contractor at no cost to the Owner.

3.4 EXCAVATION

A. Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Excavated materials may include soil materials, and

obstructions. No changes in the Contract Sum or the Contract Time will be authorized regardless of the character of surface and subsurface conditions encountered.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.5 LINER FOUNDATION LAYER

A. Notify Engineer before start and when liner foundation layer has been completed.

B. Reconstruct liner foundation layer damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer, without additional compensation.

C. Rocks over 1.5 inches or frozen material shall be removed prior to initiating compaction.

D. Any damage to the layer shall be repaired by the Contractor at no cost to the Owner. Desiccation and freezing damage will be of primary concern.
   1. Keep the surface moist during the day with a water truck.
   2. Proof roll the completed liner foundation layer with a steel drum roller.
   3. Proceed with construction of the liner cover and leachate collection system immediately after acceptance of the liner.
   4. Any desiccation cracks shall be scarified to the depth of the cracking, watered and recompacted to the liner subgrade specifications.
   5. If freezing weather should occur during construction of the liner foundation layer, the Contractor shall scarify the liner foundation layer to the depth of frost and allow the material to thaw. The material shall then be recompacted to the specifications.

3.6 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water at locations shown on the Drawings. Cover to prevent windblown dust or stabilize as necessary for permanent placement.
   1. Stockpile soil materials away from edge of excavations.

3.7 EMBANKMENT

A. Embankments may be constructed of material excavated from on-site or from identified borrow areas. Use material free of cinders, ash, refuse, organic or frozen material, boulders, or other deleterious materials.

B. The select native soil cover for liner side slopes shall be placed in one continuous 24-inch-thick loose lift, graded, and left uncompacted.

C. The drain gravel cover shall be placed in one continuous 15-inch-thick lift and left uncompacted. Extra care should be taken not to damage the flexible membrane liner and fabric materials when materials are placed over it.

D. Embankment material shall not be excessively dry or wet when placed. If necessary, the Contractor shall manipulate the material as required to assure that compaction will be performed at or near the optimum moisture content given in the moisture density curve.

3.8 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade, liner foundation layer, and each subsequent fill or backfill soil layer before compaction to within 3 percent of optimum moisture content.
   1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
   2. Remove and replace or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.9 COMPACTION OF SOIL EMBANKMENTS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches (200 mm)] in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.

B. Complete compaction entirely across each layer of embankment and/or subgrade, commencing at the sides and progressing toward the center, overlapping each preceding pass by approximately one-half the width of the compaction equipment.

C. Suspend and modify compaction as required whenever evidence of pumping or unconsolidation of underlying work is observed.

D. Control the operation of compaction equipment to prevent damage to previously completed work including adjacent structures, pipelines, and previously completed layers of embankment.

E. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

F. Place and compact soil materials as follows to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
   1. Embankment
      a. Place embankment backfill in maximum 8-inch-thick compacted lifts within 3 percent of optimum moisture content and compact to a minimum of 95 percent.
      b. If utilizing Rhyolite soils, break-up / crush material as specified by the Geotechnical Engineer of Record (GER).

   2. Liner Foundation Layer (Liner Subgrade)
      a. If native soils are encountered during excavation meeting the specification for Liner Foundation Layer density and material type, leave the material undisturbed and compact material to a minimum of 95 percent.
      b. Place Liner Foundation Layer backfill in one 6-inch lift.
      c. Compact to a minimum of 95 percent of modified proctor.
      d. Sheepsfoot compaction may be augmented by steel drum rollers, loaded scrapers or other methods as approved by the GER.

   3. Liner Protective Cover (Select Native Soil)

a. Fine grade the protective cover until smooth with no compactive effort other than equipment trafficking.
b. Place the protective cover in one continuous lift in a manner that protects the liner from damage.
c. For drain gravel on the floor of the landfill refer to Section 02627 "Leachate

4. Pipe Trenches in Embankment
   a. Use embankment material free of organic debris and deleterious material and containing no rocks greater than one inch) in any dimension to carefully bed pipe placed in the embankment.
   b. Place trench backfill in maximum 8-inch compacted lifts compact to a minimum of 95 percent of modified proctor.

3.10 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
   1. Provide a smooth transition between adjacent existing grades and new grades.
   2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations as shown on the drawings.

3.11 CLEANUP AND DISPOSAL

A. As work progresses, remove debris and complete to finish grade each portion of the work. Once the work is complete, finish the entire site to a smooth, uniform surface presenting a neat and workmanlike appearance.

B. Remove all vegetation, debris, concrete, large boulders, and other undesirable material from the site and legally dispose of them. Remove and dispose of all rocks brought to the surface during excavation or backfilling. Burning is not permitted on site.

END OF SECTION

SECTION 02345

GEOTEXTILE FABRICS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections and Landfill Special Provisions apply to this Section.

1.2 SUMMARY

A. The work shall consist of providing all tools, equipment, and labor necessary to install the Owner-provided geotextile fabric to the lines and grades shown in the drawings. The work includes geotextile fabrics complete with seams, and other appurtenances. The work shall include all QC and the necessary testing and sampling equipment. Owner will supply the 16-oz cushion fabric. If more is required to complete the project than the Owner has purchased, additional material shall be provided to meet Part 2 of this Specification. Provide necessary drainage fabric for the leak detection system.

1.3 REFERENCES

A. The following test methods shall be incorporated into this specification in their entirety, subject to the indicated test modifications:
   1. GRI-GT12(a), "Test Methods and Properties for Nonwoven Geotextiles Used as Protection (or Cushioning) Materials"

PART 2 - MATERIALS

2.1 CUSHIONING FABRIC

A. The fabrics shall be non-woven polypropylene filter fabric. The fabric shall be inert to commonly encountered chemicals and soils and shall remain stable over a temperature range of -50°F to 150°F and at a pH range of 2 to 13.

Required Properties for Landfill Cell Filter Fabric

	Fabric Property	Test Method	Value
A.	Mass/Unit Area	ASTM D-5261	16.0oz/yd^2
B.	Minimum Grab Tensile Strength (lbs)	ASTM D-4632	425
C.	Grab Tensile Elongation (%)	ASTM D-4632	50
D.	Trapazoidal Tear Strength (lbs)	ASTM D-4533	155
E.	Puncture Strength (lb)	ASTM D-6241	1200
F.	UV Resistance (%)	ASTM D-4355	70
G.	Maximum Apparent Opening Size (U.S. sieve number)	ASTM D-4751	100

2.2 LEAK DETECTION SYSTEM – SUMP PIPE WRAP

A. Provide 6-oz non-woven fabric similar to the cushioning fabric from the same manufacturer.

2.3 ACCEPTANCE REQUIREMENTS

A. Thirty days prior to installation of the proposed fabric, the Contractor shall submit to the Engineer two copies of a mill certificate or affidavit signed by a legally authorized official from the company manufacturing the fabric. The mill certificate or affidavit shall attest that the fabric meets the chemical, physical, and manufacturing requirements stated in this Specification. Also, at least 30 days prior to the use of any fabric, a sample of two square yards of the fabric shall be submitted to the Engineer for approval. The sample shall be labeled with the lot and batch number, date of sampling, project number, specifications, manufacturer, and product name.

2.4 SHIPMENT AND STORAGE

A. During all periods of shipment and storage, the fabric shall be protected from direct sunlight, ultraviolet rays, temperature greater than 140° F, mud, dirt, dust, and debris. To the extent possible, the fabric shall be maintained wrapped in a heavy-duty protective covering.

PART 3 - CONSTRUCTION METHODS

3.1 INSTALLATION OF FABRIC

A. The fabric shall be placed in the manner shown on the Plans or indicated in the General Requirements.

B. The fabric shall be installed by hand or machine methods as recommended by the manufacturer and as subgrade conditions permit. Laps shall be made by overlapping the fabric a minimum of twenty-four inches or by sewing the fabric together in a manner recommended by the manufacturer.

C. Any rocks, debris or other matter that causes localized stresses in the fabric shall be removed and any holes, tears, or cuts in the fabric shall be repaired by placing a fabric patch over the ruptured area which extends a minimum of three feet in any direction from any part of the rupture, prior to placing backfill.

D. At the time of installation, the fabric will be rejected if it has defects, seams or weakness, rips, holes, flaws, deterioration, or damage incurred during manufacture, transportation or storage.

E. Once the fabric has been installed, no vehicles or equipment shall be permitted on the fabric.

END OF SECTION

SECTION 02627

LEACHATE COLLECTION SYSTEM / LEAK DETECTION SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections and Landfill Special Provisions apply to this Section.

1.2 SUMMARY

A. This item consists of elements necessary to construct a leachate collection system. System components include collection pipe and trenches, cleanouts and risers, strip drains, leachate collection system gravel, and leachate forcemain piping and appurtenances. The work consists of providing all tools, equipment, and labor necessary to install the leachate collection system to the lines and grades shown on the drawings. Owner will provide HDPE piping. If additional piping is required, the Contractor shall provide to match the Owner-purchased piping.

B. Work items include:

A. Installing leachate collectors – central (8-inch) and toe (6-inch) perforated HDPE SDR 11 leachate collection pipe and fittings;

B. Installing 6-inch and 8-inch solid wall HDPE SDR 11 pipe with concrete pads and blind flanges for leachate cleanouts as shown on the Drawings;

C. Installing side slope risers for the leachate sump pumps – 18-inch perforated and 18-inch solid wall pipe and fittings;

D. Furnishing and installing drain rock for leachate collection trenches and leachate sump;

E. Furnishing and installing drain gravel over the liner on the floor;

F. Installing the select native soil on slopes over the liner native side slope protective cover;

G. Furnishing and installing leachate pumps, motors, risers, pump accessories, and appurtenances – see also Section 02628 (Alternating Duplex Leachate Extraction Pumping System);

H. Installing HDPE forcemain piping, vaults valves, etc. see also Section 02628.

I. Installing the leak detection system HDPE piping (solid and perforated), drain gravel, fabric, and riser system with the leak detection probe / sleeve piping system.

1.3 SUBMITTALS

A. Action:

a. Provide submittals for all products / materials and source and progress testing results.

PART 2 - MATERIALS

2.1 DRAIN GRAVELS

A. Leachate Collection Trenches: The select drainage gravel shall be 1.5 to 2 -inch washed or screened gravel with less than 1.0% passing a #200 sieve and less than 5% passing a #10 sieve. At least 85% shall be larger or equal to 1-inch.

B. Leachate Sump Gravel: The select drainage gravel shall be 2 -inch washed or screened gravel with less than 1.0% passing a #200 sieve and less than 5% passing a #10 sieve. At least 85% shall be larger or equal to 2-inches.

C. All gravel shall be rounded rock and be free of calcite (test to confirm no calcite is required). Crushed or angular rock is not permitted on the liner. The materials will need to be imported to the site. The Contractor shall provide samples for approval and collect samples for gradation testing every 2,500 cubic yards of each material. The Contractor shall pay for all laboratory testing.

2.2 DRAIN SAND (LEAK DETECTION SYSTEM)

A. The drain sand for the leak detection system (LDS) shall consist of clean material meeting the following gradation:

Sieve Size	Percent Passing
½”	90-100
No. 4	57-100
No. 10	40-100
No. 50	3-30
No. 100	0-4
No. 200	0-3

B. The wrap around the LDS pipe in the LDS sump shall be 6-oz non-woven fabric that is securely connected to the perforated section of pipe to provide free drainage through the pipe.

2.3 SELECT NATIVE SOIL

A. The protective cover utilized on the side slopes shall consist of 24 inches of select, native soils excavated during the cell construction and stockpiled on-site. This material shall be the general material backfill (no topsoil or rhyolite is permitted). The side slope protective cover shall be 2-inch minus material.

2.4 STRIP DRAINS

A. Strip drains shall geocomposite drainage flownet.

B. The drainage flownet shall be a bonded composite of HDPE drainage net with a layer of nonwoven geotextile factory-bonded to both sides.

C. The geocomposite shall be manufactured by heat bonding the geotextile(s) to the HDPE drainage net. No burn-through geotextiles shall be permitted. No glue or adhesive shall be permitted.

D. The bond between the geotextile and the HDPE drainage net shall exhibit minimum average peel strength of 2 lbs. per inch as per ASTMD-413.

E. The manufacturer shall submit samples of the HDPE drainage net and geotextile to the engineer with a complete set of specifications for approval. The manufacturer shall also

furnish a complete set of written instructions for storage, handling, installation, and joining.

A. The composite shall have a minimum transmissivity (ASTM D4716-87) of 2 gal/min/ft at gradient = 0.1 and pressure = 14.5 psi.

B. The nonwoven geotextile(s) shall have a minimum fabric weight (ASTMD 3776) of 6 oz./sq.yd.

PART 3 - INSTALLATION

3.1 DRAIN GRAVEL OVER LINER

A. No vehicle or equipment shall be allowed directly on the non-woven geotextile fabric that is placed on the geomembrane liner. Material shall be stockpiled at one end of the area to be covered and spread by low-ground pressure equipment (approved by the Engineer) in one continuous 15-inch-thick lift. Any damage incurred to the fabric or underlying geomembrane shall be repaired immediately by the Contractor at no additional charge to the Owner and under the direction of the Engineer. The Contractor will be responsible for demonstrating to the Engineer the completed drain gravel cover has a minimum thickness of 15 inches.

3.2 LEACHATE COLLECTION PIPING

A. The leachate collection piping and leachate forcemain shall be laid to the lines and grades shown on the plans. The HDPE piping shall be butt fusion welded per manufacturer's specifications. No equipment shall be allowed to travel over the leachate collection system lines until the 15-inch base protective gravel layer has been placed. Any damage to the leachate collection piping system prior to acceptance of the landfill cell shall be repaired by the Contractor at no additional charge to the Owner.

3.3 NON-WOVEN GEOTEXTILE

A. The non-woven geotextile fabric shall be installed according to Section 02345 of the Technical Specifications.

3.4 SELECT NATIVE SOIL OVER LINER

A. The select native soil cover shall be placed in one continuous 24-inch-thick lift. The soil cover shall be spread from the edges by low-ground-pressure equipment (approved by the Engineer). The cover shall be placed in such a manner as not to damage the underlying geosynthetics. Any damage to the geosynthetics shall be repaired immediately by the Contractor at no additional charge to the Owner and under the supervision of the Engineer.

3.5 DRAIN GRAVEL IN LEACHATE COLLECTION TRENCHES

A. Gravel shall be placed in the collection piping trenches as shown on the plans. This material shall be placed in such a manner as to not damage the geotextile or leachate piping.

3.6 LEACHATE PUMP SYSTEM

A. Pump system, carrier, riser pipe and electrical components shall be installed per manufacturer's recommendations. See also applicable Technical Specifications.

3.7 STRIP DRAINS

A. Strip drains shall be installed on side slopes of the landfill cell perpendicular to slope and placed in such a manner as to not damage the geotextile.

B. Splice the drains together as recommended by the manufacturer.

C. Ensure that the drains are flat and secure when placing material over them.

END OF SECTION

SECTION 02628

ALTERNATING DUPLEX LEACHATE EXTRACTION PUMPING SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections and Landfill Special Provisions apply to this Section.

1.2 SUMMARY

A. The alternating duplex leachate extraction pumping system shall perform to the design operating requirements within the conditions and dimensions as described and shall be complete and consist of pumps and motor assemblies with power cables; retrieval cables, flow meters, connections, cord grips, system controller, level sensors and cables with gauges and meters as required; deployment and retrieval assembly to include pump discharge hose/pipe assembly; flow meters, pitless adapters, air/vacuum release, valves, insulation, appropriate exit fittings and all appropriate fasteners, fittings and accessories necessary for operation in the service intended.

B. The system shall be designed for primary and secondary service. Multiple systems shall be identical and interchangeable.

1.2 QUALITY ASSURANCE

A. All equipment within the leachate extraction pumping system listed in this section shall be provided by a single manufacturer who shall have sole and complete responsibility for the system without recourse to others. The manufacturer shall be a duly incorporated, licensed and insured entity with a minimum of five (5) years' experience in providing complete leachate extraction pumping systems for landfills.

B. Hydraulic Institute Compliance: Design, manufacture, and install pumps in accordance with "Hydraulic Institute Standards."

C. National Electrical Code Compliance: Components shall comply with NFPA 70 "National Electrical Code."

D. UL Compliance: Pumps shall be listed and labeled by UL and comply UL Standard 778 "Motor Operated Water Pumps."

E. SSPMA Compliance: Test and rate sump and sewage pumps in accordance with the Sump and Sewage Pump Manufacturers Association (SSPMA) Standards.

F. Design Criteria: The Drawings indicate sizes, profiles, connections, and dimensional requirements of pumps and are based on the specific manufacturer types and models indicated. Pumps having equivalent performance characteristics by other manufacturers may be considered, provided that deviations in dimensions and profiles do not change the design

concept or intended performance as judged by the Engineer. The burden of proof for equivalency of pumps is on the proposer.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Store pumps in a dry location.

B. Retain shipping flange protective covers and protective coatings during storage.

C. Protect equipment and couplings against damage from sand, grit, and other foreign matter.

D. Comply with manufacturer's rigging instructions for handling.

1.4 WARRANTY

A. The complete pumping system as a whole, inclusive of all provided components, parts, equipment, controllers, instrumentation, assemblies and accessories shall be warranted to be free of defects in material and workmanship for a period of sixty (60) months from date of start-up by the manufacturer or authorized representative.

B. If any portion of the system fails due to either materials or workmanship during the applicable period, the manufacturer shall repair, substitute or replace the item at no-charge based on the item's being returned freight pre-paid with a returned materials authorization (RMA) to the system manufacturer for evaluation. The repaired, substituted or replaced item shall be promptly returned to the Owner freight prepaid by the manufacturer. The system manufacturer will not be liable for a fair wear and tear through service in application or damage to any item caused by abnormal operating conditions, accident, misuse, power surges, ungrounded equipment, acts of God, unauthorized alteration, modification or repair.

C. The manufacturer shall provide reasonable assistance and troubleshooting by telephone at no cost to the Owner. On-site technical assistance by an engineer or service technician shall be available with compensation to the manufacturer based on time, materials and expenses with pro-rated credit to be issued if a warranty consideration is determined to be merited.

1.5 SUBMITTALS

A. Action Submittals
1. The submittal package shall include a complete list of components provided, pump curves, motor data, layout drawing, control panel drawings consisting of wiring schematic, bill of materials and component layout drawing, and warranty statement.

PART 2 - EQUIPMENT

2.1 PUMPS

A. The contractor shall furnish and install a complete leachate pumping system.

B. Pumps shall be centrifugal, submersible design, and suitable to handle primary landfill leachate. The pumps will be coupled to a submersible motor that is non-overloading throughout the operating curve of the pump.

C. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include the following:

D. Pumps shall be QED Environmental Systems Model # 25SRP05-3, or approved equal, rated for 27 GPM at 55 feet Total Dynamic Head.

E. Motor horsepower shall be a minimum of 1/2 horsepower, and shall operate on 240-volt, single phase, 60 hertz supply power.

F. Pumps design shall include the following features:
1. Impeller: 304 Stainless Steel
2. Impeller Seal Ring: Teflon
3. Motor Adaptor: 304 Stainless Steel
4. Inlet Screen: 304 Stainless Steel
5. Pump Shaft: 431 Stainless Steel
6. Coupling: 316 Stainless Steel
7. Check Valve Housing: 304 Stainless Steel
8. Check Valve: 304 Stainless Steel
9. Check Valve Seat: 304 Stainless Steel
10. Diffuser Chamber: 304 Stainless Steel
11. Fasteners: 304 Stainless Steel
12. Bearings: Teflon
13. Suspension Cables: 3/16" – 7x19 Braided 304 Stainless Steel

G. PUMP MOTOR DESIGN

1. Motors corrosion-resistant motors as manufactured by Franklin Electric or Grundfos or approved equal having the following characteristics:

    i. Temperature and Time Rating: Continuous duty with 0.25 ft/sec. flow past motor. Temperature 30° C ambient.

    ii. Enclosure: Hermetically sealed windings, corrosion-resistant materials. Stainless Steel, splined shaft.

    iii. Bearings:
        1. Thrust Bearing: (Stationary) Carbon
        2. Radial Bearing: (Complete) Ceramic
        3. Thrust Bearing: (Rotating) Ceramic

    iv. Lubrication: Water Based

2. Pump Shroud: Each pump shall be mounted in a High Density Polyethylene (HDPE) casing (shroud) designed for side slope riser leachate applications. Wheels are not acceptable.

3. Check Valve: Pump shall have a factory installed check valve. The check valve shall have a hole drilled in it to allow leachate to drain out of the line when it is not pumping for frost protection. Manufacturer shall drill the hole to meet their requirements without voiding warranty.

4. Submersible Transducer: A submersible transducer shall be provided integral with each pump and with an adequate size cable for each pump to be set in the housing (side slope riser) pipe in the sump floor as shown on the drawings. The transducer shall be 316 stainless steel. The unit shall provide a 4-20mA signal output to the control unit. Static accuracy rating shall be no less than ± 0.1% of full scale. The cable shall be the same length as the pump power cable. Splicing of transducer cable will not be allowed.

5. A properly sized jacketed power cable suitable for leachate service shall be provided.

2.3 DISCHARGE HOSE / PIPE

A. The discharge hose shall be 1.5-inch SDR 11 HDPE pipe having a rated working pressure of no less than 150 PSI and a temperature range of -45 to +150 degrees Fahrenheit.

B. Hose suitable for leachate service shall be provided in a length commensurate with the dimensional requirements of the application and field fitted by installing contractor.

2.4 DISCHARGE HOSE FITTINGS

A. All hose fittings shall be 316 stainless steel and shall be suitable for the application. All hose bands shall be hi-torque 316 series stainless construction.

2.5 DISCHARGE EXIT FITTINGS

A. General: All fittings shall be 316 stainless steel construction.
B. Discharge Adapter: Each pump discharge shall be fitted with a discharge adapter at the crest (top) of the riser pipes. The adapter shall be 316 SST, 1-1/2" NPT as manufactured by EPG Companies, or approved equal.

2.6 PIPE INSULATION

A. All above ground and near ground (to frost depth) pipe shall be insulated using rigid pipe foam insulation and protected using stainless steel or galvanized steel jacketing. The R value shall be 7.5 per inch. The insulation shall be continuous and glued. All jacketing shall be galvanized or stainless steel continuously and securely attached with no sharp corners or gaps or holes where insects can nest. All fittings along the insulated pipe sections shall have insulated blankets that can be easily removed for inspection of equipment.

2.7 COMBO AIR RELEASE / VAC VALVE

A. The combination air release and vacuum break valve shall provide a means for the leachate to drain back into the Cell A sump to avoid freezing inside the line when the system is not actively pumping and allow air in the line to be released and shall be model D-020 (for wastewater) as manufactured by ARI, or approved equal. Size as shown on the plans.

2.8 ISOLATION AND CHECK VALVES

A. Isolation Valve – the isolation valve shall be stainless steel and be of either plug or ball style with pressure rating to match the adjoining pipe. Size as shown on plans. The valve actuator shall be a standard nut or t-handle for access from the ground surface after lifting the vault lid.

B. Check Valve – the check valve shall be a swing check style and made of stainless steel with pressure rating to match the adjoining pipe. Size as shown on plans.

2.9 EXAMINATION

A. Examine areas, equipment foundations, and conditions with installer present, for compliance with requirements for installation and other conditions affecting performance of pumps. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Examine rough-in for piping systems to verify actual locations of piping connections prior to installation.

2.7 INSTALLATION

A. General: Comply with the manufacturer's written installation and alignment instructions.

B. Install Pumps and appurtenances in indicated locations.

2.8 COMMISSIONING

A. After installation of pumps and related piping and controls, manufacturer's representatives shall perform system start-up and tests to ensure proper functioning of pumping system.

PART 3 - CONTROLS

3.1 CONTROL PANEL

A. Each system controller shall provide true pump and transducer alternation as well as separate simplex operation and be manufactured and registered by a UL certified panel shop permitted to make industrial control panels for hazardous locations and intrinsically safe apparatus and associated apparatus for use in Class I, II, and III, Division 1, Hazardous Locations. The system controller shall comply with all other necessary requirements dictated and noted by the designer for relevant panel location and service.

B. Each system controller shall provide the means to alternate, control and adjust pump operation; provide status information on pump conditions, faults, alarms, level indication and optionally flow indication; and appropriate electrical and motor protection for duplex alternating system and simplex system.

C. Furnish one duplex control panel (QED Commander Controller, or approved equivalent), to operate two 1/2 HP pump motors and auxiliary equipment in manual or automatic mode. The control panel enclosure shall be a NEMA type 4X. The enclosure shall be equipped with a window in the outer door, an inner door, and a drip shield. The NEMA 4X enclosure will be stainless steel. The control system will operate a 230 Volt, 60 Hertz, 3-wire power supply. Pump control components shall be sized to operate a pump motor of specified horsepower and shall be supplied and turn-key by a single manufacturer.

D. The control panel shall include the following as standard features:

1. Panel: the control panel shall be constructed in accordance with the Underwriter's Laboratories (UL) Standard 508 "Industrial Control Equipment" and UL standard 698A Industrial Control Panels Relating to Hazardous (Classified Locations). The panel shall be shop inspected by UL or constructed in a UL recognized facility. The panel shall bear a serialized UL label indicating acceptance under Standards 508 and 698A.

2. Pump Controller: The level controller shall be mounted on the inner door and viewable by the enclosure outer door window. The controller shall have a 4-digit, 13.8 mm, 14-segment readout, scrolling help text and the capability to monitor and maintain liquid levels as well as output a high-level indication. Level controller shall be accurate to within 0.1 inch.

3. Level Transducer: A submersible level transducer shall be provided in the sump. The transducer shall be constructed of 316 SST and shall be a suspended type; a 4-20 mA signal shall be output to the controller for display and control of sump level. The pressure transmitter level sensor shall have a range of 0 to 5 PSI with a 4-20 mA output signal proportional to the required sump level.

4. Flow Meter: A paddle wheel type flow meter shall be provided in the pump discharge line for each pump; each paddle wheel flow sensor shall be constructed of PVC, and shall be of insertion type, a square wave signal shall be output to the controller for display of flow and total flow.

5. Main Disconnect Switch: The main disconnect switch shall be UL 98 rated and will prevent opening of the control panel inner door while the power is on and includes a proper size breaker for circuit size.

6. Control Circuit Breaker: A UL 489 type current limiting circuit breaker shall be provided on the control circuit.

7. Hand-Off-Auto Selector Switch: Allows manual or automatic operation of the pump motor. The selector switch shall be a heavy duty, oil tight, NEMA 4 rated switch mounted on the inner door and shall be viewable by the enclosure outer door window.

8. Motor Starter: Provide full voltage non-reversing, circuit breaker combination type with adjustable electronic overload relay.

9. Wire Markers: Brady type printed wire markers shall be provided on both ends of all conductors to correlate with manufactures drawings.

10. Terminal Blocks: Provide terminal blocks sized for the wire used for all field terminations, clearly mark all terminal blocks with a typewritten marking system, terminal blocks shall be DIN rail mounted, screw clamp, feed through type with 600-volt minimum rating.

11. Control Relays: Shall be general purpose type, contacts rated 10 amps at 120 VAC, coil voltage as required, and include indicator lamp.

12. Control Transformer: A transformer with UL 489 type current limiting circuit breakers on the primary and secondary circuits shall be provided where required. If fuses are used provide 10 of each type used as spare parts.

13. Run Light: A pump running indicator lamp shall be provided. It shall be heavy duty, LED, oil tight, NEMA 4 rated. The light shall be connected to the motor starter auxiliary contacts and shall be mounted on the inner door and will be green in color and viewable by the enclosure outer door window.

14. Run Time Meter: A pump run time meter shall be provided and incorporated into the controller for each pump. The runtime meter shall be connected to the motor starter auxiliary contacts and shall be mounted on the inner door and viewable by the enclosure outer door window.

15. Alarm Light: A red 25-watt high intensity alarm beacon shall be provided on top of the enclosure to provide high alarm indication; the lamp shall be replaceable from the inside of the enclosure so not to disrupt water tightness of the light fixture.

16. Intrinsically Safe Barrier: The level sensor circuit shall be protected by an intrinsically safe barrier.

17. Heater with Adjustable Thermostat: A heater with adjustable thermostat shall be provided; it shall maintain the minimum temperature required for the operation of the level controller.

18. Lightning Arrestor: Eaton CHSA type or approved equal shall be provided.

19. Pass Along Circuit: A pass along circuit shall be provided to enable a shutdown of the pump in the event of a high-level alarm at a storage facility.

20. Breakout Junction Box: A junction box with terminals shall be provided for connections of field devices to the control panel, 1 junction box shall be provided for the pump power connection, 1 shall be provided for the level transducer and, 1 shall be provided for the flow meter per pump. A poured seal off shall be installed between the junction box and the control panel to prevent migration of landfill gases into the control panel.

3.2 LEVEL CONTROL

A. A panel mounted digital readout display controller with 3 ½-inch digits shall be provided to indicate level in the sump(s). The pump(s) "OFF", "LEAD ON"', "LAG ON" and "HIGH LEVEL" selections shall be user friendly and capable of being set/adjusted on the front of the unit.

B. The controller shall be capable of accepting a 4 to 20 mA signal from a submersible transducer and provide a level indication range of 0 to 138.6 inches of liquid.

C. Outputs include duplex alternation as well as Hand-Off-Auto toggle switches. Pump run times can be displayed for each pump with tenth of an hour resolution up to 99,999.9 hours.

D. The controller shall come standard with "Level Simulator" that allows simulation of the input signal and a 4 to 20 mA output signal that is proportional to and independent from the input signal.

E. A submersible transducer with adequate sized cable shall be provided for each pump. The transducer(s) shall be constructed of 300 series stainless steel and shall be mounted to the pump

carriage. Transducer(s) shall provide a 4 to 20 mA output signal and come equipped with built-in surge protection. Static accuracy shall be no less than 1.0%.

F. A permanent aneroid bellows type breather device shall be mounted in the control panel to prevent moisture in the vent tube.

G. A panel mounted intrinsically safe barrier shall be provided for each transducer signal.

3.3 ELECTRICAL

A. Contractor shall install buried electrical service to the pump as indicated on the electrical drawings. All electrical equipment and installation shall meet electrical code requirements. Contractor shall be responsible for obtaining all necessary electrical permits.

PART 4 - MISCELLANEOUS ITEMS

4.1 CABLE FITTINGS

B. Non-metallic, compression type threaded cable exit fittings, properly sized for the pump power cable and level sensor cable shall be provided for installation in the riser pipes.

PART 5 - EXECUTION

5.1 START-UP / COMMISSIONING

A. At the time of start-up, the contractor shall coordinate with the manufacturer and the Owner to provide operator training and troubleshooting.

B. A complete operations and maintenance manual with index for the system shall be provided. Information shall include manufacturers contact list, equipment list, equipment cut sheets, parts breakdowns, control panel information and a troubleshooting guide

END OF SECTION

SECTION 02644

FLEXIBLE MEMBRANE LINER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections and Landfill Special Provisions apply to this Section.

1.2 SUMMARY

A. The work shall consist of providing all tools, equipment, and labor necessary to install the Owner-provided flexible membrane liner (FML) to the lines and grades shown in the drawings. The work includes preparation of the surface to receive the geomembrane, excavation and backfilling of the anchor trenches, installation of the geomembrane material complete with seams, and other appurtenances. The work shall include field testing and sampling of seams and providing the necessary testing and sampling equipment. If more FML is required to complete the project than the Owner has purchased, additional material shall be provided to meet Part 2 of this Specification.

1.3 REFERENCES

A. Geosynthetic Research Institute (GRI) Standards
1. GRI Test Method GM13 Test Methods, Test Properties and Testing Frequency for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes
2. GRI Test Method GM19, Seam Strength and Related Properties of Thermally Bonded Polyolefin Geomembranes
3. GRI Test Method GM29, Field Integrity Evaluation of Geomembrane Seams (and Sheet) Using Destructive and Nondestructive Testing

B. American Society for Testing and Materials (ASTM)
1. D 638 Standard Test Method for Tensile Properties of Plastic
2. D 698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort
3. D 792 Standard Test Method for Density and Specific Gravity (Relative Density) of Plastics by Displacement
4. D 1004 Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting
5. D 1238 Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer
6. D 1505 Test Method for Density of Plastics by the Density-Gradient Technique
7. D 1593 Specification for Nonrigid Vinyl Chloride Plastic Sheeting
8. D 1603 Standard Test Method for Carbon Black in Olefin Plastics
9. D 1693 Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics
10. D3895-Standard Test Method for Oxidative-Induction Time of Polyolefins by Differential Scanning Calorimetry

11. D4833 Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products
12. D5199 Standard Test Method for Measuring the Nominal Thickness of Geosynthetics
13. D5397 Standard Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test
14. D5596 Standard Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics
15. D5641-94 (2011), Standard Practice for Geomembrane Seam Evaluation by Vacuum Chamber
16. D5820 Standard Practice for Pressurized Air Channel Evaluation of Dual Seamed Geomembranes
17. D5885 Standard Test Method for Oxidative Induction Time of Polyolefin Geosynthetics by High-Pressure Differential Scanning Calorimetry
18. D5994 Standard Test Method for Measuring Core Thickness of Textured Geomembrane
19. D6392 Standard Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods
20. D6693 Standard Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembranes
21. D6938 Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
22. D7466 Standard Test Method for Measuring the Asperity Height of Textured Geomembranes

1.4 SUBMITTALS

A. Manufacturer's qualifications as specified herein demonstrating the minimum level of experience required.

B. Furnish all product data, in writing, to the Engineer for approval prior to shipment and delivery of the FML products.

C. Resin Data shall include the following:
1. Certification stating that the resin meets the specification requirements
2. Certifications stating all resin is from the same Manufacturer
3. Copy of Quality Assurance/Quality Control certificates issued by Geomembrane Manufacturer and resin supplier shall be submitted.

D. Each Geomembrane Roll
1. Certification and test results showing that the resin meets the specification requirements
2. Statement certifying no reclaimed polymer is added to resin
3. Copy of quality assurance certificates issued by Geomembrane Manufacturer shall be furnished
4. Submitted to Engineer upon delivery of each roll to site.

E. Extrudate resins and/or rod shall be certified that all extrudate is from one Manufacturer, is the same resin type, and was obtained from the same resin supplier as the resin used to manufacture the geomembrane rolls.

F. Furnish the following information to the Engineer prior to installation
   1. Installation layout drawings. Submit drawings showing proposed panel layout including field seams and details. These drawings shall be approved prior to installing the geomembrane. This approval will be for concept only and actual panel placement will be determined by site conditions.
   2. Statements of experience from the proposed HDPE supplier and installer
   3. Installer's geosynthetic Field Installation Quality Assurance Plan
   4. Samples of HDPE proposed for use on project
   5. Reference lists from both the HDPE supplier and installer
   6. Results of conformance testing specified within Paragraphs 1.4, 1.5 and 1.6.

G. Submittals on a daily basis during installation
   1. Subgrade Acceptance Forms
   2. All QC documentation and field testing results (destructive and non-destructive test results)

H. Submit the following to the Engineer upon completion of installation
   1. Certificate stating the geomembrane has been installed in accordance with the Contract Documents
   2. Material and installation warranties
   3. As-built drawings showing actual geomembrane panel placement and seams including typical anchor trench

1.5 CONFORMANCE TESTING

A. The Contractor shall sample Contractor-supplied HDPE materials before they arrive on-site for conformance testing. The Contractor will be responsible for forwarding conformance samples to a certified, third-party testing laboratory for testing. Conformance samples will be taken a minimum of each lot or every 100,000 square feet of material whichever results in more tests. HDPE samples will be tested for thickness, yield, elongation @ yield, elongation @ break, and puncture resistance. Samples will be tested to ensure conformance with the specifications listed in Table 1 and Table 2 of this section.

B. No HDPE material shall be installed until conformance testing is complete on that material and results show that the delivered material meets the requirements of the specifications. Material which fails to meet the requirements of the conformance testing shall be rejected and not utilized within the project. Rejected material will be replaced with material meeting the specifications at no additional cost to the Owner. The Contractor shall pay for all costs associated with this conformance testing and retesting of new material, if necessary.

1.6 FIELD TESTING

A. The Contractor shall submit results of the field destructive and non-destructive field testing in writing to the Engineer at the end of every day in which geomembrane welding and seaming has been conducted. The results shall indicate location of the test, passing or failure of the test, and any remedial action taken.

1.7 AS-BUILT DRAWINGS

A. The Contractor shall maintain and submit as-built drawings showing panel layout with identifying panel numbers, the location of all seams, the location of destructive test samples with identification numbers and the location of all repairs. The Contractor shall submit a table showing the correspondence between the Manufacturer's roll number and the assigned panel numbers. Updated as-built drawings shall be submitted within one week after each one hundred thousand square feet of geomembrane has been installed.

1.8 MANUFACTURER'S QUALIFICATION AND QUALITY

A. The Manufacturer of the FML materials described in these specifications shall have previously demonstrated ability to produce these exact or equivalent FML products for each specified product by having successfully manufactured a minimum of ten (10) million square feet of the specified material.

B. The Manufacturer of FML shall perform quality control testing of all FML produced in accordance with the Geosynthetics Research Institute Standards GM-13. Certified results of factory quality control testing shall be submitted to the Engineer prior to shipment and delivery to the project site.

PART 2 - PRODUCTS

2.1 GENERAL

A. Each roll shall be labeled or tagged with roll identification number, name of manufacturer, date of production, product type and grade, lot number, physical dimensions, and roll weight. The label or tag information shall be fixed or attached to the roll at all times.

B. Primary Landfill and Leachate Pond Liner: High-density polyethylene (HDPE) double-side textured FML, produced using new first-quality products designed and manufactured specifically for the purpose of liquid containment. The textured surfaces shall be manufactured simultaneously with the extrusion of the liner. The geomembrane material shall have a nominal thickness of no less than 60 mil, a minimum thickness of 54 mil (single test not average) and also meet the specifications in table below. Pre-approved product: AGRU MicroSpike® Liner, or approved equal by the Engineer. The approved equal shall also constitute shear strength equivalency to meet the seismic requirements for the project.

TABLE 1

PRODUCT DATA							
Property	**Test Method**	**Frequency**	**Minimum Average Values**				
Thickness (nominal), mil (mm)	ASTM D5994	Per Roll	30 (0.75)	40 (1.0)	60 (1.5)	80 (2.0)	100 (2.5)
Thickness (min avg), mil (mm)			29 (0.71)	38 (0.95)	57 (1.43)	76 (1.9)	95 (2.38)
Thickness (min 8 of 10), mil (mm)			27 (0.68)	36 (0.90)	54 (1.35)	72 (1.8)	90 (2.25)
Thickness (lowest individual), mil (mm)			26 (0.64)	34 (0.85)	51 (1.28)	68 (1.7)	85 (2.13)
Asperity Height mils, (mm)	ASTM D7466	2nd Roll	20 (0.51)	20 (0.51)	20 (0.51)	18 (0.46)	18 (0.46)
Density, g/cc, minimum	ASTM D792, Method B	200,000 lb	0.94	0.94	0.94	0.94	0.94
Tensile Properties (both directions)	ASTM D6693, Type IV						
Strength @ Yield, lb/in width (N/mm)	2 in/minute	20,000 lb	66 (11.6)	88 (15.4)	132 (23.1)	176 (30.8)	220 (38.5)
Elongation @ Yield, % (GL=1.3in)			12	12	12	12	12
Strength @ Break, lb/in width (N/mm)			66 (11.6)	88 (15.4)	132 (23.1)	176 (30.8)	220 (38.5)
Elongation @ Break, % (GL=2.0in)			350	350	350	350	350
Tear Resistance, lb,s. (N)	ASTM D1004	45,000 lb	23 (102)	30 (133)	45 (200)	60 (267)	72 (320)
Puncture Resistance, lbs. (N)	ASTM D4833	45,000 lb	60 (267)	90 (400)	120 (534)	150 (667)	180 (801)
Carbon Black Content, % (range)	ASTM D4218	20,000 lb	2-3	2-3	2-3	2-3	2-3
Carbon Black Dispersion (Category)	ASTM D5596	45,000 lb	Only near spherical agglomerates: 10 views in Cat. 1 or 2				
Stress Crack Resistance (SP-NCTL), hrs.	ASTM D5397 Appendix	200,000 lb	500	500	500	500	500
Oxidative Induction Time, minutes	ASTM D3895, 200°C, 1 atm O_2	200,000 lb	≥140	≥140	≥140	≥140	≥140

C. <u>Secondary Liner for Landfill Sumps and Leachate Pond Liner:</u> High-density polyethylene (HDPE) single-sided texted integrated drain liner FML, produced using new first quality products designed and manufactured specifically for the purpose of liquid drainage between liners and liquid containment. The textured surface and studs shall be manufactured simultaneously with the extrusion of the liner. The geomembrane material shall have a nominal thickness of no less than 60 mil, a minimum thickness of 54 mil (single test not average) and also meet the specifications in table below 1. Pre-approved product: AGRU MicroDrain® Liner, or approved equal by the Engineer. The approved equal shall also constitute equivalent drainage capacity and shear strength equivalency to meet the seismic requirements for the project.

TABLE 2

PRODUCT DATA						
Property	Test Method	Frequency	Minimum Average Values			
Thickness (nominal), mil (mm)	ASTM D5994	Per Roll	50 (1.25)	60 (1.5)	80 (2.0)	100 (2.5)
Thickness (min avg), mil (mm)			47.5 (1.19)	57 (1.43)	76 (1.9)	95 (2.38)
Thickness (min 8 of 10), mil (mm)			45 (1.12)	54 (1.35)	72 (1.8)	90 (2.25)
Thickness (lowest individual), mil (mm)			42.5 (1.06)	51 (1.28)	68 (1.7)	85 (2.13)
Drainage Stud Height, mil (mm)	ASTM D7466	2nd Roll	130 (3.3)	130 (3.3)	130 (3.3)	130 (3.3)
MicroSpike® Asperity Height, mil (mm)	ASTM D7466	2nd Roll	20 (0.51)	20 (0.51)	18 (0.46)	18 (0.46)
Density, g/cc, minimum	ASTM D792, Method B	200,000 lb	0.94	0.94	0.94	0.94
Tensile Properties (both directions)	ASTM D6693, Type IV					
Strength @ Yield, lb/in width (N/mm)	2 in/minute	20,000 lb	110 (19.3)	132 (23.1)	176 (30.8)	220 (38.5)
Elongation @ Yield, % (GL=1.3in)			12	12	12	12
Strength @ Break, lb/in width (N/mm)			110 (19.3)	132 (23.1)	176 (30.8)	220 (38.5)
Elongation @ Break, % (GL=2.0in)			300	300	300	300
Tear Resistance, lb,s. (N)	ASTM D1004	45,000 lb	38 (169)	42 (187)	56 (249)	70 (310)
Puncture Resistance, lbs. (N)	ASTM D4833	45,000 lb	80 (356)	95 (422)	126 (560)	158 (703)
Carbon Black Content, % (range)	ASTM D4218	20,000 lb	2-3	2-3	2-3	2-3
Carbon Black Dispersion (Category)	ASTM D5596	45,000 lb	Only near spherical agglomerates: 10 views Cat. 1 or 2			
Stress Crack Resistance (SP-NCTL), hrs.	ASTM D5397 Appendix	200,000 lb	500	500	500	500
Oxidative Induction Time, minutes	ASTM D3895, 200°C, 1 atm O_2	200,000 lb	≥140	≥140	≥140	≥140
Transmissivity, m^2/sec[1]	ASTM D4716	Periodic	4×10^{-3}			

2.2 HANDLING AND STORAGE

A. Handling of the FML materials by the Supplier upon delivery of the products shall conform to the Manufacturer's recommendations and shall be done in a manner as to prevent damage. Any damaged material upon discovery by the installation contractor shall be replaced by the Manufacturer upon proper documentation.

B. Store the materials in the designated location on the site and ensure that the location meets the storage recommendations by the Manufacturer.

PART 3 - EXECUTION

3.1 GEOMEMBRANE INSTALLER

A. The installation of the geomembrane shall be performed by the Manufacturer of the material or an installer certified by the Manufacturer using the Manufacturer's installation methods. All the installer supervisors overseeing the geomembrane installation shall have over ten million square feet of geomembrane supervisory experience. All field technicians shall have over one million square feet of seaming experience.

3.2 SUBGRADE PREPARATION

A. The HDPE liner shall be placed directly upon the GCL. The Contractor shall protect the GCL from flooding and moisture. If the GCL hydrates, it shall be replaced by the Contractor as approved by the Engineer and at no additional cost to the Owner.

B. The geomembrane installer shall, prior to commencing installation, certify in writing that the surface on which the geomembrane is to be installed is acceptable. The installer shall also certify that anchor trenches, slopes and grades are acceptable and will not affect the performance or durability of the geomembrane.

3.3 ANCHOR TRENCH SYSTEM

A. Excavation - The anchor trench shall be excavated to the lines and widths shown on the drawings. Trenches shall be excavated only the distance required for that day's installation. The corners of the trench shall be slightly rounded where the geomembrane adjoins the trench to minimize sharp bends.

B. Backfill - Material used to backfill the anchor trenches shall be approved by the Engineer. The material shall be placed in six (6) inch loose lifts and shall be compacted to 95 percent of the maximum dry density at a moisture content within 2 percent of optimum moisture content as defined by ASTM D698. Field compaction tests, utilizing the nuclear method outlined in ASTM D6938 or other methods approved by the Engineer, will be made as backfilling of the anchor trenches proceed.

3.4 FIELD PANEL PLACEMENT

A. Identification and Location of Field Panels - Each panel used for installation shall be given an identification number consistent with the shop drawings. The identification number shall be related to a manufacturing roll number that identifies the resin type, batch number and date of manufacture.

B. Field panels shall be installed at locations shown on the shop drawings. If panels are installed in a location other than that indicated on the shop drawings, the revised location shall be noted in the field on a layout drawing. The Contractor shall provide the Engineer, in writing at the end of each day of geomembrane installation, with the identification and locations of panels installed and notify the Engineer of any revised panel locations.

C. Weather Conditions - Geomembrane shall not be installed during any precipitation, in the presence of excessive moisture, in areas of standing water, or during high winds. The Engineer shall be the final authority on determining proper weather conditions for geomembrane installation.

D. Placement - Geomembrane panels shall be placed using equipment and procedures so as not to damage the geomembrane, the GCL, or the subgrade surface and in a manner to minimize both wrinkles and stretching. Sufficient material slack shall be provided to allow for geomembrane expansion and contraction.

E. Personnel working on the geomembrane shall not smoke, wear shoes that can damage the geomembrane or engage in actions which can result in damage to the geomembrane.

F. Damaged panels shall be repaired in accordance with Part Eight of this section or removed. Remedial measures shall be approved by the Engineer.

3.5 TEMPORARY ANCHORAGE

A. Sandbags shall be placed to prevent uplift of the geomembrane by the wind.

3.6 FIELD SEAMING

A. Equipment - Field seam welding equipment shall be capable of continuously monitoring and controlling the temperature in the zone of contact where the machine is joining the geomembrane.

B. Layout - The seams shall be generally oriented parallel to the slope. Where necessary, horizontal seams shall be located five feet minimum from the toe of the slopes. Individual panels of geomembrane material shall be overlapped as recommended by the Manufacturer. The area to be welded shall be cleaned and prepared according to the procedures specified by the Manufacturer.

C. Types of Welds - Geomembrane panels shall be seamed using double track hot wedge welding. Detail seaming around pipes and concrete structures and seaming for patches shall be fabricated with fillet extrusion welds.

D. Weather - Seaming shall not take place when the temperature is below 40°F or above 100°F except under approval of Engineer. Seaming shall not take place during rain, snow, sleet or other wet conditions or when the subgrade beneath the geomembrane is frozen. The Engineer shall be the final authority on determining proper weather conditions for seaming.

PART 4 - FACTORY FABRICATION QUALITY CONTROL

4.1 MANUFACTURING QUALITY ASSURANCE & CONTROL

A. The Manufacturer of geomembrane material shall perform quality control testing of all geomembrane produced in accordance with the Geosynthetics Research Institute Standards GM-13. Certified results of factory quality control testing shall be submitted to the Engineer prior to or upon delivery to the site.

PART 5 - TEST WELDS

5.1 SAMPLING

A. Test welds shall be performed at the beginning of each seaming period and at least once each five (5) hours for each welding apparatus used that day. Test welds shall be made under the same conditions as exist for the geomembrane seaming. The test welds shall be at least three feet long and shall be made by joining pieces of geomembrane at least nine inches wide.

5.2 FIELD TESTING

A. Two random samples shall be cut from the test weld. The samples shall be tested in shear and in peel in accordance with ASTM D6392 using a field extensiometer supplied and operated by the Installer. The welds shall exhibit a Film Tearing Bond (FTB). If a specimen fails, the entire sampling and testing procedure shall be repeated. If any of the second set of specimens fail, the welding machine shall not be accepted for seaming until the deficiencies have been corrected and a passing test seam achieved.

PART 6 - FIELD SEAM TESTING

6.1 GENERAL

A. One hundred percent (100%) of all field seams shall be subjected to Engineer approved non-destructive seam testing.

6.2 AIR PRESSURE TESTING

A. All double-track welds shall be air pressure tested to 30 psi according to the Manufacturer's recommendations. The pressure may not drop over 4 psi in a five-minute period or the seam fails. Failing seams shall be remedied according to the Manufacturer's recommendations until the seam passes the air pressure tests. Air pressure feed holes shall be repaired by extrusion welding.

6.3 VACUUM BOX TESTING

A. All extrusion welds shall be vacuum tested in accordance with Manufacturer's recommendations.

6.4 DESTRUCTIVE TESTING - LABORATORY

A. One (1) destructive test sample shall be taken randomly at a minimum average frequency of one (1) test location every 500 feet of seam length and submitted to the Engineer. Seam destructive samples shall be sent by the Contractor to an approved third party laboratory and tested for shear strength and peel adhesion (ASTM D6392). Testing shall be paid for by the Contractor. Five (5) specimens shall be tested for each test method. Four (4) out of the five (5) specimens must exhibit FTB for each round of peel and shear testing. In addition, four (4) of the five (5) individual specimens and the average of the five (5) peel and shear tests must meet or exceed the specified strength requirements.

6.5 DESTRUCTIVE TESTING - FIELD

A. The Installer shall duplicate the laboratory testing (Section 7.4) using a field extensiometer provided by the Installer. The results of field testing shall be submitted to the Engineer immediately after testing.

6.6 FAILED DESTRUCTIVE TESTS

A. If a destructive test sample fails either in the laboratory or in the field, an additional destructive test shall be taken from each seam completed by that welder on the day in which the seam failed.

B. The Contractor may be required to cut out the entire failed seam and double track wedge weld in new HDPE liner in place of the failed seam at the Engineer’s discretion. Extrusion welding a cap over the failed seam may be permitted at the discretion of the Engineer. Non-destructive testing will be required on the repaired seam. A minimum of

one destructive test sample will be required from the repaired seam if double track wedge welded.

PART 7 - REPAIRS

7.1 GENERAL

A. All seams which have failed destructive or non-destructive tests shall be repaired. All defects, holes, blisters or other signs of damage shall also be repaired. Repairs shall be conducted under the supervision of the Engineer according to the Manufacturer's specifications. Every repair shall be non-destructively tested according to Part 7 of this specification. Repairs in excess of 150 lineal feet shall require a destructive test.

PART 8 - DOCUMENTATION

8.1 GENERAL

A. The Contractor shall provide the Engineer with the following documentation for approval before, during and after liner installation as appropriate:
   1. Geomembrane layout sequence
   2. Details of welding and seaming operations
   3. Non-destructive seam testing methods and schedule
   4. Test weld method and schedule
   5. Manhole welding details
   6. Destructive test sampling from field seamed liner and schedule
   7. Repair procedures
   8. QA/QC Plan
   9. QA/QC forms for job
      a. Delivery/Inventory Checklist
      b. Panel Placement Form
      c. Test Weld Form
      d. Panel Seaming Form
      e. Non-Destructive Testing Form
      f. Destructive Test Log
      g. Daily Field Report
   10. As-built drawings of panel placements

PART 9 - WARRANTY AND GUARANTEE

9.1 GENERAL

A. The manufacturer and installer shall each provide a written warranty. The manufacturer shall provide a five-year warranty on the material. The installer shall provide a two-year warranty on the installation.

END OF SECTION

SECTION 02709

TOPSOIL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections and Special Provisions apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Placing topsoil at the locations shown on the Drawings.

B. Related Sections include the following:
   1. Division 1 Section "Construction and Temporary Facilities" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities, and environmental protection measures during site operations.
   2. Division 2 Section “Site Clearing” for clearing materials and harvesting topsoil for reuse.
   3. Division 2 Section "Earthwork" for soil materials, excavating, backfilling, and site grading.
   4. Division 2 Section “Soil Stabilization” for permanently stabilizing the topsoil following placement.

1.3 SUBMITTALS

A. Material testing for any import topsoil material.

B. Copies of delivery tickets for any import material.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil shall consist of a natural friable surface soil consisting of loam, sandy loam, silty loam, silty clay loam, or clay loam, without admixtures of undesirable subsoil, refuse, or foreign materials. It shall be reasonably free from roots, hard clay, coarse gravel, stones larger than one inch in any dimension, noxious weeds, tall grass, brush, sticks, stubble or other material which would be detrimental to the proper development of vegetative growth. Topsoil shall be obtained from naturally well drained sites where

topsoil occurs at least 4-inches deep. Topsoil shall not be obtained from bogs, marshes, or wetlands.

B. The project GER shall approve the topsoil source(s) for use.

PART 3 – EXECUTION

2.2 GENERAL

A. All areas that are disturbed during construction which are not covered with surfacing shall be graded to a neat, uniform grade line and appearance and covered with a neat uniform, 6-inch minimum thickness of topsoil and seeded or hydroseeded, unless otherwise indicated in the Contract Documents.

B. The topsoil shall be evenly spread on the designated areas to a depth, which, after settlement and compaction, shall be six inches, or as indicated in the Contract Documents. Spreading shall not be done when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to the work. Roadway surfaces shall be kept clean during hauling and spreading operations.

C. After spreading has been completed, large clods, stones larger than one inch in any dimension, roots stumps, and other litter shall be raked up and removed.

D. The final grading of the topsoil prior to seeding or hydroseeding shall be to a tolerance that will not permit ponding of water in excess of one inch in depth.

E. Topsoil Finish Grading:
1. Provide labor personnel experienced with landscaping work that involves fine grading of topsoil for soil stabilization.
2. Remove and dispose of all excess materials resulting from the finish grading of the topsoil.
3. Prepare for seeding. Refer to Division 2 Section “Soil Stabilization.”

END OF SECTION

SECTION 02821

CHAIN-LINK FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections and Landfill Special Provisions apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Chain-Link Fences: Industrial
   2. Gates: Swing (Industrial)

1.3 SUBMITTALS

A. Action:
1. Product Data: For each type of product indicated.
2. Shop Drawings: Show locations, components, materials, dimensions, sizes, weights, and finishes of components. Include plans, gate elevations, sections, details of post anchorage, attachment, bracing, and other required installation and operational clearances.

PART 2 - PRODUCTS

2.1 CHAIN-LINK FENCE FABRIC

A. General: Height indicated on Drawings. Comply with ASTM A 392, CLFMI CLF 2445, and requirements indicated below:
   1. Steel Wire Fabric: Metallic coated 9-gauge wire with a diameter of 0.148 inch (3.76 mm), galvanized before weaving (GBW).
      a. Mesh Size: 2 inches (50 mm).
      b. Metallic (Zinc) Coating: ASTM A 392, Type II.
   2. Selvage: Twisted top and knuckled bottom.

2.2 INDUSTRIAL FENCE FRAMING

A. Posts and Rails: Comply with ASTM F 1043 for framing, ASTM F 1083 for Group IC round pipe, and the following:
   1. Group: IC, round steel pipe, yield strength 50,000 psi (345 MPa)
   2. Coating for Steel Framing:
      a. Metallic coating.

2.3 TENSION WIRE

A. General: Provide horizontal tension wire at bottom of fence fabric.

B. Metallic-Coated Steel Wire: 0.177-inch- (4.5-mm-) diameter, marcelled tension wire complying with ASTM A 817 and ASTM A 824.
   1. Metallic Coating: Type III, Zn-5-Al-MM alloy.

2.4 INDUSTRIAL SWING GATES

A. General: Comply with ASTM F 900 for swing gate types.
   1. Metal Pipe and Tubing: Galvanized steel. Comply with ASTM F 1083 and ASTM F 1043 for materials and protective coatings.

B. Frames and Bracing: Fabricate members from round, galvanized steel tubing with outside dimension and weight according to ASTM F 900 and the following:
   1. Gate Fabric Height: 2 inches (50 mm) less than adjacent fence height.
   2. Leaf Width: As indicated.
   3. Frame Members:
      a. Tubular Steel: 1.66 inches (42 mm) round, full weight

C. Frame Corner Construction:
   1. Welded and 5/16-inch diameter, adjustable truss rods for panels 5 feet (1.52 m) wide or wider].

D. Extended Gate Posts and Frame Members: Extend gate posts and frame end members above top of chain-link fabric at both ends of gate frame 14 inches (300 mm) as required to attach barbed wire assemblies.

E. Hardware: Latches permitting operation from both sides of gate, hinges, center gate stops and keepers for each gate leaf more than 5 feet (1.52 m) wide. Fabricate latches with integral eye openings for padlocking; padlock accessible from both sides of gate.

F. Gate stops: Post and hardware to keep gate in open position.

2.5 FITTINGS

A. General: Comply with ASTM F 626.

B. Finish:
   1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz. /sq. ft. (366 g /sq. m) zinc.
   2. Aluminum: Mill finish.

2.6 FENCE GROUNDING

A. Conductors: Bare, solid wire for No. 6 AWG and smaller; stranded wire for No. 4 AWG and larger.
   1. Material above Finished Grade: Copper.
   2. Material on or below Finished Grade: Copper.
   3. Bonding Jumpers: Braided copper tape, 1 inch (25 mm) wide, woven of No. 30 AWG bare copper wire, terminated with copper ferrules.

B. Connectors and Grounding Rods: Comply with UL 467.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install chain-link fencing to comply with ASTM F 567 and more stringent requirements specified.

B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.

C. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
1. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.

D. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment.

E. Line Posts: Space line posts uniformly at 10 feet (3 m) o.c.

F. Post Bracing and Intermediate Rails: Install according to ASTM F 567. Install braces at end and gate posts and at both sides of corner and pull posts.

G. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fencing.

H. Top Rail: Install according to ASTM F 567.

I. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 2 inches (50 mm) between finish grade or surface and bottom selvage, unless otherwise indicated.

J. Tie Wires: Attach wire per ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.

K. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

L. Barbed Wire: Uniformly spaced, angled toward security side of fence. Pull wire taut and install securely to extension arms and secure to end post or terminal arms.

3.2 GATE INSTALLATION

A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.3 GROUNDING AND BONDING

A. Fence Grounding: Install at maximum intervals of 1500 feet (450 m).

B. Fences within 100 Feet (30 m) of Buildings, Structures, Walkways, and Roadways: Ground at maximum intervals of 750 feet (225 m).
   1. Grounding Method: At each grounding location, drive a grounding rod vertically until the top is 6 inches (150 mm) below finished grade. Connect rod to fence with No. 6 AWG conductor. Connect conductor to each fence component at the grounding location.

C. Bonding Method for Gates: Connect bonding jumper between gate post and gate frame.
   1. Connections: Make connections so possibility of galvanic action or electrolysis is minimized.

END OF SECTION

APPENDIX D

Geotechnical Reports

XCELL ENGINEERING, LLC
260 Laurel Lane
Chubbuck, ID 83202
Phone (208) 237-5900
Fax (208) 237-5925
E-mail: paul@xcelleng.com

FAXED
FAXED NOV 16 2022 FAXED
BY:

November 15, 2022
P22020

Travis Pyle, PE
Pacific Northwest
Solid Waste Business Unit Manager
3050 N Lake Harbor Lane Ste 201
Boise, ID 83703

RE: **SEISMIC STABILITY EVALUATION**
Newdale Landfill
Newdale, Idaho

Travis:

Xcell Engineering has performed the seismic stability evaluation for the proposed 4:1 exterior slope planned on the subject project. This report summarizes the results of our evaluation and presents our findings and opinions. Specific geotechnical information is included in this report from soil and groundwater characteristics encountered during our field exploration. Xcell Engineering should provide review and consultation during design and field observation during construction for design continuity through all phases of the project. We appreciate the opportunity to work with you on this project. Please contact our office if you have questions or comments.

Sincerely,
Xcell Engineering, LLC

PROFESSIONAL ENGINEER
LICENSED
J. Paul Bastian, PE
Project Engineer
7257
11/15/2022
STATE OF IDAHO
JUSTIN PAUL BASTIAN

REPORT
Seismic StabilityEvaluation
Newdale Landfill
Newdale, Idaho

PREPARED FOR:
Forsgren Associates
350 North 2nd
Rexburg, ID 83440

PREPARED BY:

Xcell Engineering, LLC
260 Laurel Lane
Chubbuck, Idaho 83202

November 15, 2022

Building on Excellence

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REPORT
Seismic Stability Evaluation
Newdale Landfill
Newdale, Idaho

INTRODUCTION

The planned Newdale landfill is located approximately 10 miles southeast of the Newdale as shown on the attached site aerial photograph. The site consists of approximately 95 acres of non-irrigated farmland. Subsurface soil conditions have been evaluated by a series of test pits and borings as shown in the geotechnical report dated August 29, 2022. The site soil conditions are 10 to 20 feet fine sandy silt (ML or CL/ML) underlain by moderately fractured rhyolite bedrock. The silt overburden has Plasticity Index typically ranging between 8 to 11 and unit weight ranging from 102 to 105 pounds per cubic foot. The underlying rhyolite bedrock is moderately fractured, angular, free draining, hard and fresh or not weathered. Unit weight of the crushed rhyolite is expected to be 125 pounds per cubic foot. The rhyolite material underlying the site is a lithified material having an unconfined compressive strength of 3 kips per square foot and a friction angle of 36°. These values are conservative and represent the worst-case strength parameters anticipated on the site.

PROPOSED CONSTRUCTION

We understand construction includes multiple cells with cut depths on the order of 35 to 60 feet and maximum waste fill depths on the order of 160 feet. The native silt on the site is approximately 18-feet in thickness indicating that the cell bottoms will be in or supported by the underlying rhyolite bedrock. We understand that the rhyolite excavated from the cells will be used to construct the embankments by mixing the fractured or crushed rock with the native silt. Unit weight of the composite material is anticipated to be 125 pounds per cubic foot when compacted to 95% of its maximum dry density per ASTM D-698. Design cohesion of the compacted composite fill is 50 psf and the friction angle in-place as compacted to specification is 34°.

Seismic evaluation of the site indicates uniform hazard peak ground acceleration (PGA_{UH}) of 0.201g with a 2% probability of exceedance in 50 years or 10% in 250 years. Based on mapped information from ASCE7-16 the site is located within a seismic impact zone.

ENGINEERING ANALYSIS AND RECOMMENDATIONS

Based on ASCE7-17 the peak ground acceleration with a 10% probability of exceedance in a 250-year period is 0.201g. This exceeds the criteria in 40 CFR §258.14 and consequently the facility containment structures must be designed to resist maximum horizontal acceleration in lithified earth material at the site.

EPA Seismic Design Guidance for MSWLF indicates that the maximum horizontal ground acceleration may be reduced by 50% to represent the average horizontal acceleration on any given slope. In a 0.2 second period the Maximum Credible Earthquake acceleration is 0.467 at the site. Half this value is 0.233g which was used for the pseudo static analysis of the modeled slope.

MATERIAL STRENGTH PROPERTIES

The contractor should perform independent shear strength tests to verify shear strength properties for varying liner system materials. In all cases the interface shear strength properties should be equal to or greater than the recommended values presented below.

Minimum Liner System Interface Shear Strength

STANDARD TESTING REQUIREMENTS				
Test	**Method**	**Loads**	**Minimum Shear Strength Values (Peak/Residual)**	
Interface Shear Strength	ASTM D5321	Normal Loads of 2, 4 & 8 ksf w/minimum displacement of 3-inches	Normal Load (ksf)	Shear Stress (ksf)
			2	.95/.71
			4	1.35/.95
			8	2.2/1.35
NATIVE / NON-WOVEN DRAINAGE FABRIC INTERFACE				
Test	**Method**	Test Conditions		
Interface Shear Strength	ASTM D5321	Non-woven drainage fabric against native soil. Clamp non-woven component. Place soil loose*		
NON-WOVEN DRAINAGE FABRIC/TEXTURED HDPE INTERFACE				
Test	**Method**	Test Conditions		
Interface Shear Strength	ASTM D5321	Non-woven drainage fabric against textured HDPE		
GRAVEL BASE COVER / NON-WOVEN DRAINAGE FABRIC INTERFACE				
Test	**Method**	Test Conditions		
Interface Shear Strength	ASTM D5321	Non-woven drainage fabric against gravel. Clamp non-woven component. Place gravel loose*		
TEXTURED HDPE / GCL INTERFACE				
Interface Shear Strength	ASTM D6243	Textured HDPE against GCL		
GCL / COMPACTED SUBGRADE INTERFACE				
Interface Shear Strength	ASTM D6243	GCL against native subgrade or constructed earth embankment material. Prepare soil at +/-2% of optimum and density of 95% or greater determined by ASTM D-698		

- Indicative of worst-case conditions

Values in the table above are based on published value ranges. Shear strength properties vary depending on the manufacturer and material types. Testing performed

prior to construction should be submitted to Xcell Engineering for review. If the contractors test data indicate values less than the recommended values above Xcell will need to evaluate the data with respect to our seismic stability evaluation and additional evaluation may be required.

As indicated above the static slope stability factor of safety is 2.961 for rotational slope failure within the MSW having the indicated geometry. The failure plane is shallow and surficial and does not compromise underlying lithology or the containment structure. When the design seismic acceleration of 0.233g is applied the rotational failure plane is also shallow and surficial with a factor of safety of 1.53 which is above the EPA recommended value of 1.5 and does not compromise the underlying lithology or containment structure.

Shallow block failure was also evaluated and in the static condition provides a factor of safety of 2.997 – Slightly higher than the rotational factor of safety. Further the block failure plane is predicted by the model to be slightly rotational at the toe of the failure plane. This observation is also observed when the design seismic acceleration is applied to the block failure model and the predicted factor of safety is 1.54. To assess the potential for deeper block failure the model was constrained to greater block height and the factor of safety during seismic acceleration increases 1.702. As noted, the factor of safety increases with increasing block depth and a pronounced rotational plane prediction was observed even in the block failure modeling. In the preceding cases of block and rotational failure modeling neither the underlying lithology nor the containment structure were compromised. Lastly, the model was constrained to fail through the containment structure (berm) and underlying lithology. The model indicated an increased factor of safety of 1.837 during the design seismic event. This model does not represent any realistic failure mechanisms on the project. It has been included solely to provide a frame of reference and to help quantify stability of the underlying lithology and containment structure.

Based on the slope stability modeling results the planned cell(s) provide adequate factors of safety referencing those suggested by the EPA. Modeled slope failure planes are indicated to be shallow and factors of safety increase with increasing depth of failure planes in both rotational and block failure models. Values of liner system interface shear strength are based on loose conditions. In practice good construction procedures and adequate material testing during construction should provide conditions significantly better than the minimums indicated. Adequate long-term performance of the slopes is dependent on good construction practices and adherence to the construction plans and specifications. This includes good site grading and drainage that will prevent ponding of water on, near or at the toe of any slope. Water management and good drainage is critical in order to achieve good long term performance.

CONSTRUCTION OBSERVATION AND TESTING

It is our opinion success of the proposed construction will be dependent on following the report recommendations, good construction practices and providing the

necessary geotechnical construction observation, testing and consultation to verify the work has been completed as recommended. We recommend Xcell or another qualified agency be retained on behalf of the owner to provide geotechnical observation, testing and consultation services, to verify our report recommendations and related project specifications are being followed. If we are not retained to perform the recommended services, we cannot be responsible for geotechnical related construction errors or omissions.

EVALUATION LIMITATIONS

The opinions and recommendations contained herein are based on findings and observations made at the time of our subsurface evaluations and our understanding of the proposed construction. Our services consist of professional opinions and recommendations made in accordance with generally accepted geotechnical engineering principles and practices. This acknowledgement is in lieu of all warranties, either expressed or implied.

This document has been prepared to provide information to the engineering design team during project design. It is understood that changes and modifications to the proposed project could occur. This report shall not be used as a stand-alone tool to facilitate bids, project submittals and construction planning but must be used in conjunction will all project design and construction information.

The following plates accompany and complete this report:

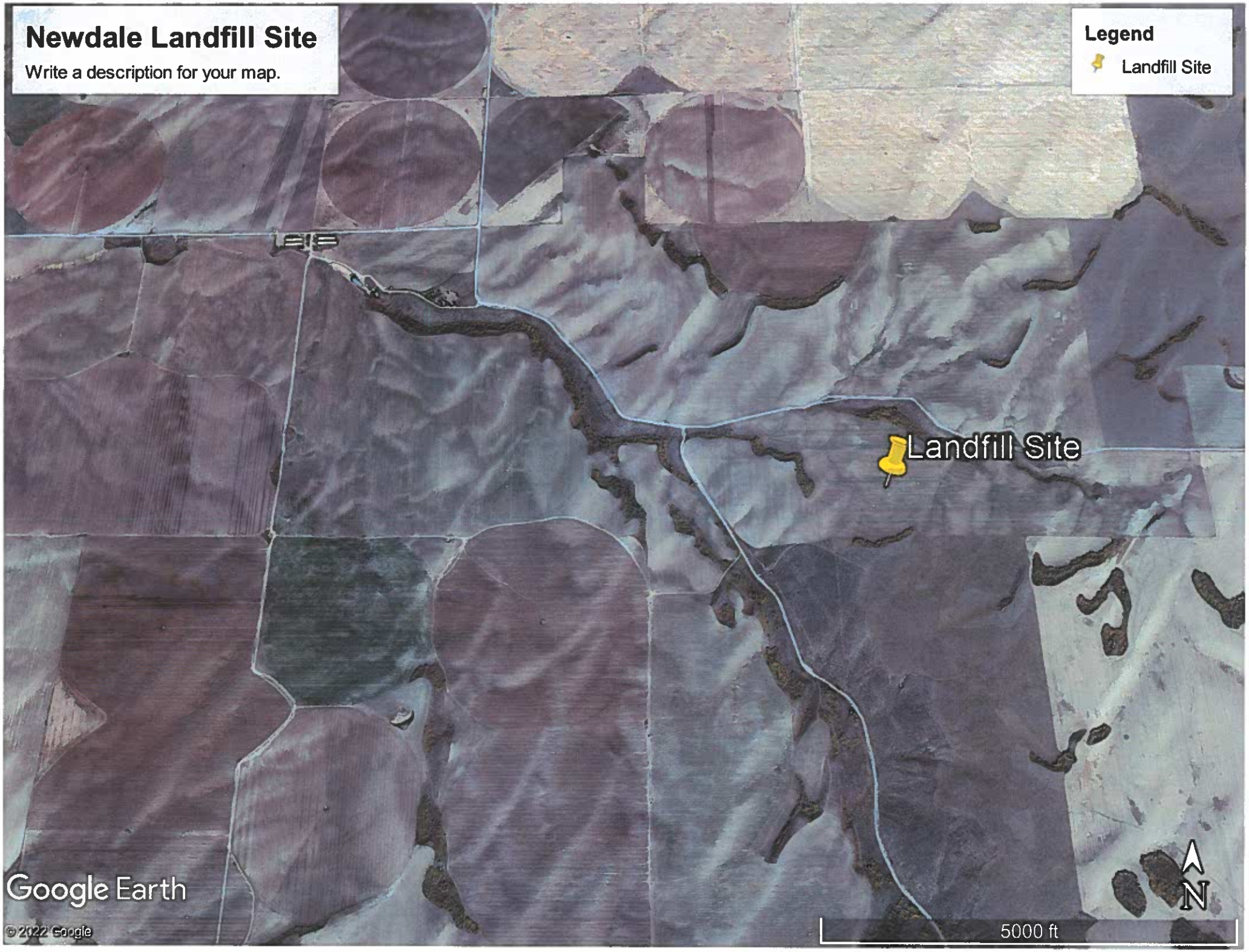
Plate 1: Site Aerial
Plate 2: Unified Soil Classification System (USCS)

Appendix: Site Seismic Characterization
Slope Stability FEA – Rotational and Block

References:

1. Idaho Statutes, Title 39 chapter 74 Section 39-7404
2. 40 CFR §258.14
3. Idaho Standards for Public Works Construction, 2015 Edition Section 200 –Earthwork – Parts 2.
4. Idaho Standards for Public Works Construction, 2015 Edition Section 300 – Trenching 3.18.
5. *Journal of Geotechnical & Geoenvironmental Engineering,* Sep 1999 Volume 125 Seismic Earth Pressure on Retaining Structures, Richards, Huang & Fishman pp 771.
6. International Building Code – 2021 Chapters 16, 18 and 19.
7. *Principles of Geotechnical Engineering,* Braja M. Das, PWS Publishers 1985.
8. *Series in Soil Engineering – Soil Mechanics,* Lambe & Whitman, Wiley 1969.
9. *Soil Mechanic in Engineering Practice 3rd Edition,* Terzaghi, Peck & Mesri Wiley 1996.

10. *NAVFAC Design Manual 7.01Soil Mechanics,* 1986.
11. US EPA Siting Tool http://epamap20.epa.gov/tri/emtri.asp
12. USGS Earthquake Hazards Program http://eqdesign.cr.usgs.gov/cgi-bin/design-lookup-96.cgi

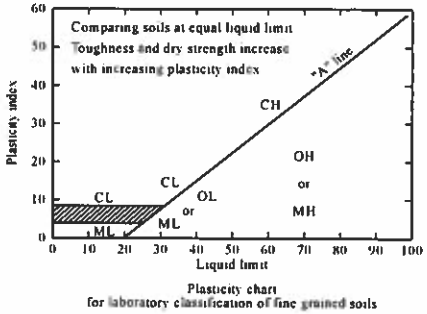

Newdale Landfill Site
Write a description for your map.
Legend
Landfill Site
Landfill Site
Google Earth
© 2022 Google
5000 ft
N

Unified Soil Classification

Field Identification Procedures - (Excluding particles larger than three inches and basing fractions on estimated weights)				Group Symbol (a)	Typical Names	Information Required for Describing Soils
Coarse Grained Soils: More than half of material is larger than No. 200 Sieve Size (b)	Gravels - More than half coarse fraction is larger than 1/4 "	Clean Gravels - (little or no fines)	Wide Range in grain size and substantial amounts of all intermediate particle sizes	GW	Well graded gravels, gravel sand mixtures, little or no fines	Give typical name;indicate approximate percentages of sand and gravel; maximum size; angularity, surface condition and hardness of the coarse grains; local geologic name and other pertinent descriptive information; symbols in ( ). For undisturbed soils add information on stratification, condition, cementation and moisture. EXAMPLE: Silty SAND - (SM) - Light brown, medium dense to dense, damp to moist. Moderately cemented from 2-3 feet, roots to 1 foot.
			Predominantly one size or a range of sizes with intermediate sizes missing	GP	Poorly graded gravels, gravel sand mixtures, little or no fines	
		Gravels with fines- (appreciable amount of fines)	Non plastic fines (for identification procedure see ML below)	GM	Silty gravels, poorly graded gravel-sand-silt mixtures	
			Plastic fines (for identification procedure see CL below)	GC	Clayey gravels, poorly graded gravel-sand-clay mixtures	
	Sands - More than half coarse fraction is smaller than 1/4 "	Clean Sands (little or no fines)	Wide Range in grain size and substantial amounts of all intermediate particle sizes	SW	Well graded sands, gravelly sands, little or no fines	
			Predominantly one size or a range of sizes with intermediate sizes missing	SP	Poorly graded sands, gravelly sands, little or no fines	
		Sands with fines (appreciable amount of fines)	Non plastic fines (for identification procedure see ML below)	SM	Silty sands, poorly graded sand-silt mixtures	
			Plastic fines (for identification procedure see CL below)	SC	Clayey sands, poorly graded sand-clay mixtures	

Laboratory Classification Criteria		
Use grain size distribution curve to verify fractions as identified in the field	Determine percentages of gravel and sand from grain size distribution curve. Depending on percentage passing the No. 200 sieve soils are classified as follows: Less than 5% = GW, GP, SW, SP More than 12% = GM, GC, SM, SC 5% to 12% are borderline cases requiring use of dual symbols	(Cu=D60/D10)>4 Cc=(D30)^2/(D10*D60) between 1&3
		Not meeting all the requirements for GW
		Atterberg limits below "A" line or PI<4 — Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols
		Atterberg limits above "A" line with PI>7
		(Cu=D60/D10)>6 Cc=(D30)^2/(D10*D60) between 1&3
		Not meeting all the requirements for SW
		Atterberg limits below "A" line or PI<4 — Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols
		Atterberg limits below "A" line with PI>7

Fine-grained soils: More than half the material is smaller than the No. 200 sieve		Identification Procedures on Fraction Smaller than No. 40 Seive			Group Symbol (a)	Typical Names	Information Required for Describing Soils
		Dry Strength	Dilatancy	Toughness			
	Silts and clays liquid limit less than 50	None to slight	Quick to slow	None	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sand with slight plasticity	Give typical name;indicate degree and character of plasticity, amount and max size of coarse grains; color when wet, odor, local geologic name, any other information. For undisturbed soil add information on structure, stratification, consistency in undisturbed and remolded states and moisture. EXAMPLE: Clayey SILT -(ML)- brown, stiff to very stiff, moist, (loess).
		Medium to high	None to very slow	Medium	CL	Inorganic clays of low to medium plasticity, lean clays, may be gravelly, sandy or silty.	
		Slight to medium	Slow	Slight	OL	Organic silts and organic silt-clays of low plasticity	
	Silts and clays liquid limit greater than 50	Slight to medium	Slow to none	Slight to medium	MH	Inorganic silts micaceous or diatomaceous fine sandy or silty soils, elastic silts	
		High to very high	None	High	CH	Inorganic clay of high plasticity, fat clays	
		Medium to high	None to very slow	Slight to medium	OH	Organic clays of medium to high plasticity	
Highly Oganic Soils		Readily identified by color, odor, spongy feel and frequently y fibrous texture			Pt	Peat and other highly organic soils	



Plasticity chart for laboratory classification of fine grained soils

XCELL ENGINEERING LLC

"Building on Excellence"

USCS: Plate 2

APPENDIX

Siter Seismic Characteristics
Static Rotational Model
Pseudo Static Rotational Model
Static Block Model
Pseudo Static Block Model
Constrained Deep Block Models 1 and 2

OSHPD

Latitude, Longitude: 43.813620, -111.536275

Date	11/15/2022, 11:02:59 AM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Default (See Section 11.4.3)

Type	Value	Description
S_S	0.467	MCE_R ground motion. (for 0.2 second period)
S_1	0.166	MCE_R ground motion. (for 1.0s period)
S_{MS}	0.666	Site-modified spectral acceleration value
S_{M1}	0.376	Site-modified spectral acceleration value
S_{DS}	0.444	Numeric seismic design value at 0.2 second SA
S_{D1}	0.25	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	D	Seismic design category
F_a	1.427	Site amplification factor at 0.2 second
F_v	2.269	Site amplification factor at 1.0 second
PGA	0.201	MCE_G peak ground acceleration
F_{PGA}	1.399	Site amplification factor at PGA
PGA_M	0.281	Site modified peak ground acceleration
T_L	6	Long-period transition period in seconds
SsRT	0.467	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	0.503	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.166	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.176	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.5	Factored deterministic acceleration value. (Peak Ground Acceleration)
PGA_{UH}	0.201	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C_{RS}	0.927	Mapped value of the risk coefficient at short periods
C_{R1}	0.943	Mapped value of the risk coefficient at a period of 1 s
C_V	1.011	Vertical coefficient

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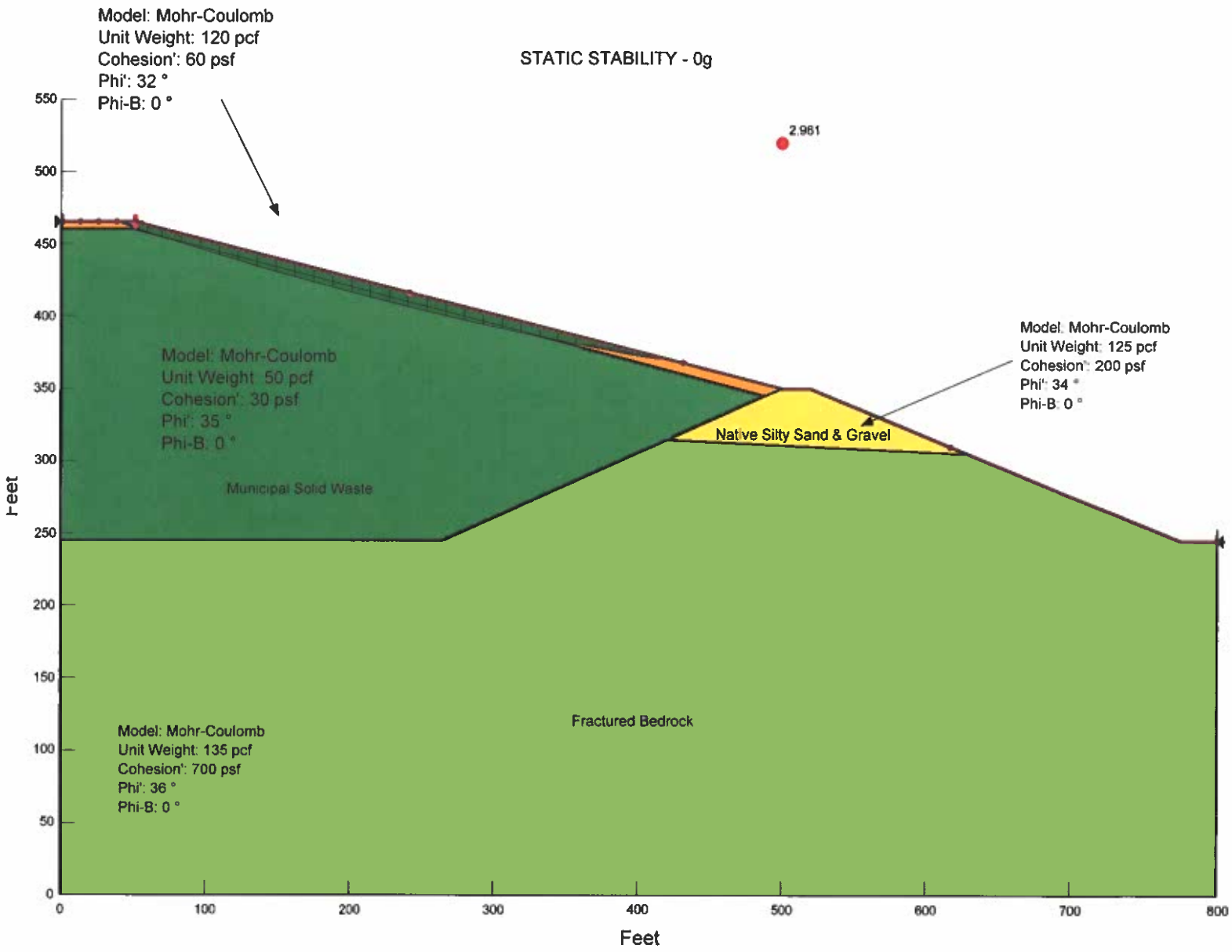
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 60 psf
Phi': 32 °
Phi-B: 0 °
STATIC STABILITY - 0g
2.961
Model: Mohr-Coulomb
Unit Weight: 50 pcf
Cohesion': 30 psf
Phi': 35 °
Phi-B: 0 °
Municipal Solid Waste
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 200 psf
Phi': 34 °
Phi-B: 0 °
Native Silty Sand & Gravel
Fractured Bedrock
Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion': 700 psf
Phi': 36 °
Phi-B: 0 °
Feet
Feet
0
50
100
150
200
250
300
350
400
450
500
550
0
100
200
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400
500
600
700
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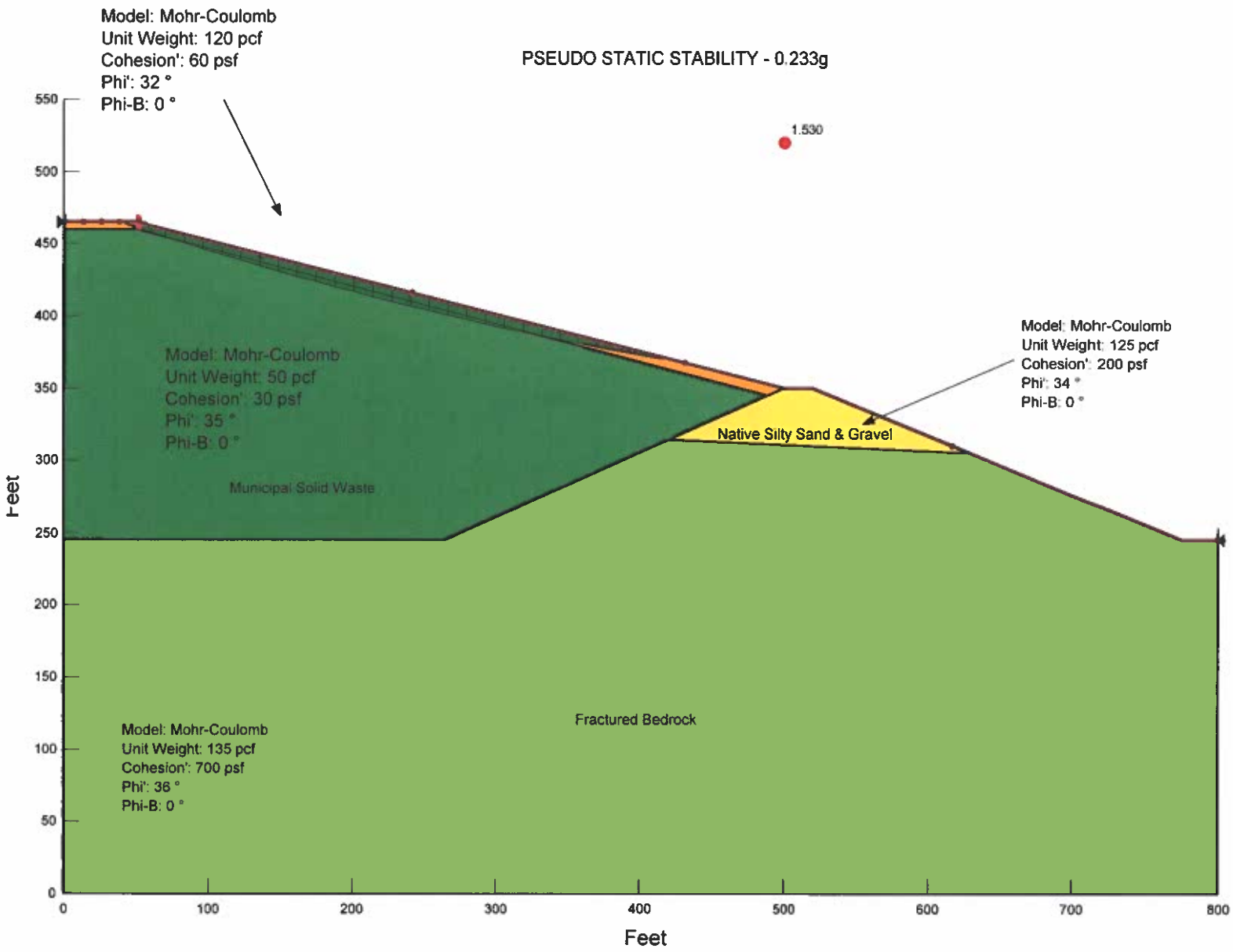
PSEUDO STATIC STABILITY - 0.233g
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 60 psf
Phi': 32 °
Phi-B: 0 °
1.530
Model: Mohr-Coulomb
Unit Weight: 50 pcf
Cohesion': 30 psf
Phi': 35 °
Phi-B: 0 °
Municipal Solid Waste
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 200 psf
Phi': 34 °
Phi-B: 0 °
Native Silty Sand & Gravel
Fractured Bedrock
Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion': 700 psf
Phi': 36 °
Phi-B: 0 °
Feet
Feet
0
50
100
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250
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400
450
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0
100
200
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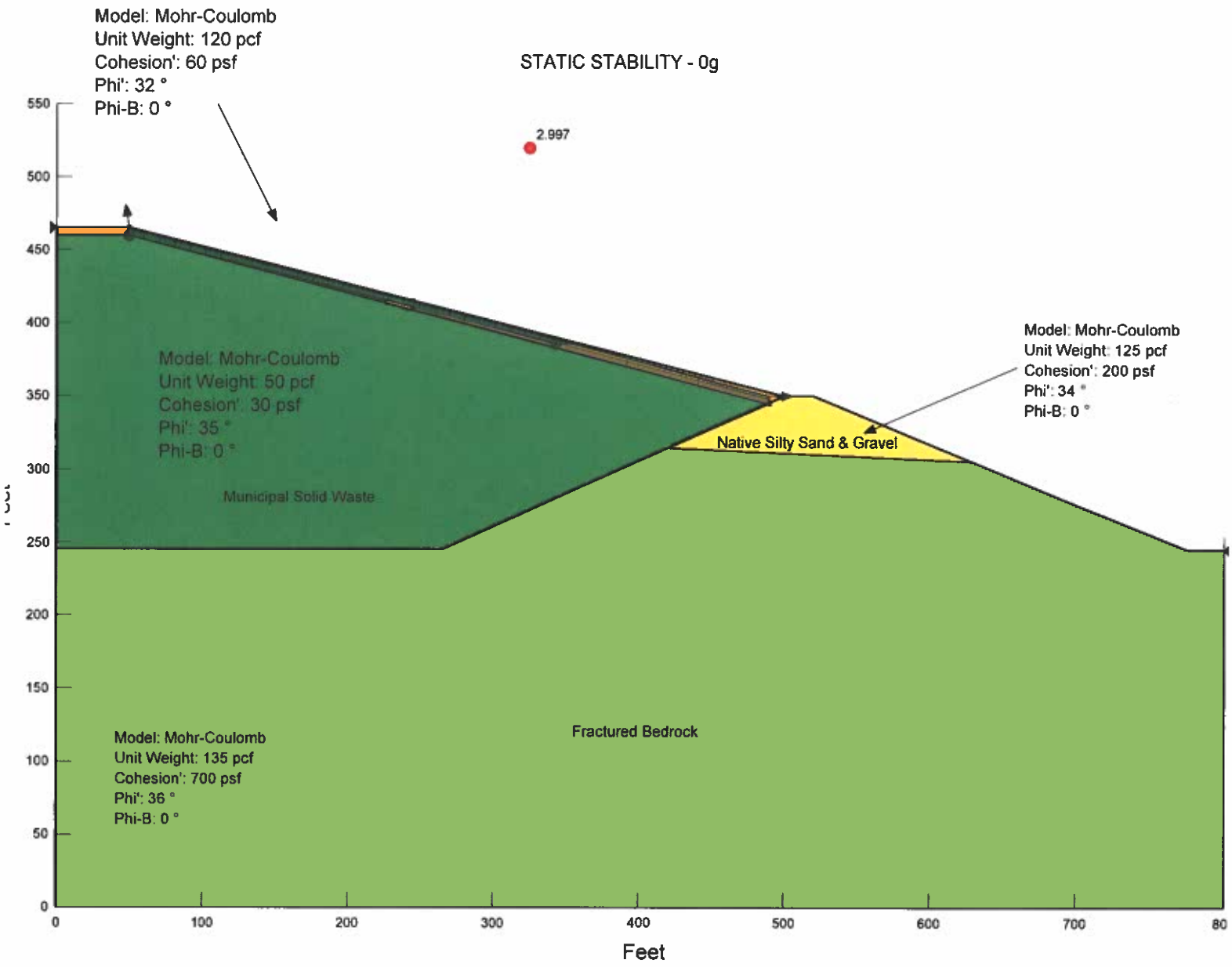
800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Municipal Solid Waste
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 200 psf
Phi': 34 °
Phi-B: 0 °
Native Silty Sand & Gravel
Fractured Bedrock
Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion': 700 psf
Phi': 36 °
Phi-B: 0 °
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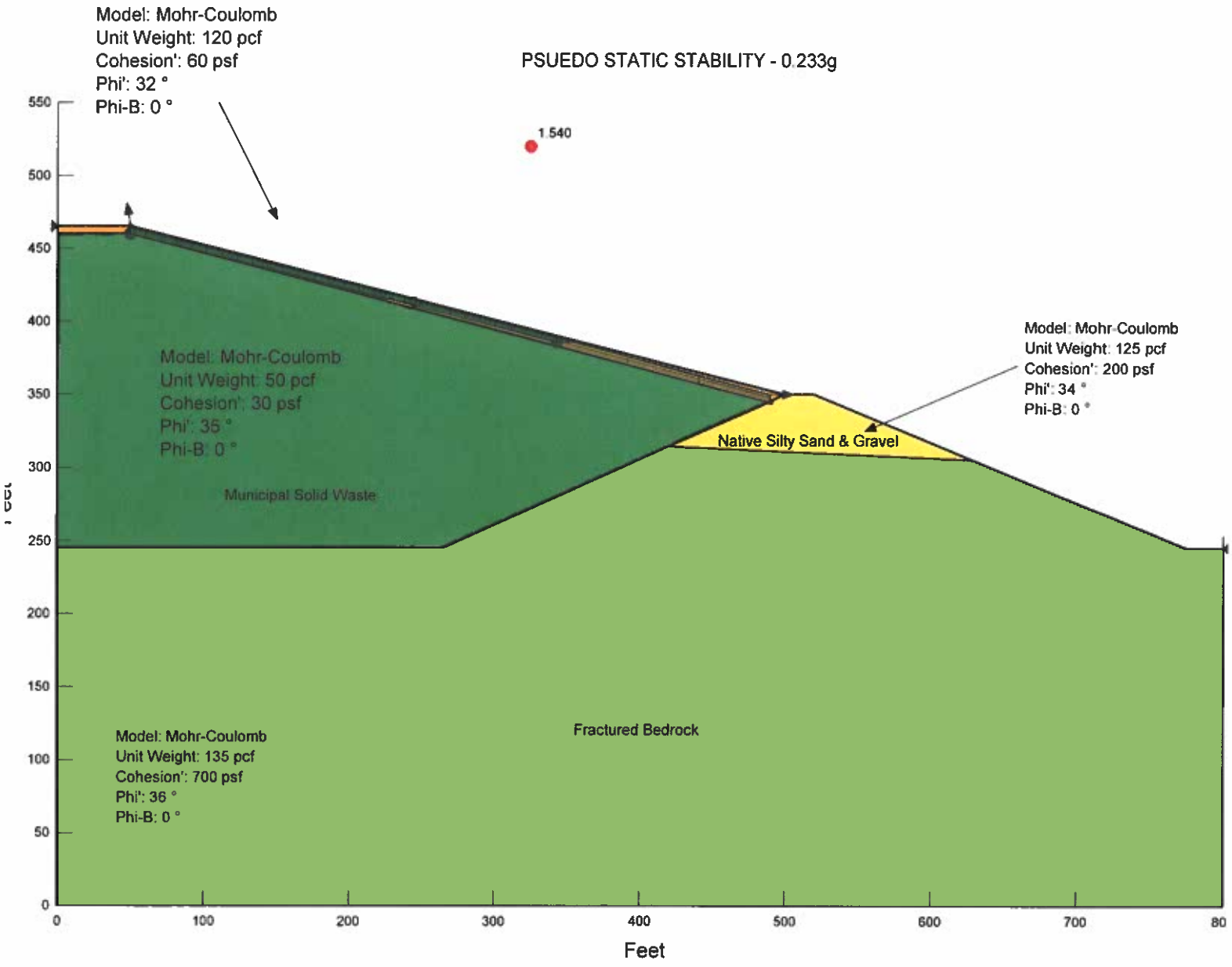
Feet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Unit Weight: 50 pcf
Cohesion': 30 psf
Phi': 35 °
Phi-B: 0 °
Municipal Solid Waste
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 200 psf
Phi': 34 °
Phi-B: 0 °
Native Silty Sand & Gravel
Fractured Bedrock
Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion': 700 psf
Phi': 36 °
Phi-B: 0 °
550
500
450
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200
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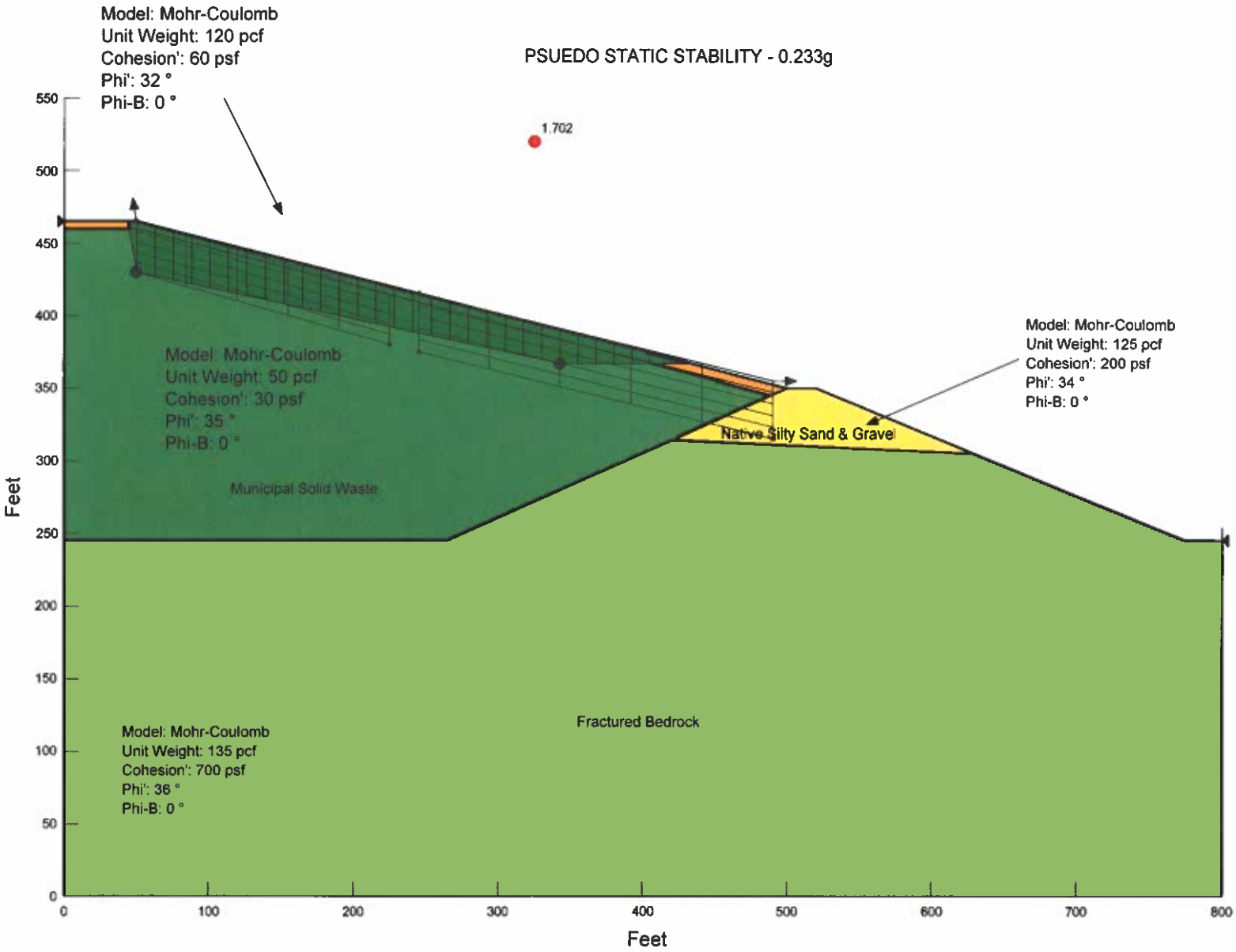
700
80
Feet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Unit Weight: 50 pcf
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Phi': 35 °
Phi-B: 0 °
Municipal Solid Waste
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 200 psf
Phi': 34 °
Phi-B: 0 °
Native Silty Sand & Gravel
Fractured Bedrock
Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion': 700 psf
Phi': 36 °
Phi-B: 0 °
Feet
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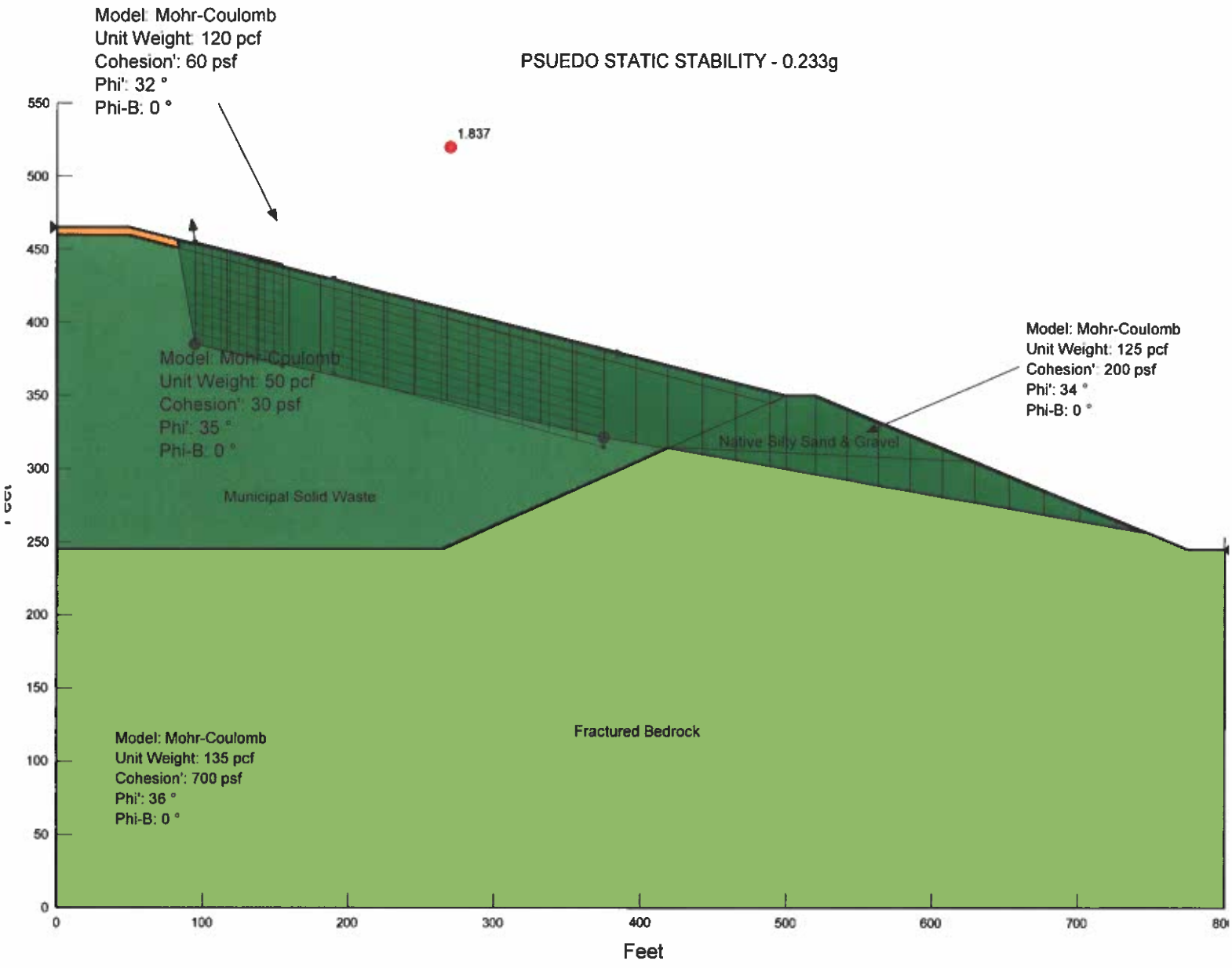
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Municipal Solid Waste
Native Silty Sand & Gravel
Model: Mohr-Coulomb
Unit Weight: 125 pcf
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Phi': 34 °
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Fractured Bedrock
Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion': 700 psf
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Phi-B: 0 °
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500
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700
Feet

XCELL ENGINEERING, LLC
260 Laurel Lane
Chubbuck, ID 83202
Phone (208) 237-5900
Fax (208) 237-5925
E-mail: paul@xcelleng.com

June 15, 2024
P23009

Travis Pyle, PE
Pacific Northwest
Solid Waste Business Unit Manager
3050 N Lake Harbor Lane Ste 201
Boise, ID 83703

RE: **SEISMIC STABILITY EVALUATION**
Newdale Landfill
Newdale, Idaho

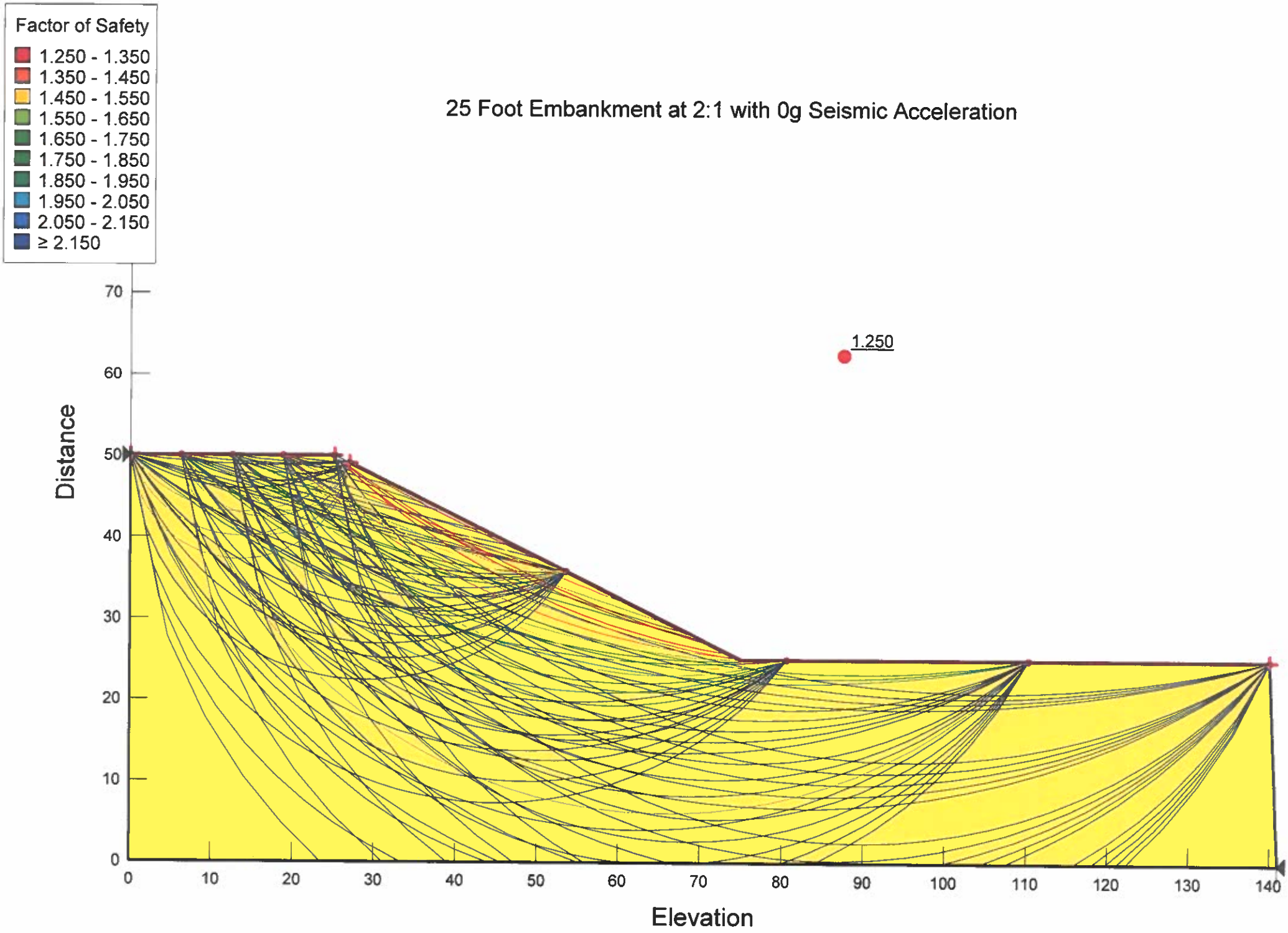
Travis:

Xcell Engineering has performed the seismic stability evaluation for rhyolite waste piles that are planned on the site. Attached to this letter you will find seven finite element slope stability analyses. Geometry and seismic acceleration have been adjusted ranging from 2:1 to 4:1 and 0 to 0.444g respectively as indicated by the ASCE7-16 mapping submitted on November 15, 2022. Unit weight of the fill and the internal friction angle (Ø) have been held constant at 125 pounds per cubic foot and 32 degrees respectively. The results show that in a static (aseismic) condition a 2:1 slope will provide an infinite length slope stability factor of safety of 1.25. If seismic accelerations of 0.25g and 0.444g are added, factors of safety decrease to 0.768 and 0.593 respectively. This indicates that a 2:1 slope is expected to experience slope failure during the 1 second seismic acceleration associated with the design event at the site. The same is, of course, true for the higher 0.2 second acceleration. If slope geometry is modified to consider a 3:1 slope the infinite slope stability factor of safety is 1.04. Unfortunately, this factor of safety is not in accordance with typical minimums that would generally require a factor of safety of at least 1.1 during the design event. If slope geometry is modified to a slope of 4:1 a factor of safety of 1.245 is achieved during the 1.0 second design acceleration of 0.25g. You will note on the last slope stability analysis sheet that the factor of safety of a 4:1 slope subjected to 0.444g is 0.925 indicating that slope failure is expected. Adequate slope stability of the rhyolite can be

achieved using a 5:1 slope subjected to the design acceleration of 0.444g, this will require considerable real estate in order to stockpile a reasonable depth of fill. This is due to the high anticipated acceleration at the site. If the fill piles can be located in such a way that surficial slope failure could be tolerated a 4:1 slope would provide adequate stability in all but the highest duration short term acceleration. If risk cannot be tolerated or failure of the slope to any degree is not acceptable a maximum side slope of 5:1 (or flatter) is recommended. These slope stability calculations do not consider increases to the shear strength resulting from compaction achieved by construction traffic on the fill piles because it would be too variable in nature to rely on. Please contact our office if you have questions or comments.

Sincerely,
Xcell Engineering, LLC

PROFESSIONAL ENGINEER
LICENSED
J. Paul Bastian, PE
Project Engineer
7257
6/15/2023
STATE OF IDAHO
JUSTIN PAUL BASTIAN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1.350 - 1.450
1.450 - 1.550
1.550 - 1.650
1.650 - 1.750
1.750 - 1.850
1.850 - 1.950
1.950 - 2.050
2.050 - 2.150
≥ 2.150
25 Foot Embankment at 2:1 with 0g Seismic Acceleration
1.250
Distance
Elevation
0
10
20
30
40
50
60
70
80
90
100
110
120
130
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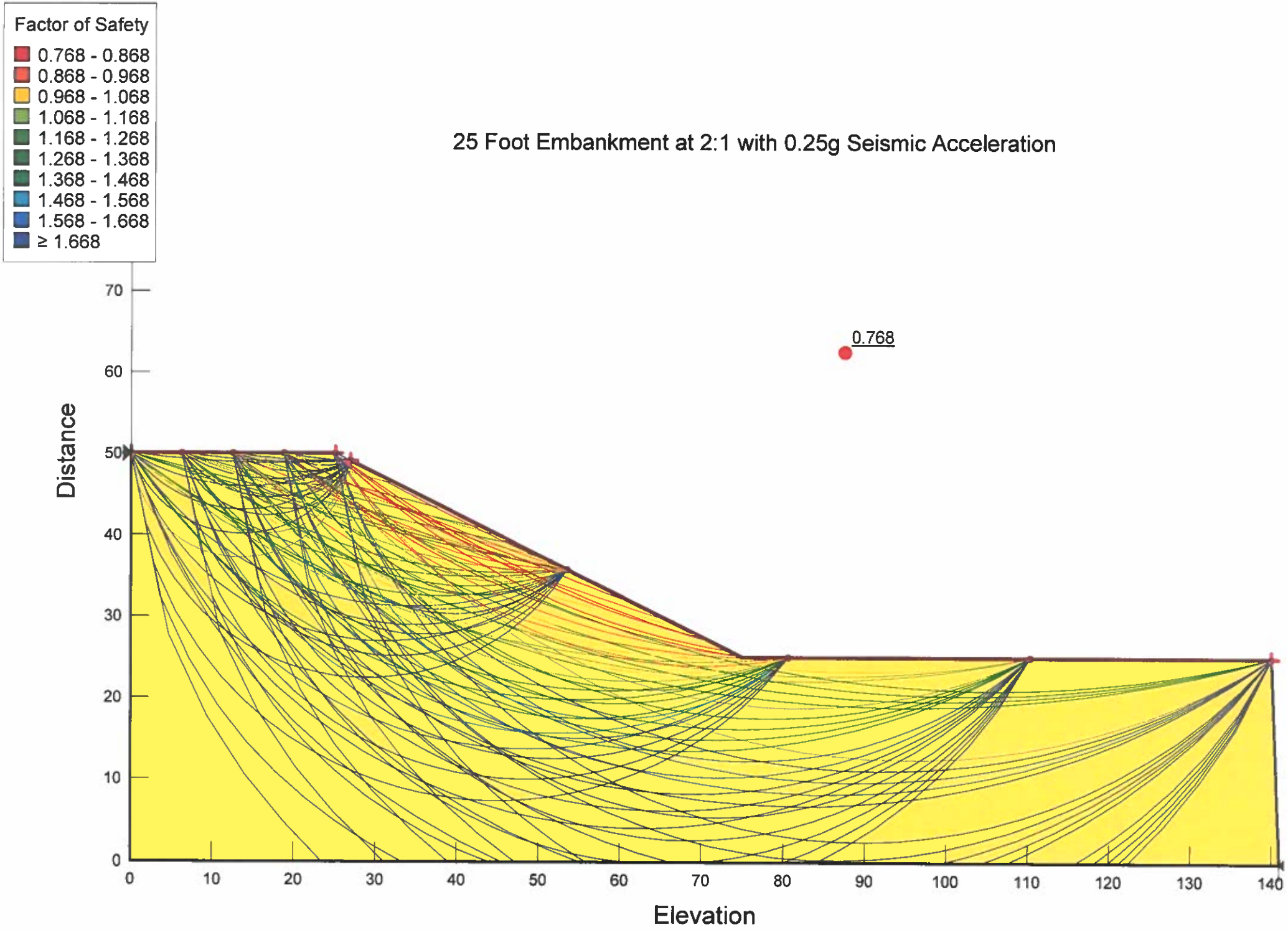
Factor of Safety
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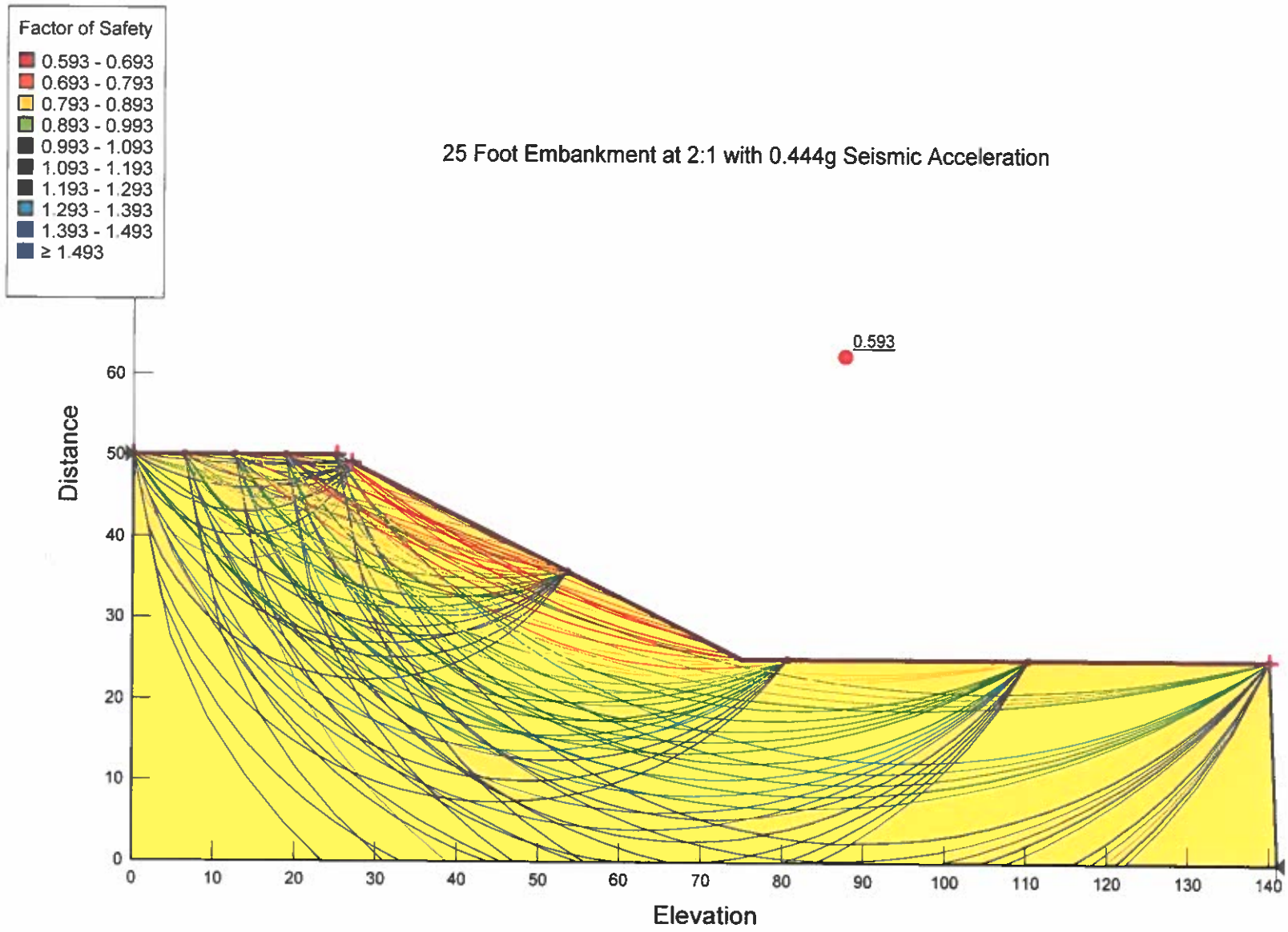
0.868 - 0.968
0.968 - 1.068
1.068 - 1.168
1.168 - 1.268
1.268 - 1.368
1.368 - 1.468
1.468 - 1.568
1.568 - 1.668
≥ 1.668
25 Foot Embankment at 2:1 with 0.25g Seismic Acceleration
0.768
Distance
Elevation
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140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0.693 - 0.793
0.793 - 0.893
0.893 - 0.993
0.993 - 1.093
1.093 - 1.193
1.193 - 1.293
1.293 - 1.393
1.393 - 1.493
≥ 1.493
25 Foot Embankment at 2:1 with 0.444g Seismic Acceleration
0.593
Distance
Elevation
0
10
20
30
40
50
60
70
80
90
100
110
120
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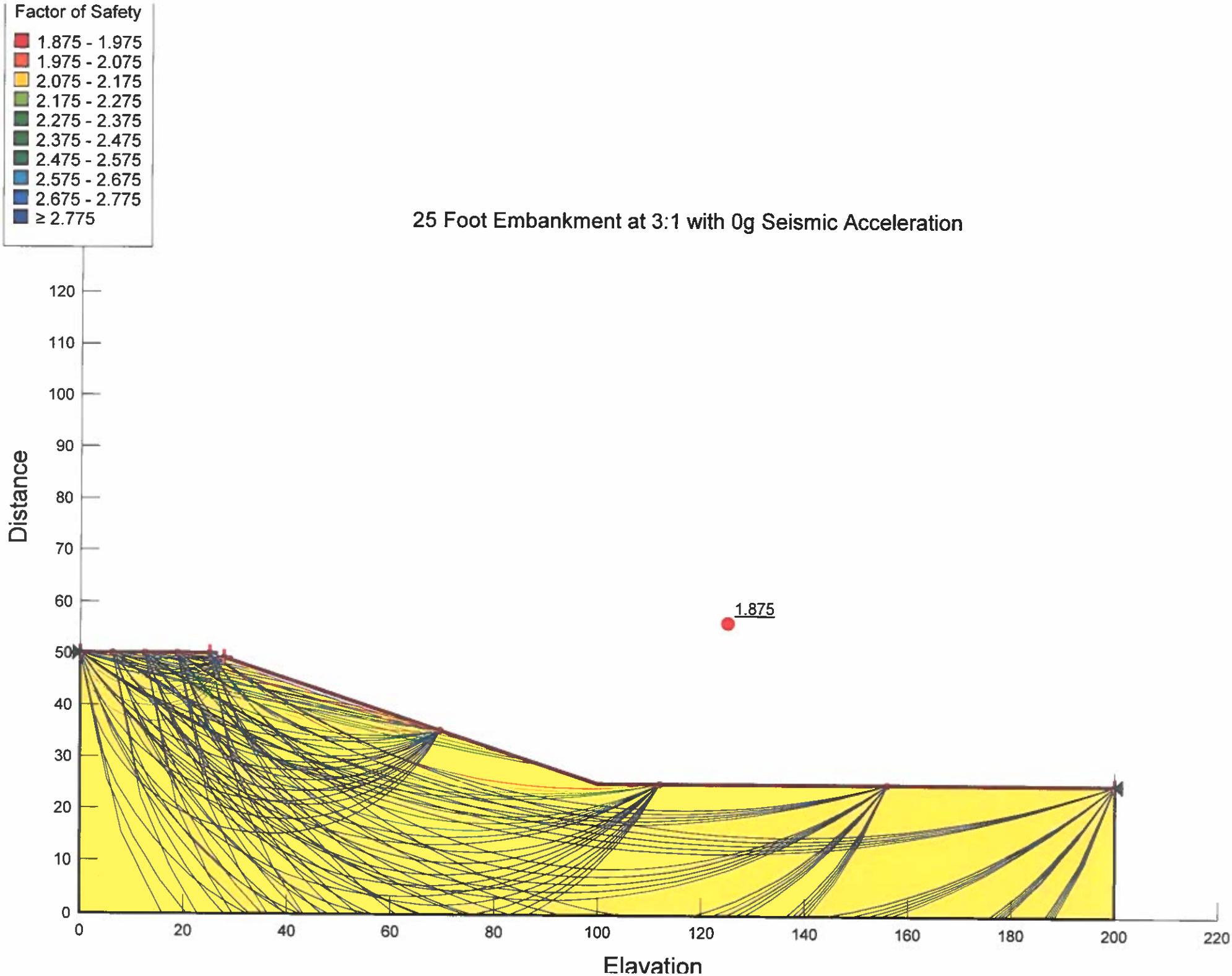
Factor of Safety
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1.975 - 2.075
2.075 - 2.175
2.175 - 2.275
2.275 - 2.375
2.375 - 2.475
2.475 - 2.575
2.575 - 2.675
2.675 - 2.775
≥ 2.775
25 Foot Embankment at 3:1 with 0g Seismic Acceleration
1.875
Distance
Elavation
0
10
20
30
40
50
60
70
80
90
100
110
120
0
20
40
60
80
100
120
140
160
180
200
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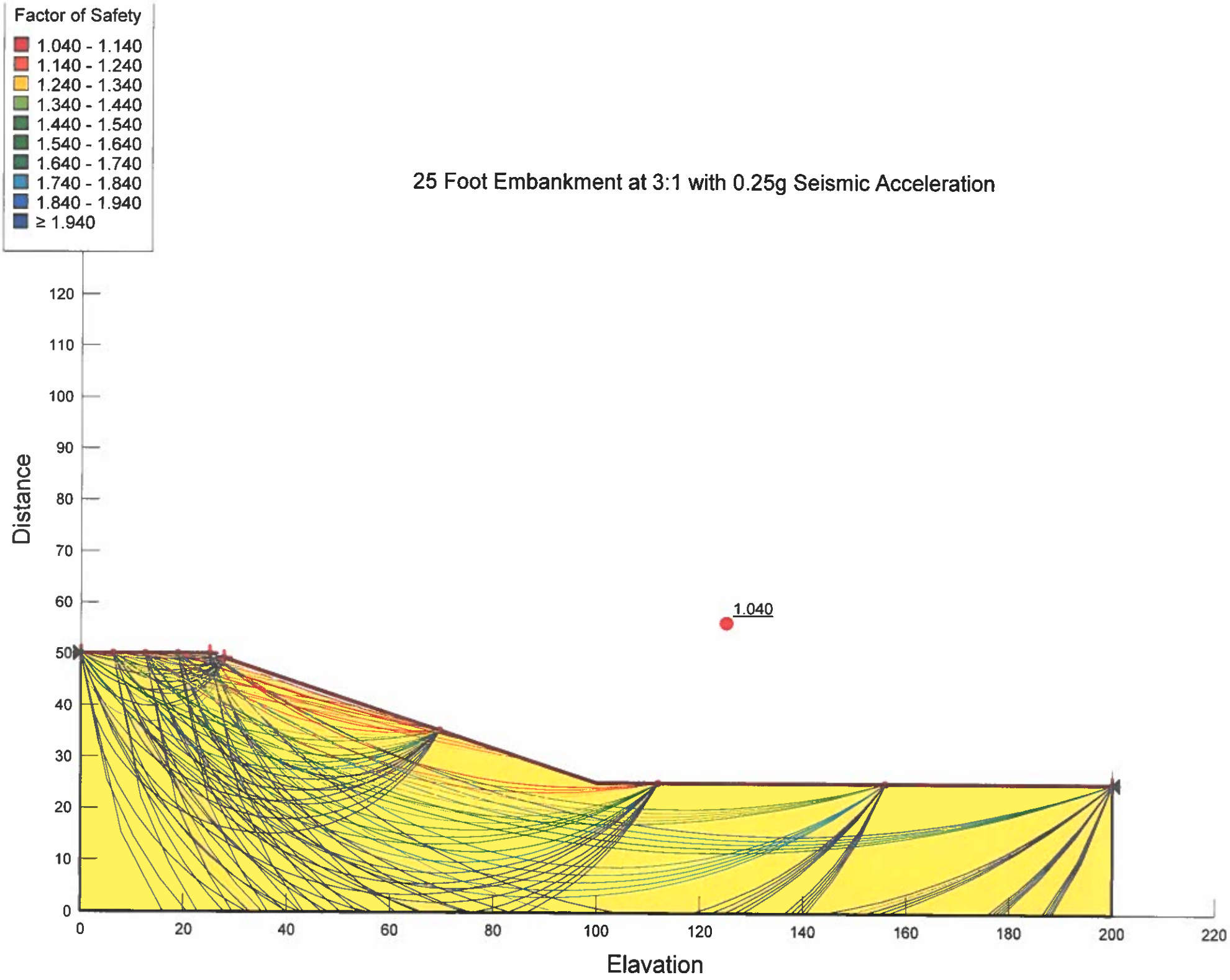
Factor of Safety
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1.140 - 1.240
1.240 - 1.340
1.340 - 1.440
1.440 - 1.540
1.540 - 1.640
1.640 - 1.740
1.740 - 1.840
1.840 - 1.940
≥ 1.940
25 Foot Embankment at 3:1 with 0.25g Seismic Acceleration
1.040
Distance
Elavation
0
10
20
30
40
50
60
70
80
90
100
110
120
0
20
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80
100
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140
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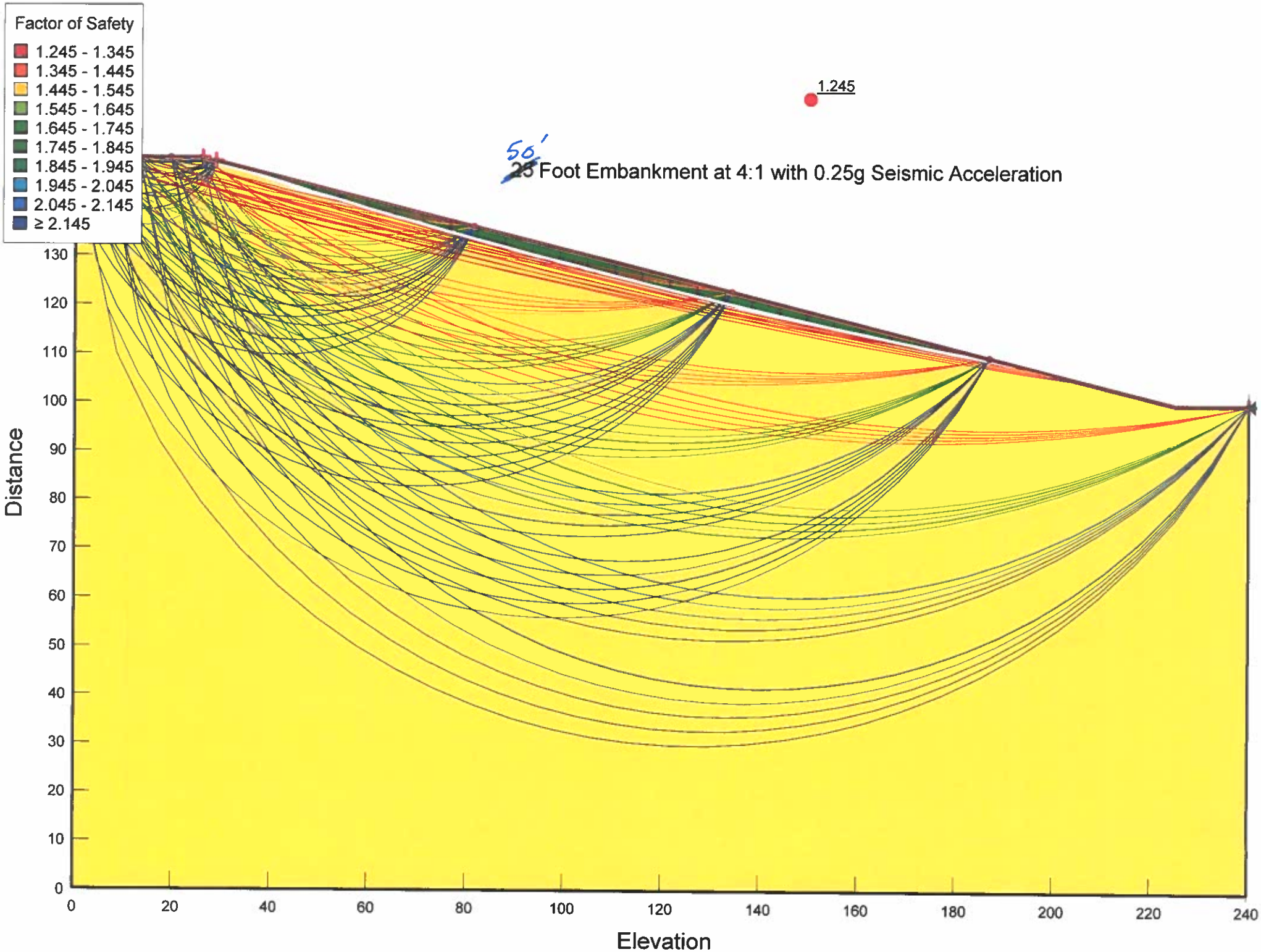
Factor of Safety
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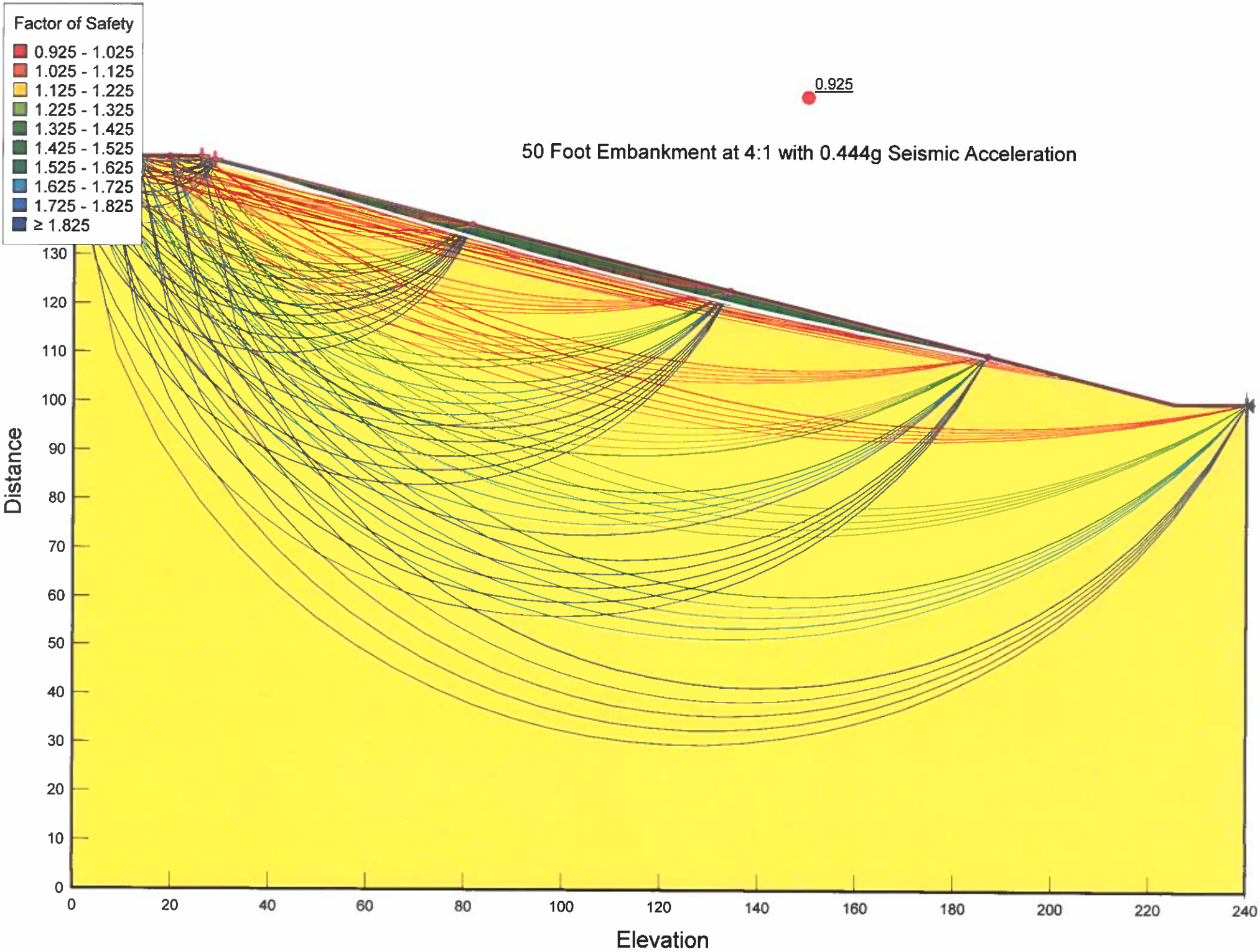
1.345 - 1.445
1.445 - 1.545
1.545 - 1.645
1.645 - 1.745
1.745 - 1.845
1.845 - 1.945
1.945 - 2.045
2.045 - 2.145
≥ 2.145
1.245
50'
~~25~~ Foot Embankment at 4:1 with 0.25g Seismic Acceleration
Distance
Elevation
0
10
20
30
40
50
60
70
80
90
100
110
120
130
0
20
40
60
80
100
120
140
160
180
200
220
240


Factor of Safety
0.925 - 1.025
1.025 - 1.125
1.125 - 1.225
1.225 - 1.325
1.325 - 1.425
1.425 - 1.525
1.525 - 1.625
1.625 - 1.725
1.725 - 1.825
≥ 1.825
0.925
50 Foot Embankment at 4:1 with 0.444g Seismic Acceleration
Distance
Elevation
0
10
20
30
40
50
60
70
80
90
100
110
120
130
0
20
40
60
80
100
120
140
160
180
200
220
240

OSHPD

Latitude, Longitude: 43.813620, -111.536275

Date	11/15/2022, 11:02:59 AM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Default (See Section 11.4.3)

Type	Value	Description
S_S	0.467	MCE_R ground motion. (for 0.2 second period)
S_1	0.166	MCE_R ground motion. (for 1.0s period)
S_{MS}	0.666	Site-modified spectral acceleration value
S_{M1}	0.376	Site-modified spectral acceleration value
S_{DS}	0.444	Numeric seismic design value at 0.2 second SA
S_{D1}	0.25	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	D	Seismic design category
F_a	1.427	Site amplification factor at 0.2 second
F_v	2.269	Site amplification factor at 1.0 second
PGA	0.201	MCE_G peak ground acceleration
F_{PGA}	1.399	Site amplification factor at PGA
PGA_M	0.281	Site modified peak ground acceleration
T_L	6	Long-period transition period in seconds
SsRT	0.467	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	0.503	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.166	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.176	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.5	Factored deterministic acceleration value. (Peak Ground Acceleration)
PGA_{UH}	0.201	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C_{RS}	0.927	Mapped value of the risk coefficient at short periods
C_{R1}	0.943	Mapped value of the risk coefficient at a period of 1 s
C_V	1.011	Vertical coefficient

APPENDIX E

Alternative Liner / No Migration to Groundwater Demonstrations

EASTERN IDAHO REGIONAL SOLID WASTE DISTRICT

Regional Municipal Solid Waste Landfill

Alternative Liner Demonstration and
No Migration to Groundwater Demonstration Report

Original Report December 2022; Revised Final Report May 2023

GreatWest
ENGINEERING

Certification Page

This report was prepared by Mr. Donald Craig Sauer, whom is a licensed Professional Geologist in Idaho and is employed with Great West Engineering. He has over 22 years of consulting experience related to groundwater monitoring, solid waste, and environmental compliance, and holds a bachelor's degree in Geology and a master's degree in Hydrology.

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List of Acronyms

DB	Deep boring
bgs	Below Ground Surface
CFR	Code of Federal Regulations
cm	centimeter
DEQ	Idaho Department of Environmental Quality
EIRSWD	Eastern Idaho Regional Solid Waste District
ET	Evapotranspiration
FML	Flexible Membrane Liner
ft	feet
ft^3	cubic feet
GCL	Geosynthetic Clay Liner (liner)
H	Horizontal
HDPE	High Density Polyethylene (liner material)
IDWR	Idaho Department of Water Resources
K	Hydraulic Conductivity
lb	pounds
LDS	Leak Detection System
MEK	Methyl Ethyl Ketone
mil	one thousandth of an inch
mm	Millimeter
msl	Mean sea level (elevation)
MSW	Municipal Solid Waste
MSWLF	Municipal Solid Waste Landfill
PCE	Tetrachloroethylene
SB	Shallow Boring
sec	second
SRPA	Snake River Plain Aquifer
TCE	Trichloroethylene
TP	Test Pit
ug/L	micrograms per liter (concentration unit)
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
V	Vertical
VOC	Volatile Organic Compound

1.0 Introduction

1.1 Purpose and Objectives

The purpose of this report is to provide the Idaho Department of Environmental Quality (DEQ) with a technical evaluation to demonstrate that the proposed alternative liner design is at least as protective of groundwater as the prescriptive landfill liner system for the Eastern Idaho Regional Solid Waste District (EIRSWD) regional municipal solid waste landfill. The proposed facility is located in southeast Idaho, near Newdale in Madison County.

In accordance with Idaho Statues (Title 39, Chapter 74, Idaho Solid Waste Facilities Act), an alternative design may be approved by the Department (that is, the DEQ). The approval shall be based on site-specific environmental performance as allowed under 40 Code of Federal Regulations (CFR) 258.40(a)(1), which ensures that the concentration values listed in Table 1 (per 40 CFR 258.40) will not be exceeded in the uppermost aquifer (groundwater) at the relevant point of compliance and that the proposed (alternative) liner design shall also include a leachate collection system.

In tandem with the requested approval for the alternative liner design, this document presents a 'no migration to groundwater demonstration,' as described in the July 29, 2022, letter to the DEQ RE: EIRSWD Subtitle D Municipal Solid Waste (MSW) Landfill – Notification of 'No Migration Demonstration'.

1.2 Site Location and Description

Figure 1 shows the study area location. **Figure 2** shows the overall site development plan and site features. The site is located approximately 12 miles east of Rexburg, Idaho in Madison County within Township 6 North, Range 42 East, Section 30. The study area is situated near the Long Hollow drainage, which generally drains the higher elevations to the southeast of the site, and then gradually meanders and slopes to the west/northwest towards Rexburg. Access to the site is from Long Hollow Road, with the site situated just to the southeast of the intersection of N11000RD E and Long Hollow Road.

1.3 Regulatory Coordination

In support of the site characterization needed for permitting of the site under the Idaho Statures, a Hydrogeologic Study Work Plan (Great West, February 2022) was prepared submitted to the DEQ. The Work Plan was considered an initial phase (Phase 1) of investigation with supplemental test pits, shallow borings, and up to three deeper groundwater monitoring wells drilled to identify the depth to uppermost groundwater beneath the site.

Phase 1 field exploration work was completed per the Work Plan over the period from July 7 through July 27, 2022. The findings from Phase 1 with respect to determining the depth to uppermost groundwater at the site were intended to be used to plan out a subsequent Phase 2 investigation, which was planned to include typical groundwater monitoring wells that would be used for detection monitoring over the life of the landfill. However, the uppermost groundwater was not encountered in the deep borings, which were drilled to planned depths of 700 feet (ft) below ground surface (bgs) per the Phase 1 Work Plan.

In consideration of the Phase 1 findings with respect to not encountering groundwater to 700 ft bgs beneath the footprint of the landfill, the site permitting strategy shifted to a regulatory option of 'no migration to groundwater' as introduced in Section 3.1 of the February 2022 Work Plan. Following

completion of the deep borings, the consultant team (Forsgren and Great West) on behalf of the EIRSWD held a teleconference meeting with the DEQ on July 25, 2022, to discuss the findings from Phase 1 investigation. At that meeting the consultant team stated the intent to shift the environmental compliance strategy to the 'no migration to groundwater' demonstration option allowed per IDAPA and Federal Rules. This approach was documented to DEQ in the August 2, 2022, letter, submitted by Mr. Kevin Harris (Forsgren) to Amanda Freeman (DEQ). At the request of the DEQ, a clarification letter was subsequently submitted to the DEQ (Amanda Freeman) on behalf of EIRSWD, clarifying that the MSW landfill (MSWLF) will be designed and constructed with (1) a 60-mil HDPE geomembrane as the primary liner system to impede vertical migration of leachate into the subsurface, and (2) a leachate control/management and collection system, with leachate ponds that are lined with 60-mil geomembrane.

This report compiles and summarizes the body of field exploration data for the site collected from the Phase 1 field investigation, and publicly available site data to setup and inform the predictive modeling demonstrations herein. Both the alternative liner and 'no migration demonstration' model are based on meeting the requirements cited under Idaho Code Title 39 Chapter 7410, 1(b) and CFR 258.50(b), whereby the demonstration is based on *(1) site specific parameters effecting the contaminant fate and transport of contaminants to groundwater, and (2) utilize contaminant fate and transport predictions that maximize contaminant migration and consider impacts on human health and the environmen*t.

1.4 Document Organization and Contents

This document is organized into the following five sections:

- **Section 1 – Introduction:** This section provides the document purpose and objectives, along with a description of the site.

- **Section 2 – Liner Design and Site Conditions:** This section describes the prescriptive versus the proposed alternative liner specifications and the subsurface conditions at the site. The narrative on subsurface conditions includes both a regional setting discussion, followed by site specific data, which collectively sets the framework for alternative liner and no migration to groundwater demonstration model as presented in the next section.

- **Section 3 – Predictive Model Methods and Results:** This section summarizes the modeling tool, logic and assumption for model variables, and the model output in support of both the alternative liner demonstration, and the no migration to groundwater demonstration.

- **Section 4 – Summary and Conclusions:** This section summarizes the key findings of the alternative liner and no migration demonstration model within the framework of the document objectives.

- **Section 5 – References:** This section lists the cited references.

Tables, figures, and appendices listed in the Table of Contents are attached and referenced herein.

2.0 Liner Design and Site Conditions

2.1 Liner System Design

In accordance with 40 CFR 258.40 – *Design Criteria*, a "composite liner" means a system consisting of two components. The upper component must consist of a minimum 30-mil flexible membrane liner (FML), and the lower component must consist of at least a two-foot layer of re-compacted soil with a permeability (K) of no more than 1×10^{-7} cm/sec. FML components consisting of high-density polyethylene (HDPE) must be at least 60-mil thick. The FML component must be installed in direct and uniform contact with the compacted soil component. For the purposes of this report, the composite liner is considered the prescriptive liner, and for comparative purposes, assumes the FML is 60-mil thick HDPE geomembrane, underlain by 2 feet of clay soil with K of $1x10^{-7}$ cm/sec.

EIRSWD proposes to construct the landfill with an alternative liner design that meets (or exceeds) the performance of the prescriptive composite liner. From top to bottom, the proposed alternative liner consists of:

1. Gravel base drainage layer (floor) and / or protective soil layer (side slopes) with embedded leachate collection pipes to maintain less than 12 inches of leachate (head) over the base liner,
2. Non-woven 16-oz cushion geotextile fabric,
3. Upper composite liner component, consisting of 60-mil HDPE,
4. Lower composite component, consisting of a geosynthetic clay liner (GCL)
5. Re-compacted 6-inch-thick sub-grade base layer, sourced onsite consisting of fine-grained sandy-silt, or equivalent material.

The leachate collection system (item 1 above) will consist of 15 inches of drain gravel over the floor of the cell. The interior 3H:1V side slopes will utilize a 24-inch-layer of select native soils (protective soil layer) with buried strip drains (sitting on the geomembrane liner) spaced out to help control head buildup. The idea is that the leachate will hit the top of the soil layer and run down to the floor, where it will drain into the toe collector trenches and eventually into the in-cell sumps. The floor drainage will be controlled with central collector trenches that will also drain to the in-cell sump. It should be noted that the in-cell sumps and the two leachate ponds will be double-lined with a leak detection system (LDS). The double liner will add a second layer 60-mil HDPE geomembrane with a interstitial drainage material.

Figure 3 shows the proposed alternative liner design layers as listed above**. Figure 4** shows the excavation plan, illustrating the depth of excavation to construct the bottom liner system, along with a cross-section line (see depth of liner in Figure 6).

Appendix A includes the product specification sheets for the alternative liner, showing the specifications of density and permeability for both the HDPE and GCL materials. Collectively, the HDPE and GCL liners/ layers are the effective barrier systems impeding the migration of leachate into uppermost soils. As shown in the liner specifications data sheets, the K value of the GCL layer is maximum of $5x10^{-9}$ cm/sec (listed at $5x10^{-11}$ meters per sec), which is consistent with published values by Booker (2004) citing K values in the range of $5x10^{-10}$ to $5x10^{-9}$ cm/sec for GCL.

2.2 Site Conditions

This section presents a summary of regional hydrogeologic framework of the study area in southeast Idaho, and site-specific subsurface conditions to support the alternative liner and no migration model setup and assumptions presented in Section 3.

2.2.1 Regional Hydrogeologic Conditions

2.2.1.1 Data Sources

The regional hydrogeologic framework has been synthesized and presented in this report from a review of the following publicly available data sources:

- Topographic map of the study area, USGS Map of the White Owl Butte Quadrangle, Idaho-Madison County, 7.5-Minute Series.
- Soils map and soil descriptions from the Natural Resources Conservation Service Web Soil Survey (NRCS, 2022).
- *Geologic Map of the Study Area: Geologic Map of Rexburg Quadrangle, Madison County, Idaho; Idaho Geological Survey, Digital Web Map 178, Phillips et. Al (2016).*
- Surface Water and Wetlands Map by the US Fish and Wildlife Service, National Wetlands Survey (USFWS, 2022).
- *Regional Hydrogeologic Characterization Studies for Madison County or Snake River Plain Aquifer: Summary of the Snake River Plain Regional Aquifer System Analysis in Idaho and Eastern Oregon, USGS Paper 1408-A, 1994.).*
- Water Well Records from the Idaho Department of Water Resources Web-Based Tool (accessed September 2022).

For reference, **Appendix B.1** includes copies of these publicly available data sources that are the basis of discussions in subsequent sections in this report, including topographic map, climate data, geologic map(s), soils map, surface waters/wetlands delineation map, watershed boundaries map, and data from water supply well logs/records search from the Idaho Department of Water Resources (IDWR) well records database.

2.2.1.2 Regional Setting, Physiography, and Climate

The project study area lies within Madison County, which is in the southeast portion of Idaho (see **Figure 1**). **Appendix B.1** includes topographic map of the study area, showing surface topography characteristics, surface elevations of the site, and physiographic features of the study area. Surface elevations at the site range from approximately 5,780 ft above mean sea level (msl) to 5,860 ft msl, which is consistent with the survey of field investigation data as presented in Table 1. Elevations to the southeast of the site in the Big Hole Mountains, rise to elevations in excess of 9,000 ft msl at Garns Mountain Summit. Lower elevations near Rexburg along the margins of Snake River Plain are generally in the range of 4,800 to 5,000 ft msl.

Appendix B.1 (summary table B.1-2) includes a summary of average monthly high and low temperatures, monthly precipitation, and monthly snowfall based on data from the Rexburg-Madison County weather station (located roughly 10 miles west of the site). The climate around Rexburg, Idaho is classified as “cold semi-arid” and falls under the BSk climatic category according to the *Köppen* system of climatic classification. The average high and low temperatures are 57- and 31-degrees Fahrenheit, respectively. The average annual precipitation is 10.3 inches with the highest months being May and June, while the least precipitation occurs during the months of December, January, and February. The

average annual snowfall is approximately 23 inches and typically occurs during the months of November through March.

The water balance analysis (table B.1-2) utilizes the monthly average data for total precipitation minus runoff and evapotranspiration (ET) and assumes a limited runoff coefficient of 0.15 to reflect the rolling terrain and typically sandy soils with fines observed at the site from the test pits. From this average monthly analysis, it suggests that combined losses from ET and runoff exceed the monthly estimates of potential infiltration from rainfall and/or snowmelt for most months, estimating no surplus infiltration potential occurring during the months of March through October. For the months of November through February, the total estimated net infiltration is 3.9 inches, which is 23 percent of annual inputs from precipitation and snowmelt. Note that this water-balance analysis does not account for potential soil moisture storage in the uppermost soil horizon and is a screening-level analysis developed to help characterize potential annual recharge/infiltration at the site. As described in subsequent sections for model setup, the leachate source is assumed as a 'constant source' and thus quantification of precipitation and/or leachate volume into the subsurface is not relevant for the modelling approach in this report.

2.2.1.3 Regional Geology

Appendix B.1 includes a published geologic map of the study area as presented in the *Geologic Map of Rexburg Quadrangle, Madison County, Idaho; Idaho Geological Survey, Digital Web Map 178, Phillips et. Al (2016).* The regional geology of southeast Idaho is relatively complex as related to past and present volcanism associated with the Eastern Snake River Plan, and the currently active Yellowstone caldera, located roughly 80-90 miles to the northeast of the site. The main origin of Snake River Plain can be linked to volcanic eruptions of rhyolite along a row of extinct volcanoes, starting in the southwestern portion of Idaho about 13 million years ago, and sweeping eastward. The volcanos become progressively younger to the northeast of the Snake River Plain, along a nearly straight line which ends in the Yellowstone caldera, which is still active.

From a review of the geologic map by Phillips (2016), the geologic units mapped to the east of Rexburg are volcanic rocks, consisting mainly of a relatively thin sequence of rhyolite (mapped as Qyh), underlain by a thick sequence of basalt of Rexburg (mapped as Tbr) and then rhyolite (mapped as Thr). As shown in cross-section(s), the basalt is on the order of several hundred feet thick, and the rhyolite is on the order of 900+ ft thick.

Structural features, such as faults occur in Madison County as shown in the geologic Map by Phillips (2016). The structural features are related to the depositional history of various geologic units and the volcanic eruptions from the Yellowstone caldera. As described by Phillips (2016), the study site lies near the eastern margin of the Snake River Plain, near the termination of the Grand Valley normal fault. Near the Rexburg bench, just east of the site, an array of short, low-offset, near vertical faults are present. Pit craters along the Rexburg shield volcano are aligned along several of the faults. Phillips (2016) notes that shaking due to earthquakes could occur throughout the entire eastern margin of the Snake River Plan, associated with active volcanism of the Yellowstone complex.

It is important to note that there are no Holocene faults (10,000 to 12,000 years ago) within 200 feet of the proposed landfill. This was documented in the Site Certification Supporting Documentation Report (Forsgren, October 2021).

2.2.1.4 Regional Hydrogeology

The study area lies outside the boundaries of the Snake River Plain Aquifer (SRPA), which is a massive groundwater resource that is recharged in northeast Idaho at the headwaters of the Snake River, consisting of surface water flow from major rivers such as the Henrys Fork and the Teton River, and tributaries to these rivers. **Appendix B.1** includes a map showing the site location is approximately 10

miles outside (east) of the mapped boundary of the SRPA. The SRPA is a major aquifer resource for the southern Idaho users for both irrigation and water supply, and so being outside of this jurisdictional boundary is favorable for siting a landfill and for the 'no migration to groundwater' demonstration in subsequent sections.

Appendix B.1 includes a map showing the surface water features of the study area, including perennial (seasonal) surface waters, and jurisdictional wetlands as mapped by the USFWS Wetland Delineation Tool. As described above (Regional Geology), the geologic mapping by Phillips (2016) shows volcanic rocks mapped to the east of Rexburg encompassing the study area. In cross-section, this map suggests the geologic units from ground surface down, consisting of basalt and rhyolite (volcanic rocks). Section 2.2.2 describes site-specific characteristics of hydrogeology based on a synthesis and interpretation of regional/public data and site-specific field investigating data.

2.2.1.5 Well Log Search and Regional Hydrogeologic Interpretations

Appendix B.1 (table B.1-6) includes a compilation and summary of the well log records found from the Idaho Department of Water Resources (IDWR) web-based search tool. The search included an approximate radius of 2.5 miles surrounding the EIRSWD proposed landfill site, which identified a total of 13 well log records. From a review of these logs, the field investigation plan as noted in the Work Plan to DEQ, included provisions to drill down to 700 ft (depth) to characterize subsurface geology and identify depth to uppermost groundwater. As noted in Section 1.3 (and described in more detail in Section 2.2.2 below), groundwater was not encountered to depths of 700 ft bgs in two of the deep borings; and was not encountered to depths of 455 ft bgs in the third deep boring.

As shown in the well logs (and from the summary table), the purpose of the wells was primarily drilled for irrigation, and the method was typically air-rotary or cable tool. Most of the wells were constructed with blank steel casing and no screens were installed. From the well logs identified within the 2.5-mile radius from site, the total depths ranged from 895 to 1,380 ft bgs. The depth to water recorded on the logs to the east of the site was noted as 260 to 435 ft bgs (respectively, Parkinson Farms and Schwendiman 3), and was typically identified in the range of approximately 500 to 700 ft for the cluster of well logs to the northwest of the site. Based on the review of these existing publicly available logs from the IDWR search tool, the inferred depth to uppermost groundwater was estimated at 400-700 ft bgs as described in the Work Plan. Each log includes drilling observations recorded by the driller, and was commonly logged as clay, rhyolite, and/or lava. The observation of rhyolite from nearby logs is consistent with the observation of rhyolite from drilling of deep borings at the Newdale site as described in the next section.

From the regional characteristics and review of the well logs within a 2.5-mile radius of the site, it is inferred that the potential groundwater flow direction for uppermost groundwater in the vicinity of the Newdale site would be away from recharge areas inferred to be higher elevations, and toward discharge areas inferred to be lower elevations. From the site setting and regional topography, it would be inferred that theoretical groundwater flow for uppermost groundwater may be to the west or northwest, and generally towards the SRPA. However, since uppermost groundwater was not identified to at least 700 ft bgs at the site, actual groundwater flow direction, and potential hydraulic connection or isolation from the SRPA, is uncertain with available data.

2.2.2 Site Specific Conditions – Field Investigation Methods and Results

Figure 2 shows the preliminary design layout of the landfill features, including the entrance road, stormwater ponds, entrance scales, leachate ponds, landfill cell, and the perimeter road. **Figure 5** shows the site features, along with the totality of site investigations completed as outlined in the Work Plan. Locations of the test pits and shallow borings were mainly selected to help characterize subsurface conditions for the purpose of design and construction of the key landfill features (i.e., for geotechnical engineering considerations). The shallow borings were placed in strategic locations to assess subsurface conditions for constructability of the landfill, as well as verification of subsurface conditions for hydrogeologic characterization. Two of the deep borings were placed in the footprint of the landfill (DB-1

and DB-2), and the third deep boring (DB-3) was situated to the east of the leachate ponds, selected to provide spatial coverage for the overall layout of the landfill. As noted in the Work Plan, the deep borings for Phase 1 were intended to characterize subsurface conditions, and to determine the presence or depth to uppermost groundwater beneath the site.

Table 1 provides a summary of the field investigation locations (coordinates), dates of completion, and the depth of exploration. In total, the field investigations completed at the site to support with subsurface characterization consisted of 43 test pits (TPs) (31 test pits labels 100-series and 12 supplemental test pits labeled 200 series), 12 shallow borings (SBs), and 3 deep borings (DBs). **Appendix B.2 includes** a 'photo log' illustrating some of the field investigation activities for test pit exploration and drilling activities.

Appendix B.2 includes the Geotechnical Engineering Report prepared by the geotechnical engineer, Xcell Engineering, LLC; these reports include a description and photographs of the subsurface soils from a combination of test pits, drilling (borings), and soils testing. Shallow soils/subsurface conditions as summarized in the Xcell report were noted as relatively uniform across the site, and the soils/subsurface conditions were generalized as approximately 10 to 15 feet of light brown, loose, fine sandy silt underlain by variably weathered rock (interpreted as rhyolite). The rock material was noted as moderately fractured and could be excavated with conventional excavation equipment.

Appendix B.2 includes field logs for the 12 SBs, and 3 DBs (labeled DB-1, DB-2, and DB-3). As noted in Section 1 and per the Work Plan, the deep borings were intended to identify and characterize the depth to uppermost groundwater. The depths of deep borings ranged from 455 ft bgs (DB-1) to 700 ft bgs (at both DB-2 and DB-3). DB-1 was drilled first in sequence of the 3 deep borings, and at a depth of approximately 455 ft the driller indicated he thought he encountered uppermost groundwater, and left the borehole open overnight to re-assessed borehole conditions the following morning. Drilling advancement in the rhyolite unit required adding minimal quantities of water to facilitate borehole advancement with the air-rotary drilling method. From borehole recovery measurements made by the driller the following day, the presence of moisture was confirmed to be from water added by driller during borehole advancement, and not from natural groundwater in the borehole. Following this determination, the intent was to continue drilling at this location down to 700 ft per the Work Plan, however, due to a miscommunication between the Forsgren Project Manager and the driller, the borehole was abandoned at a total depth of 455 ft bgs. As noted above, the subsequent two deep borings (DB-2 and DB-3) were advanced down to the planned 700 ft depth. None of the three deep borings encountered saturated conditions or uppermost groundwater.

The field logging of material confirmed the subsurface conditions were relatively uniform, and the generalized lithology beneath the uppermost soil horizon was logged as grey, dry, rock (interpreted as rhyolite), with minor interbeds of lighter color fine-grained clay or pumice/ash at depths of 85 to 115 ft bgs. The consistency of the rhyolite was noted as generally 'weathered' at depths below the upper soil horizon (roughly 15 ft bgs) down to approximately 125 ft bgs, and then at depths below approximately 125 ft bgs, the rock unit was logged as 'moderately hard' or 'fresh' (less weathered), inferred from a combination of the drill cuttings and due to slower drilling advancement and/or more 'rig chatter'. At selected intervals, the air-rotary method was observed to 'lose circulation' which resulted in limited, or loss of cuttings return and was attributed to air circulation losses to fractures within the formation.

Table 2 provides a summary of the laboratory testing of the uppermost soil horizon (logged predominantly as silt), and selected grab samples of the rhyolite rock. This information was compiled based on the soils laboratory information performed by Xcell Engineering, Inc which is included in **Appendix B.2**. Permeability of the surficial silt unit was reported in the range of 1.2×10^{-3} to 7.1×10^{-6} cm/sec; permeability of the rhyolite rock was reported as 3.0×10^{-4} cm/sec. Density of the uppermost soil (silt unit) was estimated at 98 pounds per cubic feet (lb/ft^3), whereas the density of the rhyolite rock ranged from 98 lb/ft^3 (fractured, weathered condition) to 135 lb/ft^3 (more competent or 'fresh' condition).

Down-hole video logging was performed at each of the three deep borings, showing video (visual) characteristics of borehole side-walls from ground surface to the bottom of each boring. The decision to use down-hole video technology was made to aid lithologic logging in consideration of the loss of circulation scenario for selected borehole advancement intervals. These video logs were viewed as part of compiling and finalizing the digital boring logs (refer to Appendix B.2), which confirmed the rhyolite material continuous throughout the loss of circulation zones, and that other geologic units, alluvial interbeds, and/or voids were not correlated to these loss of circulation intervals/zones from visual assessment of down-hole video logs. Careful inspection of the video logs for all three deep borings confirmed that the overall geometry of the sidewalls was often irregular; however, there were no identifiable fracture zones or voids (air space) in the formation. From a combination of field and video log data, the interpretation of the rhyolite rock characteristics is that this unit is generally competent and lacking major voids or fracture zones, and the losses of circulation are likely attributed to micro-fractures in the rhyolite rock that are undetectable from visual assessment of the video log.

Figure 6 presents a generalized hydrogeologic cross-section oriented generally from west to east through the footprint of the landfill cell (see orientation of section shown in Figures 4 and 5). The section shows the deep borings (projecting DB-3), and the nearest shallow borings along the section line, such as SB-5 and SB-9. In general, the sequence consists of approximately 10 to 15 ft of fine-grained silt at ground surface, overlying rhyolite bedrock extending down to depths of at least 700 ft bgs. In general, the drilling samples (cutting return) during drilling advancement in the rhyolite unit demonstrated the material was relatively competent and fresh. During intervals of ‘loss of circulation’, the borehole log indicates no observed lithology; however, the down-hole video was reviewed for all three deep borings, and there was no discernable difference between the ‘competent’ zones, and the zones viewed on video as ‘loss of circulation’. From this data, it is interpreted that the rhyolite unit is relatively uniform and competent. For setup of the model approach, the ‘loss of circulation’ zones are considered more fractured as shown on the cross-section. As such, the rhyolite rock is depicted in section as either ‘competent’ or ‘fractured’. This interpretation is relevant as the model setup accounts for these two different types of rock characteristics or consistencies as described in Section 3.

2.3 Source Concentration for Leachate

To evaluate performance of liner systems on impeding potential impacts to groundwater, the alternative liner and no migration to groundwater modeling approach requires estimates of source concentration of potential contaminants in leachate. The model does not account for volume or leachate generation rates if the user option assumes a ‘constant head’ source. The ‘constant head’ source was the option selected for all simulations. Given this model approach, estimates of precipitation volume and related leachate volume are not necessary for the model inputs. The information that follows in this section presents representative leachate source concentration for typical MSW and leachate results obtained from an existing MSW landfill facility near the site (Bonneville County Peterson Hill Landfill), which is used as source concentration input parameters as described in Section 3.

The alternative liner and no migration demonstration model focuses on the potential mobilization and transport of volatile organic compounds (VOCs) through the liner system(s) given that diffusive capacities from VOC compounds represent the highest potential of contaminant migration via gas-phase (diffusion) transport for an intact membrane, in comparison to liquid-phase transport through an intact membrane. The modeling approach also assumes that VOCs are generally more toxic in comparison to other liquid-phase compounds required for detection groundwater monitoring, such as inorganics and/or metals.

Appendix B.2 includes a copy of leachate monitoring report from nearby Peterson Hill Landfill collected in June 2020 (from Rocky Mountain Associates, Inc). As shown in this report, the leachate concentrations of VOCs vary substantially ranging from non-detect to highest observed upper-bound values in the range of 16,000 ug/L (acetone) to 26,000 ug/L (2-butanone, also known as methyl ethyl ketone [MEK], which is highly volatile and commonly used as an industrial solvent).

Research by Kjeldsen (2002) describes the typical composition of MSW leachate based on a review of numerous studies and landfills across the United States; their review characterized typical leachate concentrations for primary chemical groups including inorganic compounds, metals, and synthetic compounds such as VOCs. Kjeldsen (2002) noted that the most commonly detected VOCs were hydrocarbons such as benzene, toluene, ethylbenzene, and xylenes, along with halogenated hydrocarbons such as tetrachloroethylene (PCE) and trichloroethylene (TCE). Below is a summary of the leachate concentration range (micrograms per liter; ug/L) for these six commonly detected VOCs (Kjeldsen, 2002):

- Benzene – 0.2 to 1,630 ug/L
- Toluene – 1 to **12,300 ug/L** (bold represents the maximum value from this list)
- Xylene – 0.8 to 3,500 ug/L
- Ethylbenzene – Non-detect to 0.223 ug/L
- PCE – 0.01 to 250 ug/L
- TCE – 0.05 to 750 ug/L

In summary, the highest commonly detected leachate concentration researched from Kjeldsen (2002) via numerous reference sites was 12,300 ug/L for toluene. The highest recent concentration of leachate from the Peterson Hill Landfill near the site was **26,000 ug/L for 2-butanone** (which is a VOC parameter). From the literature review of VOC concentrations in leachate for typical MSW landfills, the highest recent observed leachate concentration (26,000 ug/L) from the Peterson Hill Landfill was used for the model source concentration input value to compare the performance of the prescriptive liner, versus the proposed alternative liner system. The proposed alternative liner was also evaluated with elevated source concentrations and other model variable adjustments to further evaluate liner performance given some uncertainty in the input parameters.

3.0 Liner Evaluation Modeling Methods and Results

This section summarizes the alternative liner and no migration to groundwater evaluation modeling approach, methods, input variables, and results.

3.1 Overview of Landfill Liner Modeling Approach

The modeling for this report was performed using *Pollute Software, Version 7.13*. Pollute is a software platform specifically designed to support modeling and contaminant migration for landfills designed in accordance with Subtitle D facilities. The migration of source contaminants from a landfill source through a given material (such as a liner system) and underlying geologic layers is controlled by mechanical dispersion and diffusion (GAEA Technologies, 2007). Leachate contaminant sources migrating through an intact geomembrane are controlled primarily via diffusion, while migration of contaminants within coarse-grained sediments or fractured rock material (i.e., native geologic media) is controlled primarily by mechanical dispersion. The Pollute model accounts for a combination of these processes, assigned in the model inputs as the 'coefficient of hydrodynamic dispersion'.

The modeling of chemical migration through liner systems and/or through unsaturated and saturated media needs to take into account numerous variables and relies on a combination of site-specific and assumed potential conditions. Some of the key variables are volume and chemical characteristics of the leachate (refer to Section 2.3, above), properties of the liner system, competency of the liner system, and the properties of the attenuation layers and uppermost groundwater. The term 'attenuation layers' refers to the fill or native geologic layers beneath the synthetic liner system. Some of the model variables or inputs are difficult to measure. To the extent practical and reasonable, this report relies on site-specific data or assumptions; however, since some of the inputs are difficult to measure, there are some instances where published or estimated values are used.

To account for inherent uncertainty a sensitivity analysis was performed to adjust key input variables such as source concentration, model run time, combinations of both source concentration and model run time, and porosity. The model approach relied on adjustments to porosity to substantively mimic the void space in the fractured rock environment (rhyolite) at the site, in lieu of the potential option of selecting 'fractured flow' option available in the Pollute model. This decision was based on consideration of the fractured flow option would require model inputs for size, orientation, and density of fractures, which is not well defined and virtually impractical to characterize from typical drilling techniques. On a broader scale, adjustments to porosity (voids) was assumed to substantively mimic the voids in fractured rhyolite as an 'effective porous media' model layer.

3.2 Model Inputs and Assumptions

Table 3 summarizes the model setup and layers for a comparative analysis evaluating the liner performance of the prescriptive liner versus the proposed alternative liner. The modeling was performed in a phased approach with a total of five model simulations. The initial two simulations #1 and #2 demonstrate the comparative analysis evaluating performance of the prescriptive liner versus the proposed alternative liner. The subsequent set of simulations, #3, #4, and #5 are a series of sensitivity runs evaluating performance of the proposed liner system with adjustments to source concentration (Model Run #3), extended model run time (Model Run #4), and combination of both increased source and extended run time (Model Run #5). In addition, the porosity was adjusted as a supplemental sensitivity analysis run (Model Run #6) as requested by DEQ.

Appendix C provides a summary of model setup layers and input variables for the comparison of prescriptive versus alternative liner that is specific to simulations #1 and #2. Included are model outputs from the Pollute software, and a profile (graphic) section showing model setup layers and thicknesses. **Appendix D** provides the sensitivity models to further evaluate the alternative liner for simulations #3, #4, #5, and #6. The model variables, inputs, and assumptions are described below.

3.2.1 Overview of Liner Systems and Attenuation Layers

3.2.1.1 Prescriptive Liner Design

The prescriptive liner assumes that the HDPE is 60-mil-thick geomembrane that is free of tears and is well placed and underlain by 2 feet of compacted clay. The K of the HDPE membrane is assumed to be within the range described by Lake and Rowe (2005). Lake and Rowe (2005) conducted tests on HDPE membranes using dichloroethane and benzene and reported diffusion coefficients of $6x10^{-9}$ to $3x10^{-9}$ centimeters squared per second (cm^2/sec).

A coefficient of hydrodynamic dispersion value of $2x10^{-8}$ cm^2/sec was used in modeling for the HDPE liner. This is considered reasonable since it is roughly one order of magnitude higher than published values above by Rowe. For the 2 feet layer of compacted clay beneath the HDPE, the modeled value for hydrodynamic dispersion was set to $6x10^{-6}$ cm^2/sec. This value is considered reasonable since Lake and Rowe (2005) conducted tests on clay layers and GCLs using dichloroethane and benzene and reported coefficients of diffusivity of $1x10^{-8}$ and $6x10^{-9}$ cm^2/sec, respectively.

The K of the clay layer beneath the HDPE is assumed at $1x10^{-7}$ cm/sec, based on published values from Booker (2004), and consistent with the minimum requirements for permeability as cited in 40 CFR 258.40 Design Criteria.

The porosity of the HDPE liner was assumed as 1 (unit) to allow for chemical dispersion through the liner. The porosity of clay liner was set to 40 percent (0.40) given that clay materials often yield relatively high porosity values, which is consistent with book values of clay materials cited by Fetter (1994) in the range of 33 to 60 percent.

For all model simulations, the adsorption (synonymous with distribution coefficient) was set to null (0) as a model approach. Adsorption is a term to describe the process by which solids (such as geologic media) hold molecules of gas or liquid (such as contaminants). Site specific values are difficult to obtain, and any value above 0 would result in shallower estimates of leachate transport depth and corresponding lower predicted concentrations to those values presented herein. With adsorption set to null, the model properties are driven mainly by hydrodynamic dispersion (which accounts for diffusion and mechanical dispersion), porosity, and the material density. In summary, setting adsorption to null does not 'hold' or bind any of the source contaminant concentrations, and adjusting this to any value above 0 would result in less/shallower predictions of source mobilization in comparison to setting the model to null (0).

The density value for HDPE liner material was set at 59 lb/ft^3 based on the product specifications sheet for HDPE material provided in **Appendix A** (note the specifications cite density of 0.94 g/cm^3, which is equivalent to 59 lb/ft^3). The density value for the clay layer beneath the HDPE was assumed to be "compact" with a value of 98 lb/ft^3, which is consistent with the value used for compacted subgrade fine-grained layer for the proposed alternative liner, described below. Ascertaining the actual in-situ value of dry density at depth is difficult to obtain, but this value is reasonable for 'compact' fine-grained material and is used for both models to provide a representative comparison of the two liner systems.

3.2.1.2 Proposed Alternative Liner System

The upper HDPE membrane for the proposed alternative liner is the same as prescriptive above and with same characteristics. The material beneath the HDPE geomembrane is the GCL layer, which is assumed to be 10-mm-thick in comparison to the 2-ft-thick clay for prescriptive liner noted above. The K value for

the GCL layer is maximum of $5x10^{-9}$ cm/sec (listed at $5x10^{-11}$ meters per sec), which is consistent with published values by Booker (2004) citing K values in the range of $5x10^{-10}$ to $5x10^{-9}$ cm/sec for GCL layer (see **Figure 3**, and data sheets in **Appendix A**).

The porosity, adsorption (same as distribution coefficient), and density of clay material (either the 2 ft clay, or the GCL layer) for both the proposed alternative liner and prescriptive liner was the same (see **Table 3**). The hydrodynamic dispersion value for all layers beneath the HDPE liner in both prescriptive and alternative liner systems was set to $6x10^{-6}$ cm^2/sec, and consistent with the value use for the attenuation layers. Although the exact value for either the prescriptive liner or proposed alternative system is unknown, setting the same value for both models is considered reasonable for comparative purposes.

3.2.1.3 Attenuation Layers

The attenuation layers are considered the native subsurface soils/rock and uppermost groundwater immediately beneath the liner systems. The attenuation of VOCs beneath the liners is dependent on numerous factors or variables, such as layer thickness, permeability, dispersion potential, porosity, adsorption, and density. One of the main factors for the model is thickness of the layers and the respective properties for each layer. The field logs for the deep borings in **Appendix B** were reviewed, and the generalized lithologic sequence is listed below, as illustrated in **Figure 6**.

- Generalized Conditions at DB-1:
  - 0-14ft, SILT, soil horizon
  - 14-150ft, Rhyolite Rock, competent, fresh
  - 150-165ft, Rhyolite Rock, fractured
  - 165-180ft, Rhyolite Rock, competent, fresh
  - 180-345ft, Rhyolite Rock, fractured
  - 345-391ft, Rhyolite Rock, competent, fresh
  - 391-397ft, Rhyolite Rock, fractured
  - 397-460ft, Rhyolite Rock, competent, fresh

- Generalized Conditions at DB-2:
  - 0-14ft, SILT, soil horizon
  - 14-31ft, Rhyolite Rock, competent, fresh
  - 31-205ft, Rhyolite Rock, fractured
  - 205-700ft, Rhyolite Rock, competent, fresh

- Generalized Conditions at DB-3:
  - 0-14ft, SILT, soil horizon
  - 14-257ft, Rhyolite Rock, competent, fresh
  - 257-530ft, Rhyolite Rock, fractured
  - 530-540ft, Rhyolite Rock, competent, fresh
  - 540-550ft, Rhyolite Rock, fractured
  - 550-700ft, Rhyolite Rock, competent, fresh

From the generalized layers listed above, DB-3 was observed to be the most 'fractured' sequence, and thus considered the most porous or void space (fractured) condition with respect to potential for contaminant migration through void spaces and was selected to use for setup of the model layers beneath the landfill liner systems. From the conditions at DB-3, the model assumed the following attenuation layers beneath the landfill liner system, after accounting for removal of the upper 70 ft (excavated) to construct the landfill as shown in **Figure 6** cross-section:

- 187 ft thick, Rhyolite Rock, **competent**, fresh. Attenuation layer #1.
- 273 ft thick, Rhyolite Rock, **fractured**. Attenuation layer #2.
- 10 ft thick, Rhyolite Rock, **competent**, fresh. Attenuation layer #3.
- 10 ft thick, Rhyolite Rock, **fractured**. Attenuation layer #4.
- 150 ft thick, Rhyolite Rock, **competent**, fresh. Attenuation layer #5.
- 10 ft thick, Uppermost Groundwater, assumed depth and thickness (not shown on section)

The above sequence from DB-3 conditions totals approximately 630 ft of unsaturated rhyolite rock, differentiated into either competent (less weathered) or fractured (more weathered or fractured). The sequence of 630 ft takes into account that the upper 70 ft of material will be removed to construct the landfill, and then assignment of respective layers and thicknesses from conditions observed at DB-3. The lowest/deepest layer is assumed to be 10 ft thick zone for uppermost groundwater to setup the model, however, as described earlier the depth to saturated conditions/uppermost groundwater is at least 700 ft (or 630 ft sequence plus the 70 ft removed, etc.). Although the depth to uppermost groundwater was not encountered at depth of 700 ft, the setup of the model and the objectives of the 'no migration to groundwater' necessitate predictions of performance of the liner system to impede source impacts to uppermost groundwater. As such, theoretical depth to uppermost groundwater is assumed at 630 ft below the liner system, to support the objectives of this demonstration. The above sequence are the attenuation layers beneath the liner system(s) and above uppermost groundwater, as summarized in **Table 3**.

Although difficult to measure in-situ, the porosity of the more competent rhyolite layers was assigned a value of 0.12, which is consistent with published values of 'igneous rocks' by Fetter (1994). The density of the more competent rhyolite layers was assumed at 135 lb/ft^3, which is reasonable since published values of 'igneous rock' are relatively high and in the range of 175 to 187 lb/ft^3 (via multiple on-line sources). For the more fractured rhyolite layers, the porosity was increased to 0.4 to generally mimic values of fine-grained soils (Fetter, 1994); similarly, the density was lowered to a value 98 lb/ft^3 to be comparable to 'completely weathered' or more soil-like characteristics. Additional detail on model setup and rationale for input variables is presented in the model setup in the next section.

3.2.2 Model Inputs

The narrative below follows the general sequence for model setup that is input into the Pollute software user interface.

3.2.2.1 General Data

The General Data input tab defines the name of model, number of layers, maximum depth, Darcy Velocity, and Laplace Transform Parameters.

- *Title.* Shown in **Appendix C and D** model output files and tables.
- *Maximum Depth.* This is calculated, based on user input on model layers and thicknesses.
- *Darcy Velocity.* The Darcy Velocity for the diffusion model approach assumes a value of 0, which then establishes the mobility/transport of leachate through the layers as diffusion only.

- *Number of Layers.* Set to layers to represent the primary geomembrane HDPE liner (layer 1), secondary clay liner either 'recompacted' clay or the GCL (layer 2), and then the five underlying attenuation layers (rhyolite layers as described above and shown in **Table 3**). Note that the uppermost groundwater layer is not a distinct layer in the model but considered as a "fixed outflow" boundary condition based on the input variables of K.
- The *Laplace Transform Parameters* exceed the minimum or defaults and are set to: TAU= 7, N = 4000, SIG = 0, and RNU = 400. Details of these are explained in the Pollute user manual.

3.2.2.2 Boundary Conditions

- *Top Boundary.* Assumed as 'constant source' with leachate source concentration value set to the highest observed recent VOC value in the comparative models. A constant source condition is considered unrealistically high because during the post-closure care period after cover system has been installed, the leachate source would be limited and eventually eliminated over time. Model setup of a constant source is an unrealistic and worst-case condition for source input.
- *Source Concentration*. Based on the data presented in Section 2.3, the comparative models assume a leachate source concentration of 26,000 ug/L. This value is the highest observed from monitoring at the nearby Bonneville County Peterson Hill Landfill and is almost twice the maximum leachate concentration reported from other MSW landfill reference sites (Kjeldsen, 2002). Thus, the comparative base-case models are simulated with both an elevated source concentration value and constant source concentration for leachate.
- *Bottom Boundary.* Model setups assume 'fixed outflow velocity' with a K value of the uppermost groundwater unit set at 1 ft/day, which is a mid to higher K value consistent with fractured igneous rocks as cited by Woessner (1992), and was the same value used in both models. As noted earlier, if the model simulations do not predict leachate source concentrations will reach uppermost groundwater, then the model inputs for uppermost groundwater unit (i.e., groundwater flow conditions) are effectively irrelevant since contaminants don't reach groundwater. The inputs for landfill length, width, and aquifer thickness are set to 1,800 ft, 1,800 ft, and 10 ft, respectively. The porosity for uppermost groundwater is set to 0.4 to represent a more fractured (or more permeable) condition of the rhyolite rock.

3.2.2.3 Run Parameters

- *Run Parameters.* Model output is specified in units of years (time), depth (feet), and predicted leachate source concentration in micrograms per liter (ug/L). The model output presents the predicted source concentration at depths within the attenuation layer for the user-specified time requested. For the initial comparative models, a model run time of 200 years was selected and used for simulations #1 and #2. This time period is considered reasonable considering size of unit and initial life cycle projections are on the order of 75 years (which assumes 45 years active life and 30 years post-closure care). In addition, sensitivity runs were performed which extended the model run time out to 500 years, to further evaluate the performance of the alternative liner over longer periods.

3.3 Model Results for Comparative Analysis

Appendix C is the Pollute model setup and results for the comparative analysis of the prescriptive liner system (Appendix C.1 output) versus the proposed alternative liner (Appendix C.2 output). Model setups are summarized in **Table 3** as simulations #1 and #2, respectively for the prescriptive and alternative liners. The depths assume the top of profile to the base of the attenuation layer(s) whereby the bottom of the lowest attenuation layer is the top of (inferred) uppermost groundwater.

For most VOCs, the lowest practicable quantitation limit for the laboratory detection levels is 0.5 ug/L. As such, model output files have been annotated to clearly show key model inputs, and then the predicted depths and concentrations with **bold red-font** to identify the maximum (lowest) depth in which predicted concentrations fall below the 0.5-ug/L threshold level. It is important to note that the model results show trace values many orders of magnitude below the lowest detectable concentration value. Model results with concentrations less than 0.5-ug/L threshold are inferred to be "non-detect" values that would not exceed any of the values in Table 1 (per 40 CFR 258.40).

Table 4 summarizes the model results illustrating the depths and predicted concentration values where concentrations fall below the 0.5 ug/L threshold. For the prescriptive liner model, the results show the depth at which concentrations fall below detectable threshold is 41 ft bgs with a predicted concentration of 0.13 ug/L at the end of a 200-year period; similarly, for the proposed alternative liner model, the depth at which concentrations fall below detectable levels is 39 ft bgs with a predicted concentration of 0.30 ug/L.

Overall, these results are comparable between the two models. Both models (prescriptive and proposed alternative liner systems) demonstrate that concentrations fall below the 0.5 ug/L detection level threshold at relatively shallow depths in comparison to the depth to inferred uppermost groundwater, which is at least 630 ft below the lowest portion of the liner. For a no migration to groundwater demonstration, both models predict that 'no detectable trace source concentration' (0.00 ug/L) at depths not to exceed 314 ft bgs, at the end of a 200-year simulation period (see model output in Appendix C). In summary, both liner systems are equally protective of groundwater and demonstrate an effective barrier system and attenuation layers would impede potential leachate source migration to uppermost groundwater.

3.4 Sensitivity Analysis and Results

This section presents results from a series of sensitivity simulations, which were modeled to further evaluate the performance of the proposed alternative liner. The sensitivity simulations included adjustments to leachate source concentration, extended model run time, and a combination of both increase of source with extended run time. **Table 4** summarizes the four supplemental sensitivity runs using the proposed alternative liner referenced as simulations #3, #4, #5, and #6. The model setup and output from these sensitivity runs are provided in **Appendix D.1, D.2, D.3, and D.4**, respectively.

The four sensitivity simulations consisted of:

- Simulation #3: increasing the leachate source concentration to 52,000 ug/L, which is twice the highest value used in comparative models,
- Simulation #4: extending the model run time out to 500 years, which is an arbitrary increase of over twice the base models, which were run at 200 years, and
- Simulation #5: effects of increasing both the source concentration to 52,000 ug/L and extending the model run time out to 500 years.
- Simulation #6: effects of lowering the porosity to 10 percent (0.10) for the entire attenuation sequence, and resultantly increase the density of all layers to 135 lb/ft^3 to match a more competent (less fractured) sequence. The model run time for this run was set to 500 years, to be compared with sensitivity runs #4 and #5.

For Simulation #3, the increase in source concentration to 52,000 ug/L results in a predicted depth of 39-44 ft bgs when the concentration falls below the detection levels, which is only a few feet deeper than the comparative models. This suggests that exaggerated (doubling) source concentration inputs have little effect on the migration depth beneath the liner system.

For Simulation #4, the extended model run time out to 500 years results in a predicted depth of 59-64 ft bgs when the concentration falls below detection level. This simulation suggests that a two-fold increase in model run time (i.e., from 200 to 500 years) essentially adds only about 25 ft of additional depth of predicted source migration in comparison to model runs #1 and #2.

For Simulation #5, increasing both source concentration and extending model run time results in a predicted depth of 59-64 ft beneath the liner of when concentrations fall below the detection level, comparable to results from Simulation #4. These results support that model run time is more influential to the depth of source migration in comparison to elevated source concentrations. This simulation accounts for both exaggerated run time and elevated source concentration and demonstrates that detectable source concentrations from leachate would not reach uppermost groundwater.

For simulation #6, decreasing the porosity to a relatively low value of 10 percent for all the attenuation layers, and simulation time of 500 years, predicts migration of leachate to depths of 64 ft to when concentrations drop to below 0.5 ug/L, and no detectable VOCs at depths estimated below 497 ft bgs. These results support that porosity is not a sensitive parameter for long model durations of up to 500 years, considering these results are similar to Simulations #4.

4.0 Summary and Conclusions

The following bullets summarize the key findings and conclusions as supported from this report:

- Modeling results from Pollute software present a site-specific comparative analysis for performance of the prescriptive liner system versus the proposed alternative liner system, which supports that both liner systems are comparably effective at limiting leachate migration. For model simulations out to 200 years, both the prescriptive and alternative liner models predict a concentration of less than 0.5 ug/L at depths not to exceed 41 ft below the liner systems, which is substantially shallower than the potential shallowest depth to uppermost groundwater, which is inferred at 630 ft below the liner system for demonstration purposes. The model results demonstrate that the alternative liner design will not exceed the risk-based criteria of Table 1 (40 CFR 258) since detectable concentrations will not reach uppermost groundwater.

- Sensitivity analyses runs were performed to further evaluate the proposed alternative liner by increasing the source concentration for leachate, extending the model run time, and adjusting porosity. These supplemental sensitivity runs demonstrate that that changes in extended model run time had a more pronounced effect in comparison to increases in source concentration, and that adjustments on porosity to relatively low values had virtually no effect when simulations were run out to 500 years. When simulating both increased source concentration and extended run time, which are extreme worse-case conditions (simulation #5), the model predicts source concentrations below the 0.5 ug/L threshold at depths not exceeding 64 ft bgs, and no detectable trace concentration (less than 0.00 ug/L) at depths not to exceed 499 ft bgs (see output in Appendix D.3). With these extreme worst-case simulations, the leachate source concentration does not reach uppermost groundwater, modeled at a theoretical depth of 630 ft below the liner system.

The modeling results using site-specific inputs demonstrate the proposed alternative liner system is equally protective of groundwater as compared to the prescriptive liner system, and that detectable concentrations of leachate will not migrate into uppermost groundwater even when simulating the most extreme, worse-case conditions inputs for elevated source and extended run time. These results support both the alternative liner demonstration and the no migration to groundwater demonstration. Utilization of an engineered liner system of 60-mil HDPE geomembrane and GCL along with the attenuation properties

of the site-specific native consolidated rock units beneath the liner will be effective at protecting groundwater.

In addition to the model results used to support both the alternative liner and 'no migration to groundwater' demonstrations in alignment with Idaho code requirements, it should be noted that other qualitative site-specific factors are favorable to support these modeling demonstrations. For example, (1) the site location lies outside the delineated boundaries of the SRPA, and there are no municipal water supply wells in close proximity to the site, and (2) the well video logs were considered a beneficial 'add-on' to the field investigation logging, which demonstrated the entire sequence was relatively competent and/or lacking any visible evidence of major fracture zones, which could provide a conduit to groundwater if present. Both factors are difficult to quantify with a modeling effort but are otherwise noted to be beneficial of site location and subsurface conditions with respect to the site owner gaining approval of both an alternative liner design, and the no migration to groundwater, with DEQ approvals.

And lastly, it should be noted that the site owner is installing a double liner with a 'leak detection system' under both in-cell leachate sumps as an additional measure of environmental protection so as to not impact uppermost groundwater. Although the leak detection system was not included in the model setup, an additional engineered 'liner system' in tandem with the primary liner as evaluated in this report would add to the overall protectiveness of the leachate collection design and support the overall objectives of this demonstration.

5.0 References

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Tables

Table 1. Summary of Field Investigation Locations, Coordinates, Elevations, and Depths

Alternative Liner and No Migration Demonstration Report for EIRSWD Regional MSW Landfill

ID #	Coordinates Latitude	Coordinates Longitude	Surface Elevation	Completion Date	Exploration Depth
Test Pits (TPs)					
TP-100A	43.8156777	-111.5412937	5765.87	3/9/2021	9.0
TP-101	43.8150165	-111.5402215	5794.85	3/9/2021	15.0
TP-102	43.8142250	-111.5391669	5795.89	3/9/2021	15.0
TP-103	43.8142144	-111.5379078	5806.14	3/9/2021	16.0
TP-104	43.8142039	-111.5366485	5826.52	3/9/2021	9.5
TP-105	43.8141934	-111.5353893	5835.30	3/9/2021	11.0
TP-106	43.8141827	-111.5341302	5846.57	3/9/2021	14.5
TP-107	43.8137408	-111.5349768	5842.43	3/9/2021	16.0
TP-108	43.8137479	-111.5358162	5834.06	3/9/2021	12.0
TP-109	43.8137619	-111.5374952	5815.95	3/9/2021	16.0
TP-110	43.8137688	-111.5383347	5802.09	3/9/2021	9.0
TP-111	43.8133267	-111.5391813	5813.14	3/9/2021	15.0
TP-112	43.8133057	-111.5366628	5824.95	3/9/2021	8.0
TP-113	43.8132848	-111.5341445	5848.78	3/9/2021	15.0
TP-114	43.8128427	-111.5349912	5842.73	3/9/2021	6.3
TP-115	43.8128496	-111.5358306	5835.93	3/9/2021	6.0
TP-116	43.8128637	-111.5375095	5817.37	3/9/2021	11.0
TP-117	43.8128708	-111.5383488	5819.29	3/9/2021	16.0
TP-118	43.8124286	-111.5391955	5827.59	3/9/2021	16.0
TP-119	43.8124076	-111.5366772	5826.40	3/9/2021	6.5
TP-120	43.8123866	-111.5341589	5856.04	3/9/2021	8.0
TP-121	43.8119444	-111.5350054	5853.76	3/9/2021	11.0
TP-122	43.8119515	-111.5358448	5839.23	3/9/2021	5.0
TP-123	43.8119655	-111.5375237	5826.80	3/9/2021	9.5
TP-124	43.8119725	-111.5383633	5823.08	3/9/2021	12.0
TP-125	43.8115304	-111.5392097	5831.97	3/9/2021	16.0
TP-126	43.8115200	-111.5379508	5837.79	3/9/2021	16.0
TP-127	43.8115095	-111.5366916	5839.05	3/9/2021	14.0
TP-128	43.8114989	-111.5354323	5856.69	3/9/2021	16.0
TP-129	43.8114883	-111.5341734	5877.75	3/9/2021	16.0
TP-100	43.8141020	-111.5398130	5795	6/29/2022	13.0
TP-200	43.8127413	-111.5401079	5822	6/29/2022	14.0
TP-201	43.8141739	-111.5328740	5851	6/29/2022	14.5
TP-202	43.8146618	-111.5383305	5796	6/29/2022	14.0
TP-203	43.8146540	-111.5370678	5818	6/29/2022	11.5
TP-204	43.8146480	-111.5358148	5831	6/29/2022	14.0
TP-205	43.8146391	-111.5345593	5838	6/29/2022	11.0
TP-206	43.8149765	-111.5389489	5782	6/29/2022	14.0
TP-207	43.8154110	-111.5384339	5785	6/29/2022	13.0
TP-208	43.8157027	-111.5353684	5822	6/29/2022	14.5
TP-209	43.8157027	-111.5381172	5785	6/29/2022	6.0
TP-210	43.8158104	-111.5393730	5785	6/29/2022	13.0
TP-211	43.8162790	-111.5416259	5763	6/29/2022	10.0

Table 1. Summary of Field Investigation Locations, Coordinates, Elevations, and Depths

Alternative Liner and No Migration Demonstration Report for EIRSWD Regional MSW Landfill

Shallow Boreholes (SBs)					
SB-1	43.8116697	-111.5371866	5833	7/8/2022	30
SB-2	43.8122618	-111.5385071	5821	7/7/2022	30
SB-3	43.8122380	-111.5346818	5853	7/8/2022	30
SB-4	43.8129818	-111.5391148	5812	7/7/2022	30
SB-5	43.8129842	-111.5361944	5833	7/19/2022	90
SB-6	43.8129678	-111.5338219	5850	7/11/2022	30
SB-7	43.8138585	-111.5386700	5802	7/15/2022	80
SB-8	43.8138827	-111.5366399	5825	7/14/2022	90
SB-9	43.8139408	-111.5345686	5845	7/12/2022	100
SB-10	43.8139404	-111.5326940	5848	7/11/2022	30
SB-11	43.8144879	-111.5375435	5810	7/19/2022	40
SB-12	43.8147717	-111.5350347	5835	7/11/2022	80
Deep Boreholes (DBs)					
DB-1	43.8125715	-111.5383017	5819	7/14/2022	455
DB-2	43.8139647	-111.5338548	5849	7/21/2022	700
DB-3	43.8157190	-111.5372711	5806	7/27/2022	700

Table 2. Soils Testing Methods and Results

Alternative Liner and No Migration Demonstration Report for EIRSWD Regional MSW Landfill

Location ID	Sample Type[1]	Depth (ft bgs)	Field Classification[2]	Moisture[3]	Percent Passing #200 Seive[4]	Plasticity Index	Liquid Limit	Plastic Limit	Permeability[6] (cm/sec)	Dry Density[6] (lbs/ft^3)
TP-100	Grab	6	ML	14.2%	94.4%	--			--	-
TP-101	Grab	3	CL-ML	-	-	6.9	27.1	20.2	-	-
TP-109	Grab	6	CL	17.3%	94.9%	9.8	29.4	19.6	--	-
TP-125	Grab	10	CL	9.3%	88.5%	9.1	28.1	19.0	--	-
TP-129	Grab	10	CL	18.8%	92.1%	8.4	28.1	19.7	--	-
TP-200	Grab	6	ML	9.4%	91.4%	--	--	--	--	-
TP-201	Grab	8	--	11.9%	89.3%	--	--	--	--	-
TP-202	Grab	8	--	11.9%	93.1%	--	--	--	--	-
TP-203	Grab	6	ML	15.9%	89.8%	--	--	--	7.10E-06	98.9
TP-203	Grab	10	ML	23.0%	61.6%	--	--	--	--	-
TP-204	Grab	8	--	12.60	88.1%	--	--	--	--	-
TP-204	Grab	12	--	18.50	64.6%	--	--	--		-
TP-205	Grab	6	CL	13.9%	92.1%	8.0	28.0	20.0	1.20E-03	87.2
TP-206	Grab	6	--	14.8%	95.3%	--	--	--	--	-
TP-207	Grab	2	CL	12.0%	90.7%	--	--	--	--	-
TP-207	Grab	8	CL	11.1%	88.9%	9.0	28.0	19.0	1.55E-04	94.1
TP-207	Grab	15	CL	12.7%	31.2%	--	--	--	--	-
TP-208	Grab	3	--	12.2%	92.8%	--	--	--	--	-
TP-209	Grab	1	--	6.0%	84.9%	--	--	--	--	-
TP-210	Grab	6	CL	13.8%	88.2%	11.0	31.0	20.0	3.00E-04	-
TP-210	Grab	13	CL	-	-	11.0	30.0	19.0	--	-
TP-210	Grab	15	CL	-	-	-	-	-	1.79E-04	90.1
TP-211	Grab	6	--	13.9%	86.6%	--	--	--	-	-
TP-211	Grab	10	--	9.9%	26.4%	11.0	30.0	19.0	--	-
TP-112	Grab	12	Rock (interpretted Rhyolite)	--	--	--	--	--	3.00E-04	146

Notes:

[1] Sample 'Grab' from test pit exploration.

[2] Field classification via ASTM D-2488.

[3] Moisture testing conformed with ASTM-D2216 specifications.

[4] Sieve testing conformed with ASTM-D422 specifications.

[5] Atterberg testing conformed with ASTM-D4318 specifications.

[6] Permeability and density testing performed by Xcell Engineering, Inc. (see results in Appendix B).

Table 3. Model Setup, Layers, and Simulations

Alternative Liner and No Migration Demonstration Report for EIRSWD Regional MSW Landfill

Simulation	Simulation Type	Layer(s)	Layer Type	Thickness	Porosity	Permeability (cm/sec)	Dry Density (lb/ft^3)	Hydrodynamic Dispersion (cm^2/s)	Distribution Coefficient (m^3/kg)	Source VOC Conc. (ug/L)	Run Time (years)
Prescribed Liner Setup and Layers											
#1	Prescribed Liner	Geomembrane (HDPE)	Liner, Primary Membrane	60 mil	1	$1x10^{-9}$	59	$2x10^{-8}$	0	26,000	200
		Clay, Recompacted	Liner, Recompacted Soil	2 ft	0.4	$1x10^{-7}$	98	$6x10^{-6}$	0	-	-
		Rhyolite Rock, Competent	Attenuation Layer #1, Vadoze Zone	187	0.12	0.00035	135	$6x10^{-6}$	0	-	-
		Rhyolite Rock, Fractured	Attenuation Layer #2, Vadoze Zone	273	0.4	0.0035	98	$6x10^{-6}$	0	-	-
		Rhyolite Rock, Competent	Attenuation Layer #3, Vadoze Zone	10	0.12	0.00035	135	$6x10^{-6}$	0	-	-
		Rhyolite Rock, Fractured	Attenuation Layer #4, Vadoze Zone	10	0.4	0.0035	98	$6x10^{-6}$	0	-	-
		Rhyolite Rock, Competent	Attenuation Layer #5, Vadoze Zone	150	0.12	0.00035	135	$6x10^{-6}$	0	-	-
		Rhyolite Rock, Fractured, Saturated	*Uppermost Groundwater (see notes)*	10 ft	0.4	0.0035	NA	NA	NA	-	-
Proposed Alternative Liner Setup and Layers											
#2	Alternative Liner	Geomembrane (HDPE)	Liner, Primary Membrane	60 mil	1	$1x10^{-9}$	59	$2x10^{-8}$	0	26,000	200
		Geosynthecit Clay Liner (GCL)	Liner, Clay Sandwhiched with Woven Fabric	10 mm	0.4	$5x10^{-9}$	98	$6x10^{-6}$	0	-	-
		Rhyolite Rock, Competent	Attenuation Layer #1, Vadoze Zone	187	0.12	0.00035	135	$6x10^{-6}$	0	-	-
		Rhyolite Rock, Fractured	Attenuation Layer #2, Vadoze Zone	273	0.4	0.0035	98	$6x10^{-6}$	0	-	-
		Rhyolite Rock, Competent	Attenuation Layer #3, Vadoze Zone	10	0.12	0.00035	135	$6x10^{-6}$	0	-	-
		Rhyolite Rock, Fractured	Attenuation Layer #4, Vadoze Zone	10	0.4	0.0035	98	$6x10^{-6}$	0	-	-
		Rhyolite Rock, Competent	Attenuation Layer #5, Vadoze Zone	150	0.12	0.00035	135	$6x10^{-6}$	0	-	-
		Rhyolite Rock, Fractured, Saturated	*Uppermost Groundwater (see notes)*	10 ft	0.4	0.0035	NA	NA	NA	-	-

Notes:

Attenuation layers assume most conservative conditions from boring DB-3 which represented approximately 40% fractured versus competent rhyolite as described in Section 3.

The depth of unsaturated subsurface conditions beneath the landfill assumes a modelled profile of 630 ft assuming that excavations of up to 70 ft to construct the liner, and DB-2 and 3 did not contact uppermost groundwater to 700 ft bgs.

Table 4. Summary of Model Results

Alternative Liner and No Migration Demonstration Report for EIRSWD Regional MSW Landfill

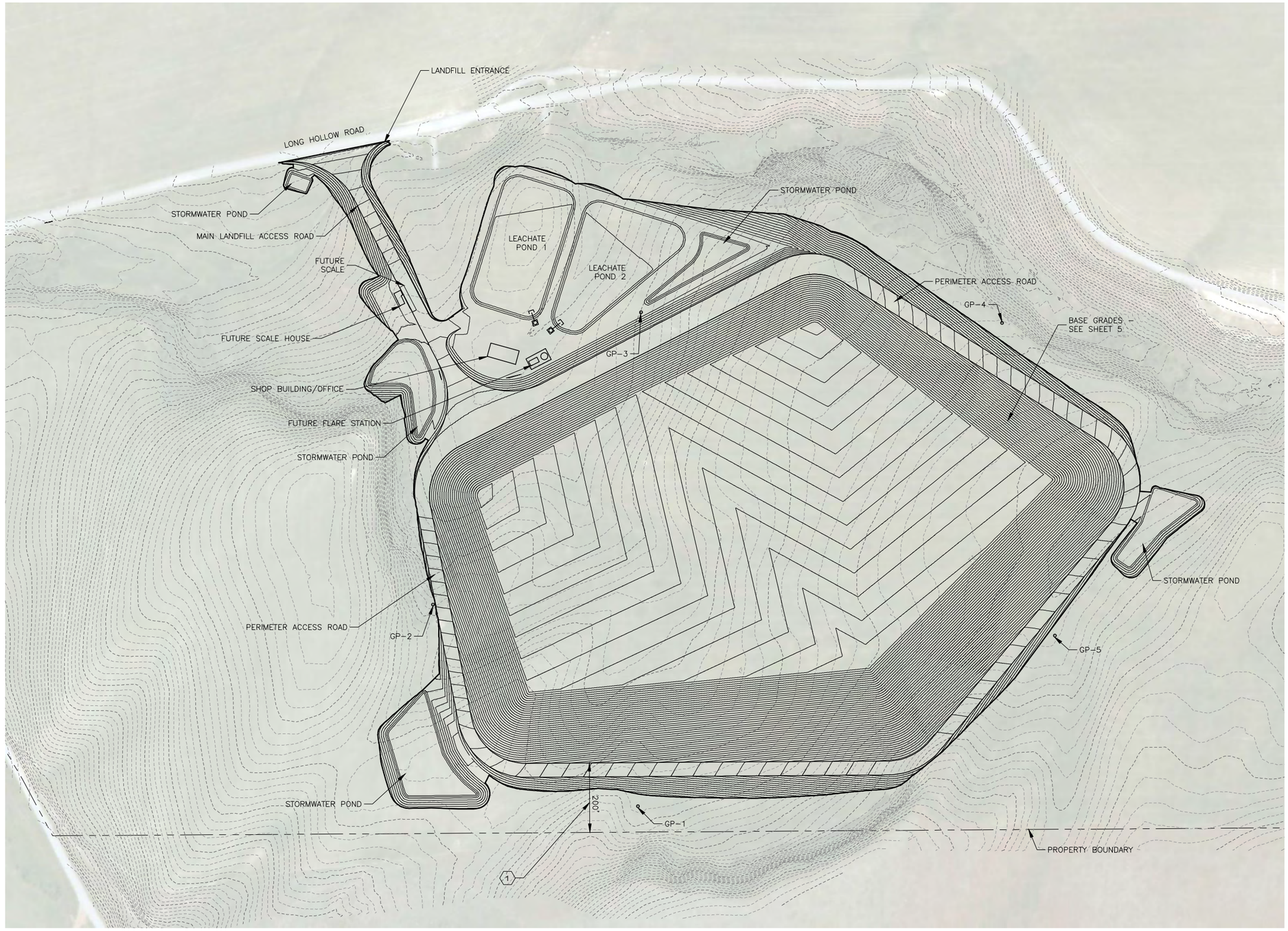
Simulation	Simulation Type	Model Output (*where to find in the report*)	Run Time (Years)	Source Concentration (ug/L)	Porosity	Predicted Depth Range (ft bgs)	Predicted Concentration at Specified Depth
Comparative Analysis Simulations #1 and #2							
#1	Prescriptive Liner	Appendix C.1	200	26,000	Per Table 3	36-41	0.13 ug/L at 41 ft
#2	Alternative Liner	Appendix C.2	200	26,000	Per Table 3	34-39	0.30 ug/L at 39 ft
Sensitivity Runs for Alternative Liner System, adjusting the Source Input and Run Time							
#3	Alternative Liner	Appendix D.1	200	52,000	Per Table 3	39-44	0.04 ug/L at 44 ft
#4	Alternative Liner	Appendix D.2	500	26,000	Per Table 3	59-64	0.18 ug/L at 64 ft
#5	Alternative Liner	Appendix D.3	500	52,000	Per Table 3	59-64	0.36 ug/L at 64 ft
#6	Alternative Liner	Appendix D.4	500	26,000	0.10	59-64	0.18 ug/L at 64 ft

Notes:

Predicted Depth Range is the depth below the landfill bottom where the concentration falls below 0.5 ug/L.

Figures

FIGURE 1
Site Vicinity and Project Location Map



SHEET NOTES:

1. REFER TO SHEET 3 FOR SUBSURFACE EXPLORATION LOACATIONS

KEYED NOTES:

1. MINIMUM OFFSET FROM EDGE OF WASTE TO PROPERTY LINE

LEGEND

⊙	GAS PROBE (GP)
— — —	PROPERTY BOUNDARY
———	PROJECT GRADING BOUNDARY

NORTH

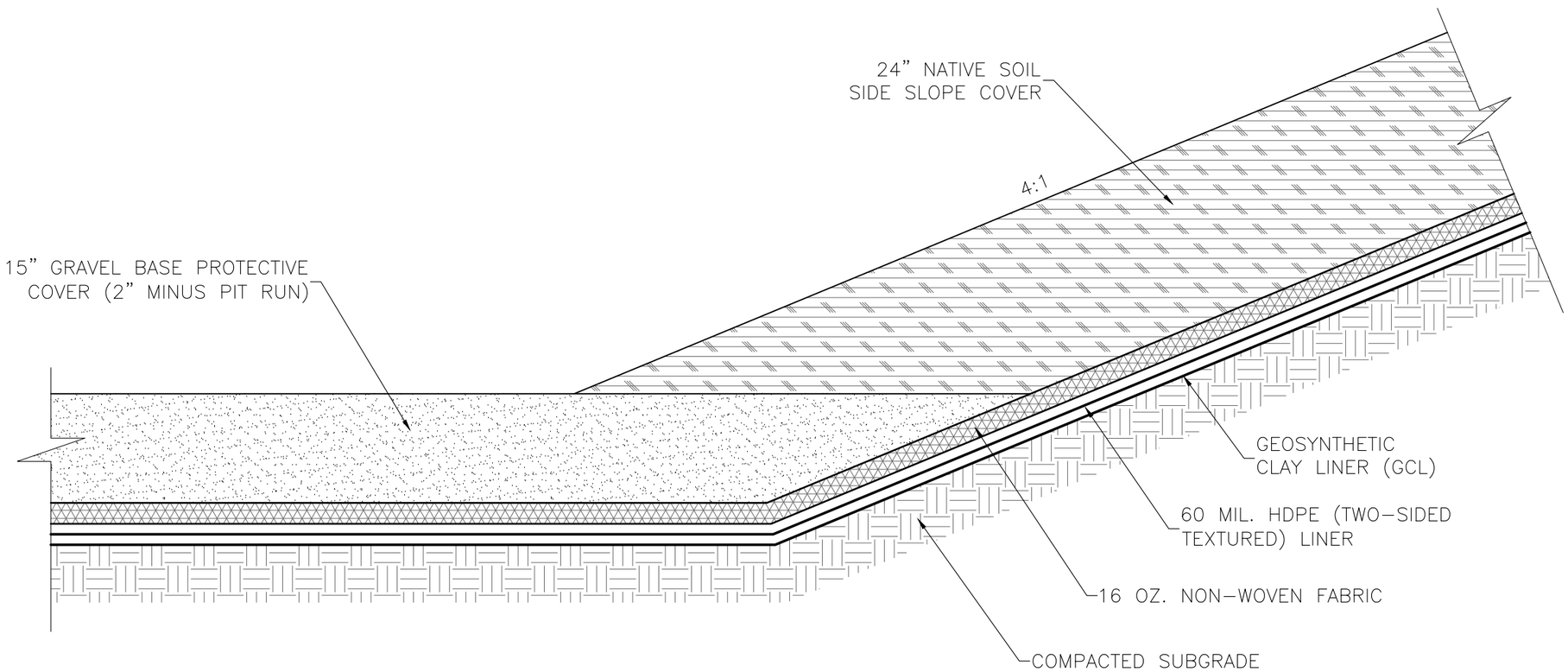
0 150 300
SCALE IN FEET

GreatWest ENGINEERING

FIGURE 2
Overall Site Development Plan

EASTERN IDAHO REGIONAL SOLID WASTE DISTRICT
REGIONAL LANDFILL MASTER PLAN

Y:\Shared\Boise Projects\4-20133-E Idaho SW District Landfill Design And Engineering Support\CADD 4-20133\Exhibits\4-20133-Overall Site Development Plan Figure 2.dwg



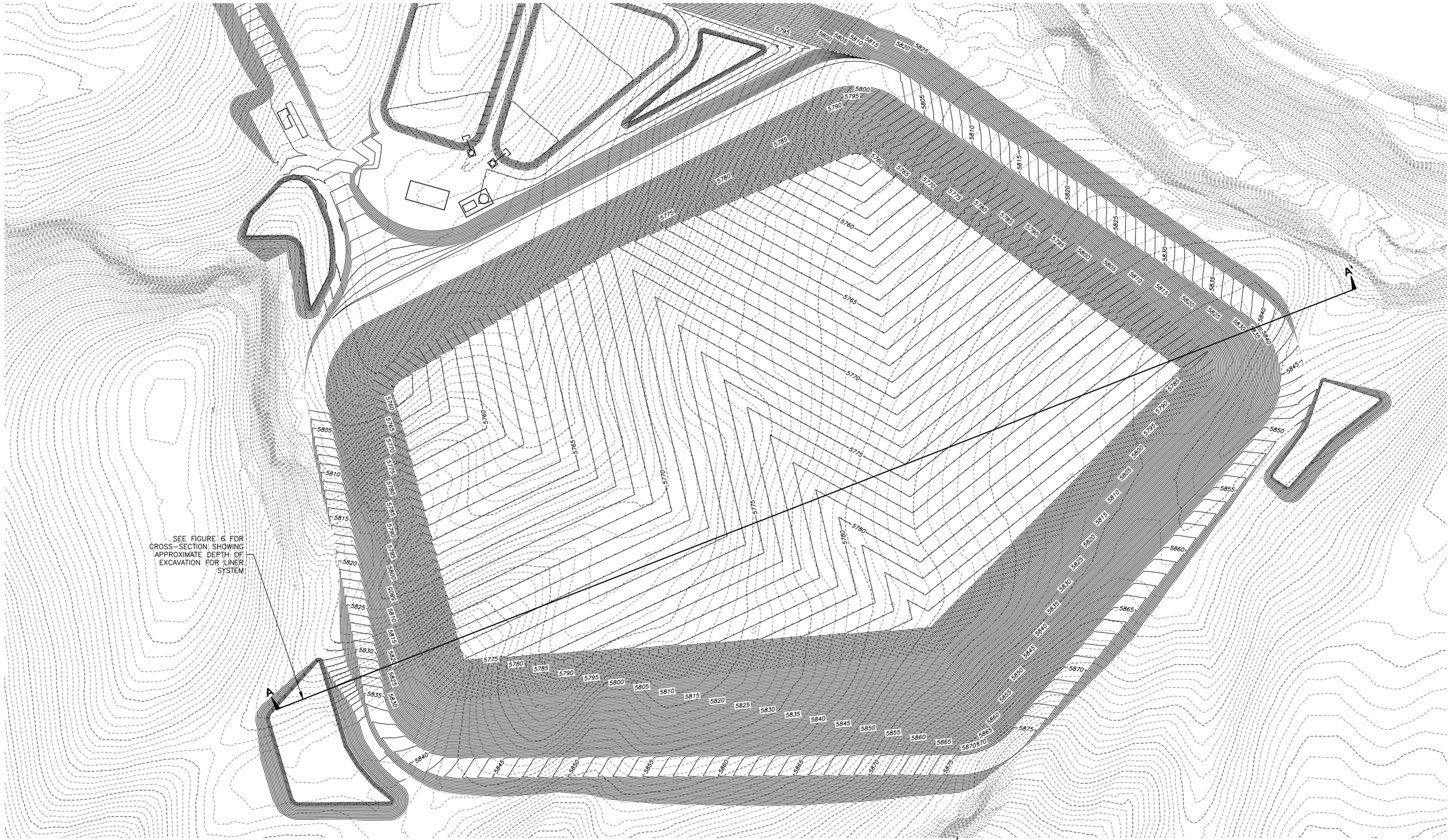
PROPOSED ALTERNATIVE LINER DESIGN

GreatWest ENGINEERING

FIGURE 3

EASTERN IDAHO REGIONAL SOLID WASTE DISTRICT
REGIONAL LANDFILL

Y:\shared\Boise Projects\4-20133-E Idaho SW District Landfill Design And Engineering Support\CADD 4-20133\Exhibits\No Migration Tech Memo Figures\4-20133 TM Figure 3.dwg



EXCAVATION PLAN AND CROSS-SECTION LINE

0 100 200
SCALE IN FEET

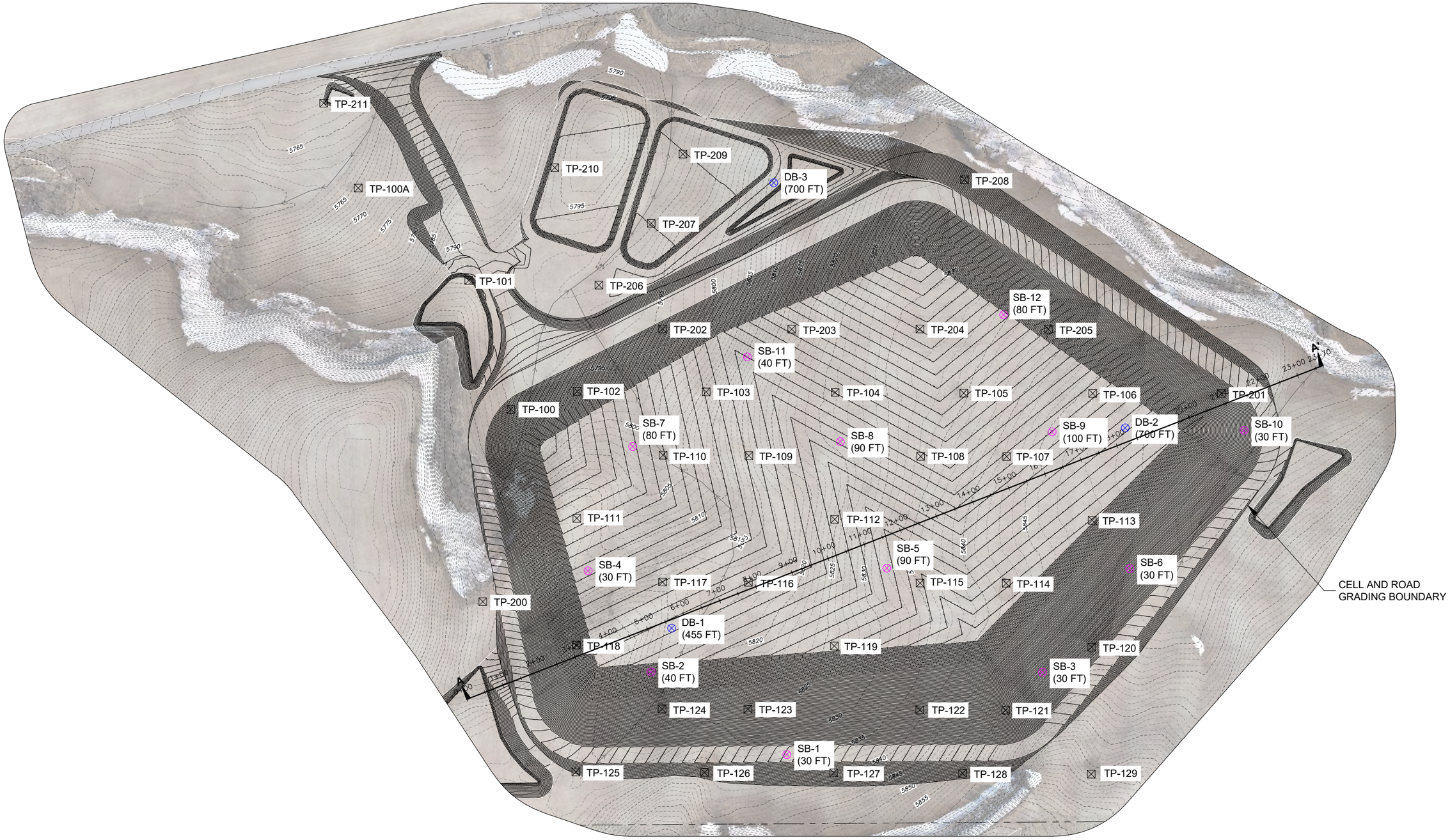
NORTH

GreatWest ENGINEERING

FIGURE 4

EASTERN IDAHO REGIONAL SOLID WASTE DISTRICT
REGIONAL LANDFILL

Y:\Shared\Boise Projects\4-20133-E Idaho SW District Landfill Design And Engineering Support\CADD 4-20133\Exhibits\No Migration Tech Memo Figures\4-20133 TM Figure 4.dwg



LEGEND

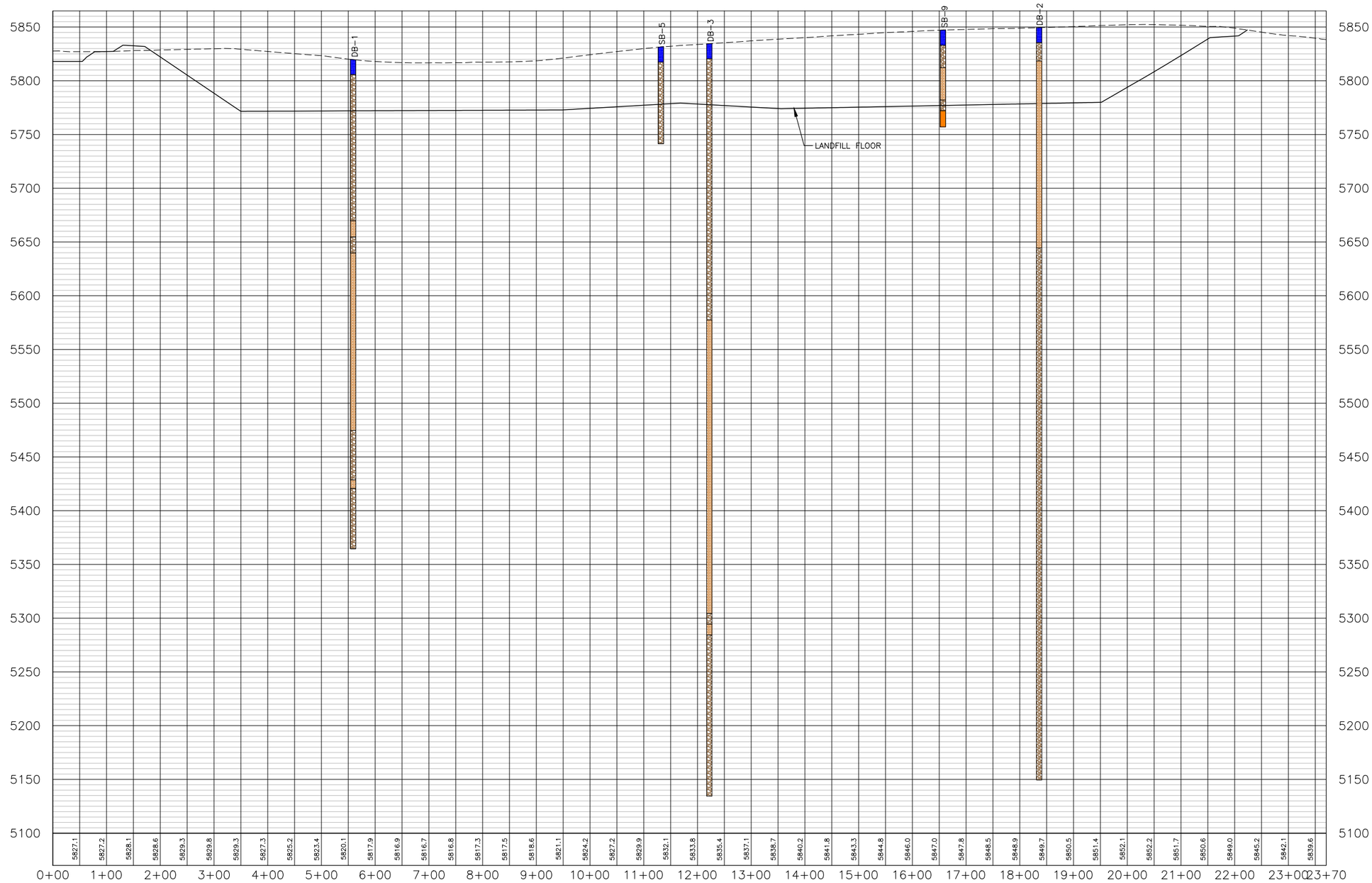
- ⊠ TEST PITS (42)
- ⊗ SHALLOW BORINGS (12)
- ⊗ DEEP BORINGS (3)

FIGURE 5
Field Investigation Locations and Cross Section Line

EASTERN IDAHO REGIONAL SOLID WASTE DISTRICT
REGIONAL LANDFILL

GreatWest ENGINEERING

Y:\shared\Boise Projects\4-20133-E Idaho SW District Landfill Design And Engineering Support\cadd 4-20133\Exhibits\4-20133 Boring Cross Section Figure 5.dwg



SECTION A-A'

HORIZONTAL SCALE: 1" = 200'
VERTICAL SCALE: 1" = 100'

GEOLOGY KEY

- SILT, SOIL HORIZON
- RHYOLITE ROCK, COMPETENT, FRESH
- RHYOLITE ROCK, FRACTURED
- RHYOLITE ROCK, FRACTURED WITH SAND INTERBEDS AND PUMICE

HYDROGEOLOGIC CROSS-SECTION A-A'

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FIGURE 6

EASTERN IDAHO REGIONAL SOLID WASTE DISTRICT
REGIONAL LANDFILL

\\egnytedrive\greatwesteng\Shared\boise projects\4-20133-E Idaho SW District Landfill Design And Engineering Support\CADD 4-20133\Exhibits\No Migration Tech Memo Figures\4-20133 TM Figure 6.dwg

Appendix A

Specification Data for Proposed Alternative Liner System (HDPE and GCL)

A.1 HDPE Specification Sheet

GEOSYNTHETICS

agru
The Plastics Experts.

MicroSpike® Liner

HIGH DENSITY POLYETHYLENE

AGRU America's structured geomembranes are manufac-tured on state-of-the-art manu-facturing equipment using the flat die calender manufac-turing process, a method that produces the most consistent texturing across the roll along with a more consistent core thickness than other processes, such as the blown film extru-sion process. AGRU uses only the highest-grade HDPE and LLDPE resins manufactured in North America.

PRODUCT DATA

Property	Test Method	Frequency	Minimum Average Values
Thickness (nominal), mil (mm)	ASTM D5994	Per Roll	60 (1.5)
Thickness (min avg), mil (mm)			57 (1.43)
Thickness (min 8 of 10), mil (mm)			54 (1.35)
Thickness (lowest individual), mil (mm)			51 (1.28)
Asperity Height mils, (mm)	ASTM D7466	2nd Roll	24 (0.61)
Density, g/cc, minimum	ASTM D792, Method B	200,000 lb	0.94
Tensile Properties (both directions)	ASTM D6693, Type IV	20,000 lb	
Strength @ Yield, lb/in width (N/mm)	2 in/minute		132 (23.1)
Elongation @ Yield, % (GL=1.3in)			13
Strength @ Break, lb/in width (N/mm)			132 (23.1)
Elongation @ Break, % (GL=2.0in)			350
Tear Resistance, lb,s. (N)	ASTM D1004	45,000 lb	45 (200)
Puncture Resistance, lbs. (N)	ASTM D4833	45,000 lb	120 (534)
Carbon Black Content, % (range)	ASTM D4218	20,000 lb	2-3
Carbon Black Dispersion (Category)	ASTM D5596	45,000 lb	Only near spherical agglomerates: 10 views in Cat. 1 or 2
Stress Crack Resistance (SP-NCTL), hrs.	ASTM D5397 Appendix	200,000 lb	500
Oxidative Induction Time, minutes	ASTM D3895, 200°C, 1 atm O_2	200,000 lb	≥140

AGRU America's geomembranes are certified to pass Low Temp. Brittleness via ASTM D746 (-80°C), Dimensional Stability via ASTM D1204 (±2% @ 100°C). Oven Aging and UV Resistance are tested per GRI GM 13. These product specifications meet or exceed GRI's GM13.

SUPPLY INFORMATION (STANDARD ROLL DIMENSIONS)

THICKNESS		WIDTH		LENGTH			AREA (APPROX.)	
mil	mm	ft	m		ft	m	ft²	m²
60	1.5	23	7	Double-Sided	540	165	12,420	1,154
				~~Single-Sided~~	~~560~~	~~171~~	~~12,880~~	~~1,197~~

Note:

Average roll weight is 3,900 lbs (1,770 kg). All rolls are supplied with two slings. Rolls are wound on a 6" core. Special length available upon request. Roll length and width have a tolerance of ±1%. The weight and length values may change due to project specifications (i.e. average or absolute minimum thickness) or shipping requirements (i.e. international containerized shipments). All information, recommendations and suggestions appearing in this literature concerning the use of our products are based upon tests and data believed to be reliable; however, it is the users responsibility to determine the suitability for their own use of the products described herein. Since the actual use by others is beyond our control, no guarantee or warranty of any kind, expressed or implied, is made by AGRU America as to the effects of such use or the results to be obtained, nor does AGRU America assume any liability in connection herewith. Any statement made herein may not be absolutely complete since additional information may be necessary or desirable when particular or exceptional conditions or circumstances exist or because of applicable laws or government regulations. Nothing herein is to be construed as permission or as a recommendation to infringe any patent.

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Revision Date: June 19, 2018

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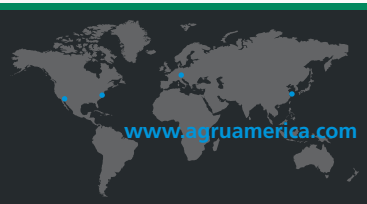


A.2 GCL Specification Sheet

TECHNICAL REFERENCE

BENTOMAT® ST CERTIFIED PROPERTIES

CETCO® Bentomat® ST is a reinforced geosynthetic clay liner (GCL) consisting of a layer of sodium bentonite between a polypropylene woven geotextile and a polypropylene nonwoven geotextile, which are needle-punched together.

MATERIAL PROPERTY	TEST METHOD	TEST FREQUENCY	CERTIFIED VALUES
Woven Base Geotextile Mass/Area[1]	ASTM D5261	200,000 ft² (20,000 m²)	3.2 oz/yd² (108 g/m²) min.
Nonwoven Cap Geotextile Mass/Area[1]	ASTM D5261	200,000 ft² (20,000 m²)	5.9 oz/yd² (200 g/m²) min.
Bentonite Moisture Content[2]	ASTM D2216	1 per 50 tonnes	12% max.
Bentonite Swell Index[2]	ASTM D5890	1 per 50 tonnes	24 mL/2g min.
Bentonite Fluid Loss[2]	ASTM D5891	1 per 50 tonnes	18 mL max.
Bentonite Mass/Area[3]	ASTM D5993	40,000 ft² (4,000 m²)	0.75 lb/ft² (3.7 kg/m²) min.
Total Mass/Area[3]	ASTM D5993	40,000 ft² (4,000 m²)	0.81 lb/ft² (4.0 kg/m²) min.
GCL Moisture Content	ASTM D5993	40,000 ft² (4,000 m²)	35% max.
GCL Grab Strength[4]	ASTM D6768	200,000 ft² (20,000 m²)	30 lbs/in (5.3 kN/m) min.
GCL Peel Strength	ASTM D6496	40,000 ft² (4,000 m²)	3.5 lbs/in (610 N/m) min.
GCL Hydraulic Conductivity[5]	ASTM D5887	250,000 ft² (25,000 m²)	5×10^{-11} m/s max.
GCL Index Flux[5]	ASTM D5887	250,000 ft² (25,000 m²)	1×10^{-8} m³/m²/s max.
GCL Hydrated Internal Shear Strength[6]	ASTM D6243	1,000,000 ft² (100,000 m²)	500 psf (24 kPa) typ.@ 200 psf (9.6 kPa)

Notes:

[1] Geotextile property tests performed on the geotextile components before they are incorporated into the finished GCL product.

[2] Bentonite property tests performed before the bentonite is incorporated into the finished GCL product.

[3] Reported at 0 percent moisture content.

[4] All tensile strength testing is performed in the machine direction using ASTM D6768.

[5] Index flux and hydraulic conductivity testing with deaired distilled/deionized water at 80 psi (550 kPa) cell pressure. 77 psi (530 kPa) headwater pressure and 75 psi (515 kPa) tailwater pressure.

[6] Peak values measured at 200 psf (9.6 kPa) normal stress for a specimen hydrated for 48 hours. Site-specific materials, GCL products, and test conditions must be used to verify internal and interface strength of the proposed design.

www.CETCO.com | contact@cetco.com

IMPORTANT: The information contained herein supersedes all previous printed versions, and is believed to be accurate and reliable. For the most up-to-date information, please contact CETCO sales team. CETCO accepts no responsibility for the results obtained through application of this product. CETCO reserves the right to update information without notice.

MINERALS TECHNOLOGIES CETCO®

Appendix B

Supporting Hydrogeologic Data

B.1-1 Topographic Map of Study Area

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

WHITE OWL BUTTE QUADRANGLE
IDAHO-MADISON CO.
7.5-MINUTE SERIES (TOPOGRAPHIC)

Bitters Butte
Canyon Creek Butte
Long Hollow
Elbow of Moody Creek
Moody Creek
Long Hollow
Dry Canyon
White Owl Butte
BM 6149
BM 6293
BM 6069
BM 5845
BM 5695
BM 5565
BM 5635
BM 5911
BM 5930
BM 5746
BM 5930
BM 6105
BM 6105
BM 5930
BM 5930
BM 5930

B.1-2 Climate and Estimated Recharge

Appendix B.1-2 Average Monthly Climate and Estimated Annual Recharge

Hydrogeologic Report for the Eastern Idaho Regional Solid Waste District Landfill

Month	Avg. Temp F (high)	Avg. Temp F (low)	Rainfall[1]	Snowfall[1]	Average Snow Density[2]	Effective Snow Moisture	Total Precipitation[3]	Precipitation minus Runoff[4]	Monthly ET[5]	Estimated Monthly Recharge/ Infiltration[6] [PRECIP-RO-ET]
January	28	11	0.4	6.1	31%	1.9	2.29	0.34	0.45	1.50
February	34	16	0.5	4.1	32%	1.3	1.81	0.27	0.92	0.62
March	46	25	0.7	1.9	36%	0.7	1.38	0.21	2.47	0.00
April	57	32	1.1	0.8	41%	0.0	1.10	0.17	4.24	0.00
May	67	39	1.7	0.0	--	0.0	1.70	0.26	6.38	0.00
June	77	46	1.2	0.0	--	0.0	1.20	0.18	7.42	0.00
July	86	51	0.6	0.0	--	0.0	0.60	0.09	8.52	0.00
August	85	49	0.7	0.0	--	0.0	0.70	0.11	7.99	0.00
September	74	41	0.9	0.0	--	0.0	0.90	0.14	5.26	0.00
October	60	31	1.00	0.3	35%	0.11	1.11	0.17	2.97	0.00
November	42	22	0.9	3.0	20%	0.60	1.50	0.23	1.05	0.23
December	29	12	0.6	6.4	28%	1.79	2.39	0.36	0.44	1.59
Totals:			**10.3**	**22.6**			**16.7**	**2.5**	**48.1**	**3.9**

Notes:

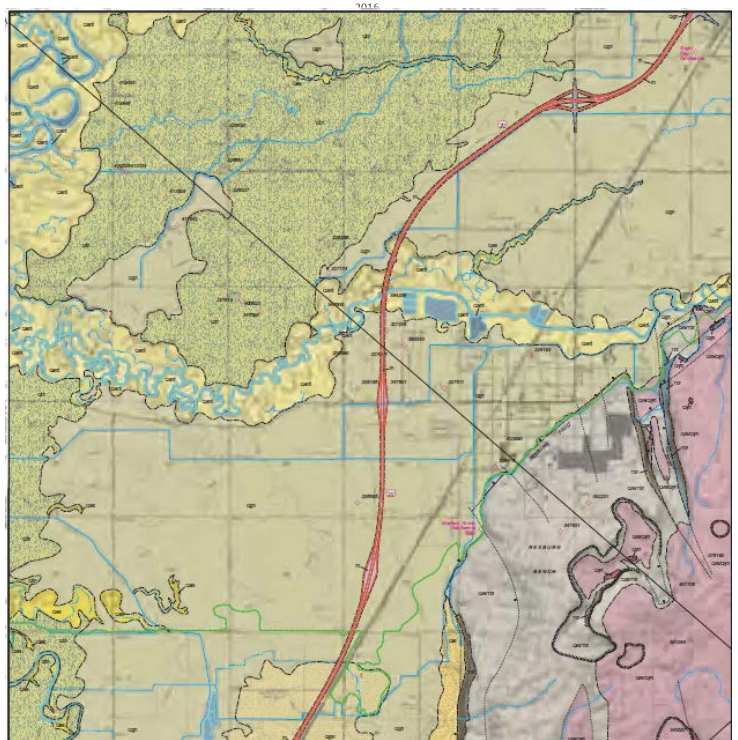
1. Mean monthly rainfall and snowfall values obtained from the Rexburg-Madison County Weather Station (Station KRXE), Period of Record from January 1980 to December 2016
2. Average monthly snow densities obtained from the Snow Density Interactive Map, USDA Natural Resources Conservation Service National Water and Climate Center. Median data from 1991 - 2020, from the Packsaddle Spring and Pine Creek Pass observatories.
3. Monthly precipitation is the combination of monthly rainfall and monthly snow water equivalent (snowfall divided by density).
4. A runoff coefficient of 0.15 was used to adjust for potential runoff to match site topography/conditions.
5. Monthly average pan evapotranspiration rates (ET) obtained from the US Bureau of Reclamation's AgriMet program for the Rexburg Station (RXGI). Period of record was 1987 - 2010.
6. Estimated monthly recharge based on the formula: Recharge = PRECIP minus RO minus ET [inches of water]
7. General - all values are in inches.

B.1-3 Geologic Map of Study Area

Geologic Map of the Rexburg Quadrangle, Madison County, Idaho

William M. Phillips[1], Glenn F. Embree[2], and John A. Welhan[3]

2014



Base Map Credit

Base map scanned from USGS film positive, 1949.

Shaded elevation from 10 m DEM, vertically exaggerated 2x.

Culture and drainage by multiplex methods from aerial photographs taken 1946. Topography by plane-table methods 1949. Photorevised 1979.

Man-made ground is engineered fill along US Highway 20.

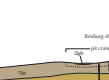
Elevation data: 10 meter DEM (Gesch, D., Oimoen, M., Evans, G., Stuck, M., and Tyler, D., 2002. The National Elevation Dataset. Photogrammetric Engineering and Remote Sensing, v. 68, no. 5, p. 5-11. Data available at: http://ned.usgs.gov/ndep.html (accessed 21 July 2015); Idaho LiDAR Consortium, 2009. Rexburg-Teton 2009 LiDAR: Idaho Geospatial Framework PY07 150 (accessed 21 July, 2015). Inside Idaho, 2011. National Agricultural Imagery Program (NAIP) digital orthoimagery 1meter, Madison County, Idaho. Data collected June and June-July. Available at: www.insideidaho.org (accessed 21 July 2015).

Projection: Idaho coordinate system, central zone (Transverse Mercator). 1927 North American Datum.

10,000-foot grid ticks based on Idaho coordinate system, central zone.

1000-meter Universal Transverse Mercator grid ticks, zone 11.

Declination from NOAA National Geophysical Data Center.



ADJOINING QUADRANGLES

[1]Idaho Geological Survey, University of Idaho, Moscow, Idaho
[2]Department of Geology, Brigham Young University-Idaho, Rexburg, Idaho
[3]Idaho Geological Survey, Idaho State University, Pocatello, Idaho

Field work conducted 2008.

This geologic map was funded in part by the U.S. Geological Survey National Cooperative Geologic Mapping Program, USGS award no. 08HQAG0079.

Digital cartography by Loudon R. Stanford and Jon S. Homel at the Idaho Geological Survey's Digital Mapping Lab.

Technical review status: Authors only.

Map version 4-7-2016.

PDF (Acrobat Reader) map may be viewed online at www.idahogeology.org.

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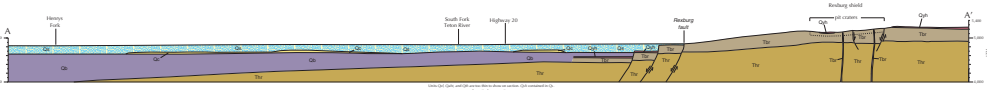
A
Henrys Fork
South Fork Teton River
Highway 20
Rexburg Bench
A'
Rexburg shield
Qsh
pit craters
Qyh
Qbf
Qb
Qfr
Qal
Qc
Qs
Tbr
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Tb

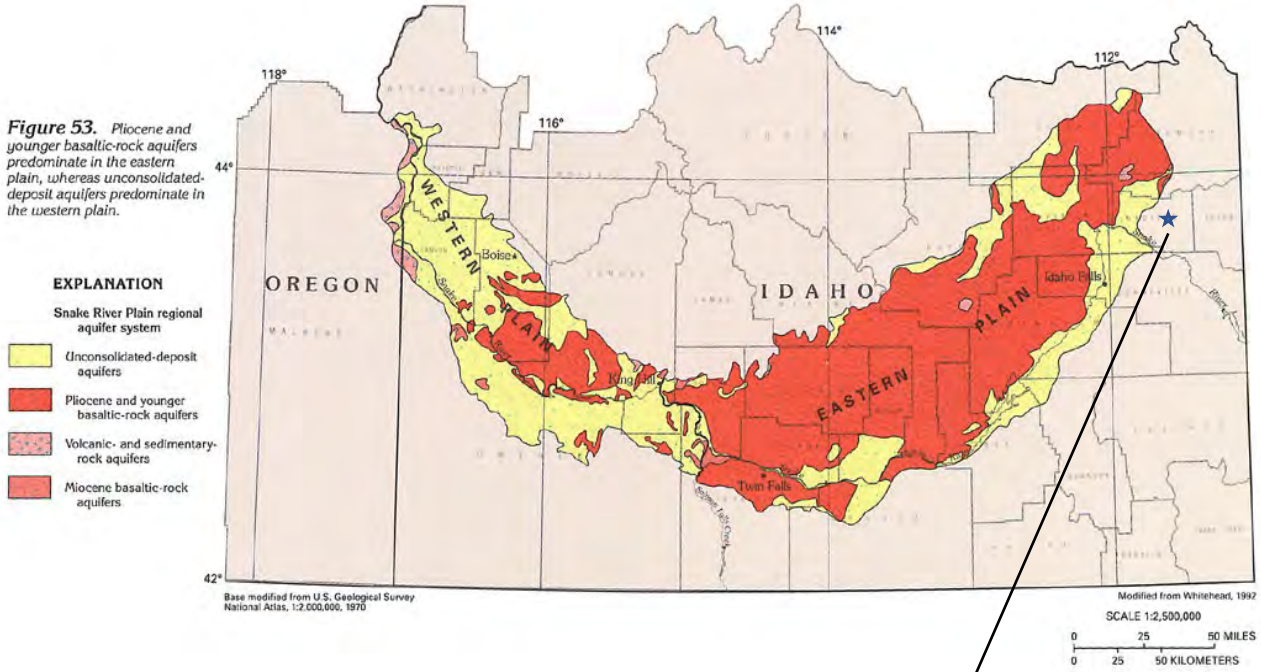
B.1-4 Map of Snake River Plain Aquifer Boundary

Base modified from U.S. Geological Survey digital data, 1:2,000,000, 1972

Modified from Whitehead, 1992

Figure 52. *The Snake River Plain regional aquifer system underlies a large, crescent-shaped lowland in southern Idaho and a small part of east-central Oregon.*

Figure 53. *Pliocene and younger basaltic-rock aquifers predominate in the eastern plain, whereas unconsolidated-deposit aquifers predominate in the western plain.*



Base modified from U.S. Geological Survey National Atlas, 1:2,000,000, 1970

Modified from Whitehead, 1992

Approximate location of Newdale Site Study Area.

B.1-5 Soils Map and Wetland Inventory Map

United States Department of Agriculture

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 Madison County Area, Idaho

April 5, 2022

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

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

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

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

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

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

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

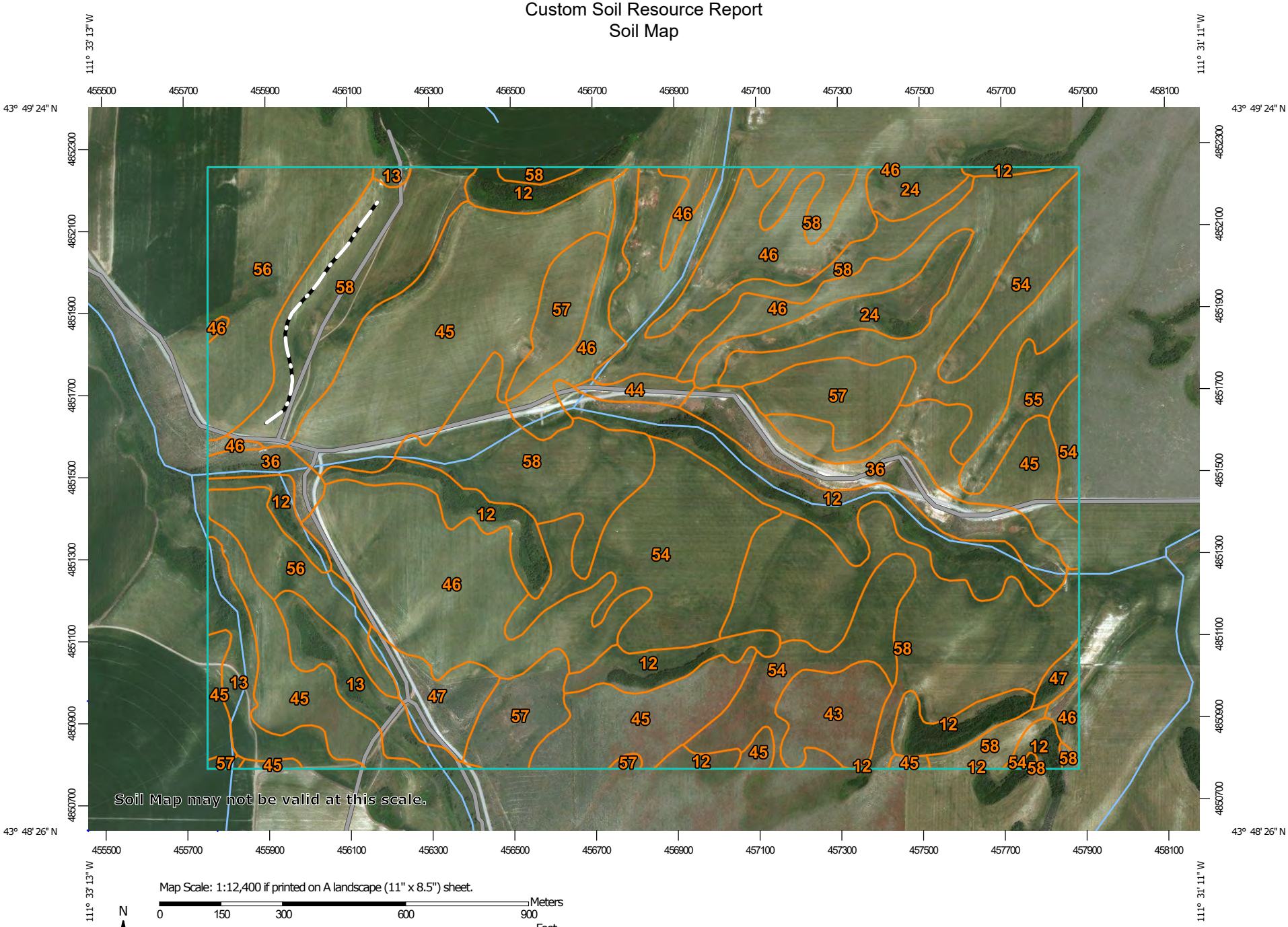
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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

Soil Map

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

Custom Soil Resource Report
Soil Map



Map Scale: 1:12,400 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 150 300 600 900

Feet: 0 500 1000 2000 3000

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: Madison County Area, Idaho
Survey Area Data: Version 16, Sep 9, 2021

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

Date(s) aerial images were photographed: Sep 24, 2011—Oct 25, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
12	Greys silt loam, 12 to 20 percent slopes	71.3	9.2%
13	Greys silt loam, 20 to 30 percent slopes	26.5	3.4%
24	Lantonia silt loam, 4 to 12 percent slopes	19.7	2.5%
36	Rammel-Rock outcrop complex, 8 to 20 percent slopes	27.3	3.5%
43	Ririe silt loam, 0 to 4 percent slopes	13.3	1.7%
44	Ririe silt loam, 4 to 8 percent slopes	3.7	0.5%
45	Ririe silt loam, 8 to 12 percent slopes	123.8	15.9%
46	Ririe silt loam, 12 to 20 percent slopes	140.1	18.0%
47	Ririe silt loam, 20 to 30 percent slopes	13.2	1.7%
54	Tetonia silt loam, 0 to 4 percent slopes	76.8	9.9%
55	Tetonia silt loam, 4 to 8 percent slopes	9.7	1.2%
56	Tetonia silt loam, 8 to 12 percent slopes	51.0	6.6%
57	Tetonia silt loam, 12 to 20 percent slopes	36.6	4.7%
58	Tetonia-Ririe silt loams, 4 to 12 percent slopes	163.3	21.0%
Totals for Area of Interest		**776.4**	**100.0%**

Map Unit Descriptions

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

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class.

Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

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

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

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

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

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

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

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

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The

pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

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

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

Madison County Area, Idaho

12—Greys silt loam, 12 to 20 percent slopes

Map Unit Setting

National map unit symbol: 2tc5
Elevation: 5,500 to 7,000 feet
Mean annual precipitation: 16 to 22 inches
Mean annual air temperature: 36 to 39 degrees F
Frost-free period: 50 to 70 days
Farmland classification: Not prime farmland

Map Unit Composition

Greys and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Greys

Setting

Landform: Plateaus
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess

Typical profile

A - 0 to 16 inches: silt loam
E - 16 to 23 inches: silt loam
Bt1 - 23 to 58 inches: silt loam
Bt2 - 58 to 60 inches: silt loam

Properties and qualities

Slope: 12 to 20 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Available water supply, 0 to 60 inches: High (about 12.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: C
Ecological site: R013XY016ID - Moist Mountain Loam 20+ POTR, F043BP609ID - Upland Cold Woodland
Hydric soil rating: No

Minor Components

Lantonia

Percent of map unit: 5 percent
Hydric soil rating: No

Ririe

Percent of map unit: 5 percent
Hydric soil rating: No

Tetonia

Percent of map unit: 5 percent
Hydric soil rating: No

Turnerville

Percent of map unit: 5 percent
Hydric soil rating: No

13—Greys silt loam, 20 to 30 percent slopes

Map Unit Setting

National map unit symbol: 2tc6
Elevation: 5,500 to 7,000 feet
Mean annual precipitation: 16 to 22 inches
Mean annual air temperature: 36 to 39 degrees F
Frost-free period: 50 to 70 days
Farmland classification: Not prime farmland

Map Unit Composition

Greys and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Greys

Setting

Landform: Plateaus
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess

Typical profile

A - 0 to 16 inches: silt loam
E - 16 to 23 inches: silt loam
Bt1 - 23 to 58 inches: silt loam
Bt2 - 58 to 60 inches: silt loam

Properties and qualities

Slope: 20 to 30 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent

Available water supply, 0 to 60 inches: High (about 12.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R013XY016ID - Moist Mountain Loam 20+ POTR
Hydric soil rating: No

Minor Components

Rammel

Percent of map unit: 5 percent
Hydric soil rating: No

Tetonia

Percent of map unit: 5 percent
Hydric soil rating: No

Turnerville

Percent of map unit: 5 percent
Hydric soil rating: No

24—Lantonia silt loam, 4 to 12 percent slopes

Map Unit Setting

National map unit symbol: 2tcl
Elevation: 5,800 to 7,000 feet
Mean annual precipitation: 15 to 18 inches
Mean annual air temperature: 36 to 45 degrees F
Frost-free period: 40 to 90 days
Farmland classification: Not prime farmland

Map Unit Composition

Lantonia and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lantonia

Setting

Landform: Plateaus
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess

Typical profile

A - 0 to 17 inches: silt loam
Bw - 17 to 36 inches: silt loam
Bk - 36 to 60 inches: silt loam

Properties and qualities

Slope: 4 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: High (about 12.0 inches)

Interpretive groups

Land capability classification (irrigated): 6c
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: B
Ecological site: R043BY009ID - LOAMY 16-22 ARTRV/FEID
Hydric soil rating: No

Minor Components

Ard

Percent of map unit: 5 percent
Hydric soil rating: No

Greys

Percent of map unit: 5 percent
Hydric soil rating: No

Tetonia

Percent of map unit: 5 percent
Hydric soil rating: No

36—Rammel-Rock outcrop complex, 8 to 20 percent slopes

Map Unit Setting

National map unit symbol: 2td0
Elevation: 5,200 to 7,000 feet
Mean annual precipitation: 15 to 20 inches
Mean annual air temperature: 36 to 45 degrees F
Frost-free period: 50 to 90 days
Farmland classification: Not prime farmland

Map Unit Composition

Rammel, very stony surface, and similar soils: 50 percent
Rock outcrop: 25 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rammel, Very Stony Surface

Setting

Landform: Canyons
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty eolian deposits over bedrock derived from rhyolite

Typical profile

A - 0 to 8 inches: stony loam
Bt - 8 to 26 inches: stony loam
Bk - 26 to 31 inches: stony loam
R - 31 to 41 inches: bedrock

Properties and qualities

Slope: 8 to 20 percent
Surface area covered with cobbles, stones or boulders: 1.5 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Available water supply, 0 to 60 inches: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C
Ecological site: R013XY001ID - LOAMY 12-16
Hydric soil rating: No

Description of Rock Outcrop

Typical profile

R - 0 to 60 inches: bedrock

Properties and qualities

Slope: 8 to 20 percent
Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: Unranked

Minor Components

Swanner

Percent of map unit: 5 percent
Hydric soil rating: No

Aquolls

Percent of map unit: 5 percent
Landform: Flood plains
Hydric soil rating: Yes

Greys

Percent of map unit: 5 percent
Hydric soil rating: No

Ard

Percent of map unit: 5 percent
Hydric soil rating: No

Ririe

Percent of map unit: 5 percent
Hydric soil rating: No

43—Ririe silt loam, 0 to 4 percent slopes

Map Unit Setting

National map unit symbol: 2td8
Elevation: 4,500 to 7,000 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 39 to 46 degrees F
Frost-free period: 70 to 100 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Ririe and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ririe

Setting

Landform: Plateaus
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty alluvium and/or loess

Typical profile

Ap - 0 to 9 inches: silt loam
Bk - 9 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 35 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Sodium adsorption ratio, maximum: 15.0
Available water supply, 0 to 60 inches: High (about 12.0 inches)

Interpretive groups
Land capability classification (irrigated): 3c
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: B
Ecological site: R013XY001ID - LOAMY 12-16
Hydric soil rating: No

Minor Components

Rexburg
Percent of map unit: 5 percent
Hydric soil rating: No

Tetonia
Percent of map unit: 5 percent
Hydric soil rating: No

Pocatello variant
Percent of map unit: 5 percent
Hydric soil rating: No

44—Ririe silt loam, 4 to 8 percent slopes

Map Unit Setting
National map unit symbol: 2td9
Elevation: 4,500 to 7,000 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 39 to 46 degrees F
Frost-free period: 70 to 100 days
Farmland classification: Farmland of statewide importance, if irrigated

Map Unit Composition
Ririe and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ririe

Setting
Landform: Plateaus
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty alluvium and/or loess

Typical profile
Ap - 0 to 9 inches: silt loam
Bk - 9 to 60 inches: silt loam

Properties and qualities

Slope: 4 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 35 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 15.0
Available water supply, 0 to 60 inches: High (about 12.0 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: B
Ecological site: R013XY001ID - LOAMY 12-16
Hydric soil rating: No

Minor Components

Rexburg

Percent of map unit: 5 percent
Hydric soil rating: No

Tetonia

Percent of map unit: 5 percent
Hydric soil rating: No

Pocatello variant

Percent of map unit: 5 percent
Hydric soil rating: No

45—Ririe silt loam, 8 to 12 percent slopes

Map Unit Setting

National map unit symbol: 2tdb
Elevation: 4,500 to 7,000 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 39 to 46 degrees F
Frost-free period: 70 to 100 days
Farmland classification: Not prime farmland

Map Unit Composition

Ririe and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ririe

Setting

Landform: Plateaus
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty alluvium and/or loess

Typical profile

Ap - 0 to 9 inches: silt loam
Bk - 9 to 60 inches: silt loam

Properties and qualities

Slope: 8 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 35 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 15.0
Available water supply, 0 to 60 inches: High (about 12.0 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: R013XY001ID - LOAMY 12-16
Hydric soil rating: No

Minor Components

Rexburg

Percent of map unit: 5 percent
Hydric soil rating: No

Tetonia

Percent of map unit: 5 percent
Hydric soil rating: No

Pocatello variant

Percent of map unit: 5 percent
Hydric soil rating: No

46—Ririe silt loam, 12 to 20 percent slopes

Map Unit Setting

National map unit symbol: 2tdc

Elevation: 4,600 to 7,000 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 39 to 46 degrees F
Frost-free period: 70 to 100 days
Farmland classification: Not prime farmland

Map Unit Composition

Ririe and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ririe

Setting

Landform: Plateaus
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty alluvium and/or loess

Typical profile

Ap - 0 to 9 inches: silt loam
Bk - 9 to 60 inches: silt loam

Properties and qualities

Slope: 12 to 20 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 35 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 15.0
Available water supply, 0 to 60 inches: High (about 12.0 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R013XY001ID - LOAMY 12-16
Hydric soil rating: No

Minor Components

Ard

Percent of map unit: 5 percent
Hydric soil rating: No

Rexburg

Percent of map unit: 5 percent
Hydric soil rating: No

Tetonia

Percent of map unit: 5 percent
Hydric soil rating: No

47—Ririe silt loam, 20 to 30 percent slopes

Map Unit Setting

National map unit symbol: 2tdd
Elevation: 4,600 to 7,000 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 39 to 46 degrees F
Frost-free period: 70 to 100 days
Farmland classification: Not prime farmland

Map Unit Composition

Ririe and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ririe

Setting

Landform: Plateaus
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty alluvium and/or loess

Typical profile

Ap - 0 to 9 inches: silt loam
Bk - 9 to 60 inches: silt loam

Properties and qualities

Slope: 20 to 30 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 35 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 15.0
Available water supply, 0 to 60 inches: High (about 12.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R013XY001ID - LOAMY 12-16
Hydric soil rating: No

Minor Components

Ard

Percent of map unit: 5 percent
Hydric soil rating: No

Tetonia

Percent of map unit: 5 percent
Hydric soil rating: No

Rexburg

Percent of map unit: 5 percent
Hydric soil rating: No

54—Tetonia silt loam, 0 to 4 percent slopes

Map Unit Setting

National map unit symbol: 2tdn
Elevation: 5,500 to 7,000 feet
Mean annual precipitation: 13 to 18 inches
Mean annual air temperature: 37 to 41 degrees F
Frost-free period: 50 to 100 days
Farmland classification: Farmland of statewide importance, if irrigated

Map Unit Composition

Tetonia and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tetonia

Setting

Landform: Plateaus
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess

Typical profile

A - 0 to 10 inches: silt loam
Bw - 10 to 22 inches: silt loam
Bk - 22 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: High (about 11.2 inches)

Interpretive groups
Land capability classification (irrigated): 6c
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: B
Ecological site: R013XY001ID - LOAMY 12-16
Hydric soil rating: No

Minor Components

Greys
Percent of map unit: 5 percent
Hydric soil rating: No

Lantonia
Percent of map unit: 5 percent
Hydric soil rating: No

Ririe
Percent of map unit: 5 percent
Hydric soil rating: No

55—Tetonia silt loam, 4 to 8 percent slopes

Map Unit Setting
National map unit symbol: 2tdp
Elevation: 5,500 to 7,000 feet
Mean annual precipitation: 13 to 18 inches
Mean annual air temperature: 37 to 41 degrees F
Frost-free period: 50 to 100 days
Farmland classification: Farmland of statewide importance, if irrigated

Map Unit Composition
Tetonia and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tetonia

Setting
Landform: Plateaus
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess

Typical profile
A - 0 to 10 inches: silt loam
Bw - 10 to 22 inches: silt loam

Bk - 22 to 60 inches: silt loam

Properties and qualities

Slope: 4 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: High (about 11.2 inches)

Interpretive groups

Land capability classification (irrigated): 6c
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: B
Ecological site: R013XY001ID - LOAMY 12-16
Hydric soil rating: No

Minor Components

Ard

Percent of map unit: 5 percent
Hydric soil rating: No

Greys

Percent of map unit: 5 percent
Hydric soil rating: No

Lantonia

Percent of map unit: 5 percent
Hydric soil rating: No

Ririe

Percent of map unit: 5 percent
Hydric soil rating: No

56—Tetonia silt loam, 8 to 12 percent slopes

Map Unit Setting

National map unit symbol: 2tdq
Elevation: 5,500 to 7,000 feet
Mean annual precipitation: 13 to 18 inches
Mean annual air temperature: 37 to 41 degrees F
Frost-free period: 50 to 100 days
Farmland classification: Not prime farmland

Map Unit Composition

Tetonia and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tetonia

Setting

Landform: Plateaus
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess

Typical profile

A - 0 to 10 inches: silt loam
Bw - 10 to 22 inches: silt loam
Bk - 22 to 60 inches: silt loam

Properties and qualities

Slope: 8 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: High (about 11.2 inches)

Interpretive groups

Land capability classification (irrigated): 6c
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: B
Ecological site: R013XY001ID - LOAMY 12-16
Hydric soil rating: No

Minor Components

Ard

Percent of map unit: 5 percent
Hydric soil rating: No

Greys

Percent of map unit: 5 percent
Hydric soil rating: No

Lantonia

Percent of map unit: 5 percent
Hydric soil rating: No

57—Tetonia silt loam, 12 to 20 percent slopes

Map Unit Setting

National map unit symbol: 2tdr
Elevation: 5,500 to 7,000 feet
Mean annual precipitation: 13 to 18 inches
Mean annual air temperature: 37 to 41 degrees F
Frost-free period: 50 to 100 days
Farmland classification: Not prime farmland

Map Unit Composition

Tetonia and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tetonia

Setting

Landform: Plateaus
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess

Typical profile

A - 0 to 10 inches: silt loam
Bw - 10 to 22 inches: silt loam
Bk - 22 to 60 inches: silt loam

Properties and qualities

Slope: 12 to 20 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: High (about 11.2 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: B
Ecological site: R013XY001ID - LOAMY 12-16
Hydric soil rating: No

Minor Components

Ard

Percent of map unit: 5 percent
Hydric soil rating: No

Greys

Percent of map unit: 5 percent
Hydric soil rating: No

Lantonia

Percent of map unit: 5 percent
Hydric soil rating: No

Ririe

Percent of map unit: 5 percent
Hydric soil rating: No

58—Tetonia-Ririe silt loams, 4 to 12 percent slopes

Map Unit Setting

National map unit symbol: 2tds
Elevation: 4,600 to 7,000 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 37 to 46 degrees F
Frost-free period: 50 to 100 days
Farmland classification: Not prime farmland

Map Unit Composition

Tetonia and similar soils: 55 percent
Ririe and similar soils: 40 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tetonia

Setting

Landform: Plateaus
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess

Typical profile

A - 0 to 10 inches: silt loam
Bw - 10 to 22 inches: silt loam
Bk - 22 to 60 inches: silt loam

Properties and qualities

Slope: 4 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: High (about 11.2 inches)

Interpretive groups
Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: B
Ecological site: R013XY001ID - LOAMY 12-16
Hydric soil rating: No

Description of Ririe

Setting
Landform: Plateaus
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty alluvium and/or loess

Typical profile
Ap - 0 to 9 inches: silt loam
Bk - 9 to 60 inches: silt loam

Properties and qualities
Slope: 4 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 35 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 15.0
Available water supply, 0 to 60 inches: High (about 12.0 inches)

Interpretive groups
Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: R013XY001ID - LOAMY 12-16
Hydric soil rating: No

Minor Components

Lantonia
Percent of map unit: 3 percent
Hydric soil rating: No

Greys
Percent of map unit: 2 percent

Hydric soil rating: No

Soil Information for All Uses

Suitabilities and Limitations for Use

The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

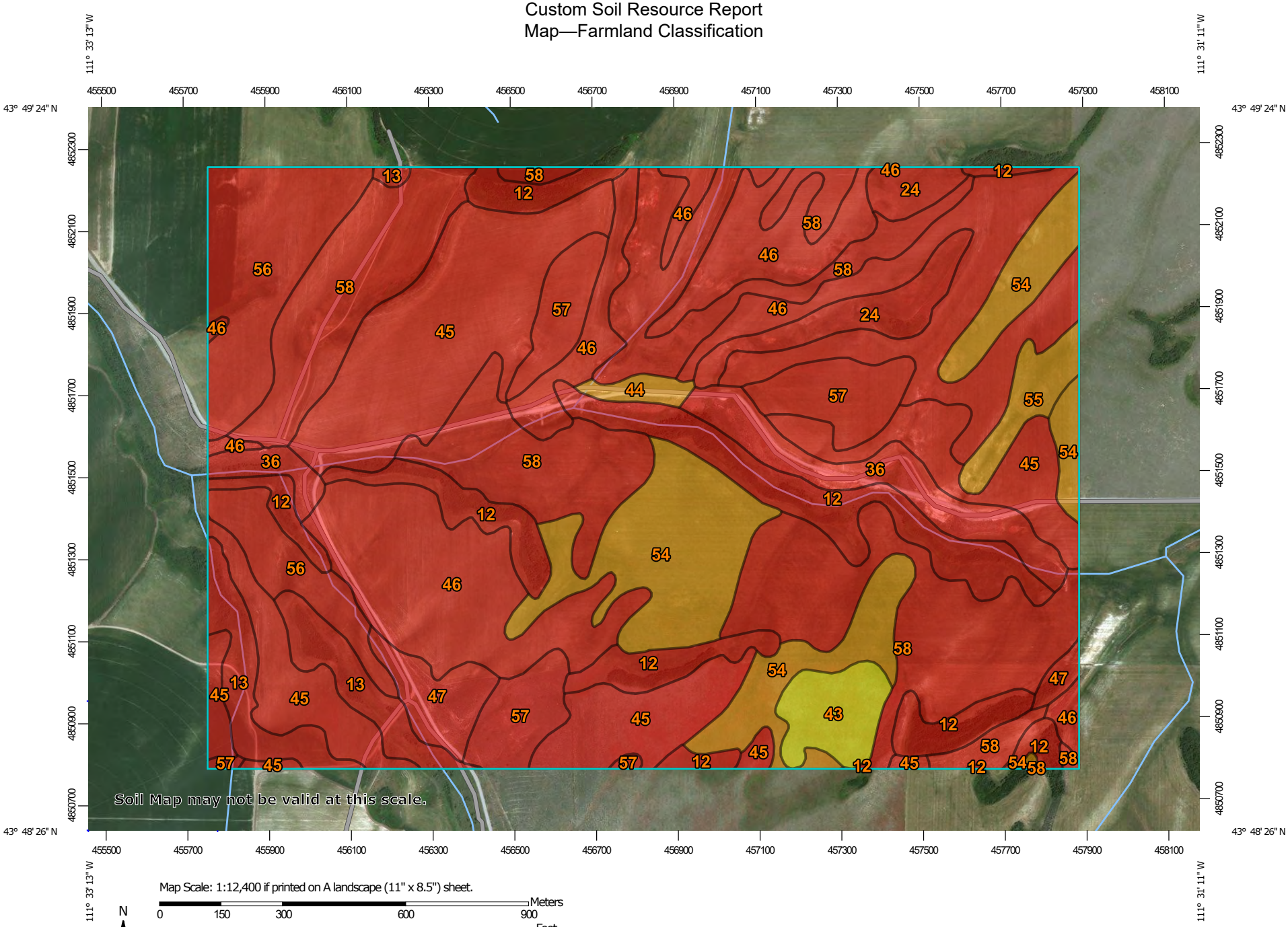
Land Classifications

Land Classifications are specified land use and management groupings that are assigned to soil areas because combinations of soil have similar behavior for specified practices. Most are based on soil properties and other factors that directly influence the specific use of the soil. Example classifications include ecological site classification, farmland classification, irrigated and nonirrigated land capability classification, and hydric rating.

Farmland Classification

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Map—Farmland Classification



Map Scale: 1:12,400 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 150 300 600 900

Feet: 0 500 1000 2000 3000

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 Rating Polygons

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of statewide importance, if drained
- Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated
- Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated and drained
- Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer
- Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough
- Farmland of statewide importance, if thawed
- Farmland of local importance
- Farmland of local importance, if irrigated
- Farmland of unique importance
- Not rated or not available

Soil Rating Lines

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of statewide importance, if drained
- Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated
- Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated and drained
- Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer
- Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough
- Farmland of statewide importance, if thawed
- Farmland of local importance
- Farmland of local importance, if irrigated
- Farmland of unique importance
- Not rated or not available

Soil Rating Points

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of statewide importance, if drained
- Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated

- Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated and drained
- Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer
- Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough
- Farmland of statewide importance, if thawed
- Farmland of local importance
- Farmland of local importance, if irrigated
- Farmland of unique importance
- Not rated or not available

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

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: Madison County Area, Idaho
Survey Area Data: Version 16, Sep 9, 2021

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

Date(s) aerial images were photographed: Sep 24, 2011—Oct 25, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
12	Greys silt loam, 12 to 20 percent slopes	Not prime farmland	71.3	9.2%
13	Greys silt loam, 20 to 30 percent slopes	Not prime farmland	26.5	3.4%
24	Lantonia silt loam, 4 to 12 percent slopes	Not prime farmland	19.7	2.5%
36	Rammel-Rock outcrop complex, 8 to 20 percent slopes	Not prime farmland	27.3	3.5%
43	Ririe silt loam, 0 to 4 percent slopes	Prime farmland if irrigated	13.3	1.7%
44	Ririe silt loam, 4 to 8 percent slopes	Farmland of statewide importance, if irrigated	3.7	0.5%
45	Ririe silt loam, 8 to 12 percent slopes	Not prime farmland	123.8	15.9%
46	Ririe silt loam, 12 to 20 percent slopes	Not prime farmland	140.1	18.0%
47	Ririe silt loam, 20 to 30 percent slopes	Not prime farmland	13.2	1.7%
54	Tetonia silt loam, 0 to 4 percent slopes	Farmland of statewide importance, if irrigated	76.8	9.9%
55	Tetonia silt loam, 4 to 8 percent slopes	Farmland of statewide importance, if irrigated	9.7	1.2%
56	Tetonia silt loam, 8 to 12 percent slopes	Not prime farmland	51.0	6.6%
57	Tetonia silt loam, 12 to 20 percent slopes	Not prime farmland	36.6	4.7%
58	Tetonia-Ririe silt loams, 4 to 12 percent slopes	Not prime farmland	163.3	21.0%
Totals for Area of Interest			**776.4**	**100.0%**

Rating Options—Farmland Classification

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Sanitary Facilities

Sanitary Facilities interpretations are tools designed to guide the user in site selection for the safe disposal of sewage and solid waste. Example interpretations include septic tank absorption fields, sewage lagoons, and sanitary landfills.

Sanitary Landfill (Area)

In an "area sanitary landfill," solid waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site. A final cover of soil material at least 2 feet thick is placed over the completed landfill. A landfill must be able to bear heavy vehicular traffic. It can result in the pollution of ground water. Ease of excavation and revegetation should be considered.

The ratings are based on the soil properties that affect trafficability and the risk of pollution. These properties include flooding, saturated hydraulic conductivity (Ksat), depth to a water table, ponding, slope, and depth to bedrock or a cemented pan. Flooding is a serious problem because it can result in pollution in areas downstream from the landfill. If Ksat is too rapid or if fractured bedrock, a fractured cemented pan, or the water table is close to the surface, the leachate can contaminate the water supply. Slope is a consideration because of the extra grading required to maintain roads in the steeper areas of the landfill. Also, leachate may flow along the surface of the soils in the steeper areas and cause difficult seepage problems.

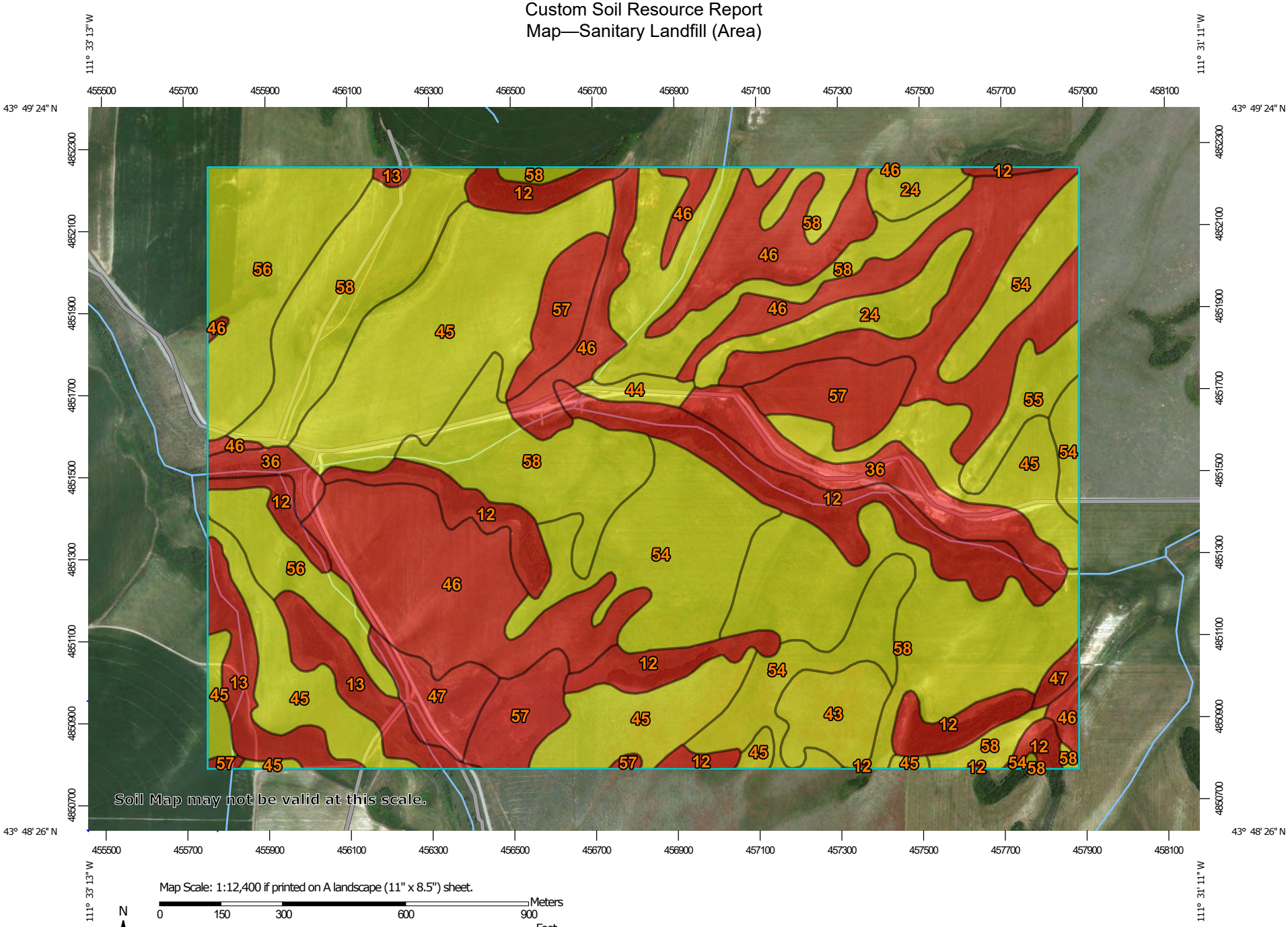
The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the specified use. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Map—Sanitary Landfill (Area)



Map Scale: 1:12,400 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 150 300 600 900

Feet: 0 500 1000 2000 3000

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 Rating Polygons

Very limited

Somewhat limited

Not limited

Not rated or not available

Soil Rating Lines

Very limited

Somewhat limited

Not limited

Not rated or not available

Soil Rating Points

Very limited

Somewhat limited

Not limited

Not rated or not available

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: Madison County Area, Idaho
Survey Area Data: Version 16, Sep 9, 2021

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

Date(s) aerial images were photographed: Sep 24, 2011—Oct 25, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Tables—Sanitary Landfill (Area)

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
12	Greys silt loam, 12 to 20 percent slopes	Very limited	Greys (80%)	Slope (1.00)	71.3	9.2%
				Dusty (0.00)		
13	Greys silt loam, 20 to 30 percent slopes	Very limited	Greys (85%)	Slope (1.00)	26.5	3.4%
				Dusty (0.00)		
24	Lantonia silt loam, 4 to 12 percent slopes	Somewhat limited	Lantonia (85%)	Dusty (0.08)	19.7	2.5%
36	Rammel-Rock outcrop complex, 8 to 20 percent slopes	Very limited	Rammel, very stony surface (50%)	Depth to bedrock (1.00)	27.3	3.5%
				Slope (0.96)		
				Dusty (0.04)		
43	Ririe silt loam, 0 to 4 percent slopes	Somewhat limited	Ririe (85%)	Dusty (0.19)	13.3	1.7%
			Pocatello variant (5%)	Dusty (0.35)		
44	Ririe silt loam, 4 to 8 percent slopes	Somewhat limited	Ririe (85%)	Dusty (0.19)	3.7	0.5%
			Pocatello variant (5%)	Dusty (0.35)		
45	Ririe silt loam, 8 to 12 percent slopes	Somewhat limited	Ririe (85%)	Dusty (0.19)	123.8	15.9%
				Slope (0.16)		
			Pocatello variant (5%)	Dusty (0.35)		
				Slope (0.16)		
46	Ririe silt loam, 12 to 20 percent slopes	Very limited	Ririe (85%)	Slope (1.00)	140.1	18.0%
				Dusty (0.19)		
47	Ririe silt loam, 20 to 30 percent slopes	Very limited	Ririe (85%)	Slope (1.00)	13.2	1.7%
				Dusty (0.19)		
54	Tetonia silt loam, 0 to 4 percent slopes	Somewhat limited	Tetonia (85%)	Dusty (0.04)	76.8	9.9%
55	Tetonia silt loam, 4 to 8 percent slopes	Somewhat limited	Tetonia (80%)	Dusty (0.04)	9.7	1.2%
56	Tetonia silt loam, 8 to 12 percent slopes	Somewhat limited	Tetonia (85%)	Slope (0.16)	51.0	6.6%
				Dusty (0.04)		
57	Tetonia silt loam, 12 to 20 percent slopes	Very limited	Tetonia (80%)	Slope (1.00)	36.6	4.7%
				Dusty (0.04)		
58	Tetonia-Ririe silt loams, 4 to 12 percent slopes	Somewhat limited	Tetonia (55%)	Dusty (0.04)	163.3	21.0%
			Ririe (40%)	Dusty (0.19)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
Totals for Area of Interest					**776.4**	**100.0%**

Rating	Acres in AOI	Percent of AOI
Somewhat limited	461.3	59.4%
Very limited	315.0	40.6%
Totals for Area of Interest	**776.4**	**100.0%**

Rating Options—Sanitary Landfill (Area)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Daily Cover for Landfill

Daily cover for landfill is the soil material that is used to cover compacted solid waste in a sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste. The ratings also apply to the final cover for a landfill. They are based on the soil properties that affect workability, the ease of digging, and the ease of moving and spreading the material over the refuse daily during wet and dry periods. These properties include soil texture, depth to a water table, ponding, rock fragments, slope, depth to bedrock or a cemented pan, reaction, and content of salts, sodium, or lime.

Loamy or silty soils that are free of large stones and excess gravel are the best cover for a landfill. Clayey soils may be sticky and difficult to spread; sandy soils are subject to wind erosion.

Slope affects the ease of excavation and of moving the cover material. Also, it can influence runoff, erosion, and reclamation of the borrow area.

The soil material used as the final cover for a landfill should be suitable for plants. It should not have excess sodium, salts, or lime and should not be too acid. After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. Some damage to the borrow area is expected, however, and plant growth may not be optimum.

This information is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil between the surface and a depth of 5 to 7

feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the ratings. Local ordinances and regulations should be considered in planning, in site selection, and in design.

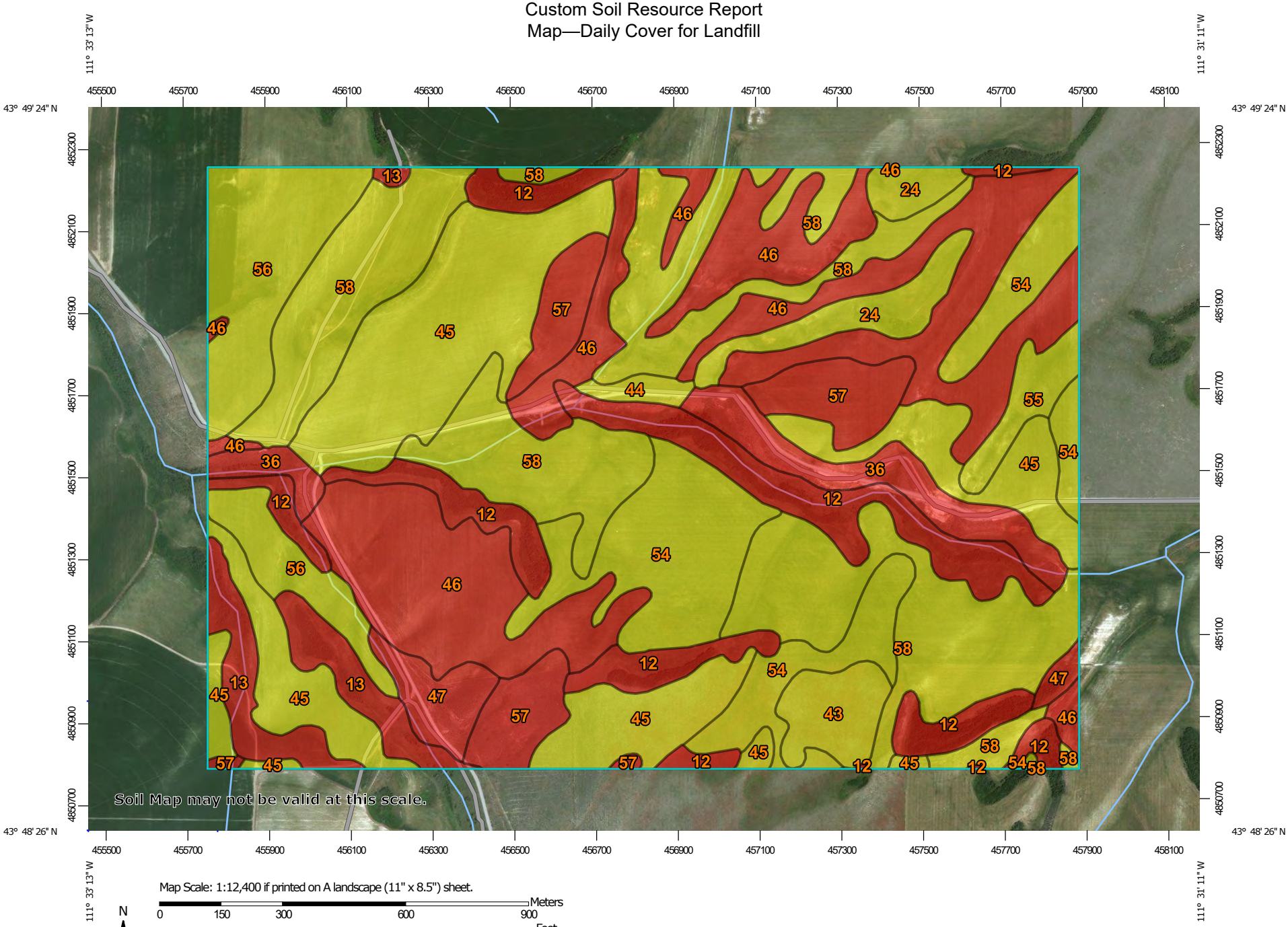
The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Map—Daily Cover for Landfill



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

Very limited

Somewhat limited

Not limited

Not rated or not available

Soil Rating Lines

Very limited

Somewhat limited

Not limited

Not rated or not available

Soil Rating Points

Very limited

Somewhat limited

Not limited

Not rated or not available

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: Madison County Area, Idaho
Survey Area Data: Version 16, Sep 9, 2021

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

Date(s) aerial images were photographed: Sep 24, 2011—Oct 25, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Tables—Daily Cover for Landfill

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
12	Greys silt loam, 12 to 20 percent slopes	Very limited	Greys (80%)	Slope (1.00)	71.3	9.2%
				Dusty (0.00)		
13	Greys silt loam, 20 to 30 percent slopes	Very limited	Greys (85%)	Slope (1.00)	26.5	3.4%
				Dusty (0.00)		
24	Lantonia silt loam, 4 to 12 percent slopes	Somewhat limited	Lantonia (85%)	Dusty (0.08)	19.7	2.5%
36	Rammel-Rock outcrop complex, 8 to 20 percent slopes	Very limited	Rammel, very stony surface (50%)	Depth to bedrock (1.00)	27.3	3.5%
				Slope (0.96)		
				Dusty (0.04)		
				Large stones (0.01)		
43	Ririe silt loam, 0 to 4 percent slopes	Somewhat limited	Ririe (85%)	Dusty (0.19)	13.3	1.7%
			Pocatello variant (5%)	Dusty (0.35)		
44	Ririe silt loam, 4 to 8 percent slopes	Somewhat limited	Ririe (85%)	Dusty (0.19)	3.7	0.5%
			Pocatello variant (5%)	Dusty (0.35)		
45	Ririe silt loam, 8 to 12 percent slopes	Somewhat limited	Ririe (85%)	Dusty (0.19)	123.8	15.9%
				Slope (0.16)		
			Pocatello variant (5%)	Dusty (0.35)		
				Slope (0.16)		
46	Ririe silt loam, 12 to 20 percent slopes	Very limited	Ririe (85%)	Slope (1.00)	140.1	18.0%
				Dusty (0.19)		
47	Ririe silt loam, 20 to 30 percent slopes	Very limited	Ririe (85%)	Slope (1.00)	13.2	1.7%
				Dusty (0.19)		
54	Tetonia silt loam, 0 to 4 percent slopes	Somewhat limited	Tetonia (85%)	Dusty (0.04)	76.8	9.9%
55	Tetonia silt loam, 4 to 8 percent slopes	Somewhat limited	Tetonia (80%)	Dusty (0.04)	9.7	1.2%
56	Tetonia silt loam, 8 to 12 percent slopes	Somewhat limited	Tetonia (85%)	Slope (0.16)	51.0	6.6%
				Dusty (0.04)		
57	Tetonia silt loam, 12 to 20 percent slopes	Very limited	Tetonia (80%)	Slope (1.00)	36.6	4.7%
				Dusty (0.04)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
58	Tetonia-Ririe silt loams, 4 to 12 percent slopes	Somewhat limited	Tetonia (55%)	Dusty (0.04)	163.3	21.0%
			Ririe (40%)	Dusty (0.19)		
Totals for Area of Interest					**776.4**	**100.0%**

Rating	Acres in AOI	Percent of AOI
Somewhat limited	461.3	59.4%
Very limited	315.0	40.6%
Totals for Area of Interest	**776.4**	**100.0%**

Rating Options—Daily Cover for Landfill

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

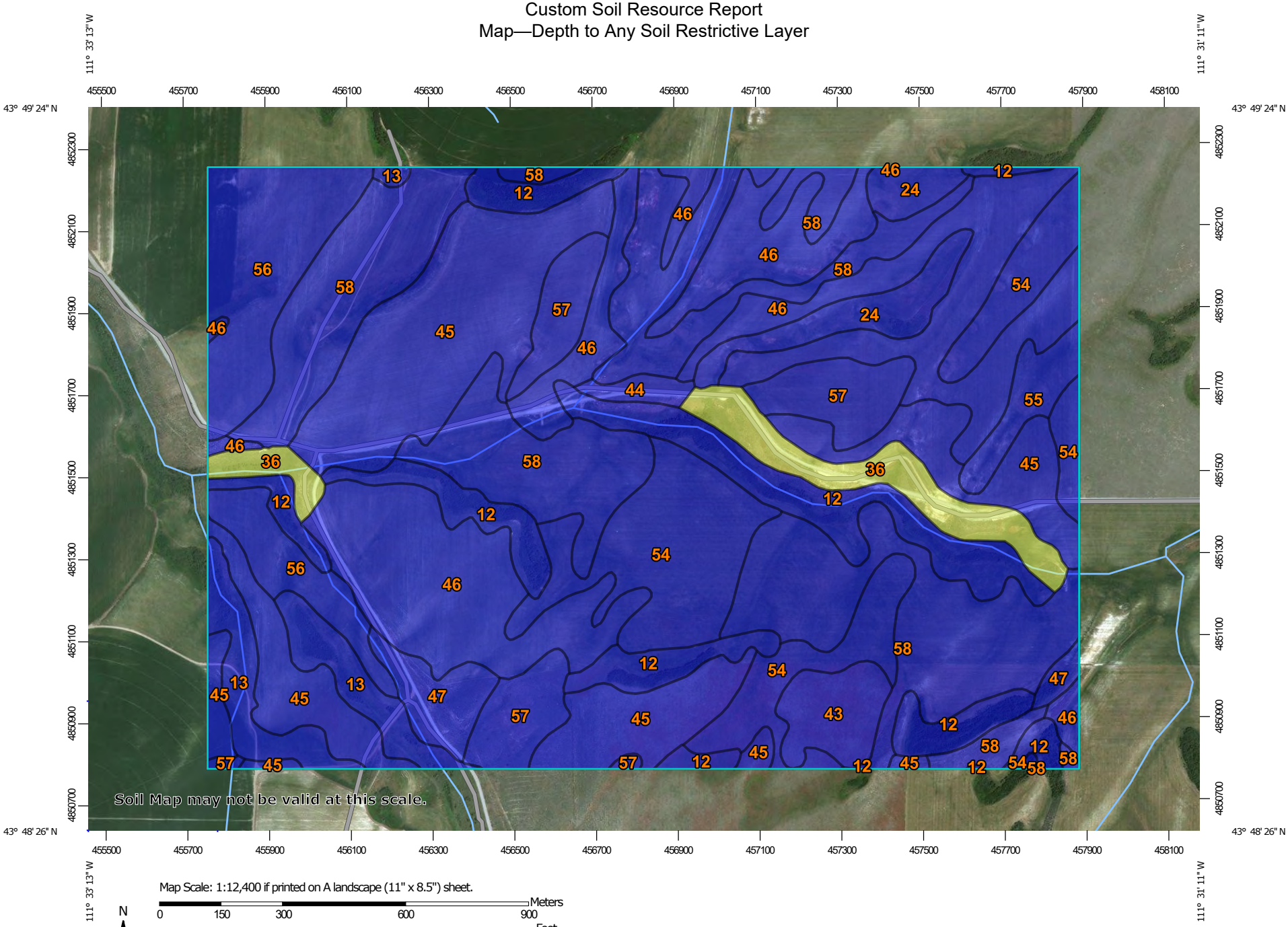
Depth to Any Soil Restrictive Layer

A "restrictive layer" is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers.

This theme presents the depth to any type of restrictive layer that is described for each map unit. If more than one type of restrictive layer is described for an individual soil type, the depth to the shallowest one is presented. If no restrictive layer is described in a map unit, it is represented by the "greater than 200" depth class.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Custom Soil Resource Report
Map—Depth to Any Soil Restrictive Layer



Map Scale: 1:12,400 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 150 300 600 900

Feet: 0 500 1000 2000 3000

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 Rating Polygons

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Lines

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

Soil Rating Points

0 - 25

25 - 50

50 - 100

100 - 150

150 - 200

> 200

Not rated or not available

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: Madison County Area, Idaho
Survey Area Data: Version 16, Sep 9, 2021

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

Date(s) aerial images were photographed: Sep 24, 2011—Oct 25, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Depth to Any Soil Restrictive Layer

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
12	Greys silt loam, 12 to 20 percent slopes	>200	71.3	9.2%
13	Greys silt loam, 20 to 30 percent slopes	>200	26.5	3.4%
24	Lantonia silt loam, 4 to 12 percent slopes	>200	19.7	2.5%
36	Rammel-Rock outcrop complex, 8 to 20 percent slopes	79	27.3	3.5%
43	Ririe silt loam, 0 to 4 percent slopes	>200	13.3	1.7%
44	Ririe silt loam, 4 to 8 percent slopes	>200	3.7	0.5%
45	Ririe silt loam, 8 to 12 percent slopes	>200	123.8	15.9%
46	Ririe silt loam, 12 to 20 percent slopes	>200	140.1	18.0%
47	Ririe silt loam, 20 to 30 percent slopes	>200	13.2	1.7%
54	Tetonia silt loam, 0 to 4 percent slopes	>200	76.8	9.9%
55	Tetonia silt loam, 4 to 8 percent slopes	>200	9.7	1.2%
56	Tetonia silt loam, 8 to 12 percent slopes	>200	51.0	6.6%
57	Tetonia silt loam, 12 to 20 percent slopes	>200	36.6	4.7%
58	Tetonia-Ririe silt loams, 4 to 12 percent slopes	>200	163.3	21.0%
Totals for Area of Interest			**776.4**	**100.0%**

Rating Options—Depth to Any Soil Restrictive Layer

Units of Measure: centimeters

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Interpret Nulls as Zero: No

References

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U.S. Fish and Wildlife Service
National Wetlands Inventory

USFWS Map

October 6, 2022

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

National Wetlands Inventory (NWI)
This page was produced by the NWI mapper

B.1-6 Well Log Search Results

Appendix B.1-6 Well Log Summary

Alternative Liner and No Migration Demonstration Report for EIRSWD Regional MSW Landfill

Existing Log	Log Name	Date	Well Type	Drilling Method	Well Construction	Total Depth (ft)	Estimated Ground Elev. (ft msl) (see note 2)	Water Level or Depth to Uppermost Water (ft)	Distance and Direction from Site (mi)	Generalized Lithology noted on Log
Yes	Brent Clark	9/17/1981	Irrigation	Cable Tool	Casing, No sceen	960	5550	652	2 NW	Typically rhyolite
Yes	Brent Clark 2	3/28/1981	Irrigation	Cable Tool	Casing, No sceen	888	5550	652	2 NW	Typically clay, rhyolite, and lava.
Yes	Pocock	5/13/2013	Irrigation	Air Rotary	Casing, No sceen	965	5550	670	2 NW	Typically lava and rhyolite
Yes	Norvue Farms	2/26/2015	Irrigation	Air Rotary	Casing, No sceen	1380	5550	710	1.75 NW	Rhyolite with few fractures
Yes	Norvue Farms 2	6/9/2004	Irrigation	Air Rotary	Casing, No sceen	1000	5550	556	2.5 NW	Typically basalt with minor clay
Yes	Paul Nedrow	9/21/1980	Irrigation	Cable Tool	Casing, No sceen	1250	5550	650	1.75 WNW	Typically clay, rhyolite, and lava.
Yes	Paul Nedrow 2	1/20/1981	Irrigation	Cable Tool	Casing, No sceen	1365	5550	595	2.25 WNW	Typically clay and rhyolite.
Yes	Paul Nedrow 3	6/29/1970	Irrigation	Cable Tool	Casing, unknown	895	5550	640	2.5 WNW	Typically welded tuff, minor clay
No	Wilbur Parks	unknown	unknown	unknown	No log	unknown	5700	unknown	1 W	No log.
Yes	Parkinson Farms	9/15/1982	Irrigation	Rotary	Casing perfed torch	1260	6000	260 / 420 (see Note 3)	2.5 ENE	Lava, clay, rhyolite.
Yes	Schwendiman	7/8/1996	Irrigation	Air Rotary	Casing perfed torch	1310	5700	890	1.75 E	Grey rock and rhyolite.
No	Schwendiman 2	unknown	unknown	unknown	No log	unknown	5700	840	1.75 NW	No log.
Yes	Schwendiman 3	8/9/1993	Irrigation	Rotary/Cable/Air	Casing perfed torch	1100	5900	435	1.5 E	Typically clay and lava.
Yes	Klinger	8/22/1974	Irrigation	Cable Tool	Casing, No sceen	1004	5600	630	2.5 NNW	Typically tuff.
Yes	Klinger 2	8/29/1991	Irrigation	Rotary/Air	Casing, No sceen	1300	5600	645	2 NW	Typically clay and rock.

Notes:

1. For reference, the Newdale site elevation is approximately 5,830 ft msl (average ground surface from all borings, shallow and deep).
2. Estimated ground elevation is approximated for each log using Topographic Map data provided in Appendix B.1-1, and rounding to nearest 50 ft.
3. Parkinson log indicates 'Statis Water Level' at 420 ft bgs, but also checks 'yes' for uppermost water on lithology at 260 ft bgs.

B.2 Site Specific Data- Field Investigation Data

B.2-1 Photo Log

Photos 1 and 2. Borehole DB-2 set up and mud pit 7/22/2022

Photos 3 and 4. Borehole DB-3 set up and mud pit 7/24/2022

Photos 5 and 6. Downhole hammer bit and collar (left). Drill stem (right) 7/26/2022

Photo 7. Rig Controls—Borehole DB-3 7/26/2022

Photos 8 and 9. DB-3 typical drill cuttings 7/25/2022

Photos 10 and 11. Logging Borehole DB-3 drill cuttings 7/23-25/2022

Photo 12. Site view to SW from Borehole DB-3 (DB-3 towards DB-1) 7/24/2022

Photo 13. Bentonite chips for borehole abandonment 7/26/2022

Photos 14 and 15. Rhyolite outcrops exposed in Deep Creek Canyon approximately 5 miles ENE of site (view to west). 7/27/2022

B.2-2 Geotechnical Data Report(s) – Test Pit Logs

Xcell Engineering, LLC
260 Laurel Lane
Chubbuck, ID 83202
Phone (208) 237-5900
Fax (208) 237-5925
E-mail: paul@xcelleng.com

March 9, 2021
P21009

Mr. Kevin Harris
Forsgren Associates
350 North 2nd East
Rexburg, ID 83440

RE: **NEWDALE LANDFILL**
Test Pit Profile and sample
Newdale, Idaho

Kevin:
At your request I have logged and sampled soil from 30 test pits at the subject site. The samples were returned to your office for testing and I have been in contact with your lab manager to discuss sample identification and potential testing. The following summarizes our findings. Please call if you have questions or comments.
Sincerely,

Xcell Engineering, LLC

J. Paul Bastian, PE
Project Engineer

PROFESSIONAL ENGINEER
LICENSED
7257
4/21/21
STATE OF IDAHO
JUSTIN PAUL BASTIAN

TEST PITS

Soil conditions in this summary are identified in accordance with the Unified Soil Classification System (USCS). The soil profile observed in the test pits was relatively consistent with respect to type of materials encountered. However, there is considerable variability in the geometry of the subsurface profile. Materials consisted of 0.5 to 3.5 feet of clayey, dark brown fine sandy silt underlain by 3 to 16+ feet of light brown fine sandy silt. Clay content in the upper dark brown material and in the underlying lighter material was variable. Maximum clay content in the light brown material was thought to be encountered in test pit 125 as will be verified by laboratory testing. The site is underlain by soft sedimentary sandstone bedrock at depths of 5 to more than 16 feet. In areas where it was encountered the sandstone was observed to be highly fractured exhibiting irregular block failure. The following table provides the depths or profile of the soil/rock types mentioned above by test pit location.

Test Pit No.	Thickness of Topsoil layer (ft)	Depth to rock Contact (ft)	Sampled at Depth (ft)
100	1.5	9	4
101	3.0	15+ No Rock	3 & 6
102	2.5	15+ No Rock	
103	3.5	16+ No Rock	3 & 8
104	2	9.5	1.5
105	2	11	
106	2	14.5	6
107	2	16+ No Rock	8
108	1	12	
109	0.5	16+ No Rock	
110	2	9	
111	2	15 No Rock	8
112	1	8	
113	2	15	
114	2.5	6.3	2 & 4
115	1	6	
116	2	11	2
117	2	16 No Rock	8
118	2	16 No Rock	10
119	2	6.5	
120	2	8	6
121	2	11	7
122	3	5	
123	3	9.5	2
124	2	12	2 & 6
125	2	16 No Rock	
126	2	16 No Rock	
127	2	14	
128	2	16 No Rock	10
129	2.5	16 No Rock	8

Competence and rock quality designation (RQD) of the underlying bedrock increased within the upper 2-3 feet. Based on the materials observed the rock may be excavated with difficulty using conventional excavation equipment. Composition of the underlying bedrock was uniform in locations where it was encountered. Based on the composition

and uniformity of material it is highly probable that the entire site is underlain by the rock. Absence of rock in the test pits is only an indicator that depth to rock exceeds the maximum depth of exploration (16') possible by the track hoe used to excavate the test pits. This information is provided as "preliminary in nature" and is indicative of surface conditions on the site. Prior to plan preparation deeper and more detailed exploration is recommended. If, during testing, there are questions or you require more information, please call.

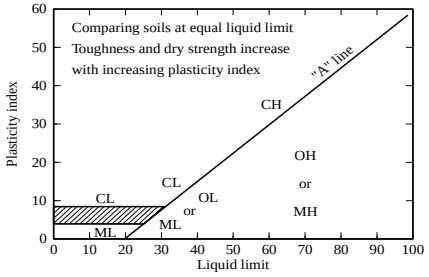
Paul

Unified Soil Classification

Field Identification Procedures - (Excluding particles larger than three inches and basing fractions on estimated weights)				Group Symbol (a)	Typical Names	Information Required for Describing Soils
Coarse Grained Soils: More than half of material is larger than No. 200 Sieve Size (b)	Gravels - More than half coarse fraction is larger than 1/4 "	Clean Gravels - (little or no fines)	Wide Range in grain size and substantial amounts of all intermediate particle sizes	GW	Well graded gravels, gravel sand mixtures, little or no fines	Give typical name;indicate approximate percentages of sand and gravel; maximum size; angularity, surface condition and hardness of the coarse grains; local geologic name and other pertinent descriptive information; symbols in ( ). For undisturbed soils add information on stratification, condition, cementation and moisture. EXAMPLE: Silty SAND - (SM) - Light brown, medium dense to dense, damp to moist. Moderately cemented from 2-3 feet, roots to 1 foot.
			Predominantly one size or a range of sizes with intermediate sizes missing	GP	Poorly graded gravels, gravel sand mixtures, little or no fines	
		Gravels with fines- (appreciable amount of fines)	Non plastic fines (for identification procedure see ML below)	GM	Silty gravels, poorly graded gravel-sand-silt mixtures	
			Plastic fines (for identification procedure see CL below)	GC	Clayey gravels, poorly graded gravel-sand-clay mixtures	
	Sands - More than half coarse fraction is smaller than 1/4 "	Clean Sands (little or no fines)	Wide Range in grain size and substantial amounts of all intermediate particle sizes	SW	Well graded sands, gravelly sands, little or no fines	
			Predominantly one size or a range of sizes with intermediate sizes missing	SP	Poorly graded sands, gravelly sands, little or no fines	
		Sands with fines (appreciable amount of fines)	Non plastic fines (for identification procedure see ML below)	SM	Silty sands, poorly graded sand-silt mixtures	
			Plastic fines (for identification procedure see CL below)	SC	Clayey sands, poorly graded sand-clay mixtures	

Laboratory Classification Criteria			
Use grain size distribution curve to verify fractions as identified in the field	Determine percentages of gravel and sand from grain size distribution curve. Depending on percentage passing the No. 200 sieve soils are classified as follows: Less than 5% = GW, GP, SW, SP More than 12% = GM, GC, SM, SC 5% to 12% are borderline cases requiring use of dual symbols	(Cu=D60/D10)>4 Cc=(D30)^2/(D10*D60) between 1&3	
		Not meeting all the requirements for GW	
		Atterberg limits below "A" line or PI<4	Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols
		Atterberg limits above "A" line with PI>7	
		(Cu=D60/D10)>6 Cc=(D30)^2/(D10*D60) between 1&3	
		Not meeting all the requirements for SW	
		Atterberg limits below "A" line or PI<4	Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols
		Atterberg limits below "A" line with PI>7	

Fine-grained soils: More than half the material is smaller than the No. 200 sieve	Identification Procedures on Fraction Smaller than No. 40 Seive						
		Dry Strength	Dilatancy	Toughness			
	Silts and clays liquid limit less than 50	None to slight	Quick to slow	None	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sand with slight plasticity	Give typical name;indicate degree and character of plasticity, amount and max size of coarse grains; color when wet, odor, local geologic name, any other information. For undisturbed soil add information on structure, stratification, consistency in undisturbed and remolded states and moisture. EXAMPLE: Clayey SILT -(ML)- brown, stiff to very stiff, moist, (loess).
		Medium to high	None to very slow	Medium	CL	Inorganic clays of low to medium plasticity, lean clays, may be gravelly, sandy or silty.	
		Slight to medium	Slow	Slight	OL	Organic silts and organic silt-clays of low plasticity	
	Silts and clays liquid limit greater than 50	Slight to medium	Slow to none	Slight to medium	MH	Inorganic silts micaceous or diatomaceous fine sandy or silty soils, elastic silts	
		High to very high	None	High	CH	Inorganic clay of high plasticity, fat clays	
		Medium to high	None to very slow	Slight to medium	OH	Organic clays of medium to high plasticity	
Highly Oganic Soils		Readily identified by color, odor, spongy feel and frequently y fibrous texture			Pt	Peat and other highly organic soils	



Plasticity chart
for laboratory classification of fine grained soils

XCELL ENGINEERING LLC
"Building on Excellence"

USCS: Plate 2

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August 29, 2022
P22009

Mr. Kevin Harris
Forsgren Associates
350 North 2nd East
Rexburg, ID 83440

RE: **Geotechnical Engineering Report**
Newdale Landfill
Newdale, Idaho

Kevin:

Xcell Engineering has prepared this authorized geotechnical engineering evaluation for the subject landfill in Newdale, Idaho. The purpose of our geotechnical engineering evaluation was to explore the subsurface soil and geologic conditions within the proposed development area and to provide geotechnical-engineering recommendations to assist project planning, design and construction.

This report summarizes the results of our field evaluation, laboratory testing, engineering opinions, and geotechnical recommendations. The soil and groundwater conditions at the site are presented in the following report. Specific geotechnical opinions and recommendations for foundation design are included. The geotechnical recommendations presented must be read and implemented in their entirety. Portions or individual portions of the report cannot be relied upon without the supporting text of relevant sections.

The success of the proposed construction will depend in part, on following the report recommendations and good construction practices. We recommend that Xcell be retained to provide geotechnical testing and consultation services during construction to verify our report recommendations are followed. It has been our experience that maintaining continuity with a single geotechnical consultant reduces errors and contributes to overall project success and economy. We appreciate the opportunity to work with you on this project. Please do not hesitate to contact us if you have any questions or comments.

Sincerely,
Xcell Engineering, LLC

Jaren Haggard, EIT
Engineering Technician

J. Paul Bastian, PE
Project Engineer

PROFESSIONAL ENGINEER
7257
8/29/22
STATE OF IDAHO
JUSTIN PAUL BASTIAN

Building on Excellence

REPORT
Geotechnical Engineering Evaluation
Newdale Landfill
Newdale, Idaho

PREPARED FOR:
Kevin Harris
350 North 2nd East
Rexburg, ID 83440

PREPARED BY:
Xcell Engineering, LLC
260 Laurel Lane
Chubbuck, Idaho 83202

August 29, 2022

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REPORT
Geotechnical Engineering Evaluation
Newdale Landfill
Newdale, Idaho

INTRODUCTION

Xcell Engineering has performed the authorized geotechnical engineering evaluation for the subject landfill in Newdale, Idaho. A Site Plan is presented as Plate 1. The purpose of the geotechnical engineering evaluation is to assess the general soil and geologic conditions within the proposed project area and to provide geotechnical and soil related construction recommendations with respect to the proposed development. Our recommendations are based on our field observations and laboratory test results. To provide this evaluation of the site we conducted the following scope of work:

1. Reviewed site map and topography maps.

2. Observed the excavation of forty-two test pits to depths of sixteen feet and fourteen borings to depths of seven hundred feet. The soil encountered in the test pits and borings was described and classified referencing ASTM D 2487 and D 2488 Unified Soil Classification System (USCS) on plate 2 that accompanies this report. Soil profiles were logged and logs are included in the appendix.

3. Field and laboratory data were analyzed to provide the project design team with geotechnical opinions and recommendations for planning, design, and construction.

4. Prepared and provided one digital copy of our final report of findings, opinions, and geotechnical recommendations to assist design, planning and construction.

PROPOSED CONSTRUCTION

The project site is located in Newdale, Idaho as shown on the site plan. We understand proposed construction will consist of a landfill and appurtenances of a landfill. Roads are planned to act as access for heavy multi-axle trucks in and out of the site. Storm water will be retained on site.

SUBSURFACE EVALUATION PROCEDURES

The first thirty test pits were excavated in February of 2022 and the second twelve test pits were excavated on June 29th, 2022. Test pits were excavated within the proposed project area as identified on the Site Plan. The test pits were excavated with an excavator to depths of sixteen feet. Borings were advanced in July of 2022, with two drill rigs to depths of up to seven hundred feet. Soil and rock encountered was visually classified and described referencing ASTM D 2487 and D 2488, Unified Soil Classification System (USCS). The USCS is provided on Plate 2 and should be referenced to interpret the terms used throughout this report. Subsurface profiles were logged and boring logs, test pit logs and laboratory test data are presented in the Appendix to this report. Select soil samples were obtained for laboratory testing.

SUBSURFACE CONDITIONS

Subsurface soil conditions are relatively uniform across the site. Subsurface soil conditions in test pits and borings typically consisted of ten to fifteen of light brown, loose, sandy silt underlain by Rhyolite. Rhyolite was closely to moderately fractured. The rock may be excavated using conventional excavation equipment including larger excavators and dozers equipped with rippers

LABORATORY TESTING

Select samples of the native soil were tested to assess grain size distribution, permeability and its plasticity index. Laboratory testing was performed referencing ASTM test procedures and indicates the soil has low plasticity and is susceptible to erosion when subjected to flowing water. Constant head permeability tests were performed to determine the permeability of the soil. Results show that soil permeability is typically 10^{-3} to 10^{-4} cm/sec. Permeability of the soil decreases as the unit weight or percent compaction of the soil increases. Laboratory test results can be found in the appendix of this report. Permeability tests were performed at widely spaced intervals and variations in clay content will occur over the site. Additional testing of the material will be required prior to its use as liner material.

GENERAL OPINIONS AND RECOMMENDATIONS

Our geotechnical opinions and recommendations are presented in the following sections to assist project planning, design, and construction of the proposed construction. Our recommendations are based on the results of our field evaluation, laboratory testing, experience with similar projects in the area, and our understanding of the proposed construction. These opinions and recommendations reflect our conversations with the project team and are based, in part on information provided to us by your company. If design plans change, such as loading conditions, foundation sizes or configuration, Xcell should be notified to review our report recommendations and make necessary modifications.

Soil conditions in the test pits and borings were observed to be relatively uniform. However, subsurface conditions will vary slightly over the site. Changes in conditions may not be apparent until construction. If the subsurface conditions change from those observed, then construction schedules, plans, and costs may change.

Site Preparation

At the time of our field evaluation the site contained vegetation and stripping of the top 2 to 3 inches will be required to remove crops, grass and trees. Native soil is not suitable for support of foundations in its current condition and bearing soil improvement is required. We recommend native soil be over-excavated 24 inches below footing subgrade and the upper 12 inches of silt exposed by over-excavation, be compacted in-place to at least 95% of its maximum dry density prior to its placement of structural fill. Over-excavated soil should be replaced with compacted structural fill as outlined in the structural fill section of this report. Inadequate compaction of bearing soil beneath foundations will increase the risk of differential settlement. We recommend foundations for the proposed building be supported by at least 24 inches of compacted structural fill over 12 inches of compacted native subgrade. The native subgrade and the structural fill must be compacted to at least 95% of its maximum dry density prior to placement of structural fill or concrete. Native subgrade is suitable for support of concrete slab on grade floors provided it is properly moisture conditioned and compacted as outlined in

the following sections of this report. Floors supporting hard wheeled and heavy traffic should be designed accordingly.

Prior to placement of fill the exposed native subgrade in the building, parking and access road locations should be moisture conditioned to near optimum moisture content and compacted in-place to at least 95% of its maximum dry density per ASTM D-698. If pumping or unstable soil is observed during compaction, the unstable soil should be removed and replaced with structural fill.

We recommend final subgrade preparation for sidewalks and building areas include compaction of loose or disturbed sub-grade soil to at least 95 percent of the maximum dry density as determined by ASTM D-698 (Standard Proctor).

Subgrade soil should be properly moisture conditioned prior to attempting compaction efforts. Optimum moisture content for compaction will vary, we anticipate optimum moisture for the soil will be near 14%. Therefore, the contractor should anticipate a moisture conditioning effort to achieve acceptable moisture levels. Xcell should review the compaction process prior to placing structural fill or concrete. Once the native soil subgrade has been properly compacted, structural fill placement or foundation or slab preparation may commence.

Excavation Characteristics

Native soil may be excavated using conventional soil excavation techniques. The native soil can be excavated near vertical for excavations up to 4 feet in depth. Trench excavations deeper than 4 feet should allow provisions for excavations to be sloped back at 1:1 (horizontal to vertical). Alternatively, deeper trenches and excavations should be shored or braced in accordance with OSHA regulations and local codes. We anticipate that the soil will be consistent throughout the property. The soil is loose and susceptible to erosion.

Temporary Slopes

Native soil is loose and prone to sloughing and slope or trench instability. If water is permitted to drain into excavations and pond, the soil will soften, lose much of its shear strength and become unstable. Care should be taken to rout run-off away from

slopes to avoid saturation and softening of the slope. Permanent slopes should be paved or re-vegetated as quickly as possible to reduce the risk of erosion and improve slope stability.

Pavement

Factors used to design this pavement section were based on anticipated traffic and index data obtained through field and laboratory testing. A traffic index of 8 while very conservative is assumed to be the minimum design traffic index. Our estimates of traffic volumes for the proposed pavement areas and our understanding of the use for the pavement are based on planned construction. Access for heavy trucks in and out of the site has been taken into consideration in the pavement design. Pavement design and subgrade preparation recommendations reflect these anticipated loading applications and construction traffic. If subgrade conditions appear significantly different during construction, if traffic loading conditions change or traffic volumes increase, Xcell should be notified to amend our recommendations accordingly.

Pavement subgrade should be compacted to at least 95 percent of the maximum dry density of the soil as determined by ASTM D 698 (Standard Proctor) as discussed in the site preparation section. Xcell should be retained to verify the native subgrade has been compacted to structural fill requirements. Providing the site preparation procedures are accomplished as described above, the following minimum pavement sections are recommended for traffic areas:

Inches	Pavement Layer
3.5	Class II asphalt concrete top course per specification
5	¾-inch-minus, crushed sand and gravel base
10	Pit-run sand and gravel sub-base course

The above-recommended flexible pavement section is based on a maximum 20-year design life. Asphalt and aggregate support characteristics were evaluated based on our experience with aggregate materials in the area.

The sub-base should consist of 6-inch-minus, well graded sand and gravel consistent with Idaho Standards for Public Works Construction (ISPWC) Section 801 and with less than 9 percent passing the No. 200 sieve. The base course should consist of ¾-inch-minus, well graded, crushed sand and gravel with less than 9 percent passing the No. 200 sieve and consistent with ISPWC Section 802. The sub-base and base course should be compacted to structural fill requirements.

We recommend crack maintenance be accomplished in all pavement areas as needed and at least every three to five years to reduce the potential for surface water infiltration into the pavement section and underlying subgrade. Therefore, we recommend the subgrade, base and asphalt surfaces slope at no less than two percent to an appropriate storm water disposal system or other appropriate location that does not impact adjacent structures. The life of the pavement will be dependent on achieving adequate drainage throughout the section, especially the subgrade, since water that ponds at the subgrade surface can induce heaving during freeze-thaw processes.

Structural Fill

Structural fill beneath foundations and footings may consist of soil classified as GP or GW soil types according to the USCS. Aggregate and rocks comprising the gravel should be hard and durable and should not experience significant crushing or breaking while being compacted. Structural fill should not contain rocks or aggregate larger than 4 inches in any dimension because the compaction equipment will tend to ride on the larger aggregate which hinders uniform compaction of the lift and can lead to poorly or non-uniformly compacted structural fill. Structural fill should be placed in loose lifts that are 8-inches or less in thickness and each lift should be compacted to at least 95% of its maximum dry density per ASTM D-698 prior to placement of additional fill. Native soil is not suitable for use as structural fill.

Concrete Slab-on-Grade Floors

We recommend that concrete slab-on-grade floors be underlain by at least 4 inches of ¾-inch-minus, well-graded, crushed sand and gravel base course to provide a leveling course and moisture protection for the slabs. The base course shall be placed

over compacted native soil and compacted to at least 95 percent of its maximum dry density as determined by ASTM test D 698 (Standard Proctor). Subgrade areas that become soft, wet or disturbed must be over-excavated to undisturbed, native soil and replaced with granular structural fill. The base course and vapor barriers should be installed after the majority of under slab plumbing and utilities are completed. Floor slabs should be designed for the anticipated use and equipment or storage loading conditions. Based on correlation to our field and laboratory test results, we recommend a modulus of subgrade reaction (k) of 180 pounds per cubic inch (pci) be used for concrete floor slab design. This modulus is based on the silt subgrade with at least 6 inches of properly compacted ¾-inch-minus base course sand and gravel beneath the floor slab.

Seismicity

We understand the 2021 International Building Code (IBC) will be used for project structural design. The 2021 IBC outlines the procedure for evaluating site ground motions and design-spectral response accelerations. Xcell used site soil, geologic data and the project location to establish earthquake loading criteria at the site referencing the ASCE 7-16. Based on the results from exploration, we recommend a Site Class D be used as a basis for structural seismic design for the project. The calculated design seismic acceleration for a 1.0 second duration is .251g according to OSHPD Seismic Design Maps.

Foundation Design

The site preparation procedures discussed above must be implemented prior to initiating foundation preparations We recommend all foundations for this structure bear on 24 inches of compacted structural fill above 6 inches of compacted native soil at least 36 inches below outside adjacent grade. Structural fill is required to achieve the desired footing elevation and the width of excavation should increase 1 foot horizontally on each side of the footing for every foot of native soil removed. All structural fill in the bottom of excavations for footings and foundations should be compacted to at least 95% of its maximum dry density per ASTM test D-698. The native soil may be reused

as landscaping fill. The following recommendations should be accomplished for all foundations for the landfill:

1. SITE OBSERVATION: Xcell Engineering should be retained to observe all footings (soil improvement) over-excavations to verify dimensions, structural fill, and to verify that all bearing surfaces have been prepared in accordance with this report.

2. EXTERIOR FOOTINGS: Exterior footings should bear at least 36 inches below the final exterior grade to help reduce frost effects. Interior footings should bear a minimum of 12 inches below the finished floor elevation.

3. FOOTING WIDTHS: Minimum strip footing widths should be consistent with the International Building Code (IBC).

4. FOOTING SUBGRADE: Loose soil, in the bottom of the footing excavations must be compacted in-place to at least 95% of its maximum dry density prior to placement of structural fill and concrete. Footings should never be constructed over loose, saturated or frozen soil. If loose or unstable areas are observed prior to placing structural fill or concrete, they should be over-excavated to undisturbed soil and replaced with compacted granular structural fill. Structural fill should extend a minimum of 1 foot beyond the footing edge on both sides of the footing for every foot of over-excavation.

5. ALLOWABLE BEARING VALUE: If above recommendations are accomplished, a maximum allowable bearing value (ABV) of 3,000 psf could be used for the footing design.

6. ANTICIPATED SETTLEMENT: If the above bearing soil, site preparation, earthwork and foundation recommendations are accomplished, we anticipate total settlement will be less than 1/3 inch and differential settlement will be less than $1/8^{th}$ inch per 25 feet of wall length, or between similarly loaded footings that are not less than 25 feet apart.

Wet Weather Construction

We recommend that site construction be undertaken during dry weather conditions. If the site preparation and grading is undertaken during wet conditions, the native or re-compacted soil will be susceptible to pumping or rutting when subjected to heavy loads from rubber-tired equipment or vehicles that exert a point load. Wet weather earthwork should be performed by low pressure, track-mounted equipment that spread and reduce the vehicle load. Work should not be performed immediately after

rainfall. All soft and disturbed areas should be excavated to undisturbed soil and backfilled with structural fill. Alternatively, the area should be moisture conditioned and re-compacted to structural fill requirements. Assuming the soil is wet and soft but not disturbed, the initial layer of fill placed over the native soil should be at least 12 inches in depth.

Subgrades that become disturbed under construction traffic will require over-excavation to remove soft or disturbed soil. In summary, careful construction procedures are critical to the successful grading operation if the onsite soil is at or above optimum moisture content and loose. Consulting Xcell prior to initiating this type of construction is recommended to help improve earthwork efficiency and achieve a stable subgrade.

Surface and Subsurface Drainage

Site grading, including all sidewalks and landscaped area grading, should slope a minimum of 2 percent away from the proposed structures to help prevent ponding and to direct surface runoff away from the structures. All runoff from downspouts, roof areas, sidewalk areas, landscaped areas, and other large volumes of storm water should be directed and maintained away from the structures and not be allowed to infiltrate the soil beneath the building areas, sidewalks or footings. All storm water must be retained on-site. Design of the storm water retention system should be reviewed by Xcell prior to construction.

ADDITIONAL SERVICES RECOMMENDED

Review of Plans and Specifications

We recommend that Xcell be retained to review the civil and structural foundation plans and earthwork specifications prior to bidding of the construction documents. It has been our experience that having the geotechnical consultant from the design team review the construction documents reduces the potential for errors, and also reduces costly changes to the contract during construction. Xcell can provide review of the construction documents on a time and expenses basis.

Construction Observation and Testing

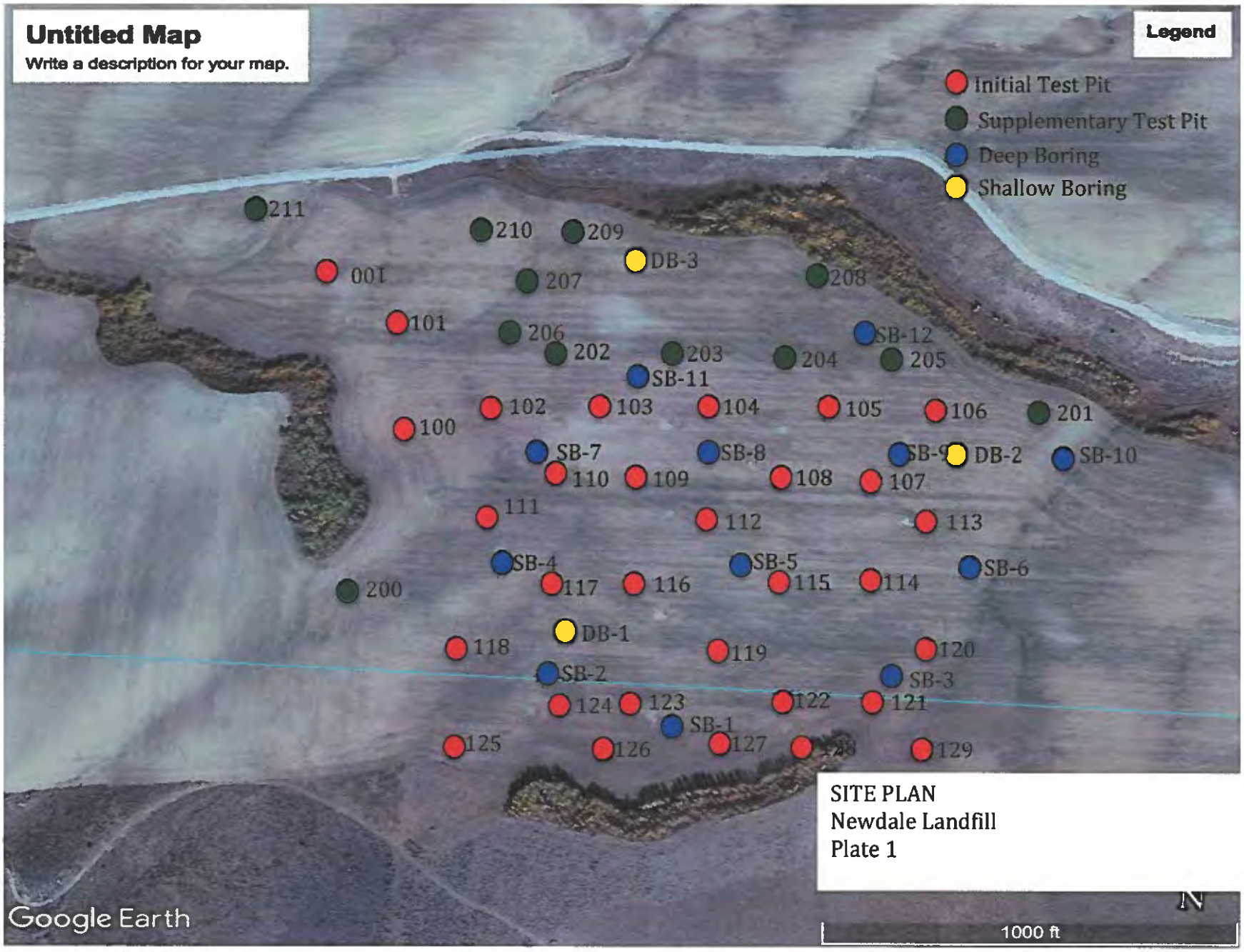
We recommend that Xcell be retained to observe the exposed subgrade in all building footing trenches and sidewalk areas to verify site stripping, and excavation has been accomplished to the recommended native bearing soil, that all soft or unsuitable soil has been compacted or removed as described above, and that all bearing surfaces have been prepared in accordance with this report. Xcell can provide construction material testing and special inspection for earthwork, concrete, asphalt, masonry, and steel. If we are not retained to perform the recommended services, we cannot be responsible for soil engineering related construction errors or omissions. The recommended services are not included in this evaluation and would be billed on a time and expense basis.

EVALUATION LIMITATIONS

This geotechnical engineering report has been prepared to assist planning and design of the proposed landfill in Newdale, Idaho. Our services consist of professional opinions and recommendations made in accordance with generally accepted geotechnical engineering principles and practices. This acknowledgment is in lieu of all warranties either expressed or implied.

The following plates accompany and complete this report:

Plate 1:	Site Map
Plate 2:	Unified Soil Classification System (USCS)
Appendix:	Test Pit Logs
	Boring Logs
	Seismic Site Characterization
	Bearing Capacity Spreadsheet
	Lateral Earth Pressure Spreadsheet
	Pavement Design
	Slope Stability
	Permeability
	Laboratory Test Results

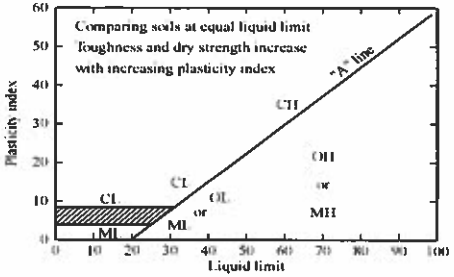


SITE PLAN
Newdale Landfill
Plate 1

Unified Soil Classification

Field Identification Procedures - (Excluding particles larger than three inches and basing fractions on estimated weights)				Group Symbol (a)	Typical Names	Information Required for Describing Soils	Laboratory Classification Criteria		
Coarse Grained Soils: More than half of material is larger than No. 200 Sieve Size (b)	Gravels - More than half coarse fraction is larger than 1/4 "	Clean Gravels - (little or no fines)	Wide Range in grain size and substantial amounts of all intermediate particle sizes	GW	Well graded gravels, gravel sand mixtures, little or no fines	Give typical name; indicate approximate percentages of sand and gravel; maximum size; angularity, surface condition and hardness of the coarse grains; local geologic name and other pertinent descriptive information, symbols in ( ). For undisturbed soils add information on stratification, condition, cementation and moisture. EXAMPLE: Silty SAND - (SM) - Light brown, medium dense to dense, damp to moist. Moderately cemented from 2-3 feet, roots to 1 foot.	Use grain size distribution curve to verify fractions as identified in the field	Determine percentages of gravel and sand from grain size distribution curve. Depending on percentage passing the No. 200 sieve soils are classified as follows: Less than 5% = GW, GP, SW, SP More than 12% = GM, GC, SM, SC 5% to 12% are borderline cases requiring use of dual symbols	(Cu=D60/D10)>4 Cc=(D30)^2/(D10*D60) between 1&3	
			Predominantly one size or a range of sizes with intermediate sizes missing	GP	Poorly graded gravels, gravel sand mixtures, little or no fines			Not meeting all the requirements for GW	
		Gravels with fines- (appreciable amount of fines)	Non plastic fines (for identification procedure see ML below)	GM	Silty gravels, poorly graded gravel-sand-silt mixtures			Atterberg limits below "A" line or PI<4	Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols
			Plastic fines (for identification procedure see CL below)	GC	Clayey gravels, poorly graded gravel-sand-clay mixtures			Atterberg limits above "A" line with PI>7	
	Sands - More than half coarse fraction is smaller than 1/4 "	Clean Sands (little or no fines)	Wide Range in grain size and substantial amounts of all intermediate particle sizes	SW	Well graded sands, gravelly sands, little or no fines			(Cu=D60/D10)>6 Cc=(D30)^2/(D10*D60) between 1&3	
			Predominantly one size or a range of sizes with intermediate sizes missing	SP	Poorly graded sands, gravelly sands, little or no fines			Not meeting all the requirements for GW	
		Sands with fines (appreciable amount of fines)	Non plastic fines (for identification procedure see ML below)	SM	Silty sands, poorly graded sand-silt mixtures			Atterberg limits below "A" line or PI<4	Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols
			Plastic fines (for identification procedure see CL below)	SC	Clayey sands, poorly graded sand-clay mixtures			Atterberg limits below "A" line with PI>7	

Fine-grained soils: More than half the material is smaller than the No. 200 sieve	Identification Procedures on Fraction Smaller than No. 40 Seive				Group Symbol (a)	Typical Names	Information Required for Describing Soils
		Dry Strength	Dilatancy	Toughness			
Silts and clays liquid limit less than 50		None to slight	Quick to slow	None	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sand with slight plasticity	Give typical name; indicate degree and character of plasticity, amount and max size of coarse grains; color when wet, odor, local geologic name, any other information. For undisturbed soil add information on structure, stratification, consistency in undisturbed and remolded states and moisture. EXAMPLE: Clayey SILT - (ML)- brown, stiff to very stiff, moist, (loess).
		Medium to high	None to very slow	Medium	CL	Inorganic clays of low to medium plasticity, lean clays, may be gravelly, sandy or silty.	
		Slight to medium	Slow	Slight	OL	Organic silts and organic silt-clays of low plasticity	
Silts and clays liquid limit greater than 50		Slight to medium	Slow to none	Slight to medium	MH	Inorganic silts micaceous or diatomaceous fine sandy or silty soils, elastic silts	
		High to very high	None	High	CH	Inorganic clay of high plasticity, fat clays	
		Medium to high	None to very slow	Slight to medium	OH	Organic clays of medium to high plasticity	
Highly Oganic Soils		Readily identified by color, odor, spongy feel and frequently y fibrous texture			Pt	Peat and other highly organic soils	



Plasticity chart
for laboratory classification of fine grained soils

XCELL ENGINEERING LC
"Building on Excellence"
USCS: Plate 2

Appendix

Test Pit Logs
Boring Logs
Site Seismic Characterization
Slope Stability
Bearing Capacity
Lateral Earth Pressure
Pavement Design
Slope Stability
Permeability
Laboratory Test Results

Test Pit No. 100

Project: Newdale Landfill
File: P22009

DEPTH (Feet)	SOIL CLASS	SOIL DESCRIPTION
0.0 –11.0	ML	Fine Sandy SILT – Light brown, loose to medium dense, damp
11.0 –13.0	RX	Rhyolite – Soft rock, highly fractured
6		94.4% Passing No. 200 Sieve 14.2% Moisture

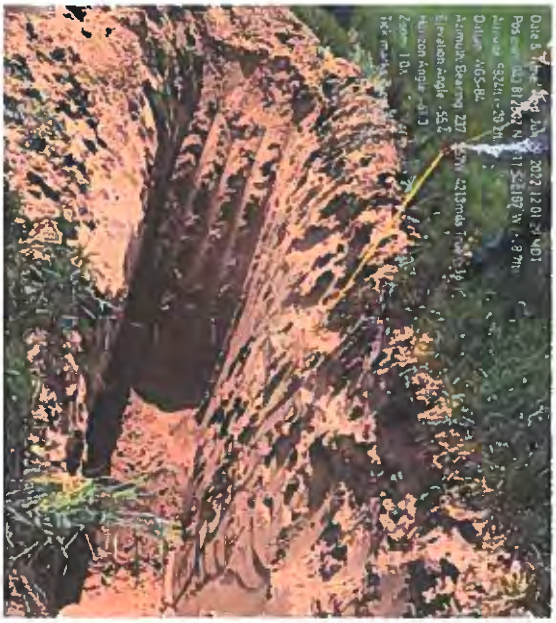
Excavated on 6/29/22
Groundwater not encountered
Test pit terminated at 13.0 feet
Bulk samples taken at 6.0 feet
Excavation Equipment: Track Excavator
Logged by: JH

XCELL ENGINEERING, LLC
"Building on Excellence"

Test Pit No. 200

Project: Newdale Landfill
File: P22009

DEPTH (Feet)	SOIL CLASS	SOIL DESCRIPTION
0.0 –14.0	ML	Fine Sandy SILT – Light brown, loose to medium dense, damp
6		91.4% Passing No. 200 Sieve 9.4% Moisture



Excavated on 6/29/22
Groundwater not encountered
Test pit terminated at 14.0 feet
Bulk samples taken at 6.0 feet
Excavation Equipment: Track Excavator
Logged by: JH

XCELL ENGINEERING, LLC
"Building on Excellence"

Test Pit No. 201

Project: Newdale Landfill
File: P22009

DEPTH (Feet)	SOIL CLASS	SOIL DESCRIPTION
0.0 –14.5	ML	Fine Sandy SILT – Light brown, loose to medium dense, damp
14.5	RX	Rhyolite – Soft rock, highly fractured
8		89.3% Passing No. 200 Sieve 11.9% Moisture

Excavated on 6/29/22
Groundwater not encountered
Test pit terminated at 14.5 feet
Bulk samples taken at 6.0 feet
Excavation Equipment: Track Excavator
Logged by: JH

XCELL ENGINEERING, LLC
"Building on Excellence"

Test Pit No. 202

Project: Newdale Landfill
File: P22009

DEPTH (Feet)	SOIL CLASS	SOIL DESCRIPTION
0.0 –14.0	ML	Fine Sandy SILT – Light brown, loose to medium dense, damp
14.0	RX	Rhyolite – Soft rock, highly fractured
8		93.1% Passing No. 200 Sieve 11.9% Moisture

Excavated on 6/29/22
Groundwater not encountered
Test pit terminated at 14.0 feet
Bulk samples taken at 8.0 feet
Excavation Equipment: Track Excavator
Logged by: JH

XCELL ENGINEERING, LLC
"Building on Excellence"

Test Pit No. 203

Project: Newdale Landfill
File: P22009

DEPTH (Feet)	SOIL CLASS	SOIL DESCRIPTION
0.0 –9.0	ML	Fine Sandy SILT – Light brown, loose to medium dense, damp
9.0 -11.5	RX	Rhyolite – Soft rock, highly fractured
6		Plasticity Index – Non-plastic
6		89.8% Passing No. 200 Sieve 15.9% Moisture
10		61.6% Passing No. 200 Sieve 23.0% Moisture

Excavated on 6/29/22
Groundwater not encountered
Test pit terminated at 11.5 feet
Bulk samples taken at 6.0 and 10.0 feet
Excavation Equipment: Track Excavator
Logged by: JH

XCELL ENGINEERING, LLC
"Building on Excellence"

Test Pit No. 204

Project: Newdale Landfill
File: P22009

DEPTH (Feet)	SOIL CLASS	SOIL DESCRIPTION
0.0 –11.5	ML	Fine Sandy SILT – Light brown, loose to medium dense, damp
11.5-14.0	RX	Rhyolite – Soft rock, highly fractured
8		88.1% Passing No. 200 Sieve 12.6% Moisture
12		64.6% Passing No. 200 Sieve 18.5% Moisture

Excavated on 6/29/22
Groundwater not encountered
Test pit terminated at 14.0 feet
Bulk samples taken at 8.0 and 12.0 feet
Excavation Equipment: Track Excavator
Logged by: JH

XCELL ENGINEERING, LLC
"Building on Excellence"

Test Pit No. 205

Project: Newdale Landfill
File: P22009

DEPTH (Feet)	SOIL CLASS	SOIL DESCRIPTION
0.0 –11.0	ML	Fine Sandy SILT – Light brown, loose to medium dense, damp
11.0	RX	Rhyolite – Soft rock, moderately fractured
6		Plasticity Index – 8
6		92.1% Passing No. 200 Sieve
		92.1% Moisture

Excavated on 6/29/22
Groundwater not encountered
Test pit terminated at 11.0 feet
Bulk samples taken at 6.0 feet
Excavation Equipment: Track Excavator
Logged by: JH

XCELL ENGINEERING, LLC
"Building on Excellence"

Test Pit No. 206

Project: Newdale Landfill
File: P22009

DEPTH (Feet)	SOIL CLASS	SOIL DESCRIPTION
0.0 –14.0	ML	Fine Sandy SILT – Light brown, loose to medium dense, damp
6		95.3% Passing No. 200 Sieve 14.8% Moisture

Excavated on 6/29/22
Groundwater not encountered
Test pit terminated at 14.0 feet
Bulk samples taken at 6.0 feet
Excavation Equipment: Track Excavator
Logged by: JH

XCELL ENGINEERING, LLC
"Building on Excellence"

Test Pit No. 207

Project: Newdale Landfill
File: P22009

DEPTH (Feet)	SOIL CLASS	SOIL DESCRIPTION
0.0 –12.0	CL-ML	Fine Sandy SILT – Light brown, loose to medium dense, damp
12.0-16.0	SM	Silty Fine to Coarse SAND and Fine GRAVEL with Fractured RHYOLITE
8		Plasticity Index – 9
2		90.7% Passing No. 200 Sieve
		88.9% Passing No. 200 Sieve
8		31.2% Passing No. 200 Sieve
		12.0% Moisture

Excavated on 6/29/22
Groundwater not encountered
Test pit terminated at 13.0 feet
Bulk samples taken at 2.0, 8.0 and 15 feet
Excavation Equipment: Track Excavator
Logged by: JH

XCELL ENGINEERING, LLC
"Building on Excellence"

Test Pit No. 208

Project: Newdale Landfill
File: P22009

DEPTH (Feet)	SOIL CLASS	SOIL DESCRIPTION
0.0 –13.0	ML	Fine Sandy SILT – Light brown, loose to medium dense, damp
13.0-14.5	RX	Rhyolite – Soft rock, highly fractured
3		92.8% Passing No. 200 Sieve 12.2% Moisture

Excavated on 6/29/22
Groundwater not encountered
Test pit terminated at 14.5 feet
Bulk samples taken at 3.0 feet
Excavation Equipment: Track Excavator
Logged by: JH

XCELL ENGINEERING, LLC
"Building on Excellence"

Test Pit No. 209

Project: Newdale Landfill
File: P22009

DEPTH (Feet)	SOIL CLASS	SOIL DESCRIPTION
0.0 –1.0	ML	Fine Sandy SILT – Light brown, loose to medium dense, damp
1.0-6.0	RX	Rhyolite – Soft rock, highly fractured
1		84.9% Passing No. 200 Sieve 6.0% Moisture

Excavated on 6/29/22
Groundwater not encountered
Test pit terminated at 6.0 feet
Bulk samples taken at 1.0 and 6.0 feet
Excavation Equipment: Track Excavator
Logged by: JH

XCELL ENGINEERING, LLC
"Building on Excellence"

Test Pit No. 210

Project: Newdale Landfill
File: P22009

DEPTH (Feet)	SOIL CLASS	SOIL DESCRIPTION
0.0 –13.0	ML	Fine Sandy SILT – Light brown, loose to medium dense, damp
6		Plasticity Index – 11
6		88.2% Passing No. 200 Sieve 13.8% Moisture
13		84.8% Passing No. 200 Sieve 14.8% Moisture

Excavated on 6/29/22
Groundwater not encountered
Test pit terminated at 13.0 feet
Bulk samples taken at 6.0 and 13.0 feet
Excavation Equipment: Track Excavator
Logged by: JH

XCELL ENGINEERING, LLC
"Building on Excellence"

Test Pit No. 211

Project: Newdale Landfill
File: P22009

DEPTH (Feet)	SOIL CLASS	SOIL DESCRIPTION
0.0 –6.0	ML	Fine Sandy SILT – Light brown, loose to medium dense, damp
6.0-10.0	SM	Fine to Coarse Silty SAND and RHYOLITE – Soft rock, highly fractured
6		86.6% Passing No. 200 Sieve 13.9% Moisture
10		26.4% Passing No. 200 Sieve 9.9% Moisture

Excavated on 6/29/22
Groundwater not encountered
Test pit terminated at 10.0 feet
Bulk samples taken at 6.0 feet
Excavation Equipment: Track Excavator
Logged by: JH

XCELL ENGINEERING, LLC
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Refer to Appendix B-2-3 for Boring Logs and B-2-4 for Physical Properties Soil Testing Results

B.2-3 Boring Logs (Shallow and Deep Borings)

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks Ground surface
- - 1 - - 2 - - 3 - - 4 - - 5 - - 6 - - 7 - - 8 - - 9 - - 10 - - 11 - - 12 - - 13 - - 14 -	Fine Sandy Silt – Light brown, loose Fine Sandy Silt – Light brown, loose Fine Sandy Silt – Light brown, loose	ML ML ML	Bulk Bulk Bulk					Auger advanced with ease
- 15 - - 16 - - 17 - - 18 - -19 - - 20	Sandy Rhyolite – Purple, moderately hard, fresh Rhyolite – Purple, moderately hard, fresh		Bulk Bulk					

Project: Newdale Landfill	**Drill Rig: Fury 130**	**BORING NO.: SB - 1**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/8/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
- 21								
- 22								
- 23								
- 24								
- 25	Rhyolite – Purple, moderately hard, fresh		Bulk					Sample accidently combined with 20' sample
- 26								
- 27								
- 28								
- 29								
- 30	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 31								
- 32								
- 33								
- 34								
- 35								
- 36								
- 37								
- 38								
-39								
- 40								

Project: Newdale Landfill	**Drill Rig: Fury 130**	**BORING NO.: SB - 1**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/8/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks Ground surface
- 1 - 2 - 3 - 4	Fine Sandy Silt – Light brown, loose	ML	Bulk					Auger advanced with ease
- 5 - 6 - 7 - 8 - 9	Fine Sandy Silt – Light brown, loose	ML	Bulk					
- 10 - 11 - 12 - 13 - 14	Fine Sandy Silt – Light brown, loose	ML	Bulk					
- 15 - 16 - 17 - 18 -19	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 20	Rhyolite – Purple, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Fury 130**	**BORING NO.: SB - 2**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/7/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-								
- 21								
-								
- 22								
-								
- 23								
-								
- 24								
-								
- 25	Rhyolite – Purple, moderately hard, fresh		Bulk					
-								
- 26								
-								
- 27								
-								
- 28								
-								
- 29								
-								
- 30	Rhyolite – Purple, moderately hard, fresh		Bulk					
-								
- 31								
-								
- 32								
-								
- 33								
-								
- 34								
-								
- 35								
-								
- 36								
-								
- 37								
-								
- 38								
-								
-39								
-								
- 40								

Project: Newdale Landfill	**Drill Rig: Fury 130**	**BORING NO.: SB - 2**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/7/22		
Logged By: JH		

OSHPD

Latitude, Longitude: 43.81176301, -111.53641831

Date	8/26/2022, 1:01:15 PM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Stiff Soil

Type	Value	Description
S_S	0.467	MCE_R ground motion. (for 0.2 second period)
S_1	0.166	MCE_R ground motion. (for 1.0s period)
S_{MS}	0.666	Site-modified spectral acceleration value
S_{M1}	0.376	Site-modified spectral acceleration value
S_{DS}	0.444	Numeric seismic design value at 0.2 second SA
S_{D1}	0.251	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	D	Seismic design category
F_a	1.426	Site amplification factor at 0.2 second
F_v	2.269	Site amplification factor at 1.0 second
PGA	0.201	MCE_G peak ground acceleration
F_{PGA}	1.399	Site amplification factor at PGA
PGA_M	0.282	Site modified peak ground acceleration
T_L	6	Long-period transition period in seconds
SsRT	0.467	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	0.504	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.166	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.176	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.5	Factored deterministic acceleration value. (Peak Ground Acceleration)
PGA_{UH}	0.201	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C_{RS}	0.927	Mapped value of the risk coefficient at short periods
C_{R1}	0.943	Mapped value of the risk coefficient at a period of 1 s
C_V	1.012	Vertical coefficient

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks Ground surface
- - 1 - - 2 - - 3 - - 4 - - 5 - - 6 - - 7 - - 8 - - 9 - - 10 - - 11 - - 12 - - 13 - - 14 -	Fine Sandy Silt – Light brown, loose Fine Sandy Silt – Light brown, loose Fine Sandy Silt – Light brown, loose	ML ML ML	Bulk Bulk Bulk					Auger advanced with ease
- 15 - - 16 - - 17 - - 18 - -19 - - 20	Rhyolite – Purple, moderately hard, fresh Rhyolite – Purple, moderately hard, fresh		Bulk Bulk					

Project: Newdale Landfill	**Drill Rig: Fury 130**	**BORING NO.: SB - 3**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/8/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
- 21								
- 22								
- 23								
- 24								
- 25	Rhyolite—Purple, moderately hard, fresh		Bulk					
- 26								
- 27								
- 28								
- 29								
- 30	Rhyolite—Purple, moderately hard, fresh		Bulk					
- 31								
- 32								
- 33								
- 34								
- 35								
- 36								
- 37								
- 38								
-39								
- 40								

Project: Newdale Landfill	**Drill Rig: Fury 130**	**BORING NO.: SB - 3**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/8/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks Ground surface
- - 1 - - 2 - - 3 - - 4 - - 5 - - 6 - - 7 - - 8 - - 9 - - 10 - - 11 - - 12 - - 13 - - 14 -	Fine Sandy SILT – Light brown, loose Fine Sandy SILT – Light brown, loose Fine Sandy SILT – Light brown, loose	ML ML ML	Bulk Bulk Bulk					Auger advanced with ease
- 15 - - 16 - - 17 - - 18 - -19 - - 20	Rhyolite – Purple, moderately hard, fresh Rhyolite – Purple, moderately hard, fresh		Bulk Bulk					

Project: Newdale Landfill	**Drill Rig: Fury 130**	**BORING NO.: SB - 4**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/7/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
- 21								
- 22								
- 23								
- 24								
- 25	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 26								
- 27								
- 28								
- 29								
- 30	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 31								
- 32								
- 33								
- 34								
- 35								
- 36								
- 37								
- 38								
-39								
- 40								

Project: Newdale Landfill	**Drill Rig: Fury 130**	**BORING NO.: SB - 4**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck Idaho 83202
Date Drilled: 7/7/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks Ground surface
- - 1 - - 2 - - 3 - - 4 - - 5 - - 6 - - 7 - - 8 - - 9 - - 10 - - 11 - - 12 - - 13 - - 14 -	Fine Sandy SILT – Light brown, loose Fine Sandy SILT – Light brown, loose Fine Sandy SILT – Light brown, loose	ML ML ML	Bulk Bulk Bulk					Auger advanced with ease
- 15 - - 16 - - 17 - - 18 - -19 - - 20	Rhyolite – Purple, moderately hard, fresh Rhyolite – Purple, moderately hard, fresh		Bulk Bulk					

Project: Newdale Landfill	**Drill Rig: Fury 130**	**BORING NO.: SB - 5**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/19/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
- 21 - 22 - 23 - 24 - 25 - 26 - 27 - 28 - 29 -	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 30 - 31 - 32 - 33 - 34 -	Rhyolite – Purple, orange, moderately hard, fresh		Bulk					
- 35 - 36 - 37 - 38 -	Rhyolite – Purple, orange, moderately hard, fresh		Bulk					
-39 - 40	Rhyolite – Purple, orange, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Fury 130**	**BORING NO.: SB - 5**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/19/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
- 41								
- 42								
- 43								
- 44								
- 45	Rhyolite – Purple, some orange, moderately hard, fresh		Bulk					
- 46								
- 47								
- 48								
- 49								
- 50	Rhyolite – Purple, some orange, moderately hard, fresh		Bulk					
- 51								
- 52								
- 53								
- 54								
- 55	Rhyolite – Purple, some orange, moderately hard, fresh		Bulk					
- 56								
- 57								
- 58								
-59								
- 60	Rhyolite – Purple, some orange, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Fury 130**	**BORING NO.: SB - 5**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/19/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
- 61								
- 62								
- 63								
- 64								
- 65 - 66	Rhyolite – Purple, some orange, moderately hard, fresh		Bulk					
- 67								
- 68								
- 69								
- 70 - 71	Rhyolite – Purple, some orange, moderately hard, fresh		Bulk					
- 72								
- 73								
- 74								
- 75 - 76	Rhyolite – Purple, some orange, moderately hard, fresh		Bulk					
- 77								
- 78								
-79 - 80	Rhyolite – Purple, some orange, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Fury 130**	**BORING NO.: SB - 5**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/19/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
- 81 - 82 - 83 - 84								
- 85 - 86 - 87 - 88 - 89	Cinders – red, orange, sand like, weak		Bulk					
- 90 - 91 - 92 - 93 - 94 - 95 - 96 - 97 - 98 -99 -100	SAND– Brown, black, weak		Bulk					

Project: Newdale Landfil	**Drill Rig: Fury 130**
File No.: P22009	**Diameter: 6"**
Date Drilled: 7/19/22	
Logged By: JH	

BORING NO.: SB - 5

XCELL ENGINEERING, LC
260 Laurel Lane
Chubbuck Idaho 83202

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks Ground surface
- 1	Fine Sandy SILT – Light brown, loose	ML	Bulk					
- 2								
- 3								Auger advanced with ease
- 4								
- 5	Fine Sandy SILT – Light brown, loose	ML	Bulk					
- 6								
- 7								
- 8								
- 9								
- 10	Fine Sandy SILT – Light brown, loose	ML	Bulk					
- 11								
- 12								
- 13								
- 14								
- 15	Fine Sandy SILT – Light brown, loose		Bulk					
- 16								
- 17								
- 18								
-19								
- 20	Rhyolite – Purple, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Fury 130**	**BORING NO.: SB - 6**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/11/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
- 21								
- 22								
- 23								
- 24								
- 25	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 26								
- 27								
- 28								
- 29								
- 30	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 31								
- 32								
- 33								
- 34								
- 35								
- 36								
- 37								
- 38								
-39								
- 40								

Project: Newdale Landfill	**Drill Rig: Fury 130**	**BORING NO.: SB - 6**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/11/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks Ground surface
- - 1 - - 2 - - 3 - - 4 - - 5 - - 6 - - 7 - - 8 - - 9 - - 10 - - 11 - - 12 - - 13 - - 14 -	Fine Sandy SILT – Light brown, loose Fine Sandy SILT – Light brown, loose Fine Sandy SILT – Light brown, loose	ML ML ML	Bulk Bulk Bulk					Auger advanced with ease
- 15 - - 16 - - 17 - - 18 - -19 - - 20	Rhyolite – Purple, moderately hard, fresh Rhyolite – Purple, moderately hard, fresh		Bulk Bulk					

Project: Newdale Landfill	**Drill Rig: Fury 130**	**BORING NO.: SB - 7**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/15/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
- 21								
- 22								
- 23								
- 24								
- 25	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 26								
- 27								
- 28								
- 29								
- 30	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 31								
- 32								
- 33								
- 34								
- 35	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 36								
- 37								
- 38								
-39								
- 40	Rhyolite – Purple, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Fury 130**	**BORING NO.: SB – 7**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/15/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
- 41								
- 42								
- 43								
- 44								
- 45	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 46								
- 47								
- 48								
- 49								
- 50	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 51								
- 52								
- 53								
- 54								
- 55	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 56								
- 57								
- 58								
-59								
- 60	Rhyolite – Purple, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Fury 130**	**BORING NO.: SB - 5**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/15/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
- 61								
- 62								
- 63								
- 64								
- 65	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 66								
- 67								
- 68								
- 69								
- 70	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 71								
- 72								
- 73								
- 74								
- 75	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 76								
- 77								
- 78								
-79								
- 80	Rhyolite – Purple, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Fury 130**	**BORING NO.: SB - 7**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/15/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks Ground surface
- 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 12 - 13 - 14	Fine Sandy SILT – Light brown, loose Fine Sandy SILT – Light brown, loose Fine Sandy SILT – Light brown, loose	ML ML ML	Bulk Bulk Bulk					Auger advanced with ease
- 15 - 16 - 17 - 18 -19	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 20	Rhyolite – Purple, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Fury 130**	**BORING NO.: SB - 8**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/14/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
- 21								
- 22								
- 23								
- 24								
- 25	Rhyolite – Purple, white, moderately hard, fresh		Bulk					
- 26								
- 27								
- 28								
- 29								
- 30			Bulk					
- 31	Rhyolite – Purple, moderately hard, fresh							
- 32								
- 33								
- 34								
- 35			Bulk					
- 36	Rhyolite – Purple, moderately hard, fresh							
- 37								
- 38								
-39								
- 40	Rhyolite – Purple, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Fury 130**	**BORING NO.: SB – 8**
File No.: P22009	**Diameter: 6"**	
Date Drilled: 7/14/22		
Logged By: JH		

XCELL ENGINEERING, LC
260 Laurel Lane
Chubbuck, Idaho 83202

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
- 41								
- 42								
- 43								
- 44								
- 45	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 46								
- 47								
- 48								
- 49								
- 50	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 51								
- 52								
- 53								
- 54								
- 55	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 56								
- 57								
- 58								
-59								
- 60	Rhyolite – Purple, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Fury 130**	**BORING NO.: SB - 8**
File No.: P22009	**Diameter: 6"**	
Date Drilled: 7/14/22		
Logged By: JH		

XCELL ENGINEERING, LC
260 Laurel Lane
Chubbuck, Idaho 83202

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
- 61								
- 62								
- 63								
- 64								
- 65	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 66								
- 67								
- 68								
- 69								
- 70	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 71								
- 72								
- 73								
- 74								
- 75	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 76								
- 77								
- 78								
-79								
- 80	Rhyolite – Purple, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Fury 130**	**BORING NO.: SB - 8**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/14/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-81			Bulk					
- 82								
- 83								
- 84								
- 85	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 86								
- 87								
- 88								
- 89								
- 90	SAND – Brown, orange, gray		Bulk					
- 91								
- 92								
- 93								
- 94								
- 95								
- 96								
- 97								
- 98								
-99								
-100								

Project: Newdale Landfill	**Drill Rig: Fury 130**	**BORING NO.: SB - 8**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/14/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks Ground surface
- - 1 - - 2 - - 3 - - 4 - - 5 - - 6 - - 7 - - 8 - - 9 - - 10 - - 11 - - 12 - - 13 - - 14 -	Fine Sandy Silt – Light brown, loose Fine Sandy Silt – Light brown, loose Fine Sandy Silt – Light brown, loose	ML ML ML	Bulk Bulk Bulk					Auger advanced with ease
- 15 - - 16 - - 17 - - 18 - -19 - - 20	Rhyolite – Purple, moderately hard, fresh Rhyolite – Purple, moderately hard, fresh		Bulk Bulk					

Project: Newdale Landfill	**Drill Rig: Fury 130**	**BORING NO.: SB - 9**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/12/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-								
- 21								
-								
- 22								
-								
- 23								
-								
- 24								
-								
- 25	Rhyolite – Purple, moderately hard, fresh		Bulk					
-								
- 26								
-								
- 27								
-								
- 28								
-								
- 29								
-								
- 30	Rhyolite – Purple, moderately hard, fresh		Bulk					
-								
- 31								
-								
- 32								
-								
- 33								
-								
- 34								
-								
- 35	Rhyolite – Purple, moderately hard, fresh		Bulk					
-								
- 36								
-								
- 37								
-								
- 38								
-								
-39								
-								
- 40	Rhyolite w/ Pumice – Purple, weak, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Fury 130**	**BORING NO.: SB - 9**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/12/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-								
- 41								
-								
- 42								
-								
- 43								
-								
- 44								
-								
- 45	Rhyolite w/ Pumice – Purple, weak, fresh		Bulk					
-								
- 46								
-								
- 47								
-								
- 48								
-								
- 49								
-								
- 50	Rhyolite w/ Pumice – Purple, weak, fresh		Bulk					
-								
- 51								
-								
- 52								
-								
- 53								
-								
- 54								
-								
- 55	Rhyolite w/ Pumice – Purple, weak, fresh		Bulk					
-								
- 56								
-								
- 57								
-								
- 58								
-								
-59								
-								
- 60	Rhyolite w/ Pumice – Purple, weak, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: SB - 9**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/12/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
- 61								
- 62								
- 63								
- 64								
- 65	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 66								
- 67								
- 68								
- 69								
- 70	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 71								
- 72								
- 73								
- 74								
- 75	Rhyolite – Purple, gray, some red, moderately hard, fresh		Bulk					
- 76								
- 77								
- 78								
-79								
- 80	Cinders – red, orange, sand like, weak		Bulk					

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: SB - 9**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/12/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-								
- 81								
-								
- 82								
-								
- 83								
-								
- 84								
-								
- 85	Cinders – red, orange, sand like, weak		Bulk					
-								
- 86								
-								
- 87								
-								
- 88								
-								
- 89								
-								
- 90	Cinders – red, orange, sand like, weak		Bulk					
-								
- 91								
-								
- 92								
-								
- 93								
-								
- 94								
-								
- 95	Cinders – red, orange, sand like, weak		Bulk					
-								
- 96								
-								
- 97								
-								
- 98								
-								
-99								
-								
-100	Sand – Black, gray, weak		Bulk					

Project: Newdale Landfil	**Drill Rig: Schramm Drill 685**	**BORING NO.: SB - 9**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck Idaho 83202
Date Drilled: 7/12/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks Ground surface
- - 1 - - 2 - - 3 - - 4 - - 5 - - 6 - - 7 - - 8 - - 9 - - 10 - - 11 - - 12 - - 13 - - 14 -	Fine Sandy SILT – Light brown, loose Fine Sandy SILT – Light brown, loose Fine Sandy SILT – Light brown, loose	ML ML ML	Bulk Bulk Bulk					Auger advanced with ease
- 15 - - 16 - - 17 - - 18 - -19 - - 20	Rhyolite – Purple, moderately hard, fresh Rhyolite – Purple, moderately hard, fresh		Bulk Bulk					

Project: Newdale Landfill	**Drill Rig: Fury 130**	**BORING NO.: SB - 10**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/11/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-								
- 21								
-								
- 22								
-								
- 23								
-								
- 24								
-								
- 25	Rhyolite – Purple, moderately hard, fresh		Bulk					
-								
- 26								
-								
- 27	Lost circulation – no return							
-								
- 28								
-								
- 29								
-								
- 30	No return							
-								
- 31								
-								
- 32								
-								
- 33								
-								
- 34								
-								
- 35								
-								
- 36								
-								
- 37								
-								
- 38								
-								
-39								
-								
- 40								

Project: Newdale Landfill	**Drill Rig: Fury 130**	**BORING NO.: SB - 10**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/11/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks Ground surface
- - 1 - - 2 - - 3 - - 4 - - 5 - - 6 - - 7 - - 8 - - 9 - - 10 - - 11 - - 12 - - 13 - - 14 -	Fine Sandy SILT – Light brown, loose Fine Sandy SILT – Light brown, loose Fine Sandy SILT – Light brown, loose	ML ML ML	Bulk Bulk Bulk					Auger advanced with ease
- 15 - - 16 - - 17 - - 18 - -19 - - 20	Rhyolite – Purple, moderately hard, fresh Rhyolite – Purple, moderately hard, fresh		Bulk Bulk					

Project: Newdale Landfill	**Drill Rig: Fury 130**	**BORING NO.: SB - 11**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/19/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-	Lost circulation – no return							
- 21								
-								
- 22								
-								
- 23								
-								
- 24								
-								
- 25	No return							
-								
- 26								
-								
- 27								
-								
- 28								
-								
- 29								
-								
- 30	No return							
-								
- 31								
-								
- 32								
-								
- 33								
-								
- 34								
-								
- 35	No return							
-								
- 36								
-								
- 37								
-								
- 38								
-								
-39								
-								
- 40	No return							

Project: Newdale Landfill	**Drill Rig: Fury 130**	**BORING NO.: SB - 11**
File No.: P22009	**Diameter: 6"**	
Date Drilled: 7/19/22		
Logged By: JH		

XCELL ENGINEERING, LC
260 Laurel Lane
Chubbuck, Idaho 83202

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks Ground surface
- - 1 - - 2 - - 3 - - 4 - - 5 - - 6 - - 7 - - 8 - - 9 - - 10 - - 11 - - 12 - - 13 - - 14 -	Fine Sandy SILT – Light brown, loose Fine Sandy SILT – Light brown, loose Fine Sandy SILT – Light brown, loose	ML ML ML	Bulk Bulk Bulk					Auger advanced with ease
- 15 - - 16 - - 17 - - 18 - -19 - - 20	Rhyolite – Purple, moderately hard, fresh Rhyolite – Purple, moderately hard, fresh		Bulk Bulk					Bigger chunks out of discharge

Project: Newdale Landfill	**Drill Rig: Fury 130**	**BORING NO.: SB - 12**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/11/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
- 21								
- 22								
- 23								
- 24								
- 25	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 26								
- 27								
- 28								
- 29								
- 30	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 31								
- 32								
- 33								
- 34								
- 35	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 36								
- 37								
- 38								
-39								
- 40	Rhyolite – Purple, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Fury 130**	**BORING NO.: SB - 12**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/11/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
- 41								
- 42								
- 43								
- 44								
- 45	Rhyolite – Purple, gray, some orange, moderately hard, fresh		Bulk					
- 46								
- 47								
- 48								
- 49								
- 50	Rhyolite – Purple, gray, some orange, moderately hard, fresh		Bulk					
- 51								
- 52								
- 53								
- 54								
- 55	Rhyolite – Purple, gray, some orange, moderately hard, fresh		Bulk					
- 56								
- 57								
- 58								
-59								
- 60	Rhyolite – Purple, gray, some orange, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Fury 130**	**BORING NO.: SB - 12**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck Idaho 83202
Date Drilled: 7/11/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
- 61 - 62 - 63 - 64 - 65 - 66 - 67 - 68 - 69	Rhyolite – Gray, black, moderately hard, fresh		Bulk					
- 70 - 71 - 72 - 73 - 74	Sandy Soft Rock – Brown, weak		Bulk					
- 75 - 76 - 77 - 78 -79	Sandy Soft Rock– Brown, weak		Bulk					
- 80	Sandy Soft Rock – Brown, weak		Bulk					

Project: Newdale Landfill	**Drill Rig: Fury 130**	**BORING NO.: SB - 12**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck Idaho 83202
Date Drilled: 7/11/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks Ground surface
- 1 - 2 - 3 - 4	Fine Sandy Silt – Light brown, loose	ML	Bulk					Auger advanced with ease
- 5 - 6 - 7 - 8 - 9	Fine Sandy Silt – Light brown, loose	ML	Bulk					
- 10 - 11 - 12 - 13 - 14	Fine Sandy Silt – Light brown, loose	ML	Bulk					
- 15 - 16 - 17 - 18 -19	Sandy Rhyolite – Purple, moderately hard		Bulk					
- 20	Rhyolite – Purple, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 1**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/7/22 – 7/14/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
- 21								
- 22								
- 23								
- 24								
- 25	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 26								
- 27								
- 28								
- 29								
- 30	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 31								
- 32								
- 33								
- 34								
- 35	Rhyolite w/ some Pumice – Purple, moderately hard, fresh		Bulk					
- 36								
- 37								
- 38								
-39								
- 40	Rhyolite – Purple, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 1**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/7/22–7/14/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-								
- 41								
-								
- 42								
-								
- 43								
-								
- 44								
-								
- 45	Rhyolite – Purple, moderately hard, fresh		Bulk					
-								
- 46								
-								
- 47								
-								
- 48								
-								
- 49								
-								
- 50	Rhyolite – Purple, moderately hard, fresh		Bulk					
-								
- 51								
-								
- 52								
-								
- 53								
-								
- 54								
-								
- 55	Rhyolite – Purple, moderately hard, fresh		Bulk					
-								
- 56								
-								
- 57								
-								
- 58								
-								
-59								
-	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 60								

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 1**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/7/22-7/14/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-								
- 61								
-								
- 62								
-								
- 63								
-								
- 64								
-								
- 65	Rhyolite – Purple, moderately hard, fresh		Bulk					
-								
- 66								
-								
- 67								
-								
- 68								
-								
- 69								
-								
- 70	Rhyolite – Purple, moderately hard, fresh		Bulk					
-								
- 71								
-								
- 72								
-								
- 73								
-								
- 74								
-								
- 75	Rhyolite – Purple, moderately hard, fresh		Bulk					
-								
- 76								
-								
- 77								
-								
- 78								
-								
-79								
-	Rhyolite – Purple,							
- 80	moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 1**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/7//22-7/14/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
- 81								
- 82								
- 83								
- 84								
- 85	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 86								
- 87								
- 88								
- 89								
- 90	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 91								
- 92								
- 93								
- 94								
- 95	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 96								
- 97								
- 98								
-99								
- 100	Rhyolite – Purple, moderately hard, fresh		Bulk					

Project: Newdale Landfil	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 1**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck Idaho 83202
Date Drilled: 7/7/22 – 7/14/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
- -101 - -102 - -103 - -104 - -105 - -106 - -107 - -108 - -109 - -110 - -111 - -112 - -113 - 114 - 115 - -116 - -117 - 118 - -119 - 120	Rhyolite – Purple, gray, moderately hard, fresh Rhyolite – Purple, gray, moderately hard, fresh Rhyolite – Purple, gray, moderately hard, fresh Rhyolite –purple, gray, black, moderately hard, fresh		Bulk Bulk Bulk Bulk					

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 1**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/7/22–7/14/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-121								
-122								
-123								
-124								
-125	Rhyolite – Gray, black, moderately hard, fresh		Bulk					
-126								
-127								
-128								
129								
-130	Rhyolite – Gray, black, moderately hard, fresh		Bulk					
-131								
-132								
-133								
-134								
-135	Rhyolite – Gray, black, moderately hard, fresh		Bulk					
-136								
-137								
-138								
-139								
-140	Rhyolite – Gray, black, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 1**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/7/22-7/14/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-141								
-142								
-143								
-144								
-145	Rhyolite – Gray , black, moderately hard, fresh		Bulk					
-146								
-147								
-148								
-149								
-150	Lost circulation/ no return							
-151								
-152								
-153								
-154								
-155	No return							
-156								
-157								
-158								
159								
-160	No return							

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 1**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/7//22-7/14/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
- -161 - -162 - -163 - -164								
- -165 - -166 - -167 - -168 - -169	Regained circulation Rhyolite – Gray, moderately hard, fresh		Bulk					
- -170 - -171 - -172 - -173 - -174	Rhyolite– Gray, moderately hard, fresh		Bulk					
- -175 - -176 - -177 - -178 - -179	Rhyolite – Gray, moderately hard, fresh		Bulk					
- -180	Lost circulation, no return							

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 1**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/7/22 – 7/14/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-181								
-182								
-183								
-184								
-185	No return							
-186								
-187								
-188								
-189								
-190	No return							
-191								
-192								
-193								
-194								
-195	No return							
-196								
-197								
-198								
-199								
-200	No return							

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 1**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/7/22–7/14/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-								
-201								
-								
-202								
-								
-203								
-								
-204								
-								
-205	No return							
-								
-206								
-								
-207								
-								
-208								
-								
-209								
-								
-210	No return							
-								
-211								
-								
-212								
-								
-213								
-								
-214								
-								
-215	No return							
-								
-216								
-								
-217								
-								
-218								
-								
219								
-								
-220	No return							

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 1**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/7/22-7/14/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-211								
-222								
-223								
-224								
-225	No return							
-226								
-227								
-228								
-229								
-230	No return							
-231								
-232								
-233								
-234								
-235	No return							
-236								
-237								
-238								
239								
-240	No return							

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 1**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/7//22-7/14/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-								
-241								
-								
-242								
-								
-243								
-								
-244								
-								
-245	No return							
-								
-246								
-								
-247								
-								
-248								
-								
-249								
-								
-250	No return							
-								
-251								
-								
-252								
-								
-253								
-								
-254								
-								
-255	No return							
-								
-256								
-								
-257								
-								
-258								
-								
259								
-								
-								
260	No return							

Project: Newdale Landfil	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 1**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/7/22 – 7/14/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-								
-261								
-								
-262								
-								
-263								
-								
-264								
-								
-265	No return							
-								
-266								
-								
-267								
-								
-268								
-								
-269								
-								
-270	No return							
-								
-271								
-								
-272								
-								
-273								
-								
274								
-								
275	No return							
-								
-276								
-								
-277								
-								
278								
-								
-279								
-								
280	No return							

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 1**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/7/22–7/14/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-281								
-282								
-283								
-284								
-285	No return							
-286								
-287								
-288								
289								
-290	No return							
-291								
-292								
-293								
-294								
-295	No return							
-296								
-297								
-298								
-299								
-300	No return							

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 1**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/7/22-7/14/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-								
-301								
-								
-302								
-								
-303								
-								
-304								
-								
-305	No return							
-								
-306								
-								
-307								
-								
-308								
-								
-309								
-								
-310	No return							
-								
-311								
-								
-312								
-								
-313								
-								
-314								
-								
-315	No return							
-								
-316								
-								
-317								
-								
-318								
-								
319								
-								
-320	No return							

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 1**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/7//22-7/14/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-321								
322								
-323								
-324								
-325	No return							
-326								
-327								
-328								
-329								
-330	No return							
-331								
-332								
-333								
-334								
-335	No return							
-336								
-337								
-338								
339								
-340	No return							

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 1**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/7/22 – 7/14/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
- -341 - -342 - -343 - -344								
- -345 - -346 - -347 - -348 - -349	Regained circulation Rhyolite – Purple, gray, black, moderately hard, fresh		Bulk					
- -350 - -351 - -352 - -353 - -354	Rhyolite – Purple, gray, black, moderately hard, fresh		Bulk					
- -355 - -356 - -357 - -358 - -359	Rhyolite – Purple, gray, black, moderately hard, fresh		Bulk					
- -360	Rhyolite – Purple, gray, black, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 1**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck Idaho 83202
Date Drilled: 7/7/22–7/14/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-361								
-362								
-363								
-364								
-365	Rhyolite – Purple, gray, black, moderately hard, fresh		Bulk					
-366								
-367								
-368								
-369								
-370			Bulk					
-371	Rhyolite – Purple, gray, black, moderately hard, fresh							
-372								
-373								
-374								
-375			Bulk					
-376	Rhyolite – Purple, gray, black, moderately hard, fresh							
-377								
-378								
379								
-380	Rhyolite – Purple, gray, black, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 1**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/7/22-7/14/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
- -381 - -382 - -383 - -384 - -385 - -386 - -387 - -388 - -389 - -390 - -391 - -392 - -393 - -394 - -395 - -396 - -397 - -398 - -399 - -400	Rhyolite – Purple, gray, black, moderately hard, fresh Rhyolite – Purple, gray, black, moderately hard, fresh Lost circulation, no return No return Regained circulation Rhyolite – Purple, gray, black, moderately hard, fresh		Bulk Bulk Bulk					

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 1**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/7//22-7/14/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
- -401 - -402 - -403 - -404 - -405 - -406 - -407 - -408 - -409 - -410 - -411 - -412 - -413 - -414 - -415 - -416 - -417 - -418 - 419 - -420	Rhyolite – Purple, gray, black, moderately hard, fresh Rhyolite – Purple, gray, black, moderately hard, fresh Rhyolite –Gray, black, moderately hard, fresh Rhyolite –Gray, black, moderately hard, fresh		Bulk Bulk Bulk Bulk					

Project: Newdale Landfil	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 1**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/7/22 – 7/14/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-421								
-422								
-423								
-424								
-425	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-426								
-427								
-428								
-429								
-430	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-431								
-432								
-433								
434								
435	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-436								
-437								
438								
-439								
440	Interbed, variety of colors, moderately hard, fresh		Bulk					"almost gravelly" - Tyson

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 1**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/7/22–7/14/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-441								
-442								
-443								
-444								
-445	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-446								
-447								
-448								
449								
-450	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-451								
-452								
-453								
-454								
-455	Rhyolite – Black, gray, moderately hard, fresh		Bulk					End of boring
-456								
-457								
-458								
-459								
-460								

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 1**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/7/22-7/14/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks Ground surface
- - 1 - - 2 - - 3 - - 4 - - 5 - - 6 - - 7 - - 8 - - 9 - - 10 - - 11 - - 12 - - 13 - - 14 -	Fine Sandy Silt – Light brown, loose, Fine Sandy Silt – Light brown, loose Fine Sandy Silt – Light brown, loose	ML ML ML	Bulk Bulk Bulk					Auger advanced with ease
- 15 - - 16 - - 17 - - 18 - -19 - - 20	Rhyolite – Purple, moderately hard, fresh Rhyolite – Purple, moderately hard, fresh		Bulk Bulk					

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/16/22–7/21/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
- 21								
- 22								
- 23								
- 24								
- 25	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 26								
- 27								
- 28								
- 29								
- 30	Rhyolite – Purple, moderately hard, fresh		Bulk					
- 31	Lost circulation							
- 32								
- 33								
- 34								
- 35	No return							
- 36								
- 37								
- 38								
-39								
- 40	No return							

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/16/22–7/21/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-								
- 41								
-								
- 42								
-								
- 43								
-								
- 44								
-								
- 45	No return							
-								
- 46								
-								
- 47								
-								
- 48								
-								
- 49								
-								
- 50	No return							
-								
- 51								
-								
- 52								
-								
- 53								
-								
- 54								
-								
- 55	No return							
-								
- 56								
-								
- 57								
-								
- 58								
-								
-59								
-								
- 60	No return							

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/16/22-7/21/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-								
- 61								
-								
- 62								
-								
- 63								
-								
- 64								
-								
- 65	No return							
-								
- 66								
-								
- 67								
-								
- 68								
-								
- 69								
-								
- 70	No return							
-								
- 71								
-								
- 72								
-								
- 73								
-								
- 74								
-								
- 75	No return							
-								
- 76								
-								
- 77								
-								
- 78								
-								
-79								
-								
- 80	No return							

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/16//22-7/21/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-								
- 81								
-								
- 82								
-								
- 83								
-								
- 84								
-								
- 85								
-	No return							
- 86								
-								
- 87								
-								
- 88								
-								
- 89								
-								
- 90								
-	No return							
- 91								
-								
- 92								
-								
- 93								
-								
- 94								
-								
- 95								
-	No return							
- 96								
-								
- 97								
-								
- 98								
-								
-99								
-								
-								
100	No return							

Project: Newdale Landfil	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/16/22–7/21/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-								
-101								
-								
-102								
-								
-103								
-								
-104								
-								
-105	No return							
-								
-106								
-								
-107								
-								
-108								
-								
-109								
-								
-110	No return							
-								
-111								
-								
-112								
-								
-113								
-								
114								
-								
115	No return							
-								
-116								
-								
-117								
-								
118								
-								
-119								
-								
120	No return							

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/16/22–7/21/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-121								
-122								
-123								
-124								
-125	No return							
-126								
-127								
-128								
129								
-130	No return							
-131								
-132								
-133								
-134								
-135	No return							
-136								
-137								
-138								
-139								
-140	No return							

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/16/22-7/21/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-141								
-142								
-143								
-144								
-145	No return							
-146								
-147								
-148								
-149								
-150	No return							
-151								
-152								
-153								
-154								
-155	No return							
-156								
-157								
-158								
159								
-160	No return							

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/16//22-7/21/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-								
-161								
-								
-162								
-								
-163								
-								
-164								
-								
-165	No return							
-								
-166								
-								
-167								
-								
-168								
-								
-169								
-								
-170	No return							
-								
-171								
-								
-172								
-								
-173								
-								
-174								
-								
-175	No return							
-								
-176								
-								
-177								
-								
-178								
-								
-179								
-								
-180	No return							

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck Idaho 83202
Date Drilled: 7/16/22–7/21/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-181								
-182								
-183								
-184								
-185	No return							
-186								
-187								
-188								
-189								
-190	No return							
-191								
-192								
-193								
-194								
-195	No return							
-196								
-197								
-198								
-199								
-200	No return							

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/16/22–7/21/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
- -201 - -202 - -203 - -204 - -205 - -206 - -207 - -208 - -209 - -210 - -211 - -212 - -213 - -214 - -215 - -216 - -217 - -218 - 219 - -220	Regained circulation Rhyolite w/ Pumice, Purple, L. gray, fresh, moderately hard Rhyolite w/ Pumice, Purple, L. gray, fresh, moderately hard Rhyolite w/ Pumice, Purple, L. gray, fresh, moderately hard Rhyolite w/ Pumice, Purple, L. gray, fresh, moderately hard		Bulk Bulk Bulk Bulk					

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 716/22-7/21/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-211								
-222								
-223								
-224								
-225	Rhyolite w/ Pumice, Purple, L. gray, fresh, moderately hard		Bulk					
-226								
-227								
-228								
-229								
-230	Rhyolite w/ Pumice, Purple, L. gray, fresh, moderately hard		Bulk					
-231								
-232								
-233								
-234								
-235	Rhyolite w/ Pumice, Purple, L. gray, fresh, moderately hard		Bulk					
-236								
-237								
-238								
239								
-240	Rhyolite w/ Pumice, Purple, L. gray, fresh, moderately hard		Bulk					

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/16//22-7/21/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-241								
-242								
-243								
-244								
-245	Rhyolite w/ Pumice, Purple, L. gray, fresh, moderately hard		Bulk					
-246								
-247								
-248								
-249								
-250	Rhyolite w/ Pumice, Purple, L. gray, fresh, moderately hard		Bulk					
-251								
-252								
-253								
-254								
-255	Rhyolite w/ Pumice, Purple, L. gray, fresh, moderately hard		Bulk					
-256								
-257								
-258								
259								
260	Rhyolite w/ Pumice, Purple, L. gray, fresh, moderately hard		Bulk					

Project: Newdale Landfil	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/16/22–7/21/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-261								
-262								
-263								
-264								
-265	Rhyolite w/ Pumice, Purple, L. gray, fresh, moderately hard		Bulk					
-266								
-267								
-268								
-269								
-270	Rhyolite w/ Pumice, Purple, L. gray, fresh, moderately hard		Bulk					
-271								
-272								
-273								
274								
275	Rhyolite w/ Pumice, Purple, L. gray, fresh, moderately hard		Bulk					
-276								
-277								
278								
-279								
280	Rhyolite w/ Pumice, Purple, L. gray, fresh, moderately hard		Bulk					

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/16/22–7/21/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
- -281 - -282 - -283 - -284 - -285 - -286 - -287 - -288 - 289	Rhyolite w/ Pumice, Purple, L. gray, fresh, moderately hard		Bulk					
- -290 - -291 - -292 - -293 - -294	Rhyolite w/ Pumice, Purple, L. gray, fresh, moderately hard		Bulk					
- -295 - -296 - -297 - -298 - -299	Rhyolite w/ Pumice, Purple, L. gray, fresh, moderately hard		Bulk					
- -300	Rhyolite w/ Pumice, Purple, L. gray, fresh, moderately hard		Bulk					

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 716/22-7/21/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-301								
-302								
-303								
-304								
-305	Rhyolite w/ Pumice, Purple, L. gray, fresh, moderately hard		Bulk					
-306								
-307								
-308								
-309								
-310	Rhyolite w/ Pumice, Purple, L. gray, fresh, moderately hard		Bulk					
-311								
-312								
-313								
-314								
-315	Rhyolite w/ Pumice, Purple, L. gray, fresh, moderately hard		Bulk					
-316								
-317								
-318								
319								
-320	Rhyolite w/ Pumice, Purple, L. gray, fresh, moderately hard		Bulk					

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/16//22-7/21/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-321								
322								
-323								
-324								
-325	Rhyolite w/ Pumice, Purple, L. gray, fresh, moderately hard		Bulk					
-326								
-327								
-328								
-329								
-330	Rhyolite w/ Pumice, Purple, L. gray, fresh, moderately hard		Bulk					
-331								
-332								
-333								
-334								
-335	Rhyolite w/ Pumice, Purple, L. gray, fresh, moderately hard		Bulk					
-336								
-337								
-338								
339								
-340	Rhyolite – D. Purple, gray, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/16/22–7/21/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-341								
-342								
-343								
-344								
-345	Rhyolite – D. Purple, gray, moderately hard, fresh		Bulk					
-346								
-347								
-348								
-349								
-350	Rhyolite – D. Purple, gray, moderately hard, fresh		Bulk					
-351								
-352								
-353								
-354								
-355	Rhyolite – D. Purple, gray, moderately hard, fresh		Bulk					
-356								
-357								
-358								
-359								
-360	Rhyolite – D. Purple, gray, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/16/22–7/21/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-361								
-362								
-363								
-364								
-365	Rhyolite – D. Purple, gray, moderately hard, fresh		Bulk					
-366								
-367								
-368								
-369								
-370	Rhyolite – D. Purple, gray, moderately hard, fresh		Bulk					
-371								
-372								
-373								
-374								
-375	Rhyolite – D. Purple, gray, moderately hard, fresh		Bulk					
-376								
-377								
-378								
379								
-380	Rhyolite – D. Purple, gray, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/16/22-7/21/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
- -381 - -382 - -383 - -384 - -385 - -386 - -387 - -388 - -389 - -390 - -391 - -392 - -393 - -394 - -395 - -396 - -397 - -398 - -399 - -400	Rhyolite – D. Purple, gray, moderately hard, fresh Rhyolite – D. Purple, gray, moderately hard, fresh Rhyolite – D. Purple, gray, moderately hard, fresh Rhyolite – D. Purple, gray, moderately hard, fresh		Bulk Bulk Bulk Bulk					

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/16/22-7/21/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-401								
-402								
-403								
-404								
-405	Rhyolite – D. Purple, gray, moderately hard, fresh		Bulk					
-406								
-407								
-408								
-409								
-410	Rhyolite – D. Purple, gray, moderately hard, fresh		Bulk					
-411								
-412								
-413								
-414								
-415	Rhyolite – D. Purple, gray, moderately hard, fresh		Bulk					
-416								
-417								
-418								
419								
-420	Rhyolite – D. Purple, gray, moderately hard, fresh		Bulk					

Project: Newdale Landfil	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/16/22–7/21/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-421								
-422								
-423								
-424								
-425	Rhyolite – D. Purple, gray, moderately hard, fresh		Bulk					
-426								
-427								
-428								
-429								
-430	Rhyolite – D. Purple, gray, moderately hard, fresh		Bulk					
-431								
-432								
-433								
434								
435	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-436								
-437								
438								
-439								
440	Rhyolite – Black, gray, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/16/22–7/21/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-441								
-442								
-443								
-444								
-445	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-446								
-447								
-448								
449								
-450	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-451								
-452								
-453								
-454								
-455	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-456								
-457								
-458								
-459								
-460	Rhyolite – Black, gray, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/16/22-7/21/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-461								
-462								
-463								
-464								
-465	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-466								
-467								
-468								
-469								
-470	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-471								
-472								
-473								
-474								
-475	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-476								
-477								
-478								
-479								
-480	Rhyolite – Black, gray, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/16/22–7/21/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-481								
-482								
-483								
-484								
-485	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-486								
-487								
-488								
-489								
-490	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-491								
-492								
-493								
-494								
-495	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-496								
-497								
-498								
-499								
-500	Rhyolite – Black, gray, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/16/22–7/21/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-501								
-502								
-503								
-504								
-505	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-506								
-507								
-508								
-509								
-510	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-511								
-512								
-513								
-514								
-515	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-516								
-517								
-518								
-519								
-520	Rhyolite – Black, gray, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/16/22-7/21/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-521								
-522								
-523								
-524								
-525	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-526								
-527								
-528								
-529								
-530	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-531								
-532								
-533								
-534								
-535	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-536								
-537								
-538								
-539								
-540	Rhyolite – Black, gray, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/16//22-7/21/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-541								
-542								
-543								
-544								
-545	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-546								
-547								
-548								
-549								
-550	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-551								
-552								
-553								
-554								
-555	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-556								
-557								
-558								
-559								
-560	Rhyolite – Black, gray, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/16/22–7/21/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-561								
-562								
-563								
-564								
-565	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-566								
-567								
-568								
-569								
-570	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-571								
-572								
-573								
574								
575	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-576								
-577								
578								
-579								
580	Rhyolite – Black, gray, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/16/22–7/21/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-581								
-582								
-583								
-584								
-585	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-586								
-587								
-588								
589								
-590	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-591								
-592								
-593								
-594								
-595	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-596								
-597								
-598								
-599								
-600	Rhyolite – Black, gray, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/16/22-7/21/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-601								
-602								
-603								
-604								
-605	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-606								
-607								
-608								
-609								
-610	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-611								
-612								
-613								
-614								
-615	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-616								
-617								
-618								
619								
-620	Rhyolite – Black, gray, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/16//22-7/21/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-621								
-622								
-623								
-624								
-625	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-626								
-627								
-628								
-629								
-630	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-631								
-632								
-633								
-634								
-635	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-636								
-637								
-638								
-639								
-640	Rhyolite – Black, gray, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/16/22–7/21/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-641								
-642								
-643								
-644								
-645	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-646								
-647								
-648								
-649								
-650	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-651								
-652								
-653								
-654								
-655	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-656								
-657								
-658								
-659								
-660	Rhyolite – Black, gray, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/16/22–7/21/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-661								
-662								
-663								
-664								
-665	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-666								
-667								
-668								
-669								
-670	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-671								
-672								
-673								
-674								
-675	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-676								
-677								
-678								
679								
-680	Rhyolite – Black, gray, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	XCELL ENGINEERING, LC 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 716/22-7/21/22		
Logged By: JH		

Depth (ft)	Description Per The Unified Soil Classification System (USCS)	USCS Class	Sample Type	Blows per 6"	Blows per Foot	SPT N-Value	Recovery (inches)	Remarks
-681								
-682								
-683								
-684								
-685	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-686								
-687								
-688								
-689								
-690	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-691								
-692								
-693								
-694								
-695	Rhyolite – Black, gray, moderately hard, fresh		Bulk					
-696								
-697								
-698								
699								
-700	Rhyolite – Black, gray, moderately hard, fresh		Bulk					

Project: Newdale Landfill	**Drill Rig: Schramm Drill 685**	**BORING NO.: DB - 2**
File No.: P22009	**Diameter: 6"**	**XCELL ENGINEERING, LC** 260 Laurel Lane Chubbuck, Idaho 83202
Date Drilled: 7/16//22-7/21/22		
Logged By: JH		

SOIL BORING LOG

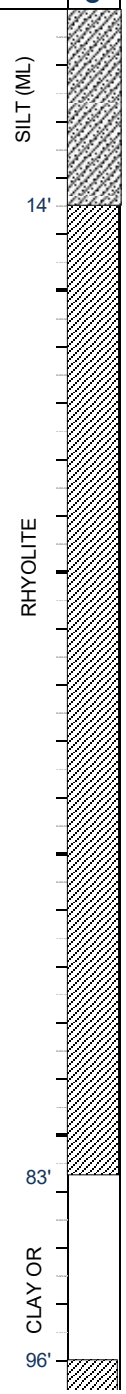
Boring ID: **Boring DB-3**

PROJECT NUMBER: 4-20133 Phase 1 Hydrogeologic Investigation
PROJECT NAME: East Idaho Regional Solid Waste District
LOCATION: Newdale, Idaho
DRILLING CONTRACTOR: Thomas Drilling
DRILLING METHOD: Air rotary
GROUND ELEVATION: Not surveyed

START DATE/TIME: 7/23/22 6:30 AM
END DATE/TIME: 7/27/22 8:15 AM
LOGGER: B. Lauerman
DRILLING EQUIPMENT: Schramm Fury 130
BORING DIAMETER: Nominal 8"
TOTAL DEPTH: 700'
SWL: NA

Depth (ft)	Sample ID/ TYPE	Sample Interval	SPT blows per 6"	Recovery (in/in)	Soil Description soil name, USCS group symbol, color, density or consistency, structure, mineralogy, grain size, grading, and moisture content.	Comments Note: sample type "G" = grab sample of air-rotary cuttings.
0			-	-	**SILT (ML),** very fine, little or no fine sand, lt-brown, dry.	
	G-5	5	-	-	Same as above (SAA), **SILT (ML)**	SILT inferred contact w rhyolite
10	G-10	10	-	-	SAA **SILT (ML)**	8-inch surface casing installed to 20 ft bgs
	G-15	15	-	-	**RHYOLITE**, massive, competent. Lt-gray/pink, dry	Rock chips/coarse sand
20	G-20	20	-	-	SAA, **RHYOLITE**	
	G-25	25	-	-	SAA, **RHYOLITE**	Driller adding 5-7 gpm of water entire drilled depth
30	G-30	30	-	-	SAA, **RHYOLITE,** lt gray, dry	
	G-35	35	-	-	SAA, **RHYOLITE**	Steady drilling, good returns
40	G-40	40	-	-	SAA, **RHYOLITE**	Coarse, sand-sized rock chips
	G-45	45	-	-	SAA, **RHYOLITE**	
50	G-50	50	-	-	SAA, **RHYOLITE**	
	G-55	55	-	-	SAA, **RHYOLITE**	
60	G-60	60	-	-	SAA, **RHYOLITE**	Dry cuttings returned
	G-65	65	-	-	SAA, **RHYOLITE**	
70	G-70	70	-	-	SAA, **RHYOLITE**	
	G-75	75	-	-	SAA, **RHYOLITE**	Dry cuttings
80	G-80	80	-	-	SAA, **RHYOLITE**	
	G-85	85	-	-	**CLAY** or **PUMICE/ASH**, dk brown, soupy	Sample wet from makeup water introduced for drilling
90	G-90	90	-	-	SAA, **CLAY** or **PUMICE/ASH**	No apparent formation water seen on downhole video log
	G-95	95	-	-	SAA, **CLAY** or **PUMICE/ASH**	Return to RHYOLITE at 96 ft bgs.

Graphic Log



					RHYOLITE, weathered, lt gray, dry		

SOIL BORING LOG

Boring ID: **Boring DB-3**

PROJECT NUMBER: 4-20133 Phase 1 Hydrogeologic Investigation
PROJECT NAME: East Idaho Regional Solid Waste District
LOCATION: Newdale, Idaho
DRILLING CONTRACTOR: Thomas Drilling
DRILLING METHOD: Air rotary
GROUND ELEVATION: Not surveyed

START DATE/TIME: 7/23/22 6:30 AM
END DATE/TIME: 7/27/22 8:15 AM
LOGGER: B. Lauerman
DRILLING EQUIPMENT: Schramm Fury 130
BORING DIAMETER: Nominal 8"
TOTAL DEPTH: 700' SWL: NA

Depth (ft)	Sample ID/ TYPE	Sample Interval	SPT blows per 6"	Recovery (in/in)	Soil Description soil name, USCS group symbol, color, density or consistency, structure, mineralogy, grain size, grading, and moisture content.	Comments Note: sample type "G" = grab sample of air-rotary cuttings.	Graphic Log
100	G-100	100	-	-	**SAA, RHYOLITE,** weathered, texture of coarse, angular		
	G-105	105	-	-	**CLAY OR PUMICE/ASH,** gray, soupy		103'
110	G-110	110	-	-	SAA, **CLAY OR PUMICE/ASH**	Wet from makeup water introduced	CLAY OR
	G-115	115	-	-	SAA, **CLAY OR PUMICE/ASH**	soft drilling, soupy. Rapid advance	
120	G-120	120	-	-	**RHYOLITE,** weathered, texture of coarse, angular sand, gray.	No apparent formation water seen on downhole video log	118'
	G-125	125	-	-	SAA, **RHYOLITE,** weathered		
130	G-130	130	-	-	**RHYOLITE**, competent, gray, dry	Rig chatter, harder drilling	
	G-135	135	-	-	**RHYOLITE**, competent, gray, dry		
140	G-140	140	-	-	SAA, **RHYOLITE**, pink/tan component, dry	Rock chips, texture of coarse, angular sand	
	G-145	145	-	-	SAA, **RHYOLITE**, gray, dry		
150	G-150	150	-	-	SAA, **RHYOLITE**, competent, gray, dry	Rig chatter	RHYOLITE
	G-155	155	-	-	SAA, **RHYOLITE**		
160	G-160	160	-	-	SAA, **RHYOLITE**	Slow advance, sand-sized rock chips	
	G-165	165	-	-	SAA, **RHYOLITE**	Slow drilling. Good recovery	
170	G-170	170	-	-	SAA, **RHYOLITE**		
	G-175	175	-	-	SAA, **RHYOLITE**	Slow, steady drilling	
180	G-180	180	-	-	SAA, **RHYOLITE**		
	G-185	185	-	-	SAA, **RHYOLITE**		
190	G-190	190	-	-	SAA, **RHYOLITE**	Good returns. Uniform, competent rock	

	G-195	195	-	-	SAA, **RHYOLITE**		

SOIL BORING LOG

Boring ID: **Boring DB-3**

PROJECT NUMBER: 4-20133 Phase 1 Hydrogeologic Investigation
START DATE/TIME: 7/23/22 6:30 AM
PROJECT NAME: East Idaho Regional Solid Waste District
END DATE/TIME: 7/27/22 8:15 AM
LOCATION: Newdale, Idaho
LOGGER: B. Lauerman
DRILLING CONTRACTOR: Thomas Drilling
DRILLING EQUIPMENT: Schramm Fury 130
DRILLING METHOD: Air rotary
BORING DIAMETER: Nominal 8"
GROUND ELEVATION: Not surveyed
TOTAL DEPTH: 700'
SWL: NA

Depth (ft)	Sample ID/ TYPE	Sample Interval	SPT blows per 6"	Recovery (in/in)	Soil Description soil name, USCS group symbol, color, density or consistency, structure, mineralogy, grain size, grading, and moisture content.	Comments Note: sample type "G" = grab sample of air-rotary cuttings.	Graphic Log
200	G-200	200	-	-	SAA, **RHYOLITE,** lt-gray	Competent, uniform No return. No sample collected	
	G-205	205	-	-	SAA, **RHYOLITE**	No return. No sample collected No return. No sample collected	
210	G-210	210	-	-	SAA, **RHYOLITE**	Slow, steady drilling	
	G-215	215	-	-	SAA, **RHYOLITE**	Rig chatter	
220	G-220	220	-	-	SAA, **RHYOLITE**	Good returns	
	G-225	225	-	-	SAA, **RHYOLITE**		RHYOLITE
230	G-230	230	-	-	SAA, **RHYOLITE**	Competent, uniform	
	G-235	235	-	-	SAA, **RHYOLITE**		
240	G-240	240	-	-	SAA, **RHYOLITE**	Spend 30 min cleaning hole. Uniform, crushed rhyolite. Coarse sand texture	
	G-245	245	-	-	SAA, **RHYOLITE**	Lost circulation (decreased ~25%)	
250	G-250	250	-	-	SAA, **RHYOLITE**	Ratty drilling 252 ft bgs	
	G-255	255	-	-	SAA, **RHYOLITE**	Lost circulation 257 ft bgs	257'
260	-	-	-	-	Lost Circulation (LC)	No return. No sample collected	
	-	-	-	-	Inferred **RHYOLITE** from downhole video	Very fractured	
270	-	-	-	-	Lost Circulation (LC)	No return. No sample collected	
	-	-	-	-	Inferred **RHYOLITE** from downhole video		
280	-	-	-	-	Lost Circulation (LC)	No return. No sample collected	
	-	-	-	-	Inferred **RHYOLITE** from downhole video	Add foam 280' bgs. Smoother, steady drilling below 280'	RHYOLITE
290	-	-	-	-	Lost Circulation (LC)	No return. No sample collected	
	-	-	-	-	Inferred **RHYOLITE** from downhole video		

SOIL BORING LOG

Boring ID: **Boring DB-3**

PROJECT NUMBER: 4-20133 Phase 1 Hydrogeologic Investigation
START DATE/TIME: 7/23/22 6:30 AM
PROJECT NAME: East Idaho Regional Solid Waste District
END DATE/TIME: 7/27/22 8:15 AM
LOCATION: Newdale, Idaho
LOGGER: B. Lauerman
DRILLING CONTRACTOR: Thomas Drilling
DRILLING EQUIPMENT: Schramm Fury 130
DRILLING METHOD: Air rotary
BORING DIAMETER: Nominal 8"
GROUND ELEVATION: Not surveyed
TOTAL DEPTH: 700'
SWL: NA

Depth (ft)	Sample ID/ TYPE	Sample Interval	SPT blows per 6"	Recovery (in/in)	Soil Description soil name, USCS group symbol, color, density or consistency, structure, mineralogy, grain size, grading, and moisture content.	Comments Note: sample type "G" = grab sample of air-rotary cuttings.	Graphic Log
300	-	-	-	-	Lost Circulation (LC)	No return. No sample collected	
	-	-	-	-	Inferred **RHYOLITE** from downhole video		
310	-	-	-	-	Lost Circulation (LC)	No return. No sample collected	
	-	-	-	-	Inferred **RHYOLITE** from downhole video	Steady drilling	
320	-	-	-	-	Lost Circulation (LC)	No return. No sample collected. Minor air return. Trip back to 240 ft bgs and take water sounding in AM	
	-	-	-	-	Inferred **RHYOLITE** from downhole video	No water detected in AM. Continue drilling LC	RHYOLITE
330	-	-	-	-	Lost Circulation (LC)	No return. No sample collected	
	-	-	-	-	Inferred **RHYOLITE** from downhole video		
340	-	-	-	-	Lost Circulation (LC)	No return. No sample collected. Minor air return affter making drill stem connection.	
	-	-	-	-	Inferred **RHYOLITE** from downhole video	Steady drilling	
350	-	-	-	-	Lost Circulation (LC)	No return. No sample collected	
	-	-	-	-	Inferred **RHYOLITE** from downhole video	Softer drilling at 355 ft bgs. Add foam.	
360	-	-	-	-	Lost Circulation (LC)	No return. No sample collected	
	-	-	-	-	Inferred **RHYOLITE** from downhole video	Decent air return 365 ft bgs Hammer not firing, very soft drilling	
370	-	-	-	-	Lost Circulation (LC)	No return. No sample collected	
	-	-	-	-	Inferred **RHYOLITE** from downhole video	Hole sloughs back to 370 ft bgs. Clean out	
380	-	-	-	-	Lost Circulation (LC)	No return. No sample collected	
	-	-	-	-	Inferred **RHYOLITE** from downhole video	Rig chatter. More competent rock	RHYOLITE
390	-	-	-	-	Lost Circulation (LC)	No return. No sample collected	

	-	-	-	-	Inferred **RHYOLITE** from downhole video	Discharge puffing some air	

SOIL BORING LOG

Boring ID: **Boring DB-3**

PROJECT NUMBER: 4-20133 Phase 1 Hydrogeologic Investigation
START DATE/TIME: 7/23/22 6:30 AM
PROJECT NAME: East Idaho Regional Solid Waste District
END DATE/TIME: 7/27/22 8:15 AM
LOCATION: Newdale, Idaho
LOGGER: B. Lauerman
DRILLING CONTRACTOR: Thomas Drilling
DRILLING EQUIPMENT: Schramm Fury 130
DRILLING METHOD: Air rotary
BORING DIAMETER: Nominal 8"
GROUND ELEVATION: Not surveyed
TOTAL DEPTH: 700'
SWL: NA

Depth (ft)	Sample ID/ TYPE	Sample Interval	SPT blows per 6"	Recovery (in/in)	Soil Description soil name, USCS group symbol, color, density or consistency, structure, mineralogy, grain size, grading, and moisture content.	Comments Note: sample type "G" = grab sample of air-rotary cuttings.	Graphic Log
400	-	-	-	-	Lost Circulation (LC)	No return. No sample collected	
	-	-	-	-	Inferred **RHYOLITE** from downhole video	Slow, steady drilling	
410	-	-	-	-	Lost Circulation (LC)	No return. No sample collected	
	-	-	-	-	Inferred **RHYOLITE** from downhole video		
420	-	-	-	-	Lost Circulation (LC)	No return. No sample collected Rig chatter-driller suspect vertidcal fracture in this zone	
	-	-	-	-	Inferred **RHYOLITE** from downhole video		RHYOLITE
430	-	-	-	-	Lost Circulation (LC)	No return. No sample collected	
	-	-	-	-	Inferred **RHYOLITE** from downhole video		
440	-	-	-	-	Lost Circulation (LC)	No return. No sample collected	
	-	-	-	-	Inferred **RHYOLITE** from downhole video		
450	-	-	-	-	Lost Circulation (LC)	No return. No sample collected	
	-	-	-	-	Inferred **RHYOLITE** from downhole video	Rig chatter, hard drilling 450 and again 457- 460 ft bgs	
460	-	-	-	-	Lost Circulation (LC)	No return. No sample collected	
	-	-	-	-	Inferred **RHYOLITE** from downhole video	Slow, steady drilling	
470	-	-	-	-	Lost Circulation (LC)	No return. No sample collected	
	-	-	-	-	Inferred **RHYOLITE** from downhole video		RHYOLITE
480	-	-	-	-	Lost Circulation (LC)	No return. No sample collected	
	-	-	-	-	Inferred **RHYOLITE** from downhole video	Not much chatter	

490	-	-	-	-	Lost Circulation (LC)	No return. No sample collected	
	-	-	-	-	Inferred **RHYOLITE** from downhole video	Consistent advance	

SOIL BORING LOG

Boring ID: **Boring DB-3**

PROJECT NUMBER: 4-20133 Phase 1 Hydrogeologic Investigation
PROJECT NAME: East Idaho Regional Solid Waste District
LOCATION: Newdale, Idaho
DRILLING CONTRACTOR: Thomas Drilling
DRILLING METHOD: Air rotary
GROUND ELEVATION: Not surveyed

START DATE/TIME: 7/23/22 6:30 AM
END DATE/TIME: 7/27/22 8:15 AM
LOGGER: B. Lauerman
DRILLING EQUIPMENT: Schramm Fury 130
BORING DIAMETER: Nominal 8"
TOTAL DEPTH: 700' SWL: NA

Depth (ft)	Sample ID/ TYPE	Sample Interval	SPT blows per 6"	Recovery (in/in)	Soil Description soil name, USCS group symbol, color, density or consistency, structure, mineralogy, grain size, grading, and moisture content.	Comments Note: sample type "G" = grab sample of air-rotary cuttings.	Graphic Log
500	-	-	-	-	Lost Circulation (LC)	No return. No sample collected	
	-	-	-	-	Inferred **RHYOLITE** from downhole video	AM sound drill stem to 482 ft bgs (diverter depth) No	
510	-	-	-	-	Lost Circulation (LC)	No return. No sample collected	
	-	-	-	-	Inferred **RHYOLITE** from downhole video		
520	-	-	-	-	Lost Circulation (LC)	No return. No sample collected	
	-	-	-	-	Inferred **RHYOLITE** from downhole video	Sudden significant return of circulation and cuttings. Coarse to fine rock chips. Driller suspects fractures have sealed off enough to evacuate borehole and other voids. Circulate for 45 minutes then proceed drilling. Cuttingsd	RHYOLITE
530	G-530	530	-	-	* **RHYOLITE,** gray		
	G-535	535	-	-	* SAA, **RHYOLITE,** gray		
540	G-540	140	-	-	* SAA**, RHYOLITE,** gray	*Note returned cuttings may represent multiple depths due to significant LC prior.	
	-	-	-	-	Lost Circulation (LC)		
550	-	-	-	-	Lost Circulation (LC)	Poor circulation. Decent air return but no cuttings. No sample collected	
	G-555	555	-	-	* SAA**, RHYOLITE,** gray	Slow and steady drilling	
560	G-560	560	-	-	SAA**, RHYOLITE,** competent, gray		
	G-565	565	-	-	SAA**, RHYOLITE**	Good returns-rock chips. Suspect true	
570	G-570	570	-	-	SAA**, RHYOLITE**		
	G-575	575	-	-	SAA**, RHYOLITE**	Slow, steady drilling	
580	G-580	580	-	-	SAA**, RHYOLITE**, competent, gray		RHYOLITE

	G-585	585	-	-	SAA, **RHYOLITE**	Decent returns for depth	
590	G-590	590	-	-	SAA, **RHYOLITE**		
	G-595	595	-	-	SAA, **RHYOLITE**	Slow and steady. No chatter	

SOIL BORING LOG

Boring ID: **Boring DB-3**

PROJECT NUMBER: 4-20133 Phase 1 Hydrogeologic Investigation
PROJECT NAME: East Idaho Regional Solid Waste District
LOCATION: Newdale, Idaho
DRILLING CONTRACTOR: Thomas Drilling
DRILLING METHOD: Air rotary
GROUND ELEVATION: Not surveyed

START DATE/TIME: 7/23/22 6:30 AM
END DATE/TIME: 7/27/22 8:15 AM
LOGGER: B. Lauerman
DRILLING EQUIPMENT: Schramm Fury 130
BORING DIAMETER: Nominal 8"
TOTAL DEPTH: 700' SWL: NA

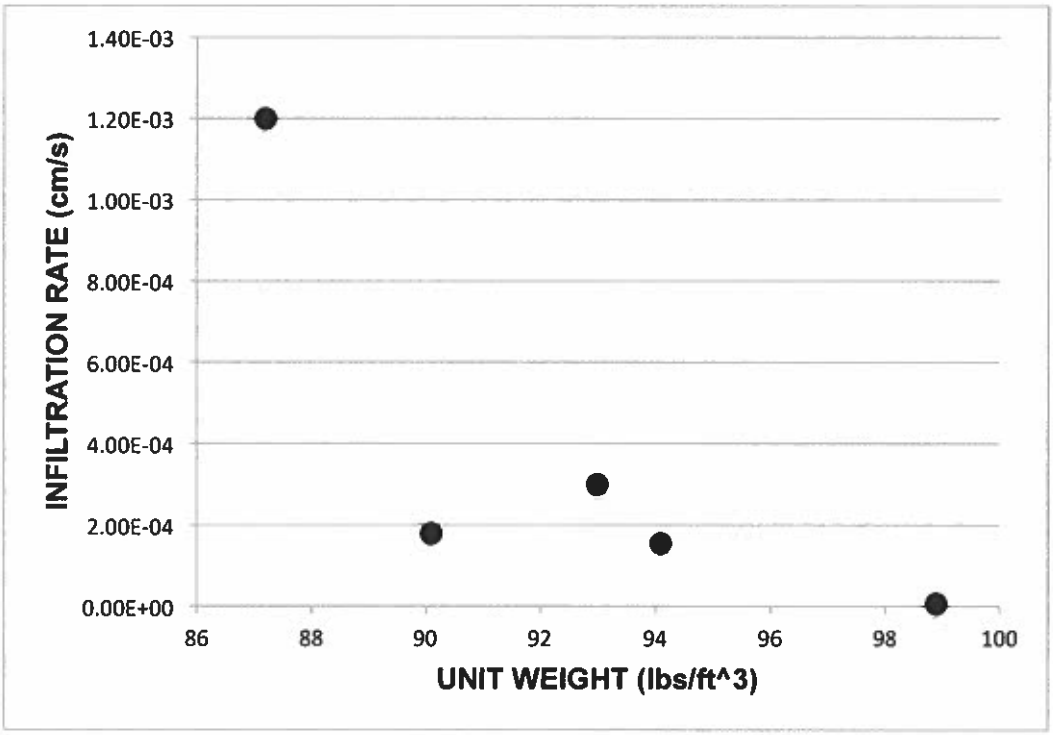
Depth (ft)	Sample ID/ TYPE	Sample Interval	SPT blows per 6"	Recovery (in/in)	Soil Description soil name, USCS group symbol, color, density or consistency, structure, mineralogy, grain size, grading, and moisture content.	Comments Note: sample type "G" = grab sample of air-rotary cuttings.	Graphic Log
600	G-600	600	-	-	SAA, **RHYOLITE,** competent, gray		
	G-605	605	-	-	SAA, **RHYOLITE**	Slow, steady drilling	
610	G-610	610	-	-	SAA, **RHYOLITE**	Good circulation	
	G-615	615	-	-	SAA, **RHYOLITE**		
620	G-620	620	-	-	SAA, **RHYOLITE**, competent, gray		
	G-625	625	-	-	SAA, **RHYOLITE**	Slow and steady. No chatter	RHYOLITE
630	G-630	630	-	-	SAA, **RHYOLITE**		
	G-635	635	-	-	SAA, **RHYOLITE**		
640	G-640	640	-	-	SAA, **RHYOLITE**. competent, gray	Steady advance	
	G-645	645	-	-	SAA, **RHYOLITE**		
650	G-650	650	-	-	SAA, **RHYOLITE**	Faster advance, softer drilling	
	G-655	655	-	-	SAA, **RHYOLITE**		
660	G-660	660	-	-	SAA, **RHYOLITE**, competent, gray		
	G-665	665	-	-	SAA, **RHYOLITE**	Good return	
670	G-670	670	-	-	SAA, **RHYOLITE**	Steady drilling	RHYOLITE
	G-675	675	-	-	SAA, **RHYOLITE**		
680	G-680	680	-	-	SAA, **RHYOLITE**, competent, gray		

680	G-680	680	-	-	SAA, **RHYOLITE**, competent, gray		
	G-685	685	-	-	SAA**, RHYOLITE**	No chatter, slow advance	
690	G-690	690	-	-	SAA**, RHYOLITE**		
	G-695	695	-	-	SAA**, RHYOLITE**		
700	G-700	700			SAA**, RHYOLITE**, competent, gray	Total Depth (TD) 700 ft bgs	

B.2-4 Physical Properties Soils Testing Data

Permeability

Project:	Newdale Landfill					
Project No.:	P22009					
Date:	8/24/22					
Source:	TP 205 @ 6'	TP 210 @ 15'	TP 210 @ 6'	TP 207 @ 8'	TP 203 @ 6'	
Tare =	0.7956	0.8022	0.8034	0.8058	0.8036	lbs
Diameter =	2.495	2.495	2.495	2.495	2.495	inches
Height =	2.7	2.7	2.7	2.7	2.7	inches
Moist Unit Weight =	0.6662	0.6884	0.7106	0.719	0.7552	lbs
Volume =	0.007639	0.007639	0.007639	0.007639	0.007639	$feet^3$
Area =	31.54	31.54	31.54	31.54	31.54	cm^2
Unit Weight	87.2	90.1	93	94.1	98.9	lbs/ft^3
Infiltration Rate	1.20E-03	1.79E-04	3.00E-04	1.55E-04	7.10E-06	cm/second



Xcell Engineering, LLC
260 Laurel Lane
Chubbuck, ID 83202
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E-mail: paul@xcelleng.com

October 21, 2022
P22009

Mr. Kevin Harris
Forsgren Associates
350 North 2nd East
Rexburg, ID 83440

RE: **NEWDALE LANDFILL**
Permeability
Newdale, Idaho

Kevin:

At the request of Craig Saur, constant head permeability tests were performed to estimate the permeability of the rhyolite encountered at the subject site. Samples of rhyolite were taken by Forsgren from the job site and given to us to perform testing. We used a rock saw to cut 2 cylindrical pieces of rhyolite to fit into our permeability test mechanism. Each piece of rhyolite was near .9-inches in thickness. We fractured one piece of rhyolite to more accurately represent the natural rhyolite at the subject site. Below are pictures of our sample.

The rhyolite in its natural state was fractured. When drilling we lost return in the borings for intervals of up to 175 feet. The loss of return was apparently caused by highly fractured structure that allowed the return to dissipate from the boring before it could

reach ground surface. While part of our sample used for permeability testing was fractured, it is not representative of the rhyolite in its natural state. We placed both cylindrical pieces of rhyolite into our test mechanism and used a waterproof silicone to seal the rhyolite and insure that water had to travel through the rhyolite when the test was performed. We then performed the test and results show that the permeability of the rhyolite is .0003 cm/sec. Although the samples tested are not the same as the rhyolite in its fractured natural state, the results seem to approximate the rate of permeability in the rhyolite. While these conditions are not representative we have performed these tests to give you the best information we can provide.

Xcell Engineering, LLC

Jaren Haggard
Engineering Technician

J. Paul Bastian, PE
Project Engineer

PROFESSIONAL ENGINEER
LICENSED
12257
10/21/21
STATE OF IDAHO
JUSTIN PAUL BASTIAN

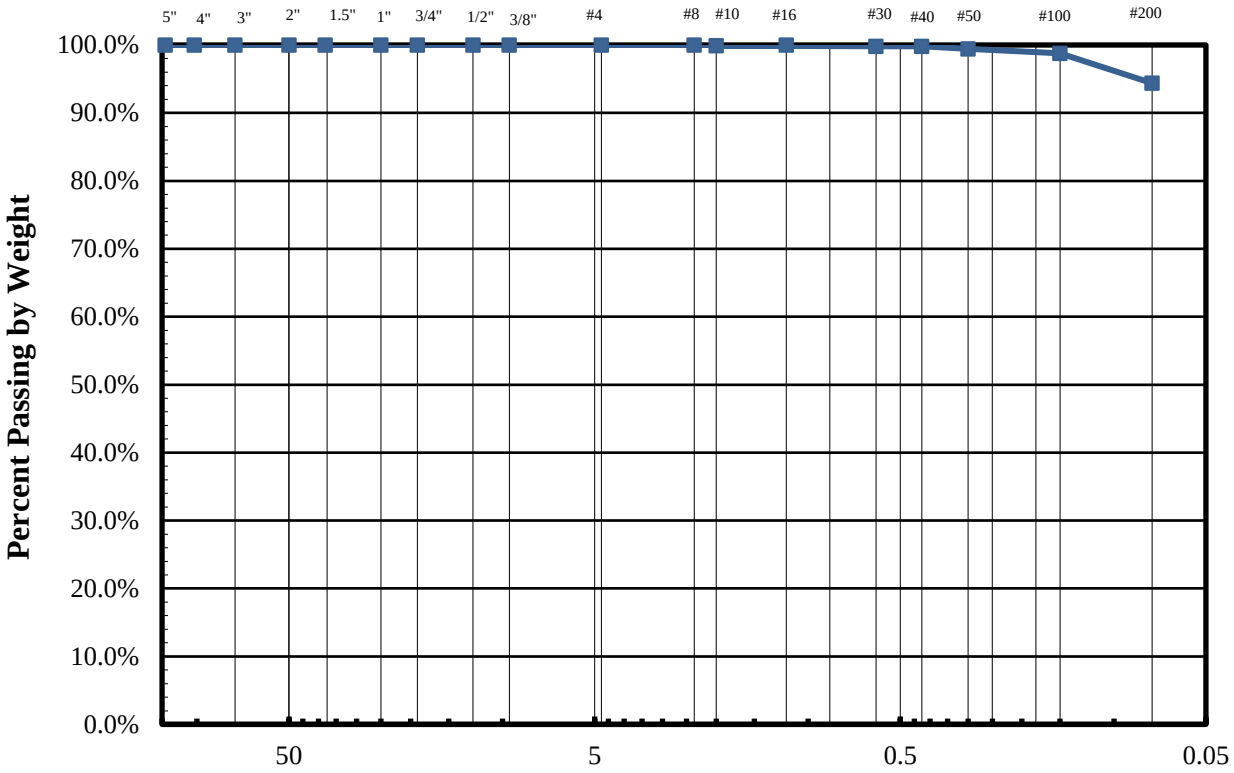
FORSGREN Associates Inc.
1137 Summers Drive
Rexburg, ID 83440
208-356-9201

Client: East Idaho Solid Waste Dist.
Project: Landfill Investigation Phase 1

Material Description: Brown Silts & Clays
Sample Location: Test Hole 100 @ 6'

Sieve Analysis
AASHTO T27 / ASTM C136

Job No.	01-21-0092-300-0001
Lab No.	22-52
Received	June 29, 2022
Reported	July 11, 2022



SIZE	PASSING	SPECIFICATION Low	SPECIFICATION High
5"	100%		
4"	100%		
3"	100%		
2"	100%		
1.5"	100%		
1"	100%		
3/4"	100%		
1/2"	100%		
3/8"	100%		
No. 4	100%		
No. 8	100%		
No. 10	100%		
No. 16	100%		
No. 30	100%		
No. 40	100%		
No. 50	99%		
No. 100	99%		
No. 200	94.4%		

Moisture Content
AASHTO T255/T265 / ASTM C123

14.2%

Particle Size (mm)

Sand Equivalent (AASHTO T176) = N/A

Reviewed By:
Eric Gunnarson
Laboratory Manager

FORSGREN Associates Inc.

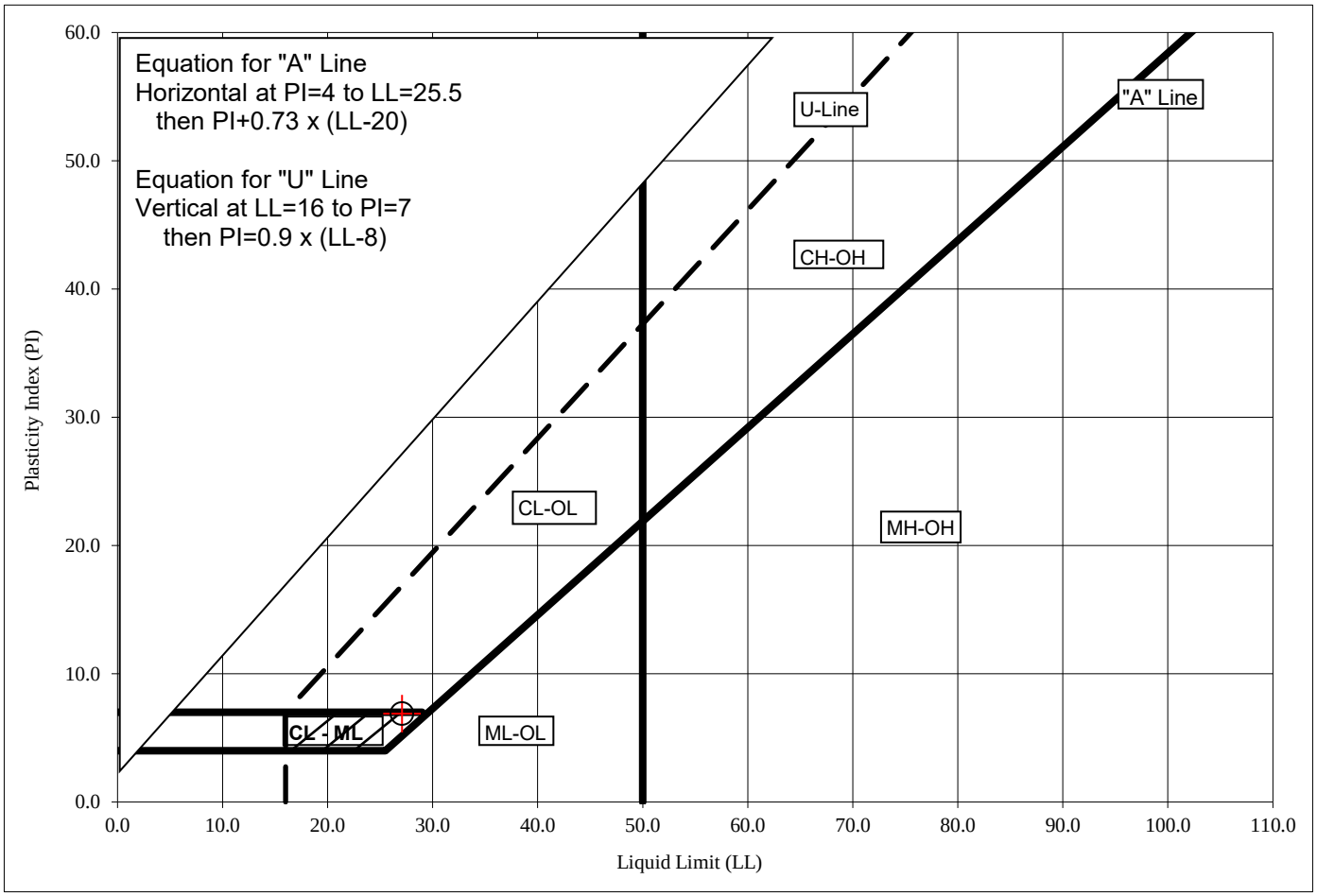
Project Number : 01-21-0xx1-100-0001
Project Name : East Idaho Solid Waste Dist.
Report Number : 1
Report to :
Copies to :

MATERIALS LABORATORY REPORT

Atterberg Limits Determination

D 4318

Sample Location: 101 @ 3'
Material Source: Light Brown
Sample ID #: 21-45
Date Obtained: 04/20/21
Date Tested: 04/26/21 | Liquid Limit: 27.1 | Plasicity Index: 6.9
Tested By: CKL | Plastic Limit: 20.2 | Soil Classification: CL-ML



Reviewed By:

Eric Gunnarson

Manager: Materials Laboratory

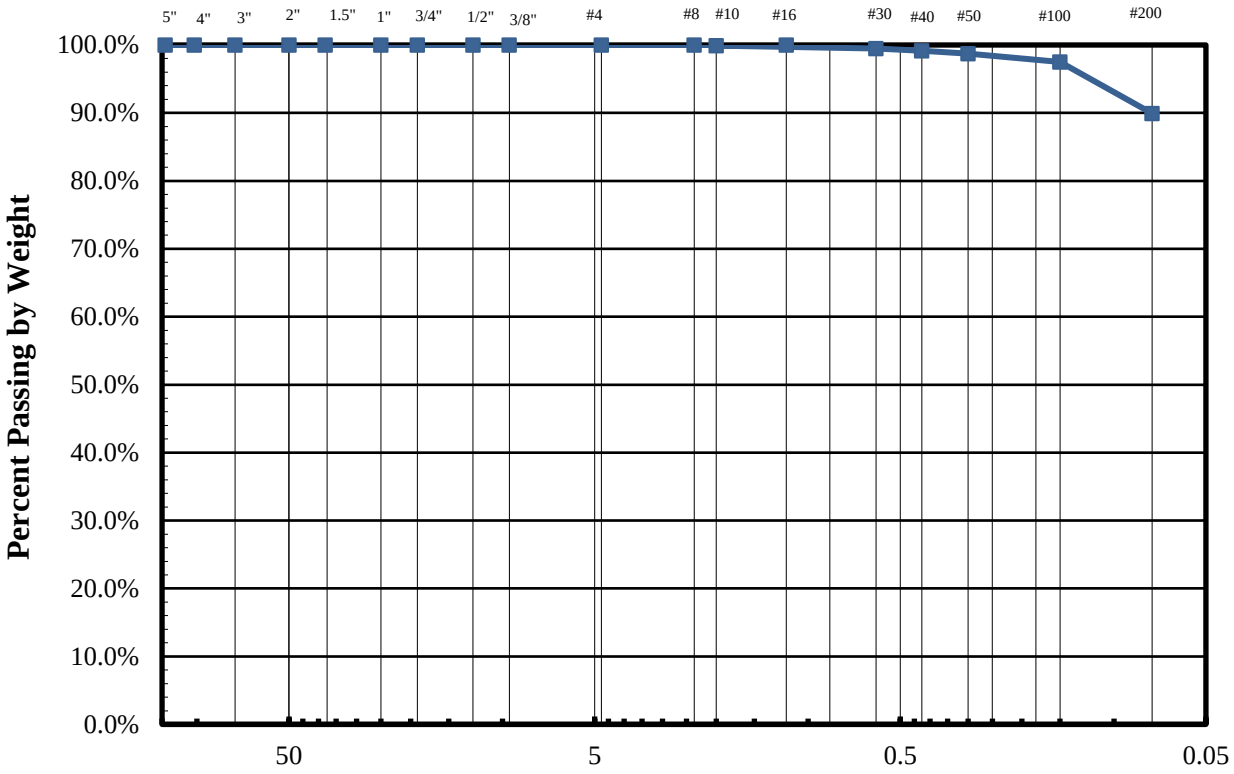
C:\Users\egunnarson\Dropbox\Material Testing\Rexburg\Reports - EMPTIED DAILY\[TH 101 @ 3' PI.xls]PI Report Sheet

Project Number : 01-21-0xx1-100-000
Report Number: 1

FORSGREN Associates Inc.
1137 Summers Drive
Rexburg, ID 83440
208-356-9201

Client: Freemont & Madiosn County
Project: East Idaho Solid Waste Dist.

Material Description: Light Brown
Sample Location: Test Hole 101 @ 3'



Sieve Analysis
AASHTO T27

Job No.	01-21-0xx1-100-0001
Lab No.	21-45
Received	April 20, 2021
Reported	April 23, 2021

SIZE	PASSING	SPECIFICATION Low	SPECIFICATION High
5"	100%		
4"	100%		
3"	100%		
2"	100%		
1.5"	100%		
1"	100%		
3/4"	100%		
1/2"	100%		
3/8"	100%		
No. 4	100%		
No. 8	100%		
No. 10	100%		
No. 16	100%		
No. 30	100%		
No. 40	99%		
No. 50	99%		
No. 100	97%		
No. 200	89.9%		

Moisture Content
AASHTO T255

16.5%

Particle Size (mm)

Sand Equivalent (AASHTO T176) = N/A

Reviewed By:
Eric Gunnarson
Laboratory Manager

FORSGREN Associates Inc.

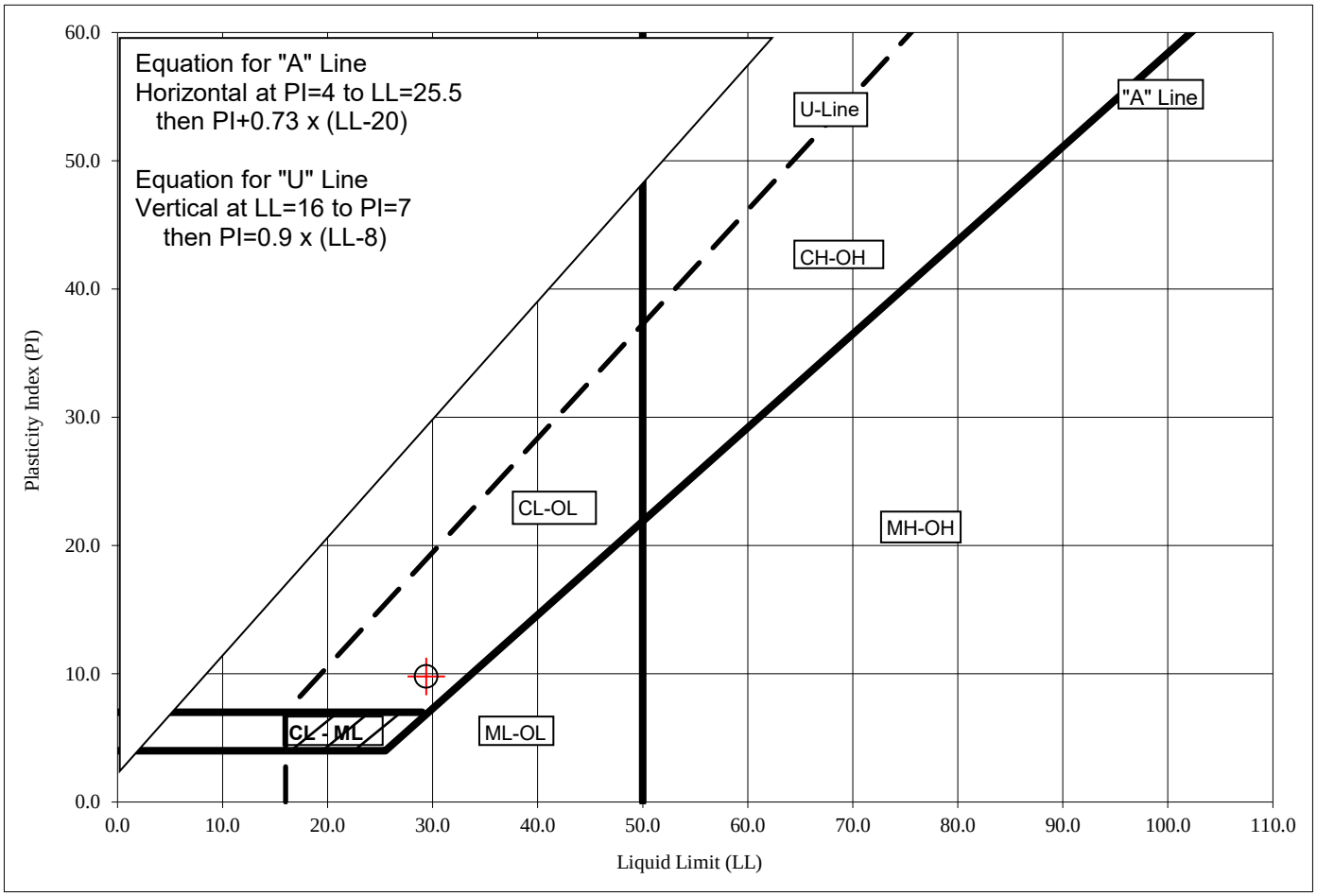
Project Number : 01-21-0xx1-100-0001
Project Name : East Idaho Solid Waste Dist.
Report Number : 1
Report to :
Copies to :

MATERIALS LABORATORY REPORT

Atterberg Limits Determination

D 4318

Sample Location: 109 @ 6'
Material Source: Light Brown
Sample ID #: 21-45
Date Obtained: 04/20/21
Date Tested: 04/26/21 | Liquid Limit: 29.4 | Plasicity Index: 9.8
Tested By: CKL | Plastic Limit: 19.6 | Soil Classification: CL



Reviewed By:

Eric Gunnarson

Manager: Materials Laboratory

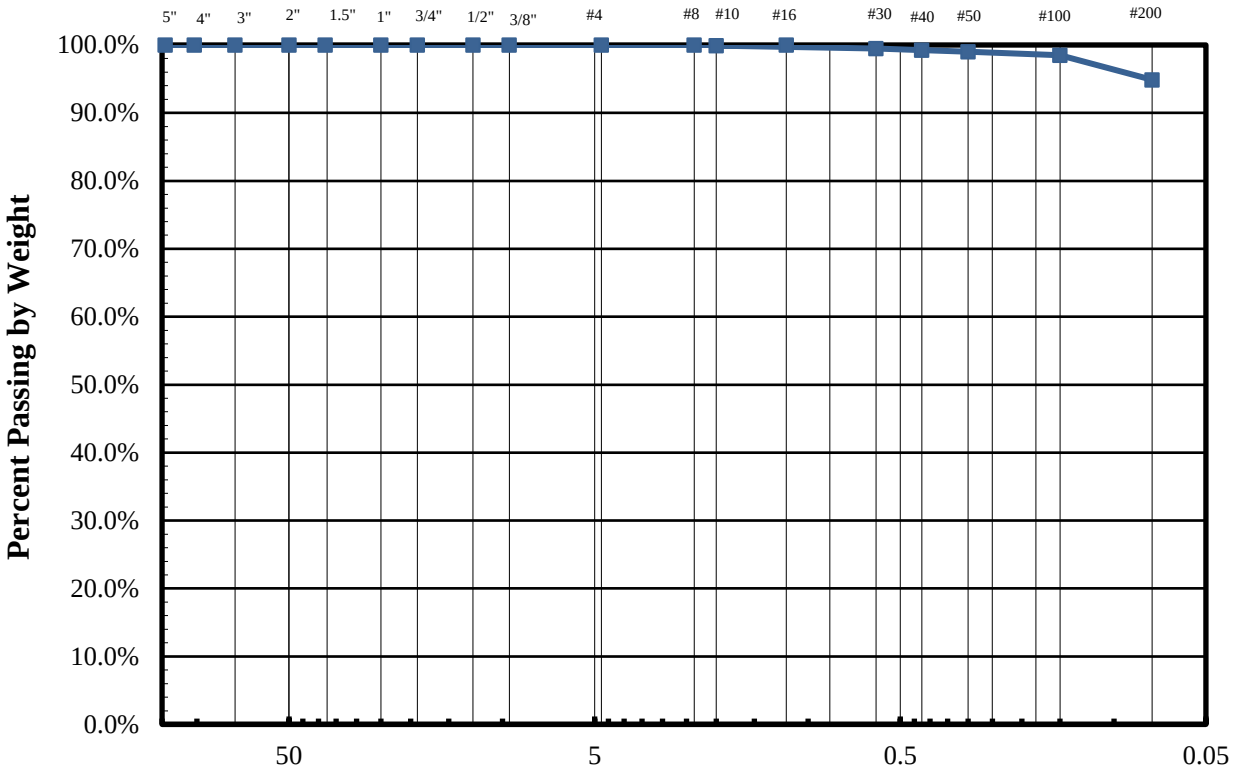
C:\Users\egunnarson\Dropbox\Material Testing\Rexburg\Reports - EMPTIED DAILY\[TH 109 @ 6' PI.xls]PI Report Sheet

Project Number : 01-21-0xx1-100-000
Report Number: 1

FORSGREN Associates Inc.
1137 Summers Drive
Rexburg, ID 83440
208-356-9201

Client: Freemont & Madison County
Project: East Idaho Solid waste Dist.

Material Description: Light Brown
Sample Location: Test Hole 109 @ 6'



Sieve Analysis
AASHTO T27

Job No.	01-21-0xx1-100-0001
Lab No.	21-45
Received	April 20, 2021
Reported	April 23, 2021

SIZE	PASSING	SPECIFICATION Low	SPECIFICATION High
5"	100%		
4"	100%		
3"	100%		
2"	100%		
1.5"	100%		
1"	100%		
3/4"	100%		
1/2"	100%		
3/8"	100%		
No. 4	100%		
No. 8	100%		
No. 10	100%		
No. 16	99%		
No. 30	99%		
No. 40	99%		
No. 50	99%		
No. 100	99%		
No. 200	94.9%		

Moisture Content
AASHTO T255

17.3%

Particle Size (mm)

Sand Equivalent (AASHTO T176) = N/A

Reviewed By:
Eric Gunnarson
Laboratory Manager

FORSGREN Associates Inc.

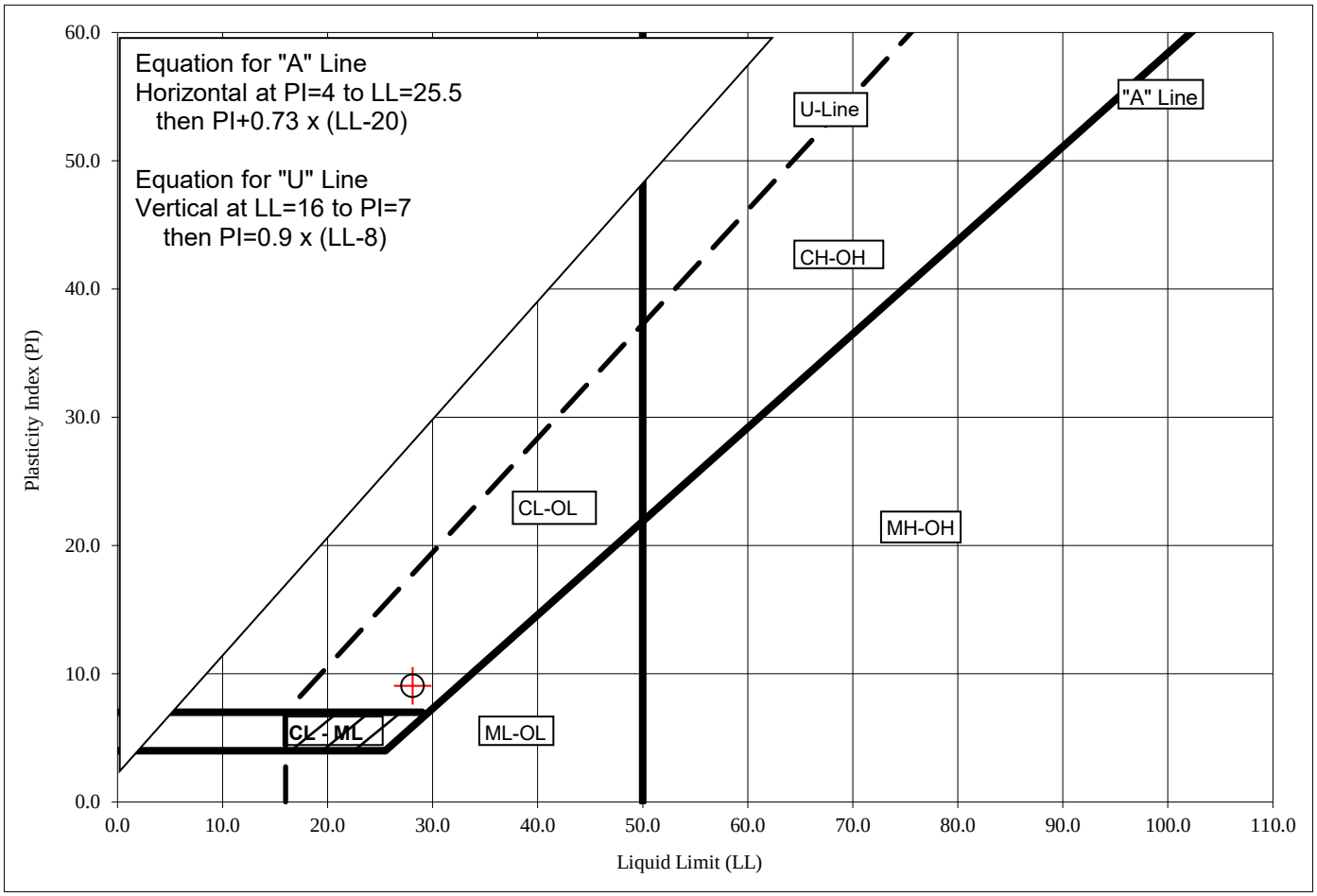
Project Number : 01-21-0xx1-100-0001
Project Name : East Idaho Solid Waste Dist.
Report Number : 1
Report to :
Copies to :

MATERIALS LABORATORY REPORT

Atterberg Limits Determination

D 4318

Sample Location: 125 @ 10'
Material Source: Light Brown
Sample ID #: 21-45
Date Obtained: 04/20/21
Date Tested: 04/26/21 | Liquid Limit: 28.1 | Plasicity Index: 9.1
Tested By: CKL | Plastic Limit: 19.0 | Soil Classification: CL



Reviewed By:

Eric Gunnarson

Manager: Materials Laboratory

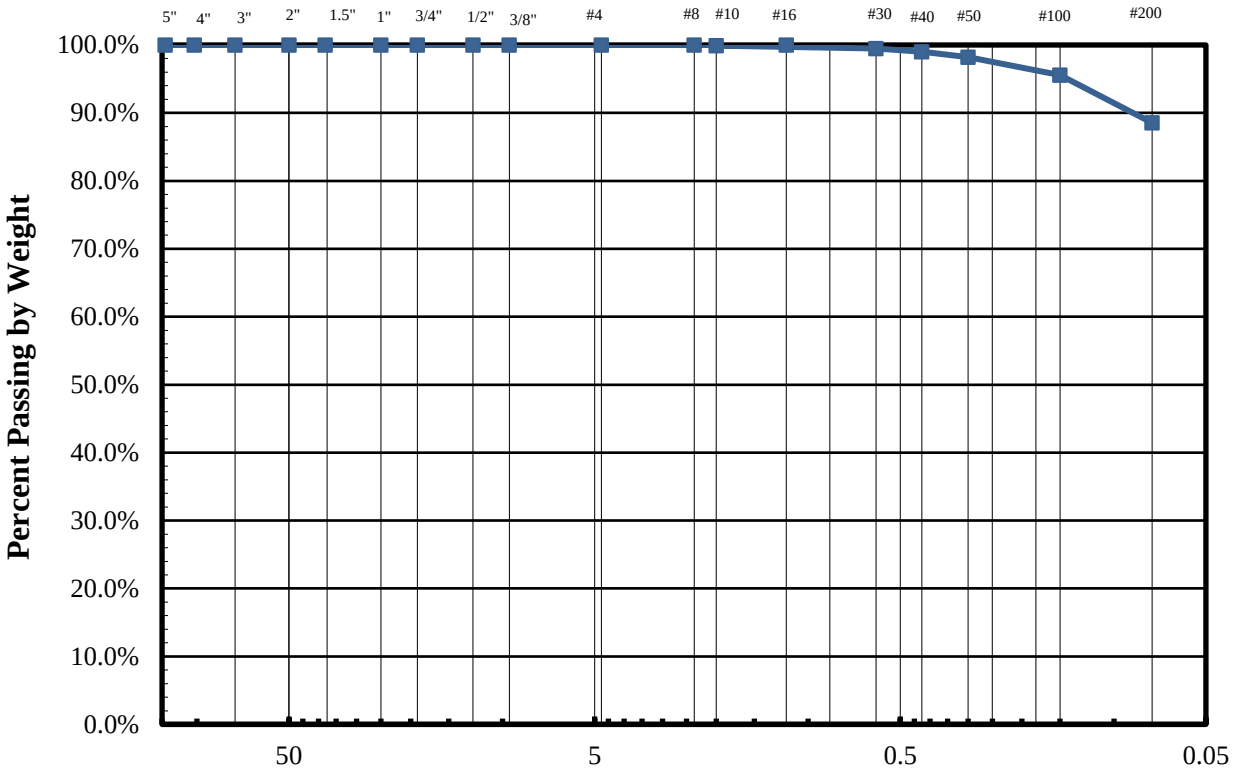
C:\Users\egunnarson\Dropbox\Material Testing\Rexburg\Reports - EMPTIED DAILY\[TH 125 @ 10' PI.xls]PI Report Sheet

Project Number : 01-21-0xx1-100-000
Report Number: 1

FORSGREN Associates Inc.
1137 Summers Drive
Rexburg, ID 83440
208-356-9201

Client: Freemont & Madison County
Project: Eat Idaho Solid Waste Dist.

Material Description: Light Brown
Sample Location: Test Hole 125 @ 10'



Sieve Analysis
AASHTO T27

Job No.	01-21-0xx1-100-0001
Lab No.	21-45
Received	April 20, 2021
Reported	April 23, 2021

SIZE	PASSING	SPECIFICATION Low	SPECIFICATION High
5"	100%		
4"	100%		
3"	100%		
2"	100%		
1.5"	100%		
1"	100%		
3/4"	100%		
1/2"	100%		
3/8"	100%		
No. 4	100%		
No. 8	100%		
No. 10	100%		
No. 16	100%		
No. 30	100%		
No. 40	99%		
No. 50	98%		
No. 100	96%		
No. 200	88.5%		

Moisture Content
AASHTO T255

9.3%

Particle Size (mm)

Sand Equivalent (AASHTO T176) = N/A

Reviewed By:
Eric Gunnarson
Laboratory Manager

FORSGREN Associates Inc.

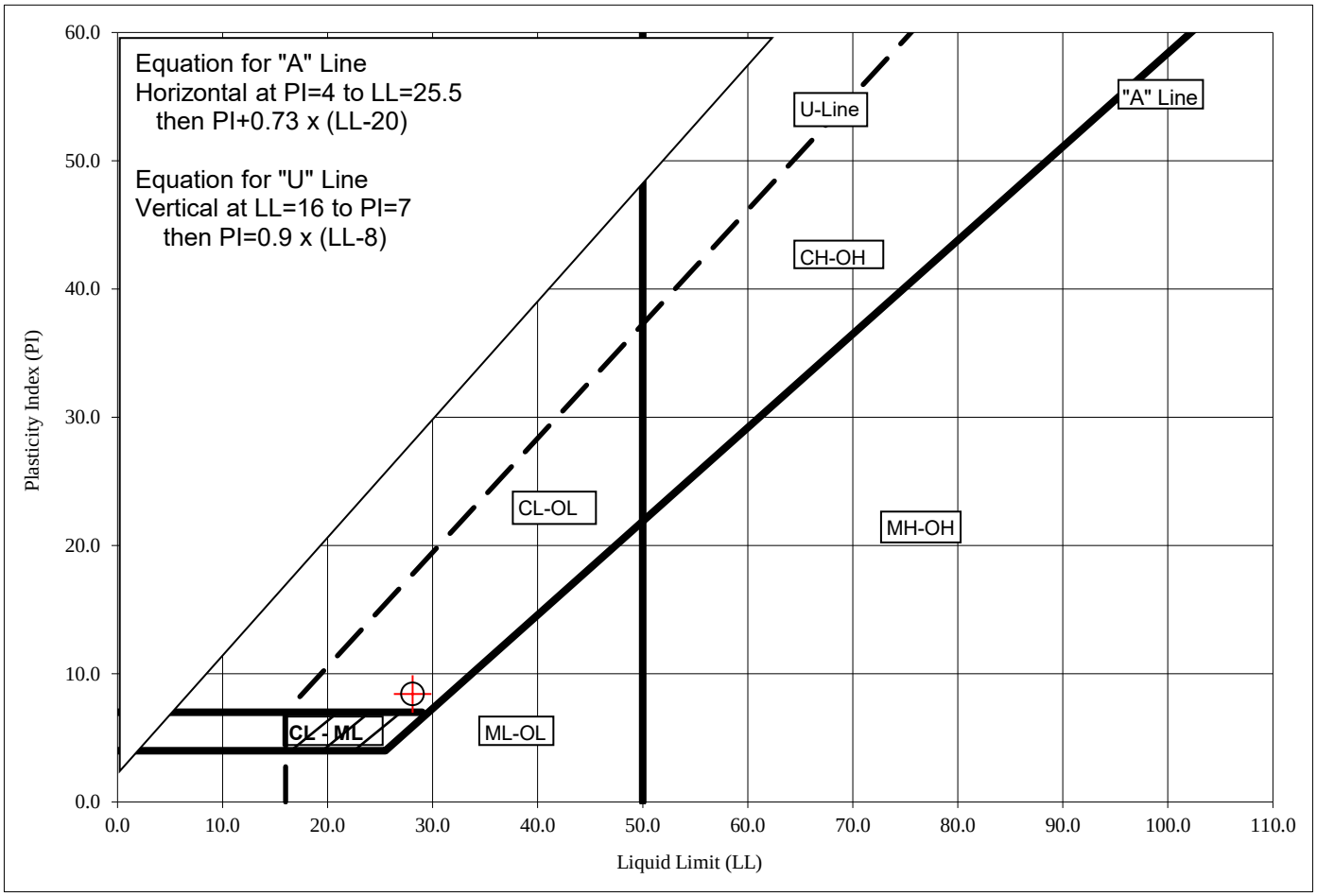
Project Number : 01-21-0xx1-100-0001
Project Name : East Idaho Waste Dist.
Report Number : 1
Report to :
Copies to :

MATERIALS LABORATORY REPORT

Atterberg Limits Determination

D 4318

Sample Location: 129 @ 8'
Material Source: Dark Brown
Sample ID #: 21-45
Date Obtained: 04/20/21
Date Tested: 04/23/21 | Liquid Limit: 28.1 | Plasicity Index: 8.4
Tested By: CKL | Plastic Limit: 19.7 | Soil Classification: CL



Reviewed By:

Eric Gunnarson

Manager: Materials Laboratory

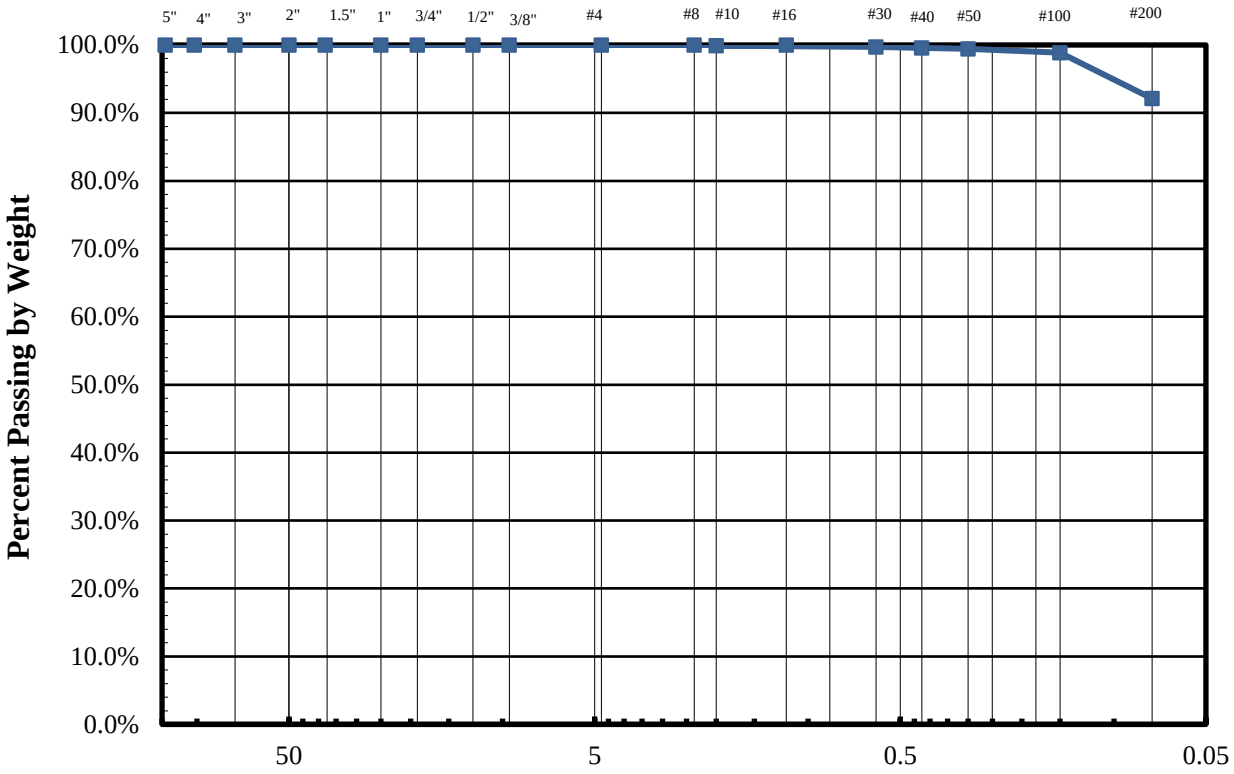
C:\Users\egunnarson\Dropbox\Material Testing\Rexburg\Reports - EMPTIED DAILY\[TH 129 @ 8' PI.xls]PI Report Sheet

Project Number : 01-21-0xx1-100-000
Report Number: 1

FORSGREN Associates Inc.
1137 Summers Drive
Rexburg, ID 83440
208-356-9201

Client: Freemont & Madison County
Project: East Idaho Solid Waste dist.

Material Description: Dark Brown
Sample Location: Test Hole 129 @ 8'



Sieve Analysis
AASHTO T27

Job No.	01-21-0xx1-100-0001
Lab No.	21-45
Received	April 20, 2021
Reported	April 23, 2021

SIZE	PASSING	SPECIFICATION Low	SPECIFICATION High
5"	100%		
4"	100%		
3"	100%		
2"	100%		
1.5"	100%		
1"	100%		
3/4"	100%		
1/2"	100%		
3/8"	100%		
No. 4	100%		
No. 8	100%		
No. 10	100%		
No. 16	100%		
No. 30	100%		
No. 40	100%		
No. 50	99%		
No. 100	99%		
No. 200	92.1%		

Moisture Content
AASHTO T255

18.8%

Particle Size (mm)

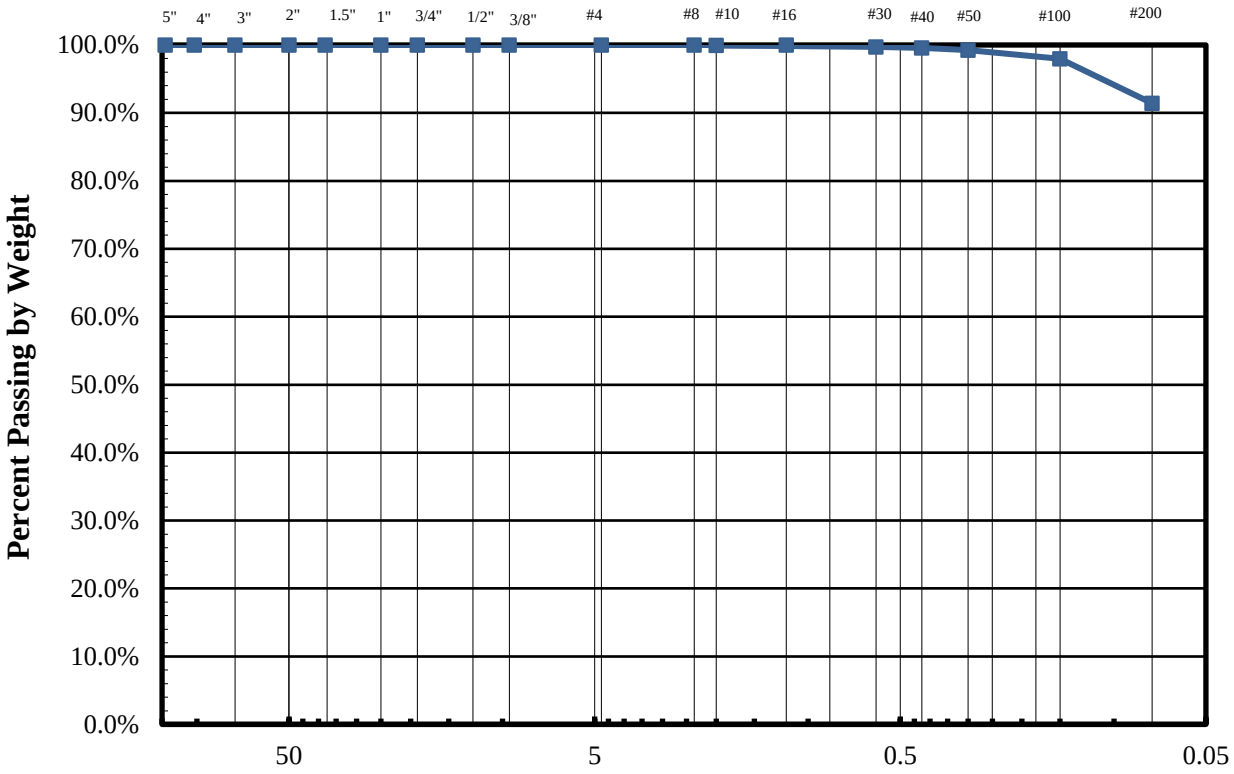
Sand Equivalent (AASHTO T176) = N/A

Reviewed By:
Eric Gunnarson
Laboratory Manager

FORSGREN Associates Inc.
1137 Summers Drive
Rexburg, ID 83440
208-356-9201

Client: East Idaho Solid Waste Dist.
Project: Landfill Investigation Phase 1

Material Description: Tan Silts & Clays
Sample Location: Test Hole 200 @ 6'



Sieve Analysis
AASHTO T27 / ASTM C136

Job No.	01-21-0092-300-0001
Lab No.	22-52
Received	June 29, 2022
Reported	July 11, 2022

SIZE	PASSING	SPECIFICATION Low	SPECIFICATION High
5"	100%		
4"	100%		
3"	100%		
2"	100%		
1.5"	100%		
1"	100%		
3/4"	100%		
1/2"	100%		
3/8"	100%		
No. 4	100%		
No. 8	100%		
No. 10	100%		
No. 16	100%		
No. 30	100%		
No. 40	100%		
No. 50	99%		
No. 100	98%		
No. 200	91.4%		

Moisture Content
AASHTO T255/T265 / ASTM C123

9.4%

Particle Size (mm)

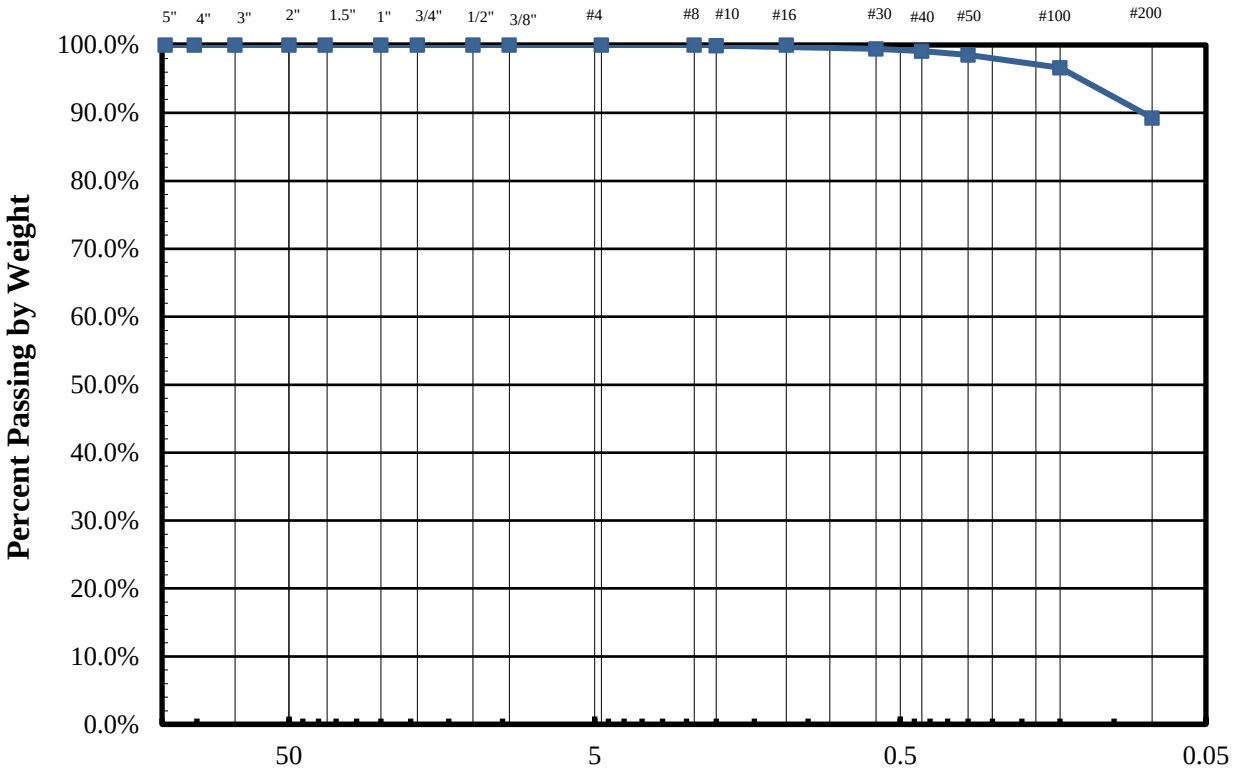
Sand Equivalent (AASHTO T176) = N/A

Reviewed By:
Eric Gunnarson
Laboratory Manager

FORSGREN Associates Inc.
1137 Summers Drive
Rexburg, ID 83440
208-356-9201

Client: East Idaho Solid Waste Dist.
Project: Landfill Investigation Phase 1

Material Description: Light Brown Silts & Clays
Sample Location: Test Hole 201 @ 8'



Sieve Analysis
AASHTO T27 / ASTM C136

Job No.	01-21-0092-300-0001
Lab No.	22-52
Received	June 29, 2022
Reported	July 11, 2022

SIZE	PASSING	SPECIFICATION Low	SPECIFICATION High
5"	100%		
4"	100%		
3"	100%		
2"	100%		
1.5"	100%		
1"	100%		
3/4"	100%		
1/2"	100%		
3/8"	100%		
No. 4	100%		
No. 8	100%		
No. 10	100%		
No. 16	100%		
No. 30	100%		
No. 40	99%		
No. 50	99%		
No. 100	97%		
No. 200	89.3%		

Moisture Content
AASHTO T255/T265 / ASTM C123

11.9%

Particle Size (mm)

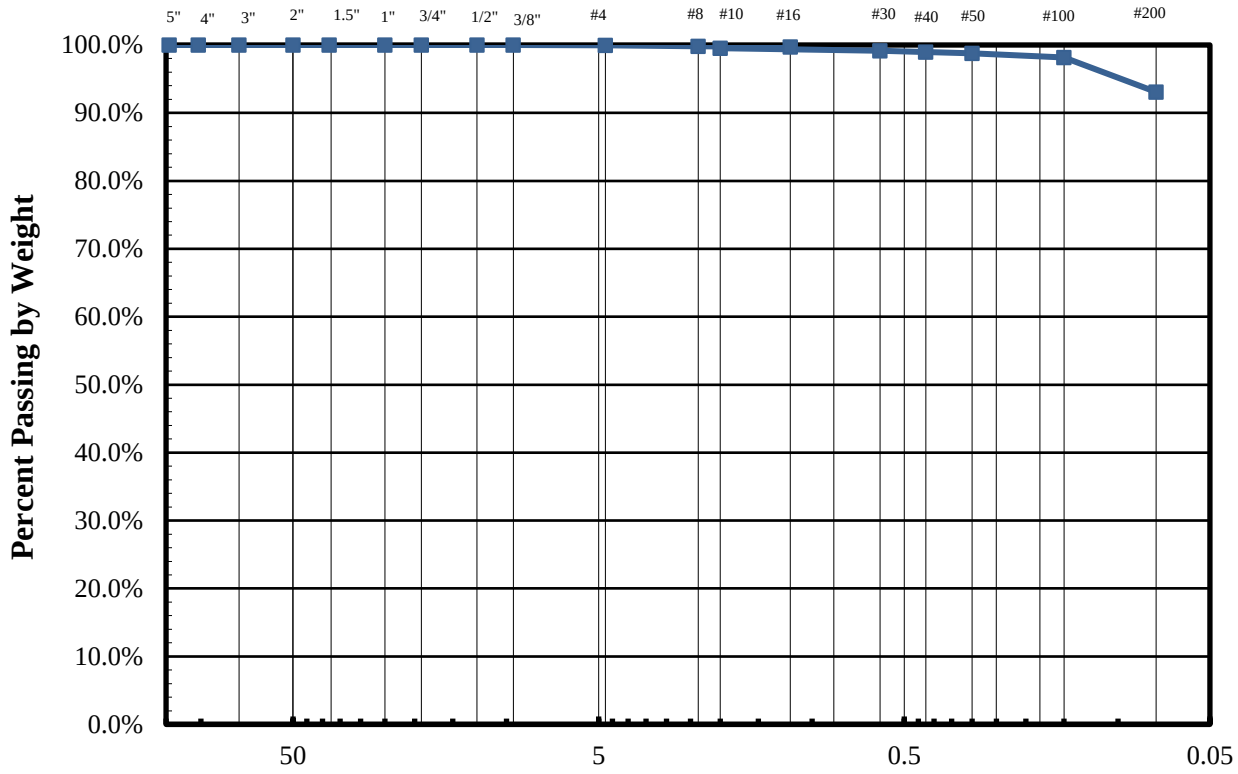
Sand Equivalent (AASHTO T176) = N/A

Reviewed By:
Eric Gunnarson
Laboratory Manager

FORSGREN Associates Inc.
1137 Summers Drive
Rexburg, ID 83440
208-356-9201

Client: East Idaho Solid Waste Dist.
Project: Landfill Investigation Phase 1

Material Description: Brown Silts & Clays
Sample Location: Test Hole 202 @ 8'



Sieve Analysis
AASHTO T27 / ASTM C136

Job No.	01-21-0092-300-0001
Lab No.	22-52
Received	June 29, 2022
Reported	July 11, 2022

SIZE	PASSING	SPECIFICATION Low	SPECIFICATION High
5"	100%		
4"	100%		
3"	100%		
2"	100%		
1.5"	100%		
1"	100%		
3/4"	100%		
1/2"	100%		
3/8"	100%		
No. 4	100%		
No. 8	100%		
No. 10	100%		
No. 16	100%		
No. 30	100%		
No. 40	99%		
No. 50	99%		
No. 100	98%		
No. 200	93.1%		

Moisture Content
AASHTO T255/T265 / ASTM C123

11.9%

Particle Size (mm)

Sand Equivalent (AASHTO T176) = N/A

Reviewed By:
Eric Gunnarson
Laboratory Manager

FORSGREN Associates Inc.

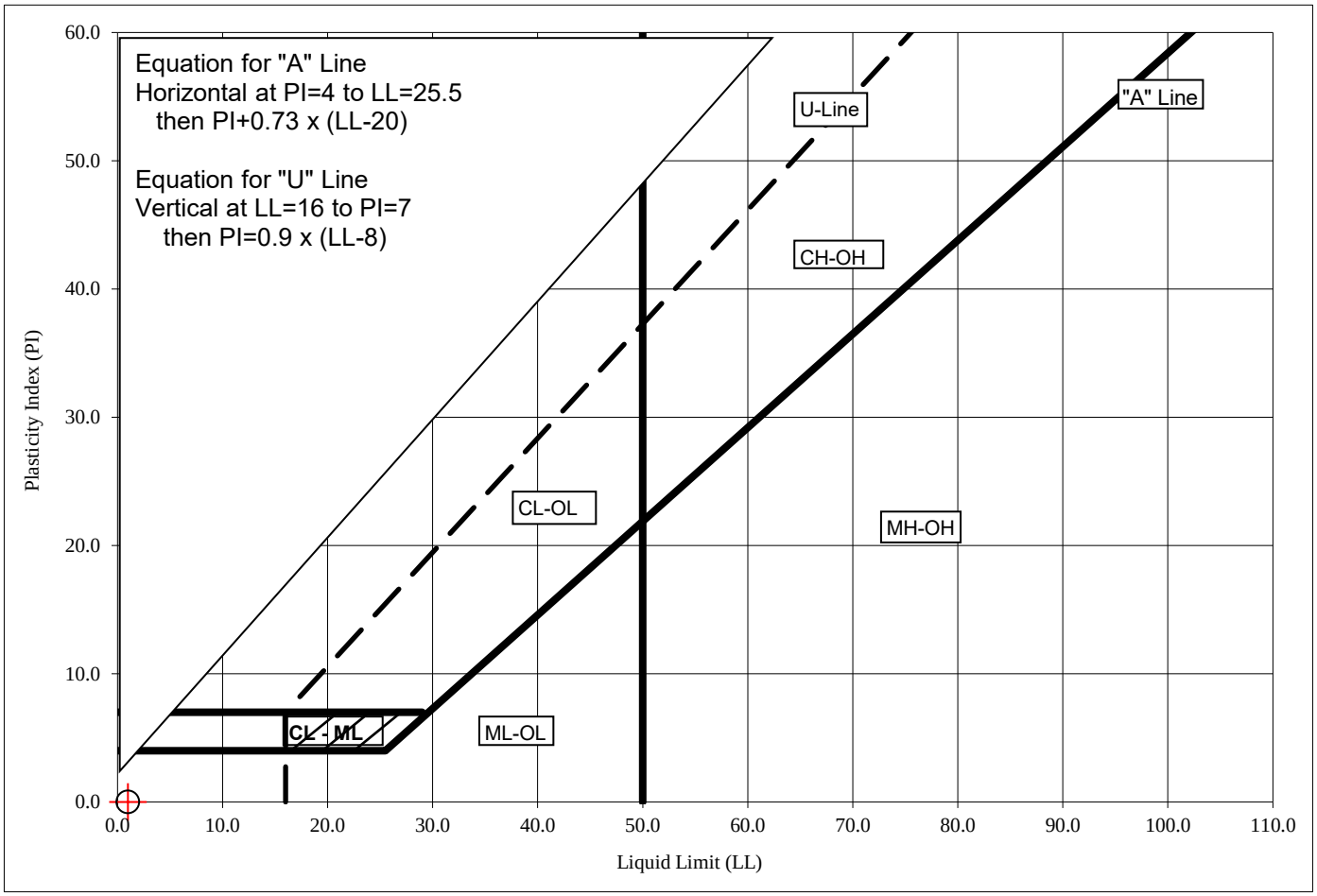
Project Number : 01-21-0092-300-0001
Project Name : Landfill Investigation Phase 1
Report Number : 1
Report to :
Copies to :

MATERIALS LABORATORY REPORT

Atterberg Limits Determination

D 4318

Sample Location: TP 203 @ 6'
Material Source: Brown Silt
Sample ID #: 22-52
Date Obtained: 06/29/22
Date Tested: 07/06/22 | Liquid Limit: NA | Plasicity Index: NP
Tested By: CKL | Plastic Limit: NP | Soil Classification: ML



Reviewed By:

Eric Gunnarson

Manager: Materials Laboratory

Project Number : 01-21-0092-300-000
Report Number: 1

P:\EIRSWD\01-21-0092 - Eastern ID. Reg. Solid Waste Dist\8 MATERIAL TESTING\10 Soils\Sieves\Test Holes\2022\[TH 203 @ 6' PI.xls]PI Report Sheet

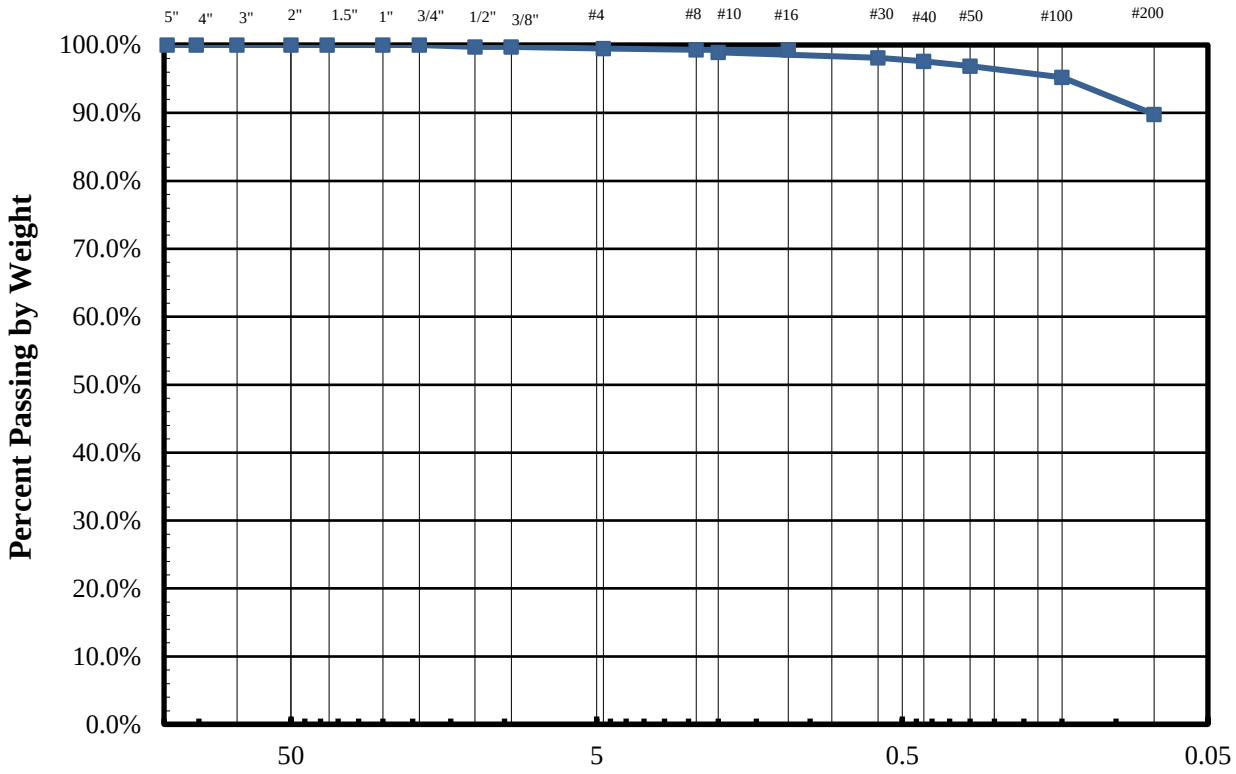
FORSGREN Associates Inc.
1137 Summers Drive
Rexburg, ID 83440
208-356-9201

Client: East Idaho Solid Waste Dist.
Project: Landfill Investigation Phase 1

Material Description: Brown Silt
Sample Location: Test Hole 203 @ 6'

Sieve Analysis
AASHTO T27 / ASTM C136

Job No.	01-21-0092-300-0001
Lab No.	22-52
Received	June 29, 2022
Reported	July 11, 2022



SIZE	PASSING	SPECIFICATION Low	SPECIFICATION High
5"	100%		
4"	100%		
3"	100%		
2"	100%		
1.5"	100%		
1"	100%		
3/4"	100%		
1/2"	100%		
3/8"	100%		
No. 4	99%		
No. 8	99%		
No. 10	99%		
No. 16	99%		
No. 30	99%		
No. 40	98%		
No. 50	97%		
No. 100	95%		
No. 200	89.8%		

Moisture Content
AASHTO T255/T265 / ASTM C123

15.9%

Particle Size (mm)

Sand Equivalent (AASHTO T176) = N/A

Reviewed By:
Eric Gunnarson
Laboratory Manager

FORSGREN Associates Inc.
1137 Summers Drive
Rexburg, ID 83440
208-356-9201

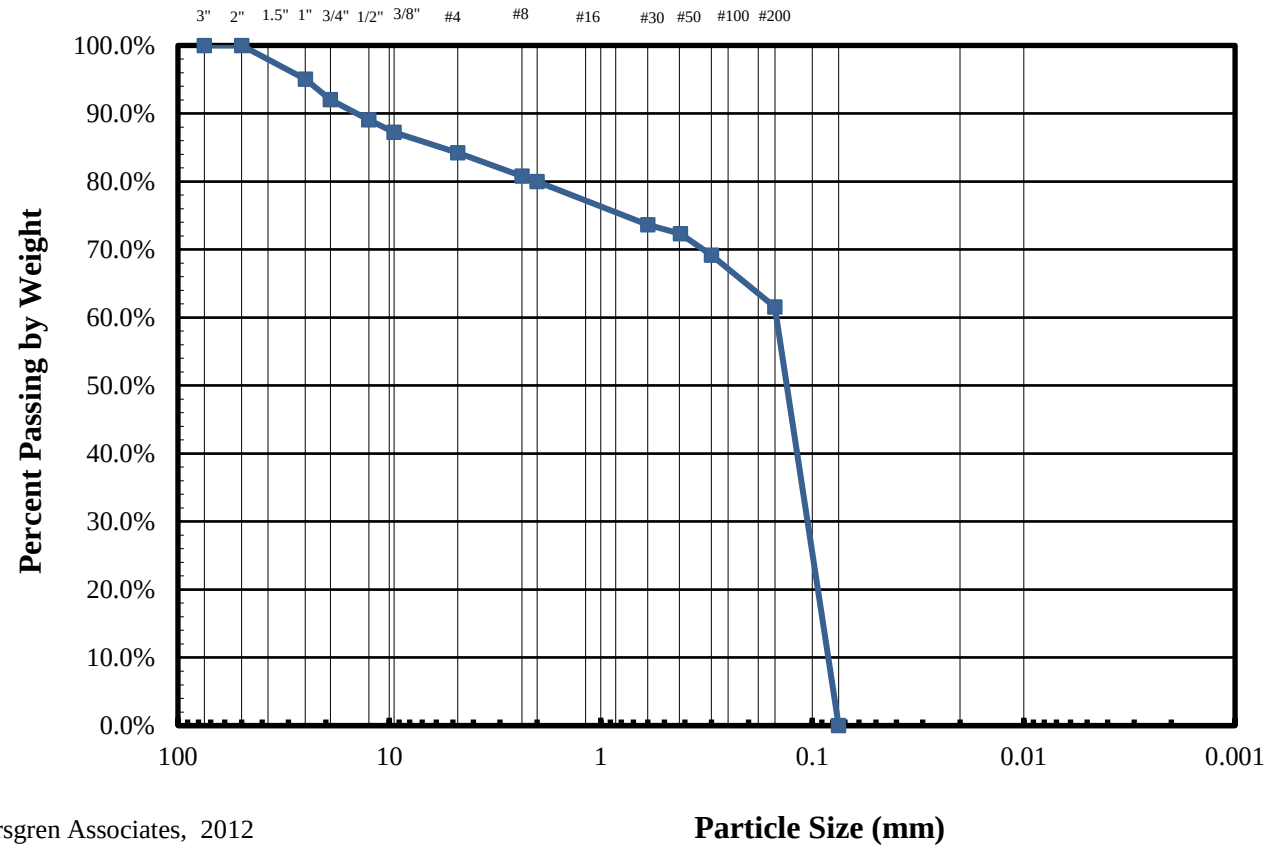
Sieve Analysis
ASTM C 136 / AASHTO T 27

Job No.	01-21-0092-300-0001
Lab No.	22-52
Received	June 29, 2022
Reported	July 11, 2022

Client: East Idaho Solid Waste Dis Project: Landfill Investigation Phase 1

Material Description: Gray-Brown Silts & Clays

Sample Location: Test Hole 203 @ 10'



SIZE	PASSING	SPECIFICATION Low	SPECIFICATION High
3"	100%		
2"	100%		
1"	95%		
3/4"	92%		
1/2"	89%		
3/8"	87%		
No. 4	84%		
No. 8	81%		
No. 10	80%		
No. 30	74%		
No. 50	72%		
No. 100	69%		
No. 200	61.6%		

Moisture Content As Received
ASTM C 123 / AASHTO T 255

23.0%

Reviewed By:
Eric Gunnarson
Laboratory Manager

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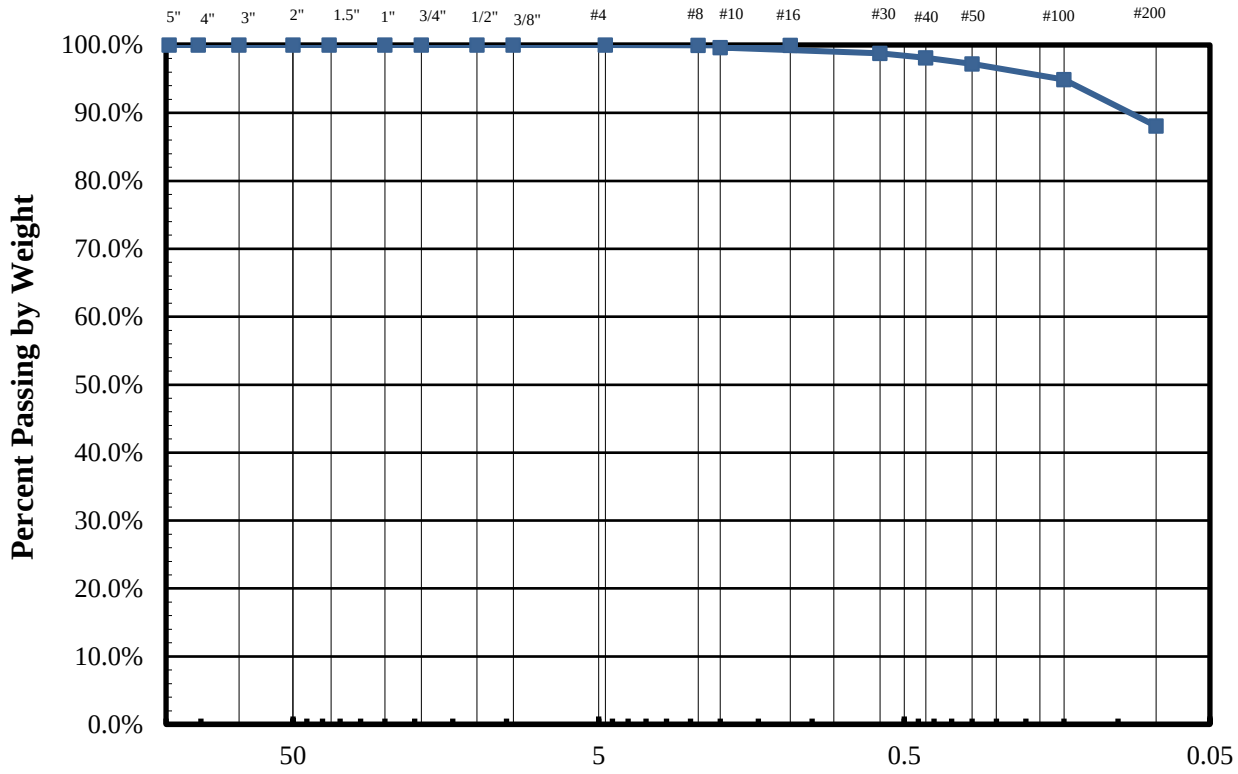
FORSGREN Associates Inc.
1137 Summers Drive
Rexburg, ID 83440
208-356-9201

Client: East Idaho Solid Waste Dist.
Project: Landfill Investigation Phase 1

Material Description: Brown Silts & Clays
Sample Location: Test Hole 204 @ 8'



Sieve Analysis
AASHTO T27 / ASTM C136

Job No.	01-21-0092-300-0001
Lab No.	22-52
Received	June 29, 2022
Reported	July 11, 2022

SIZE	PASSING	SPECIFICATION Low	SPECIFICATION High
5"	100%		
4"	100%		
3"	100%		
2"	100%		
1.5"	100%		
1"	100%		
3/4"	100%		
1/2"	100%		
3/8"	100%		
No. 4	100%		
No. 8	100%		
No. 10	100%		
No. 16	100%		
No. 30	100%		
No. 40	98%		
No. 50	97%		
No. 100	95%		
No. 200	88.1%		

Moisture Content
AASHTO T255/T265 / ASTM C123

12.6%

Particle Size (mm)

Sand Equivalent (AASHTO T176) = N/A

Reviewed By:
Eric Gunnarson
Laboratory Manager

FORSGREN Associates Inc.
1137 Summers Drive
Rexburg, ID 83440
208-356-9201

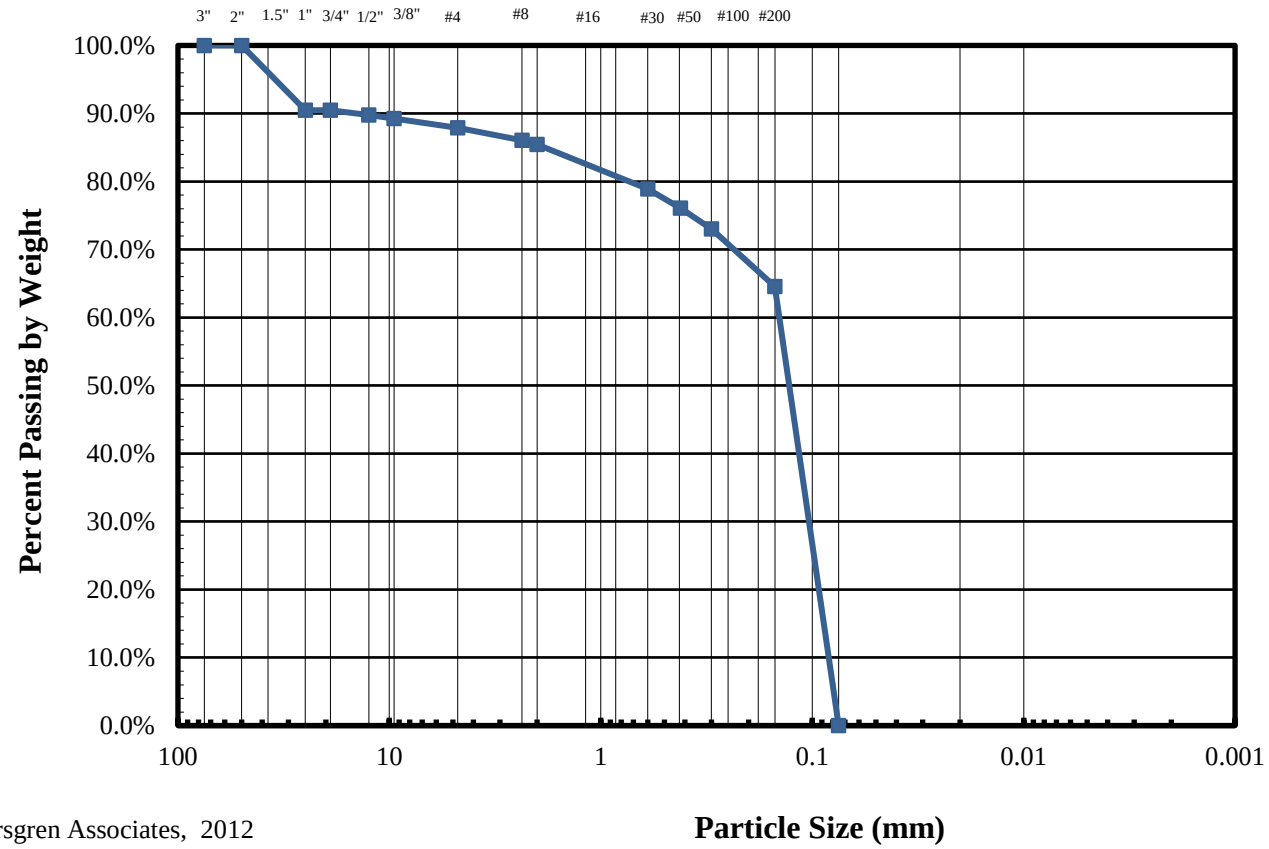
Sieve Analysis
ASTM C 136 / AASHTO T 27

Job No.	01-21-0092-300-0001
Lab No.	22-52
Received	June 29, 2022
Reported	July 11, 2022

Client: East Idaho Solid Waste Dis Project: Landfill Investigation Phase 1

Material Description: Light Brown Silts & Clays

Sample Location: Test Hole 204 @ 12'



SIZE	PASSING	SPECIFICATION Low	SPECIFICATION High
3"	100%		
2"	100%		
1"	90%		
3/4"	90%		
1/2"	90%		
3/8"	89%		
No. 4	88%		
No. 8	86%		
No. 10	85%		
No. 30	79%		
No. 50	76%		
No. 100	73%		
No. 200	64.6%		

Moisture Content As Received
ASTM C 123 / AASHTO T 255

18.5%

Reviewed By:
Eric Gunnarson
Laboratory Manager

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FORSGREN Associates Inc.

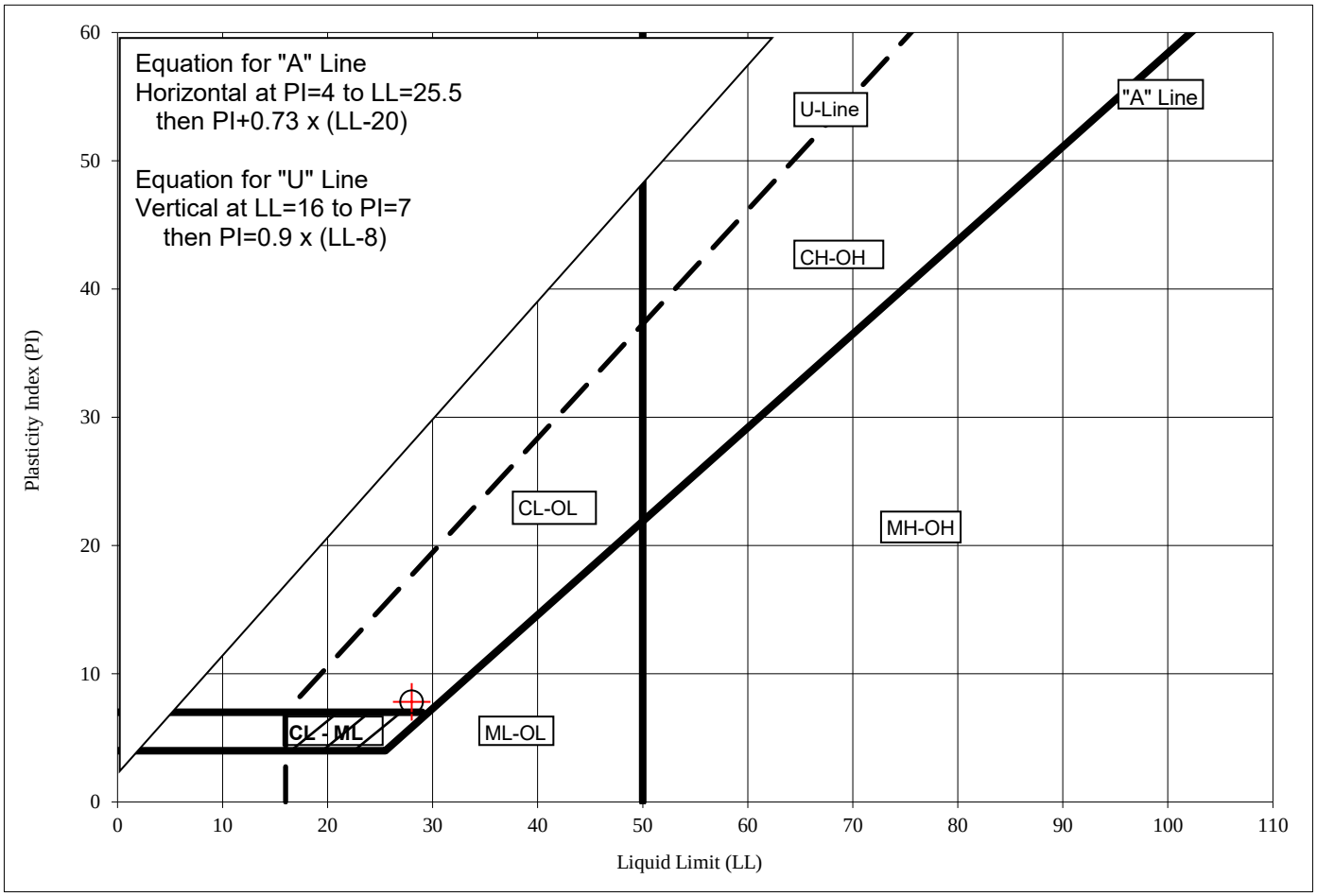
Project Number : 01-21-0092-300-0001
Project Name : Landfill Investigation Phase 1
Report Number : 1
Report to :
Copies to :

MATERIALS LABORATORY REPORT

Atterberg Limits Determination

D 4318

Sample Location: TP 205 @ 6'
Material Source: Brown Lean Clay
Sample ID #: 22-52
Date Obtained: 06/29/22
Date Tested: 07/06/22 | Liquid Limit: 28 | Plasicity Index: 8
Tested By: CKL | Plastic Limit: 20 | Soil Classification: CL



Reviewed By:

Eric Gunnarson

Manager: Materials Laboratory

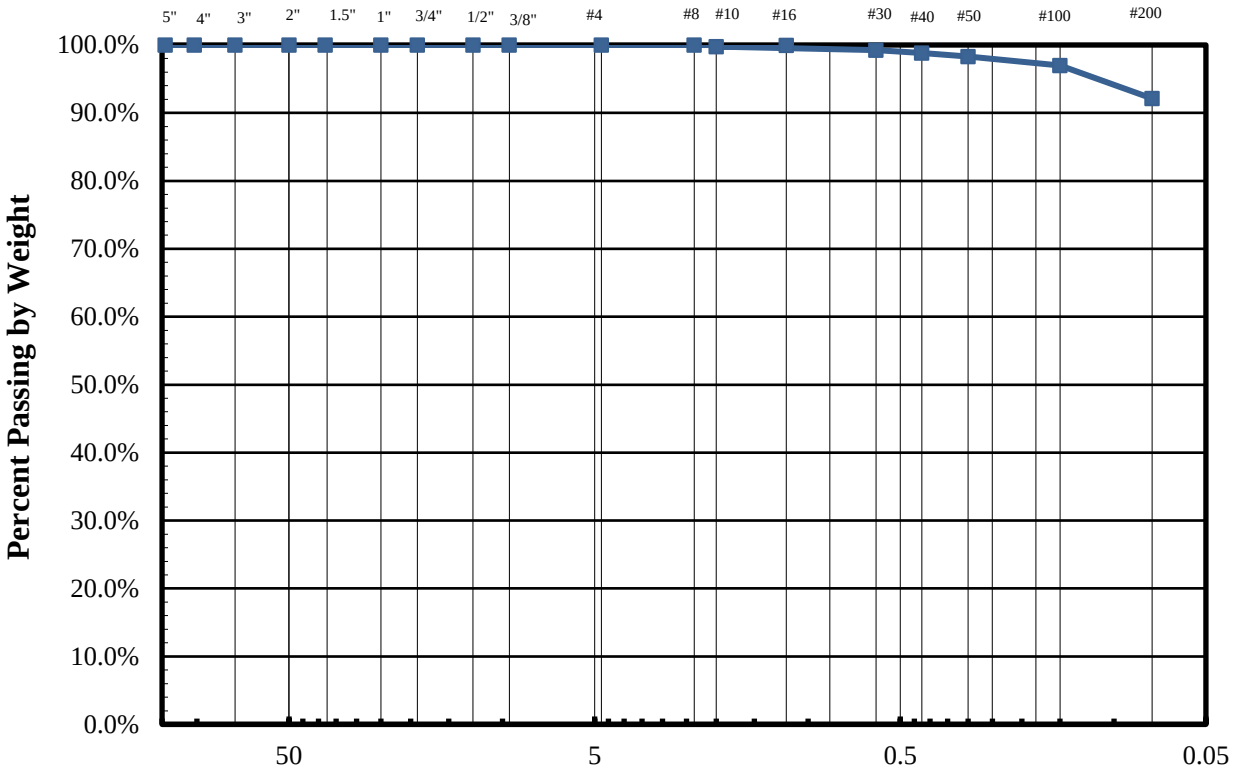
Project Number : 01-21-0092-300-000
Report Number: 1

P:\EIRSWD\01-21-0092 - Eastern ID. Reg. Solid Waste Dist\8 MATERIAL TESTING\10 Soils\Sieves\Test Holes\2022\[TH 205 @ 6' PI.xls]PI Comp Sheet

FORSGREN Associates Inc.
1137 Summers Drive
Rexburg, ID 83440
208-356-9201

Client: East Idaho Solid Waste Dist.
Project: Landfill Investigation Phase 1

Material Description: Brown Lean Clay
Sample Location: Test Hole 205 @ 6'



Sieve Analysis
AASHTO T27 / ASTM C136

Job No.	01-21-0092-300-0001
Lab No.	22-52
Received	June 29, 2022
Reported	July 11, 2022

SIZE	PASSING	SPECIFICATION Low	SPECIFICATION High
5"	100%		
4"	100%		
3"	100%		
2"	100%		
1.5"	100%		
1"	100%		
3/4"	100%		
1/2"	100%		
3/8"	100%		
No. 4	100%		
No. 8	100%		
No. 10	100%		
No. 16	100%		
No. 30	100%		
No. 40	99%		
No. 50	98%		
No. 100	97%		
No. 200	92.1%		

Moisture Content
AASHTO T255/T265 / ASTM C123

13.9%

Particle Size (mm)

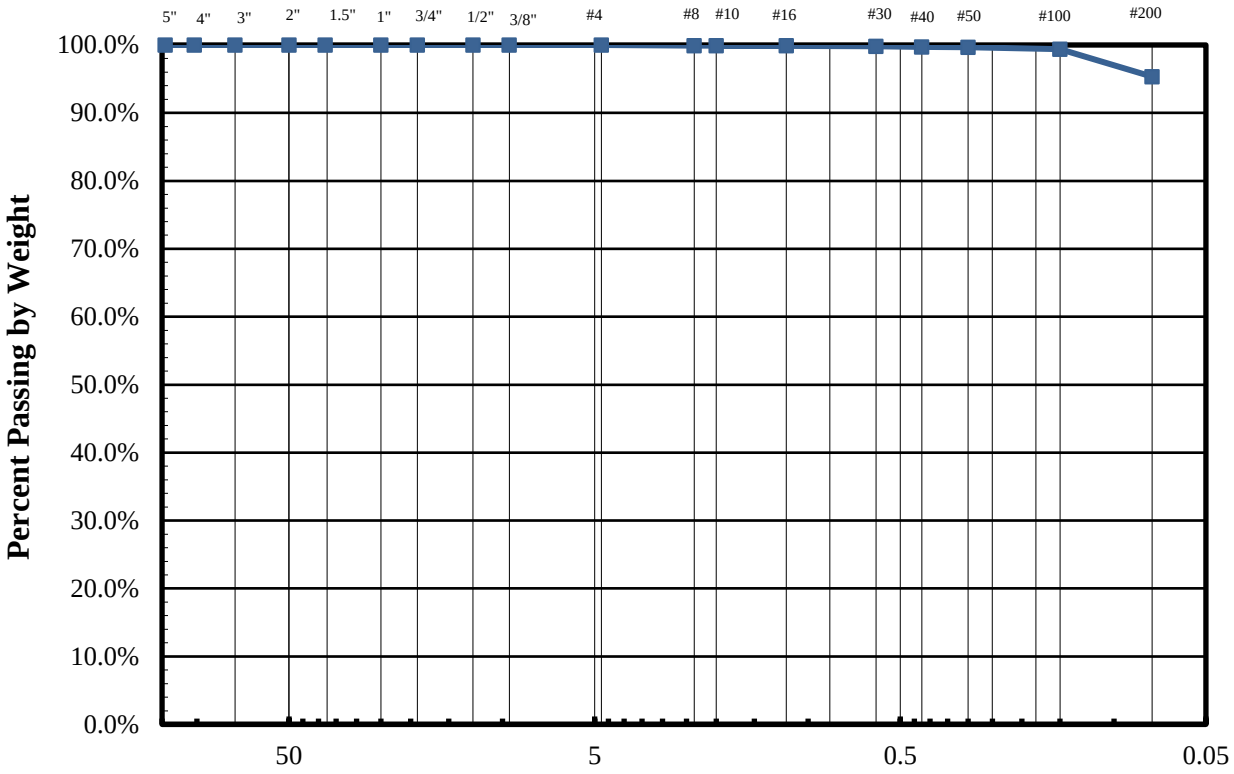
Sand Equivalent (AASHTO T176) = N/A

Reviewed By:
Eric Gunnarson
Laboratory Manager

FORSGREN Associates Inc.
1137 Summers Drive
Rexburg, ID 83440
208-356-9201

Client: East Idaho Solid Waste Dist.
Project: Landfill Investigation Phase 1

Material Description: Light Brown Silts & Clays
Sample Location: Test Hole 206 @ 6'



Sieve Analysis
AASHTO T27 / ASTM C136

Job No.	01-21-0092-300-0001
Lab No.	22-52
Received	June 29, 2022
Reported	July 11, 2022

SIZE	PASSING	SPECIFICATION Low	SPECIFICATION High
5"	100%		
4"	100%		
3"	100%		
2"	100%		
1.5"	100%		
1"	100%		
3/4"	100%		
1/2"	100%		
3/8"	100%		
No. 4	100%		
No. 8	100%		
No. 10	100%		
No. 16	100%		
No. 30	100%		
No. 40	100%		
No. 50	100%		
No. 100	99%		
No. 200	95.3%		

Moisture Content
AASHTO T255/T265 / ASTM C123

14.8%

Particle Size (mm)

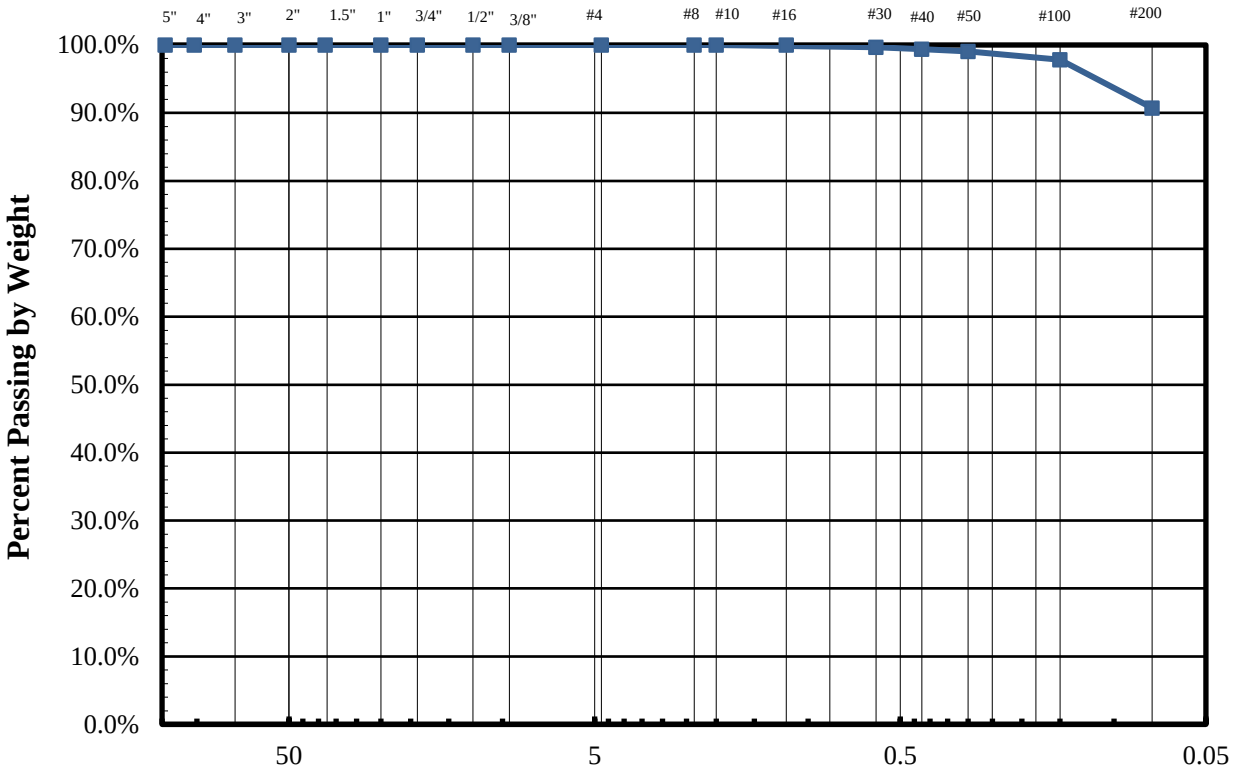
Sand Equivalent (AASHTO T176) = N/A

Reviewed By:
Eric Gunnarson
Laboratory Manager

FORSGREN Associates Inc.
1137 Summers Drive
Rexburg, ID 83440
208-356-9201

Client: East Idaho Solid Waste Dist.
Project: Landfill Investigation Phase 1

Material Description: Dark Brown Silts & Clays
Sample Location: Test Hole 207 @ 2'



Sieve Analysis
AASHTO T27 / ASTM C136

Job No.	01-21-0092-300-0001
Lab No.	22-52
Received	June 29, 2022
Reported	July 11, 2022

SIZE	PASSING	SPECIFICATION Low	SPECIFICATION High
5"	100%		
4"	100%		
3"	100%		
2"	100%		
1.5"	100%		
1"	100%		
3/4"	100%		
1/2"	100%		
3/8"	100%		
No. 4	100%		
No. 8	100%		
No. 10	100%		
No. 16	100%		
No. 30	100%		
No. 40	99%		
No. 50	99%		
No. 100	98%		
No. 200	90.7%		

Moisture Content
AASHTO T255/T265 / ASTM C123

12.0%

Particle Size (mm)

Sand Equivalent (AASHTO T176) = N/A

Reviewed By:
Eric Gunnarson
Laboratory Manager

FORSGREN Associates Inc.

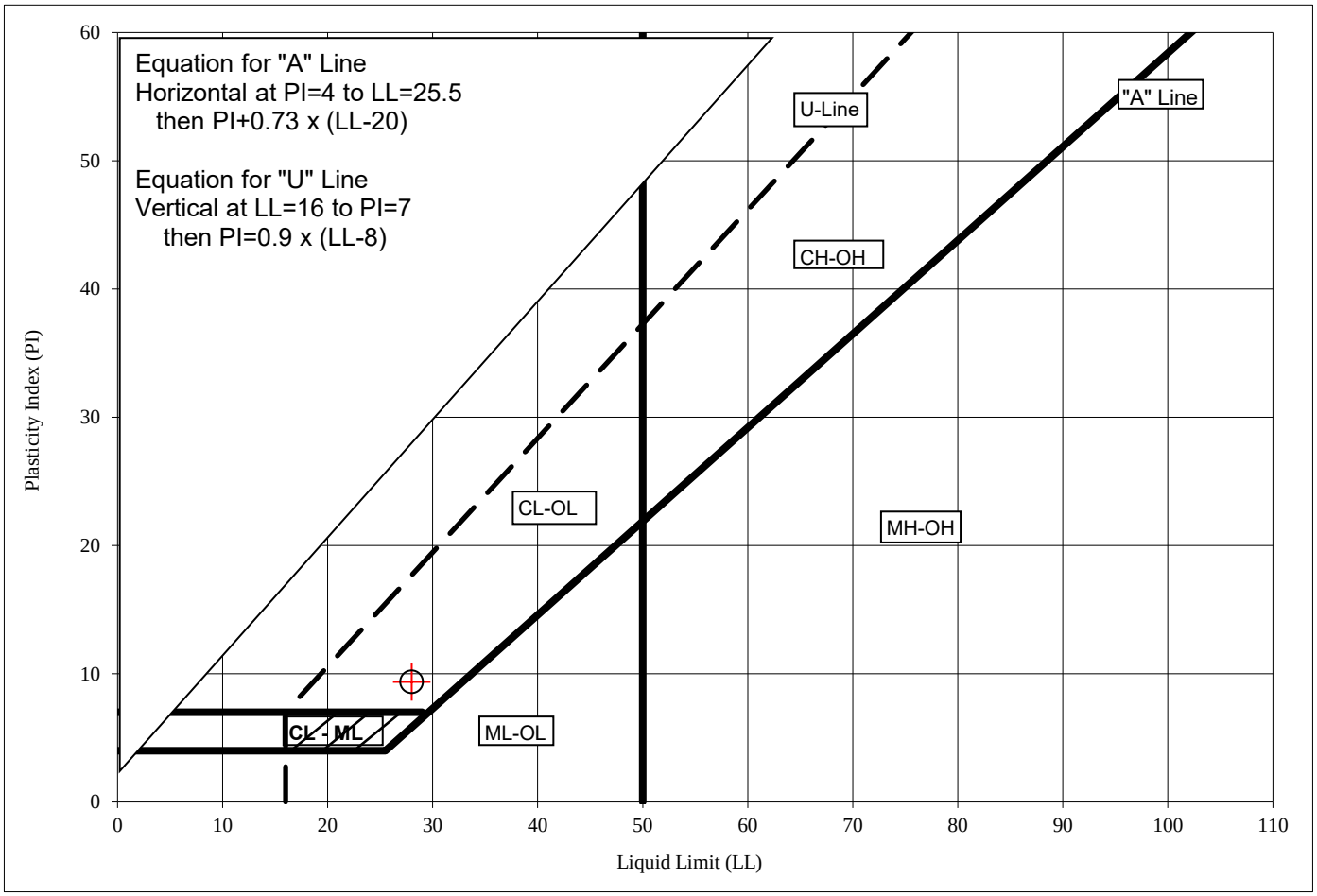
Project Number : 01-21-0092-300-0001
Project Name : Landfill Investigation Phase 1
Report Number : 1
Report to :
Copies to :

MATERIALS LABORATORY REPORT

Atterberg Limits Determination

D 4318

Sample Location: TP 207 @ 8'
Material Source: Brown Lean Clay
Sample ID #: 22-52
Date Obtained: 06/29/22
Date Tested: 07/06/22 | Liquid Limit: 28 | Plasicity Index: 9
Tested By: CKL | Plastic Limit: 19 | Soil Classification: CL



Reviewed By:

Eric Gunnarson

Manager: Materials Laboratory

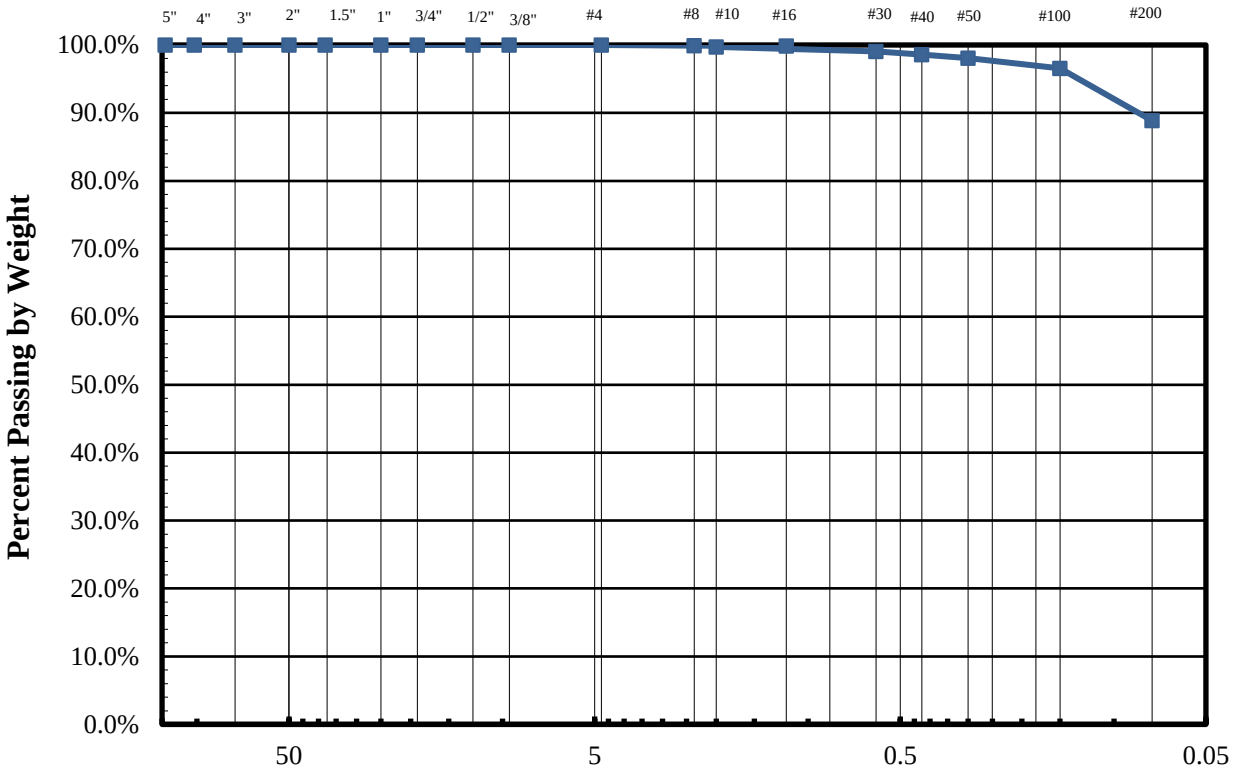
Project Number : 01-21-0092-300-000
Report Number: 1

P:\EIRSWD\01-21-0092 - Eastern ID. Reg. Solid Waste Dist\8 MATERIAL TESTING\10 Soils\Sieves\Test Holes\2022\[TH 207 @ 8' PI.xls]PI Comp Sheet

FORSGREN Associates Inc.
1137 Summers Drive
Rexburg, ID 83440
208-356-9201

Client: East Idaho Solid Waste Dist.
Project: Landfill Investigation Phase 1

Material Description: Brown Lean Clay
Sample Location: Test Hole 207 @ 8'



Sieve Analysis
AASHTO T27 / ASTM C136

Job No.	01-21-0092-300-0001
Lab No.	22-52
Received	June 29, 2022
Reported	July 11, 2022

SIZE	PASSING	SPECIFICATION Low	SPECIFICATION High
5"	100%		
4"	100%		
3"	100%		
2"	100%		
1.5"	100%		
1"	100%		
3/4"	100%		
1/2"	100%		
3/8"	100%		
No. 4	100%		
No. 8	100%		
No. 10	100%		
No. 16	100%		
No. 30	100%		
No. 40	99%		
No. 50	98%		
No. 100	97%		
No. 200	88.9%		

Moisture Content
AASHTO T255/T265 / ASTM C123

11.1%

Particle Size (mm)

Sand Equivalent (AASHTO T176) = N/A

Reviewed By:
Eric Gunnarson
Laboratory Manager

FORSGREN Associates Inc.
1137 Summers Drive
Rexburg, ID 83440
208-356-9201

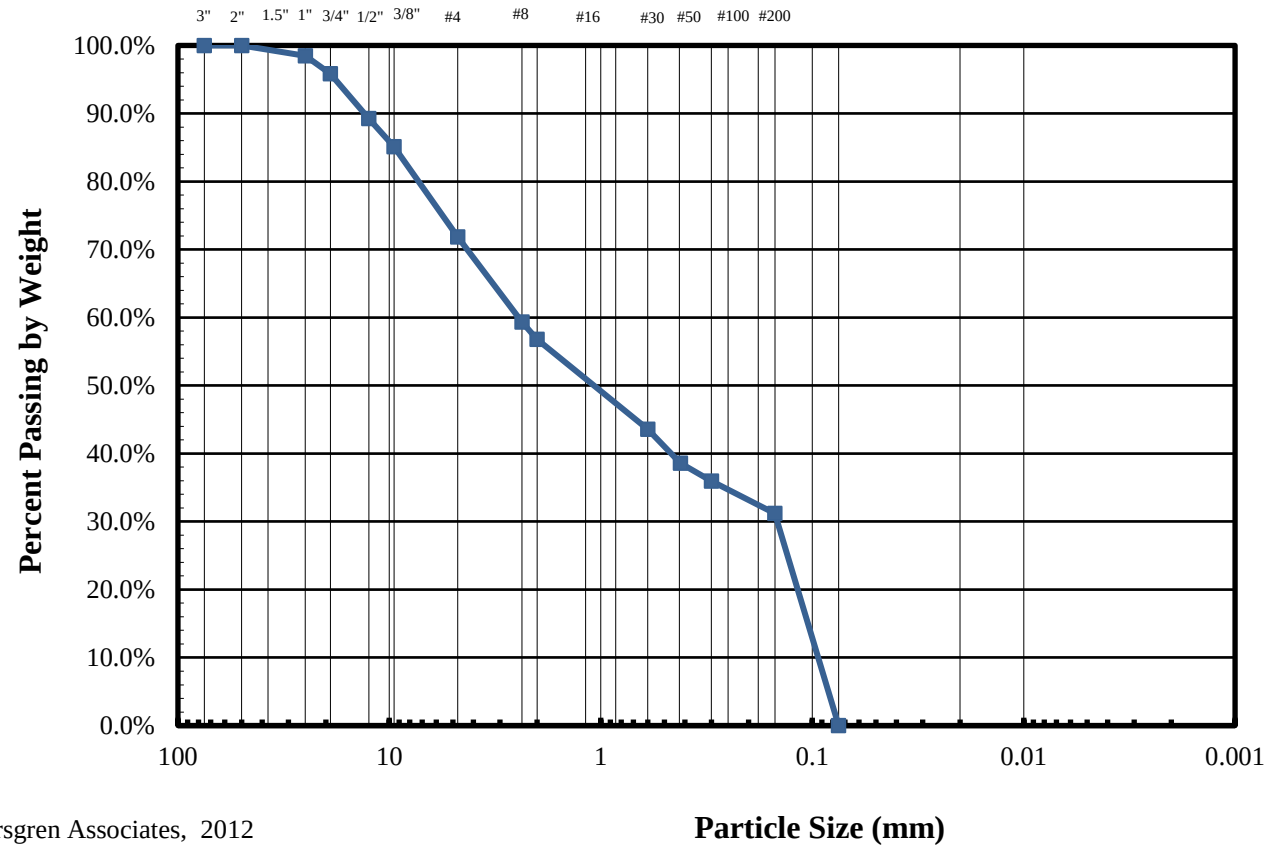
Sieve Analysis
ASTM C 136 / AASHTO T 27

Job No.	01-21-0092-300-0001
Lab No.	22-52
Received	June 29, 2022
Reported	July 11, 2022

Client: East Idaho Solid Waste Dis Project: Landfill Investigation Phase 1

Material Description: Brown Sands with Fines

Sample Location: Test Hole 207 @ 15'



SIZE	PASSING	SPECIFICATION Low	SPECIFICATION High
3"	100%		
2"	100%		
1"	98%		
3/4"	96%		
1/2"	89%		
3/8"	85%		
No. 4	72%		
No. 8	59%		
No. 10	57%		
No. 30	44%		
No. 50	39%		
No. 100	36%		
No. 200	31.2%		

Moisture Content As Received
ASTM C 123 / AASHTO T 255

12.7%

Reviewed By:
Eric Gunnarson
Laboratory Manager

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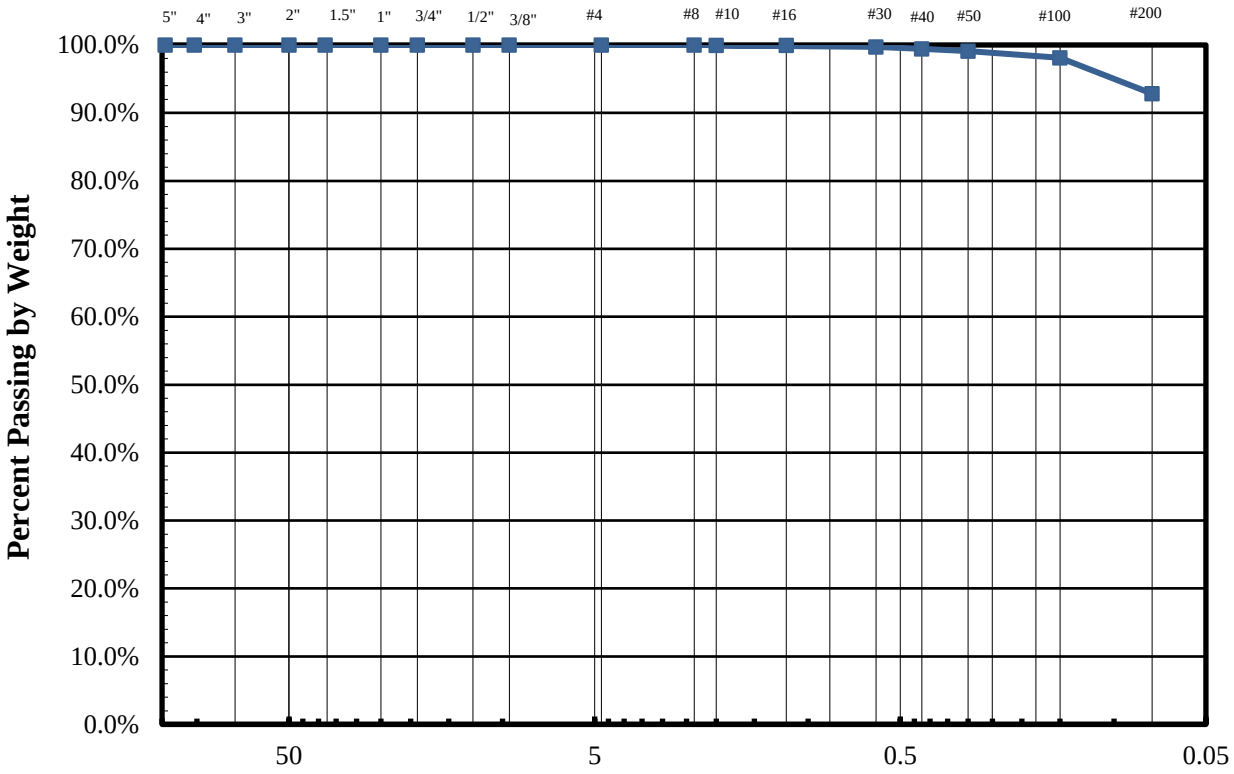
FORSGREN Associates Inc.
1137 Summers Drive
Rexburg, ID 83440
208-356-9201

Client: East Idaho Solid Waste Dist.
Project: Landfill Investigation Phase 1

Material Description: Dark Brown Silts & Clays
Sample Location: Test Hole 208 @ 3'



Sieve Analysis
AASHTO T27 / ASTM C136

Job No.	01-21-0092-300-0001
Lab No.	22-52
Received	June 29, 2022
Reported	July 11, 2022

SIZE	PASSING	SPECIFICATION Low	SPECIFICATION High
5"	100%		
4"	100%		
3"	100%		
2"	100%		
1.5"	100%		
1"	100%		
3/4"	100%		
1/2"	100%		
3/8"	100%		
No. 4	100%		
No. 8	100%		
No. 10	100%		
No. 16	100%		
No. 30	100%		
No. 40	99%		
No. 50	99%		
No. 100	98%		
No. 200	92.8%		

Moisture Content
AASHTO T255/T265 / ASTM C123

12.2%

Particle Size (mm)

Sand Equivalent (AASHTO T176) = N/A

Reviewed By:
Eric Gunnarson
Laboratory Manager

FORSGREN Associates Inc.
1137 Summers Drive
Rexburg, ID 83440
208-356-9201

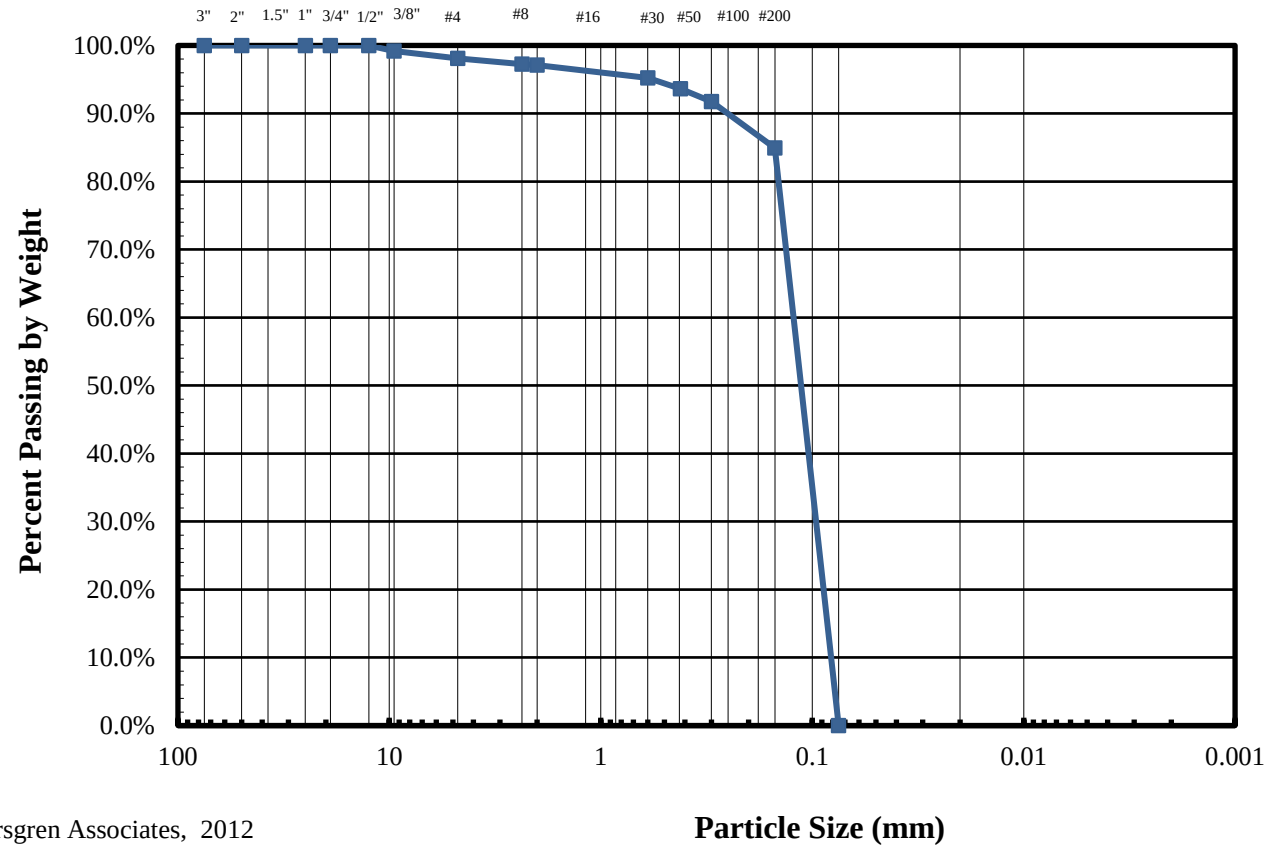
Sieve Analysis
ASTM C 136 / AASHTO T 27

Job No.	01-21-0092-300-0001
Lab No.	22-52
Received	June 29, 2022
Reported	July 11, 2022

Client: East Idaho Solid Waste Dis Project: Landfill Investigation Phase 1

Material Description: Dark Brown Silts & Clays

Sample Location: Test Hole 209 @ 1'



SIZE	PASSING	SPECIFICATION Low	SPECIFICATION High
3"	100%		
2"	100%		
1"	100%		
3/4"	100%		
1/2"	100%		
3/8"	99%		
No. 4	98%		
No. 8	97%		
No. 10	97%		
No. 30	95%		
No. 50	94%		
No. 100	92%		
No. 200	84.9%		

Moisture Content As Received
ASTM C 123 / AASHTO T 255

6.0%

Reviewed By:
Eric Gunnarson
Laboratory Manager

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FORSGREN Associates Inc.

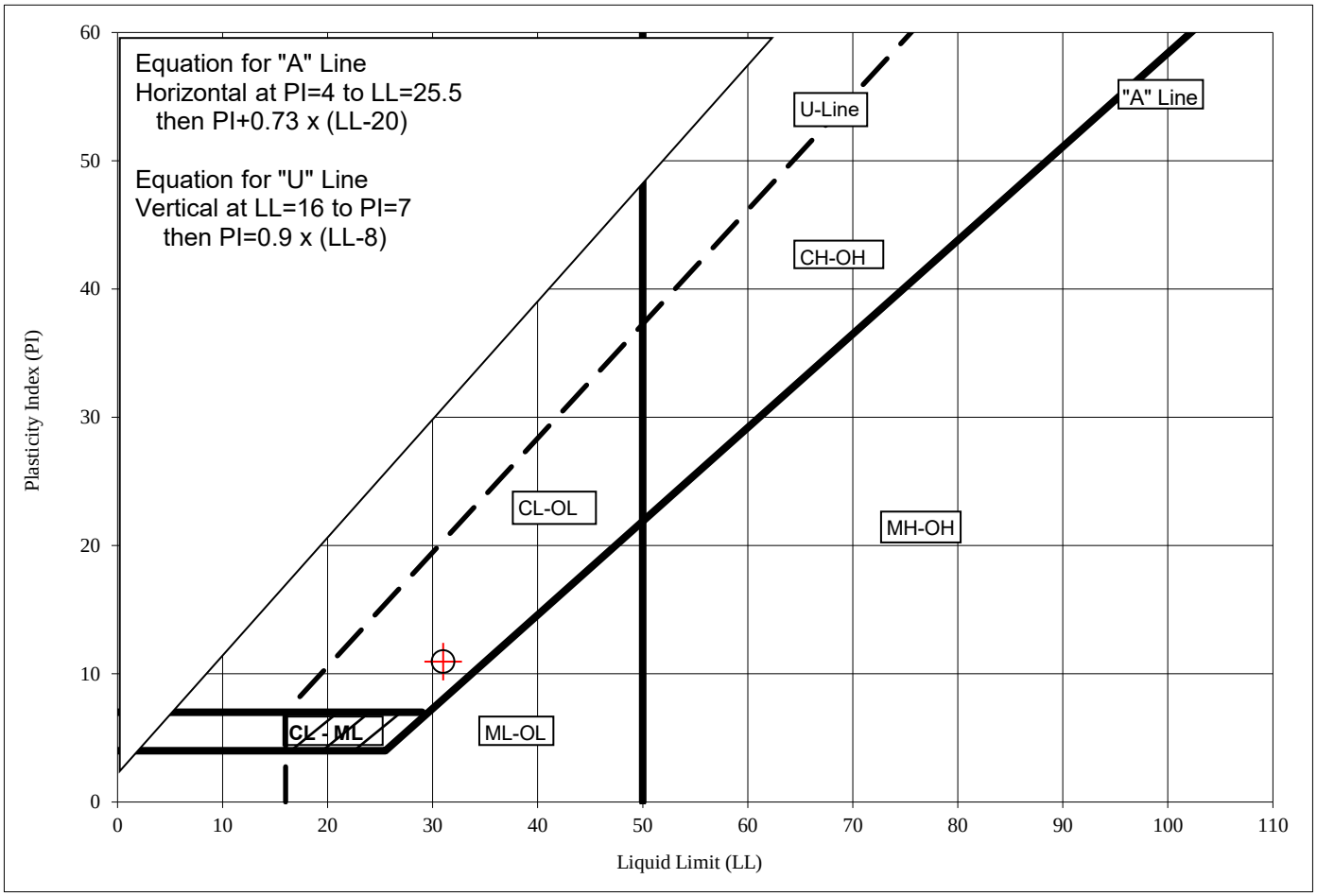
Project Number : 01-21-0092-300-0001
Project Name : Landfill Investigation Phase 1
Report Number : 1
Report to :
Copies to :

MATERIALS LABORATORY REPORT

Atterberg Limits Determination

D 4318

Sample Location: TP 210 @ 6'
Material Source: Brown Lean Clay
Sample ID #: 22-52
Date Obtained: 06/29/22
Date Tested: 07/06/22 | Liquid Limit: 31 | Plasicity Index: 11
Tested By: CKL | Plastic Limit: 20 | Soil Classification: CL



Reviewed By:

Eric Gunnarson

Manager: Materials Laboratory

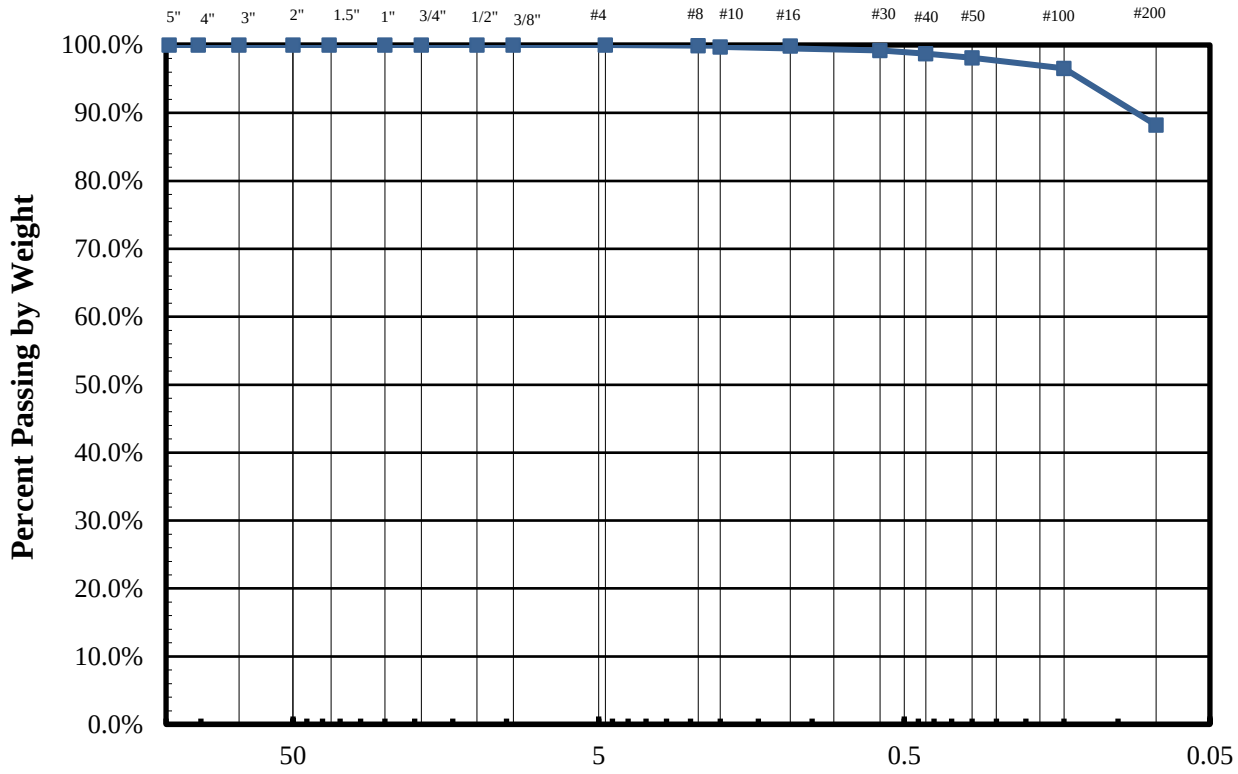
Project Number : 01-21-0092-300-000
Report Number: 1

P:\EIRSWD\01-21-0092 - Eastern ID. Reg. Solid Waste Dist\8 MATERIAL TESTING\10 Soils\Sieves\Test Holes\2022\[TH 210 @ 6' PI.xls]PI Comp Sheet

FORSGREN Associates Inc.
1137 Summers Drive
Rexburg, ID 83440
208-356-9201

Client: East Idaho Solid Waste Dist.
Project: Landfill Investigation Phase 1

Material Description: Brown Lean Clay
Sample Location: Test Hole 210 @ 6'



Sieve Analysis
AASHTO T27 / ASTM C136

Job No.	01-21-0092-300-0001
Lab No.	22-52
Received	June 29, 2022
Reported	July 11, 2022

SIZE	PASSING	SPECIFICATION Low	SPECIFICATION High
5"	100%		
4"	100%		
3"	100%		
2"	100%		
1.5"	100%		
1"	100%		
3/4"	100%		
1/2"	100%		
3/8"	100%		
No. 4	100%		
No. 8	100%		
No. 10	100%		
No. 16	100%		
No. 30	100%		
No. 40	99%		
No. 50	98%		
No. 100	97%		
No. 200	88.2%		

Moisture Content
AASHTO T255/T265 / ASTM C123

13.8%

Particle Size (mm)

Sand Equivalent (AASHTO T176) = N/A

Reviewed By:
Eric Gunnarson
Laboratory Manager

FORSGREN Associates Inc.

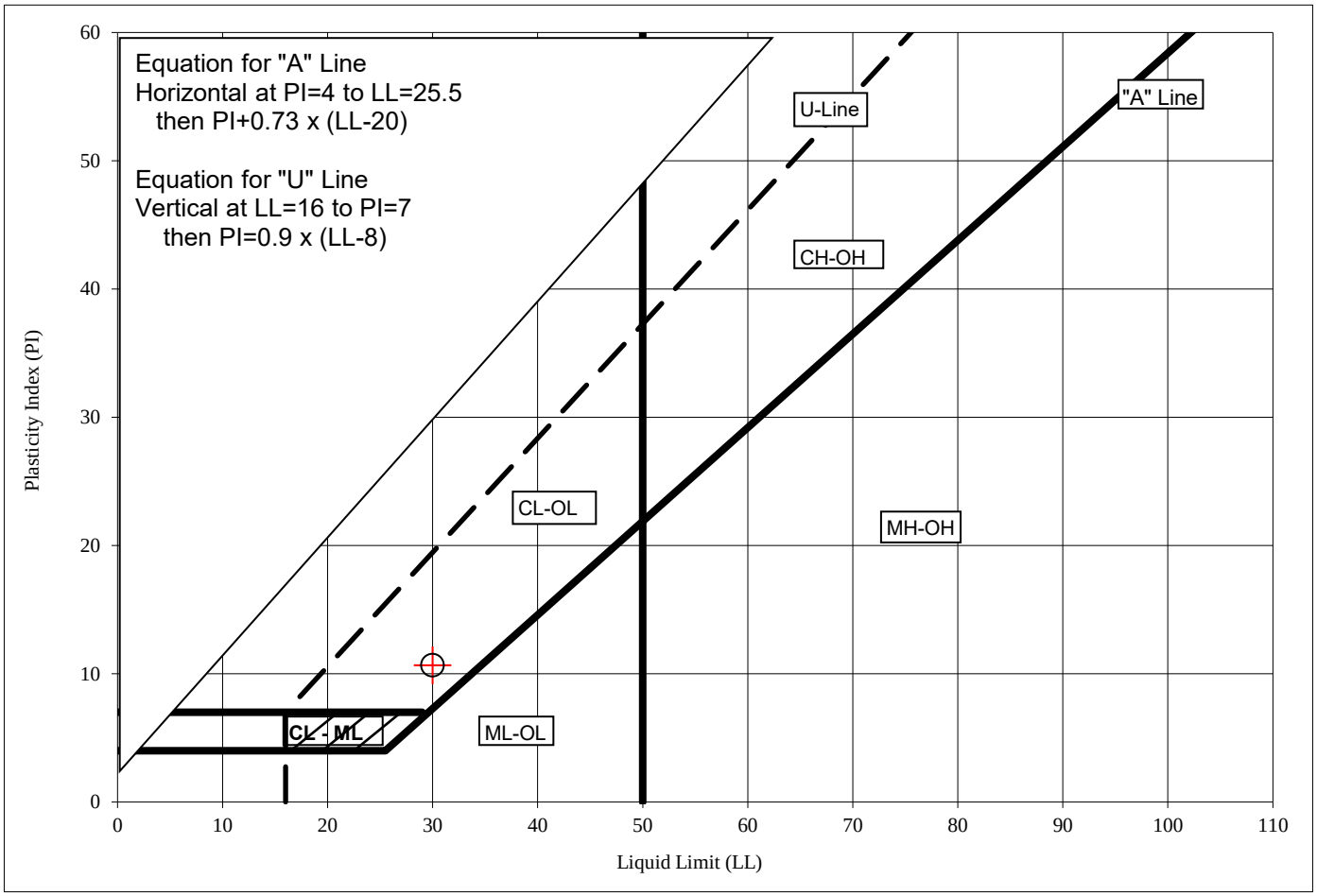
Project Number : 01-21-0092-300-0001
Project Name : Landfill Investigation Phase 1
Report Number : 1
Report to :
Copies to :

MATERIALS LABORATORY REPORT

Atterberg Limits Determination

D 4318

Sample Location: TP 210 @ 13'
Material Source: Red-brown lean clay
Sample ID #: 22-52
Date Obtained: 06/29/22
Date Tested: 07/06/22 | Liquid Limit: 30 | Plasicity Index: 11
Tested By: CKL | Plastic Limit: 19 | Soil Classification: CL



Reviewed By:

Eric Gunnarson

Manager: Materials Laboratory

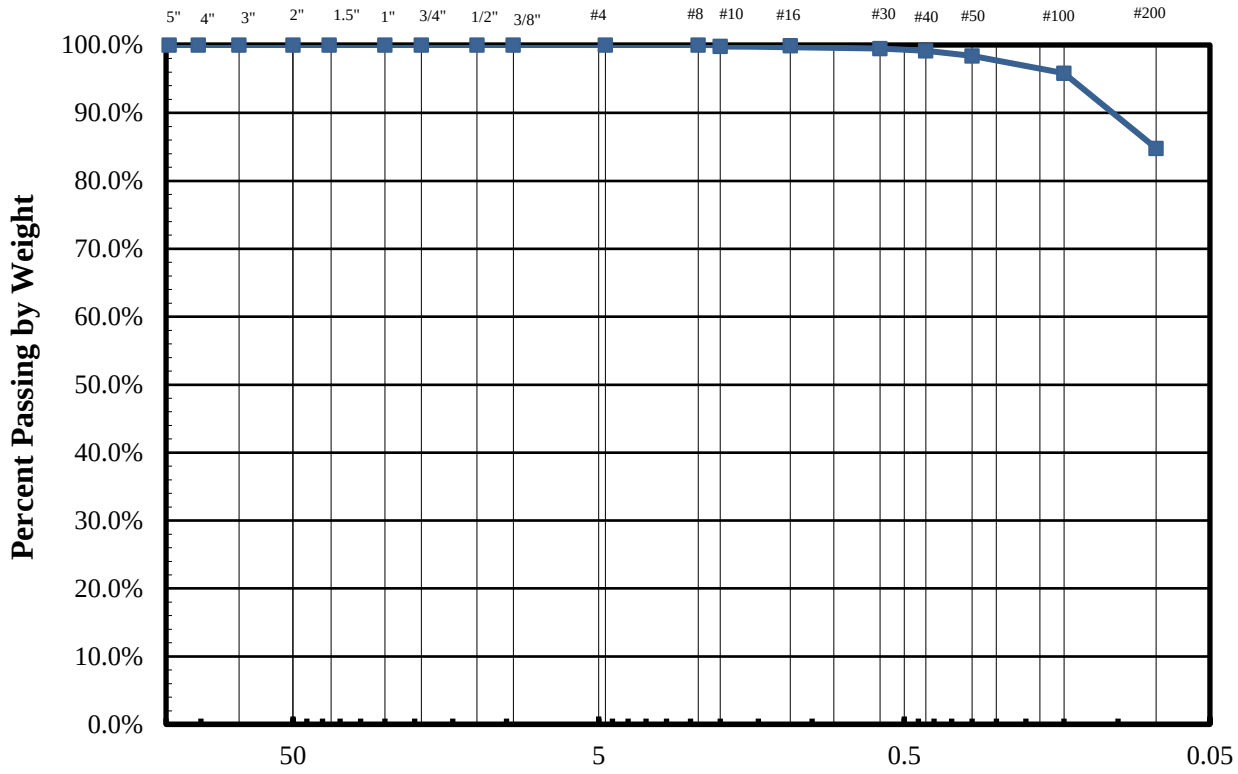
Project Number : 01-21-0092-300-000
Report Number: 1

P:\EIRSWD\01-21-0092 - Eastern ID. Reg. Solid Waste Dist\8 MATERIAL TESTING\10 Soils\Sieves\Test Holes\2022\[TH 210 @ 13' PI.xls]PI Comp Sheet

FORSGREN Associates Inc.
1137 Summers Drive
Rexburg, ID 83440
208-356-9201

Client: East Idaho Solid Waste Dist.
Project: Landfill Investigation Phase 1

Material Description: Red-brown lean clay
Sample Location: Test Hole 210 @ 13'



Sieve Analysis
AASHTO T27 / ASTM C136

Job No.	01-21-0092-300-0001
Lab No.	22-52
Received	June 29, 2022
Reported	July 11, 2022

SIZE	PASSING	SPECIFICATION Low	SPECIFICATION High
5"	100%		
4"	100%		
3"	100%		
2"	100%		
1.5"	100%		
1"	100%		
3/4"	100%		
1/2"	100%		
3/8"	100%		
No. 4	100%		
No. 8	100%		
No. 10	100%		
No. 16	100%		
No. 30	100%		
No. 40	99%		
No. 50	98%		
No. 100	96%		
No. 200	84.8%		

Moisture Content
AASHTO T255/T265 / ASTM C123

14.8%

Particle Size (mm)

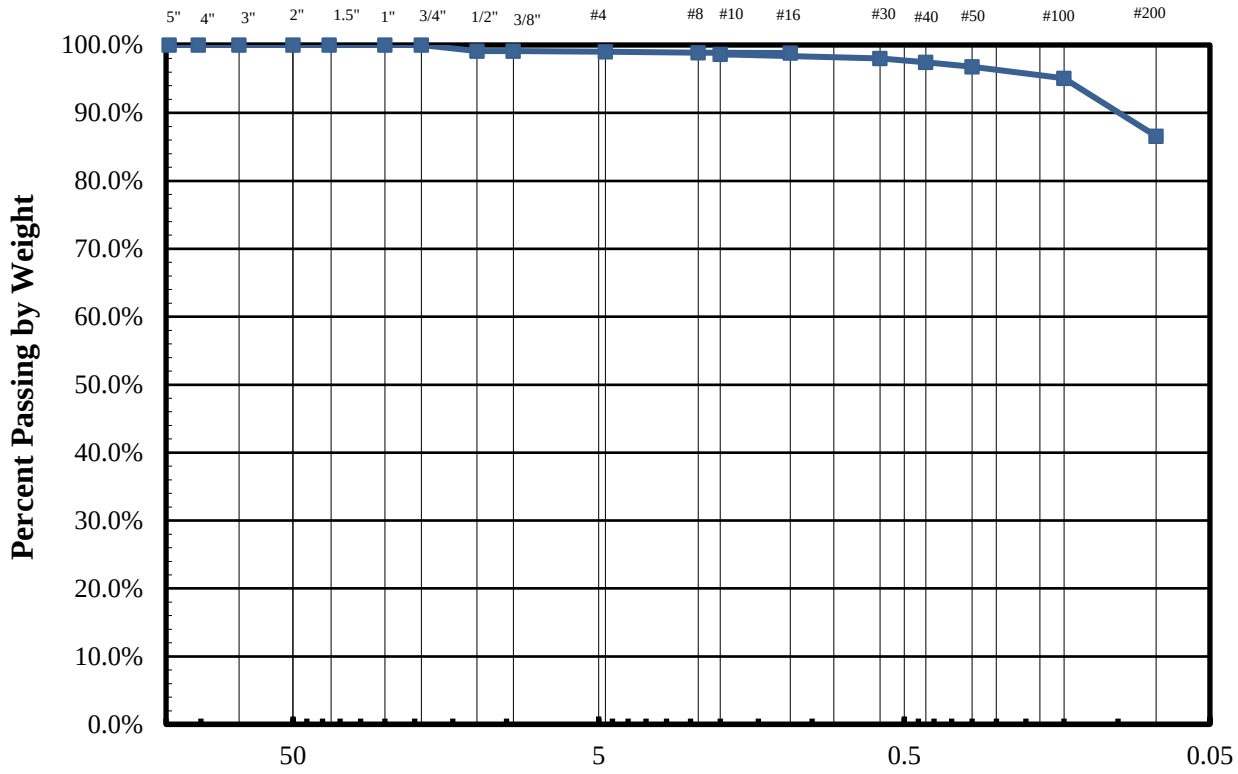
Sand Equivalent (AASHTO T176) = N/A

Reviewed By:
Eric Gunnarson
Laboratory Manager

FORSGREN Associates Inc.
1137 Summers Drive
Rexburg, ID 83440
208-356-9201

Client: East Idaho Solid Waste Dist.
Project: Landfill Investigation Phase 1

Material Description: Brown Silts & Clays
Sample Location: Test Hole 211 @ 6'



Sieve Analysis
AASHTO T27 / ASTM C136

Job No.	01-21-0092-300-0001
Lab No.	22-52
Received	June 29, 2022
Reported	July 11, 2022

SIZE	PASSING	SPECIFICATION Low	SPECIFICATION High
5"	100%		
4"	100%		
3"	100%		
2"	100%		
1.5"	100%		
1"	100%		
3/4"	100%		
1/2"	99%		
3/8"	99%		
No. 4	99%		
No. 8	99%		
No. 10	99%		
No. 16	99%		
No. 30	99%		
No. 40	97%		
No. 50	97%		
No. 100	95%		
No. 200	86.6%		

Moisture Content
AASHTO T255/T265 / ASTM C123

13.9%

Particle Size (mm)

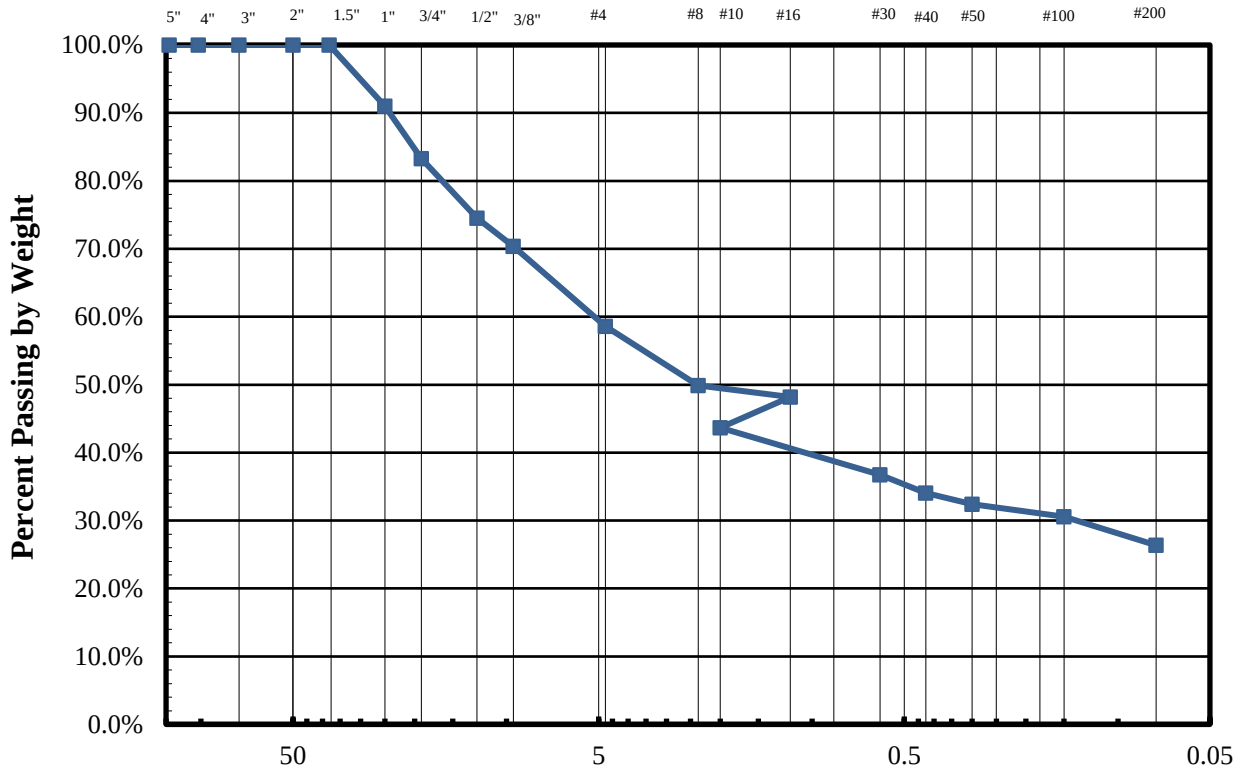
Sand Equivalent (AASHTO T176) = N/A

Reviewed By:
Eric Gunnarson
Laboratory Manager

FORSGREN Associates Inc.
1137 Summers Drive
Rexburg, ID 83440
208-356-9201

Client: East Idaho Solid Waste Dist.
Project: Landfill Investigation Phase 1

Material Description: Brown Sands with Fines
Sample Location: Test Hole 211 @ 10'



Sieve Analysis
AASHTO T27 / ASTM C136

Job No.	01-21-0092-300-0001
Lab No.	22-52
Received	June 29, 2022
Reported	July 11, 2022

SIZE	PASSING	SPECIFICATION Low	SPECIFICATION High
5"	100%		
4"	100%		
3"	100%		
2"	100%		
1.5"	100%		
1"	91%		
3/4"	83%		
1/2"	75%		
3/8"	70%		
No. 4	59%		
No. 8	48%		
No. 10	44%		
No. 16	44%		
No. 30	44%		
No. 40	34%		
No. 50	32%		
No. 100	31%		
No. 200	26.4%		

Moisture Content
AASHTO T255/T265 / ASTM C123

9.9%

Particle Size (mm)

Sand Equivalent (AASHTO T176) = N/A

Reviewed By:
Eric Gunnarson
Laboratory Manager

B.2-5 Leachate Source Concentration Data from nearby Facility

February 18, 2021 RMEA 08-0084

Mr. Lance Bates
Public Works Director
Bonneville County
605 N. Capital
Idaho Falls, ID 83402

Subject: June 2020 Landfill Leachate Results for the Peterson Hill Landfill

Dear Mr. Bates:

Rocky Mountain Environmental Associates℠ collected and analyzed a sample of the landfill leachate discharge to the leachate pond at the Peterson Hill municipal solid waste landfill on June 23, 2020. This report details the sampling procedures and laboratory results. A copy of the laboratory results package is attached.

Sampling and Analysis Methods:

On June 23, 2020 liquid leachate was present in the current location of the lined collection pond (i.e. the leachate pond) at the landfill site. In past sampling events, liquid leachate was collected directly from the discharge pipe, which discharged leachate to the old pond. The current leachate pond location is located northeast from the old leachate pond, as shown in Figure 1. Samples collected for this sampling event were obtained directly from the surface of the current pond location.

During the June 2020 sampling event the leachate was somewhat turbid, dark brown/green in color, and had an odor, typical of leachate at this site. The leachate pond was accessed from the northwest corner. RMEA staff walked down the black, polyethylene, plastic sheeting and hand grabbed a sample from approximately one foot from the shoreline. Leachate was collected by using a sterile preservative-free container provided by the lab then poured into the sample containers; including three 40-ml VOC vials, pre-preserved with HCl for volatile organic compound analysis, and one 250-ml plastic bottle, pre-preserved with nitric acid for metals analysis. The VOC vials were filled completely, in an attempt to minimize headspace in the vials, however, the sample reacted to the preservative by foaming, which did not allow for zero headspace. This reaction was also typical of previous sampling events at the old leachate pond.

The sample containers were immediately placed in a cooler, with ice, to maintain the sample temperature at 4^0 C. A chain-of-custody form was filled out, indicating the sample location, time of collection, sampler name, etc. The samples were shipped overnight to American West Analytical Laboratory (AWAL) in Salt Lake City, Utah. Samples were analyzed for the Appendix I list of contaminants, consistent with groundwater detection monitoring requirements for municipal solid waste landfills (40 CFR 258, Appendix I). Additionally, the samples were analyzed for several additional metals that are commonly associated with landfill leachate. The laboratory results and the chain-of-custody are attached to this letter.

Results:

There were two reported organic detections in the sample, including Acetone at 163 ug/L (#). The laboratory uses # "to indicate that this compound exceeded (high) the control limit for the CCV. The data is acceptable since the compound was not detected in the sample." However, the analyte was detected and a different qualifier would have been more appropriate. 2-Butanone (MEK) at 87.4 ug/L (J) J is the estimated value between the MDL and the PQL. This may be considered a trace detection. No other volatile organic compounds (VOCs) were detected in the June 23, 2020 sample. Table 1, attached to this report, presents organic compounds detected during the current sampling event and historical sampling events extending back to 2006.

The laboratory results for the inorganic Appendix I Landfill constituents are summarized in Table 2 (attached). The table includes the results from both the current round of sampling and the sampling events from 2006 through 2020. For comparative purposes, the reported results are compared to the EPA's National Primary Drinking Water Regulation's applicable Maximum Contaminant Level (MCL). MCLs, which are drinking water standards, provide some general point of reference for detected concentrations. The reported detections are compared to the Idaho Ground Water Quality Standard as the primary screening level. The IDEQ's Initial Default Target Level for groundwater where no standard exists. The concentrations of inorganic constituents that are greater than the MCL are shown in bold. The laboratory results for the landfill leachate sample indicate that the leachate contains some constituents at concentrations above drinking water standards, as would be expected for landfill leachate.

Please do not hesitate to call us at (208) 524-2353 if you have any questions regarding these sampling results.

Sincerely,

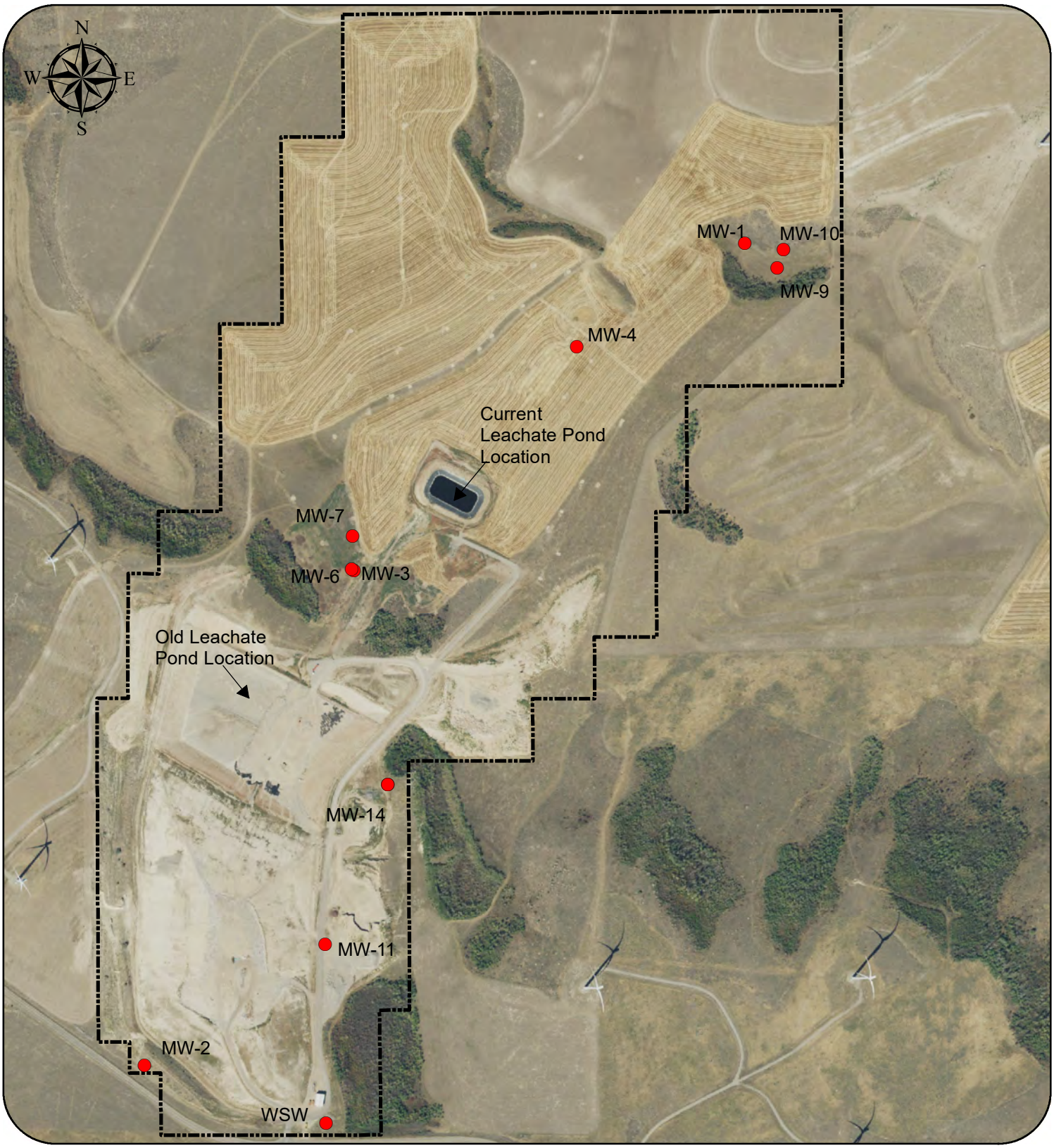
Katherine Ware
Staff Geologist

Bryce A. Contor

Bryce Contor, Senior Hydrologist
President

cc: Rensay Owen IDEQ-IFRO
Amanda Freeman IDEQ-IFRO

Enclosures: Figure 1: Current Leachate Pond Location
Table 1: Concentrations (ug/L) of Volatile Organic Compounds in Peterson Hill Landfill Leachate
Table 2: Concentrations (ug/L) of Inorganic Constituents in Peterson Hill Landfill Leachate
Laboratory Data Sheets and Chain of Custody Documentation



Legend

- Monitoring Well Data
- Landfill Boundary

0 355 710 1,420 Feet

Figure 1: Current Leachate Pond Location

Peterson Hill Landfill Bonneville County, Idaho

Rocky Mountain ENVIRONMENTAL ASSOCIATES, INC.

Table 1- Concentrations (ug/L) of Volatile Organic Compounds in Peterson Hill Landfill Leachate																
Compound	Screening Level	7/19/2006	7/24/2007	7/21/2008	7/23/2009	7/22/2010	7/21/2011	7/18/2012	7/22/2013	7/21/2014	3/18/2015	6/22/2016	6/6/2017	6/12/2018	6/25/2019	6/23/2020
1,1- Dichloroethane	1040	<2.5	<3.7	2.8 J	2.5 J	<10.0	<50.0	ND	<1.0	<0.32	<0.30	<0.22	<0.474	<0.116	<0.116	<8.44
1,2-Dichloroethane	5	<2.2	<2.2	3.7 J	4.6 J	<10.0	<50	ND	1.7J	<0.26	<0.30	<0.17	<0.263	<0.275	<0.275	<1.44
1,4-Dichlorobenzene	75	<4.4	<4.4	2.6 J	2.1 J	<10.0	<50.0	1.4 JB	1.6J		<0.30	<0.16	<0.259	<0.272	<0.272	<2.29
1,2,4 - Trimethylbenzene	439	--	--	--	--	--	--	4.1 J	--	--	--	--	--	--	--	--
2-Butanone	6260	**17,000**	**26,000**	**15000**	2200	**9270**	4770	2320	374	<5.0	34	527	491	332	223	87.4 J
2-Hexanone	NOSTD	<41	<41	19 J	15 J	<20.0	<200	ND	<5.0	<5.0	<1.5	2.7 J	<0.318	<0.215	182	<2.25
Napthalene	3.2	--	--	--	--	--	--	**3.7 JB**	--	<4.0	--	--	--	--	--	--
4-Methyl-2-Pentanone	8970	150	260	150	97	29.6	<200	45.0 J	33.2	<5.0	<1.5	<2.4	<0.881	3.46	<0.961	<2.96
cis-1,2-Dicholoroethene	70	6.4 J	<2.7	3.5 J	1.8 J	<10	<50	ND	0.71J	<0.27	<0.30	<0.21	<0.288	<0.129	<0.129	<1.88
p. Isoprophyltoluene	0.00104	--	--	--	--	--	--	4.2 J	--	--	--	--	--	--	--	--
Tetrahydrofuran	NOSTD	--	--	--	--	--	--	2070	--	--	--	--	--	--	--	--
Acetone	9390	**15,000**	**16,000**	150	2700 B	4900	2330	ND	176	<20.0	59	328	397	375	223	163 #
Benzene	5	**5.8 J**	**9.3 J**	**14**	**14**	**9.1 J**	<50	4.9 J	4.5	<0.30	<0.30	<0.21	<0.257	<0.0956	<0.0956	<1.47
Carbon Disulfide	NOSTD	--	--	--	--	--	--	--	0.55J	<0.40	<0.30	1.3	<0.292	3.46	<8.80	<8.23
Ethylbenzene	700	15 J	21	33	28	19.1	<50	8.1 J	4.7	<0.33	<0.30	0.25 J	<0.281	13.2	<1.64	<1.64
Methylene Chloride	7.45	**16 J**	**20**	4 J	2.1 J	<40	<200	ND	<4.0	<4.0	<0.30	<0.56	<0.372	2.12 B	<4.48	<3.81
Styrene	100	<2.1	<2.1	2.6 J	1.3 J	<10	<50	ND	0.50J	0.13	<0.30	<0.11	<0.253	<0.149	<0.149	<1.33
Toluene	1000	130	85	110 B	70	29.6	<50	14.9 J	12.5	0.70J	<0.30	1.0 J	2.57	10.9 B	<1.77	<2.85
Tetrachloroethene	5	<4.0	<4.0	<2.3	1.21 J	<10.0	<50.0	ND	<0.58	<0.31	<0.30	<0.19	<0.262	<0.105	<0.105	<5.18
Trichloroethene	3.32	--	--	--	--	--	--	**4.1 J**	0.54J	<0.18	<0.30	<0.14	<0.248	<0.105	<0.105	<1.80
Total Xylenes	10,000	43 J	<0.246	92	73	56	<150	37.9 J	45.5	<0.81	<0.30	<0.60	<0.720	8.14	<2.53	<5.75
Vinyl Chloride	2	**16 J**	<4.8	**22**	**7.5**	<4.0	<20	ND	1.4	<0.16	--	<0.15	<0.265	<0.184	<0.184	<2.05

Screening Level: Idaho Ground Water Quality Standard (IDAPA 58.01.11.200) is utilized as the primary screening level, however if none existed for the chemical, then Idaho DEQ's Initial Default Target Level for groundwater was used.

J = Analyte detected above the Method Detection Limit and below the Practical Quantitation Limit.

= This compound exceeded (high) the control limit for the CCV. The data is acceptable since the compound was not detected in the sample.

B = Analyte was detected in the Method Blank.

BOLD type indicates a concentration greater than the sceening level.

Table 2- Concentrations (ug/L) of Metals in Peterson Hill Landfill Leachate

Compound	MCL	7/19/2006	7/24/2007	7/21/2008	7/23/2009	7/22/2010	7/21/2011	7/18/2012	7/22/2013	7/21/2014	3/18/2015	6/22/2016	6/6/2017	6/14/2018	6/25/2019	6/23/2020
Antimony	6	**11**	**9.7**	4.3 B	**9.4 J**	**10.4**	**8.8**	**7.0 J**	5.7 J	**9.6**	1.3 J	4.4	**7.46 J**	**10.5**	**4.19**	**6.36**
Arsenic	10	**56**	**37**	**22**	**52**	**80.7**	**63.6**	**77.0**	**96.8**	**98.6**	**14**	**21.6**	**30.8**	**31.9**	**27.2**	**57.3**
Barium	2,000	2,900	2,000	940	2,100	2,440	1,780	1,490	1,750	1,350	350	933	1,040	1,080	474	855
Beryllium	4	<1.2	<0.244	0.13 B	<0.34	<0.34	<0.10	<1.8	<1.1	<0.66	<0.30	<0.15	0.349 J	<1.25	<0.0590	<0.0775
Cadmium	5	<0.52	0.35 B	0.18 B	<0.30	0.12 J	<0.15	<0.56	<0.64	0.18J	0.1 J	0.18 J	1.00 J	2.01	0.368	1.71
Chromium	100	74	**150**	42.00	72.0	99.4	78.8	107	95.8	**124**	11	73.6	69.5	82.4	37.6	63.6
Cobalt	No MCL	43	41	12.0	25	36.7	34.9	34.9	39.0	61.0	8.4	22	25.2	31.7	10.9	22.1
Copper	1300	8.4	5.6	2.0 B	8.6 J	2.6	1.9 J	<3.7	<3.5	14.1	3.4	2.2 J	11.1	8.82 J	2.26 J	1.81 J
Lead	15	2.9	3.1	1.2 B	1.5 J	2.1	2.9	2.3 B	<0.92	2.0	0.73 J	0.7	3.22 J	3.45 J	<0.357	0.698
Nickel	No MCL	470	480	180	42.0	538	467	535	509	683	65	197	196	196	160	259
Selenium	50	21	10	6.7	17 J	2.3 J	1.7 J	1.9 J	<2.4	2.4 J	4.5 J	1.3 J	3.11 J	1.34 J	0.787	1.32
Silver	No MCL	<0.73	1.7 B	0.24 B	0.36 J	<0.36	1.1 JB	9.9 JB	<1.00	0.28 J	<0.30	0.74 J	0.438 J	<0.680	0.176 J	0.315 J
Thallium	2	<0.21	0.19 B	<0.12	<0.60	<0.25	<0.25	0.74 JB	<0.50	<0.12	<0.30	0.34 J	<0.869	<1.08	<0.0470	<0.0387
Vanadium	No MCL	37	60	19	47	69.4	<0.25	88.1	89.0	127	14	36.8	45.4	45.7	22.8	50.6
Zinc	No MCL	1900	1900	370	340	525	680	586 B	249	90.2	22	113	577	567	47.2	87.3

MCL: Maximum Contaminant Level (MCL) are from the EPA's National Primary Drinking Water Regulations.

J = Analyte detected above the Method Detection Limit and below the Practical Quantitation Limit.

B = Analyte was detected in the Method Blank.

BOLD type indicates a concentration greater than the sceening level.

American West
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Kyle F. Gross
Laboratory Director

Jose Rocha
QA Officer

Katherine Ware
Rocky Mountain Environmental Assoc.
482 Constitution, Suite 303
Idaho Falls, ID 83402
TEL: (208) 524-2353

RE: Peterson Hill Leachate Pond / 08-0084

Dear Katherine Ware: Lab Set ID: 2006731

American West Analytical Laboratories received sample(s) on 6/25/2020 for the analyses presented in the following report.

American West Analytical Laboratories (AWAL) is accredited by The National Environmental Laboratory Accreditation Program (NELAP) in Utah and Texas; and is state accredited in Colorado, Idaho, New Mexico, Wyoming, and Missouri.

All analyses were performed in accordance to the NELAP protocols unless noted otherwise. Accreditation scope documents are available upon request. If you have any questions or concerns regarding this report please feel free to call.

The abbreviation "Surr" found in organic reports indicates a surrogate compound that is intentionally added by the laboratory to determine sample injection, extraction, and/or purging efficiency. The "Reporting Limit" found on the report is equivalent to the practical quantitation limit (PQL). This is the minimum concentration that can be reported by the method referenced and the sample matrix. The reporting limit must not be confused with any regulatory limit. Analytical results are reported to three significant figures for quality control and calculation purposes.

Thank You,

Approved by: Jose G. Rocha — Digitally signed by Jose G. Rocha Date: 2020.07.09 15:45:46 -06'00'

Laboratory Director or designee

All analyses applicable to the CWA, SDWA, and RCRA are performed in accordance to NELAC protocols. Pertinent sampling information is located on the attached COC. Confidential Business Information: This report is provided for the exclusive use of the addressee. Privileges of subsequent use of the name of this company or any member of its staff, or reproduction of this report in connection with the advertisement, promotion or sale of any product or process, or in connection with the re-publication of this report for any purpose other than for the addressee will be granted only on contact. This company accepts no responsibility except for the due performance of inspection and/or analysis in good faith and according to the rules of the trade and of science.

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Kyle F. Gross
Laboratory Director

Jose Rocha
QA Officer

INORGANIC ANALYTICAL REPORT

Client: Rocky Mountain Environmental Assoc. **Contact:** Katherine Ware
Project: Peterson Hill Leachate Pond / 08-0084
Lab Sample ID: 2006731-001
Client Sample ID: Leachate Pond
Collection Date: 6/23/2020
Received Date: 6/25/2020 1315h

Analytical Results TOTAL METALS

Compound	CAS	Units	Date Prepared	Date Analyzed	Method Used	MDL	Reporting Limit	Analytical Result	Qual
Antimony	7440-36-0	µg/L	7/1/2020 850h	7/2/2020 1438h	SW6020B	0.670	1.50	**6.36**	
Arsenic	7440-38-2	µg/L	7/1/2020 850h	7/2/2020 1438h	SW6020B	0.317	1.00	**57.3**	
Barium	7440-39-3	µg/L	7/1/2020 850h	7/2/2020 1624h	SW6020B	0.817	1.00	**855**	
Beryllium	7440-41-7	µg/L	7/1/2020 850h	7/2/2020 1716h	SW6020B	0.0775	0.500	< 0.500	U
Cadmium	7440-43-9	µg/L	7/1/2020 850h	7/2/2020 1438h	SW6020B	0.0400	0.175	**1.71**	
Chromium	7440-47-3	µg/L	7/1/2020 850h	7/2/2020 1438h	SW6020B	2.02	10.0	**63.6**	
Cobalt	7440-48-4	µg/L	7/1/2020 850h	7/2/2020 1438h	SW6020B	0.119	1.00	**22.1**	
Copper	7440-50-8	µg/L	7/1/2020 850h	7/2/2020 1438h	SW6020B	0.870	2.50	1.81	J
Lead	7439-92-1	µg/L	7/1/2020 850h	7/2/2020 1438h	SW6020B	0.357	0.500	**0.698**	
Mercury	7439-97-6	µg/L	6/30/2020 1028h	7/1/2020 1448h	SW7470A	0.0396	0.0900	< 0.0900	U[1]
Nickel	7440-02-0	µg/L	7/1/2020 850h	7/2/2020 1438h	SW6020B	0.344	1.00	**259**	
Selenium	7782-49-2	µg/L	7/1/2020 850h	7/2/2020 1438h	SW6020B	0.216	0.500	**1.32**	
Silver	7440-22-4	µg/L	7/1/2020 850h	7/2/2020 1438h	SW6020B	0.0855	0.500	0.315	J
Thallium	7440-28-0	µg/L	7/1/2020 850h	7/2/2020 1438h	SW6020B	0.0387	0.500	< 0.500	U
Tin	7440-31-5	µg/L	7/1/2020 850h	7/2/2020 1438h	SW6020B	1.78	2.50	**11.5**	
Vanadium	7440-62-2	µg/L	7/1/2020 850h	7/7/2020 1519h	SW6020B	3.18	10.0	**50.6**	
Zinc	7440-66-6	µg/L	7/1/2020 850h	7/2/2020 1438h	SW6020B	2.47	2.50	**87.3**	

[1] - Matrix spike recovery indicates matrix interference. The method is in control as indicated by the LCS.
J - Estimated value between the MDL and the reporting limit (PQL).
U - This flag indicates the compound was analyzed for but not detected above the MDL.

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Kyle F. Gross
Laboratory Director

Jose Rocha
QA Officer

ORGANIC ANALYTICAL REPORT

Client: Rocky Mountain Environmental Assoc. **Contact:** Katherine Ware
Project: Peterson Hill Leachate Pond / 08-0084
Lab Sample ID: 2006731-001A
Client Sample ID: Leachate Pond
Collection Date: 6/23/2020
Received Date: 6/25/2020 1315h

VOAs Landfill List by GC/MS Method 8260D/5030C

Analytical Results Test Code: 8260D-W

Analyzed: 6/26/2020 2307h **Extracted:**
Units: µg/L **Dilution Factor:** 10 **Method:** SW8260D

Compound	CAS Number	MDL	Reporting Limit	Analytical Result	Qual
1,1,1,2-Tetrachloroethane	630-20-6	1.74	20.0	< 20.0	U
1,1,1-Trichloroethane	71-55-6	3.26	20.0	< 20.0	U
1,1,2,2-Tetrachloroethane	79-34-5	1.64	20.0	< 20.0	U#[1]
1,1,2-Trichloroethane	79-00-5	1.43	20.0	< 20.0	U[1]
1,1-Dichloroethane	75-34-3	14.3	20.0	< 20.0	U
1,1-Dichloroethene	75-35-4	8.44	20.0	< 20.0	U[1]
1,2,3-Trichloropropane	96-18-4	1.50	20.0	< 20.0	U[1]
1,2-Dibromo-3-chloropropane	96-12-8	2.95	50.0	< 50.0	U[1]
1,2-Dibromoethane	106-93-4	2.48	20.0	< 20.0	U
1,2-Dichlorobenzene	95-50-1	1.55	20.0	< 20.0	U[1]
1,2-Dichloroethane	107-06-2	1.44	20.0	< 20.0	U
1,2-Dichloropropane	78-87-5	2.82	20.0	< 20.0	U
1,4-Dichlorobenzene	106-46-7	2.29	20.0	< 20.0	U
2-Butanone	78-93-3	12.2	100	87.4	J
2-Hexanone	591-78-6	2.25	50.0	< 50.0	U#
4-Methyl-2-pentanone	108-10-1	2.96	50.0	< 50.0	U
Acetone	67-64-1	27.6	100	**163**	#
Acrylonitrile	107-13-1	3.43	100	< 100	U#
Benzene	71-43-2	1.47	20.0	< 20.0	U[1]
Bromochloromethane	74-97-5	7.12	20.0	< 20.0	U
Bromodichloromethane	75-27-4	1.38	20.0	< 20.0	U
Bromoform	75-25-2	1.51	20.0	< 20.0	U
Bromomethane	74-83-9	30.8	50.0	< 50.0	U
Carbon disulfide	75-15-0	8.23	20.0	< 20.0	U
Carbon tetrachloride	56-23-5	8.59	20.0	< 20.0	U

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Kyle F. Gross
Laboratory Director

Jose Rocha
QA Officer

Lab Sample ID: 2006731-001A
Client Sample ID: Leachate Pond

Analyzed: 6/26/2020 2307h **Extracted:**
Units: µg/L **Dilution Factor:** 10 **Method:** SW8260D

Compound	CAS Number	MDL	Reporting Limit	Analytical Result	Qual
Chlorobenzene	108-90-7	1.54	20.0	< 20.0	U
Chloroethane	75-00-3	13.7	20.0	< 20.0	U
Chloroform	67-66-3	1.66	20.0	< 20.0	U
Chloromethane	74-87-3	8.02	30.0	< 30.0	U
cis-1,2-Dichloroethene	156-59-2	1.88	20.0	< 20.0	U
cis-1,3-Dichloropropene	10061-01-5	8.59	20.0	< 20.0	U
Dibromochloromethane	124-48-1	1.32	20.0	< 20.0	U
Dibromomethane	74-95-3	2.43	20.0	< 20.0	U
Ethylbenzene	100-41-4	1.64	20.0	< 20.0	U
Iodomethane	74-88-4	26.4	50.0	< 50.0	U
Methylene chloride	75-09-2	3.81	20.0	< 20.0	U
Styrene	100-42-5	1.33	20.0	< 20.0	U
Tetrachloroethene	127-18-4	5.18	20.0	< 20.0	U$
Toluene	108-88-3	2.85	20.0	< 20.0	U[1]
trans-1,2-Dichloroethene	156-60-5	2.82	20.0	< 20.0	U
trans-1,3-Dichloropropene	10061-02-6	7.72	20.0	< 20.0	U
trans-1,4-Dichloro-2-butene	110-57-6	10.8	20.0	< 20.0	U[1]@
Trichloroethene	79-01-6	1.80	20.0	< 20.0	U
Trichlorofluoromethane	75-69-4	3.75	20.0	< 20.0	U
Vinyl acetate	108-05-4	74.1	100	< 100	U
Vinyl chloride	75-01-4	2.05	10.0	< 10.0	U
Xylenes, Total	1330-20-7	5.75	20.0	< 20.0	U

Surrogate (Units: µg/L)	CAS	Result	Amount Spiked	% REC	Limits	Qual
Surr: 1,2-Dichloroethane-d4	17060-07-0	496	500.0	99.1	72-151	
Surr: 4-Bromofluorobenzene	460-00-4	523	500.0	105	80-152	
Surr: Dibromofluoromethane	1868-53-7	350	500.0	69.9	70-130	S
Surr: Toluene-d8	2037-26-5	534	500.0	107	80-124	

U - This flag indicates the compound was analyzed for but not detected above the MDL.
[1] - Matrix spike recovery indicates matrix interference. The method is in control as indicated by the LCS.
@ - High RPD due to suspected sample non-homogeneity or matrix interference.
S - Surrogate recoveries outside the control limits. MS sample yielded similar results indicating matrix interference.
The reporting limits were raised due to sample matrix interferences. Sample foams.
 # - This compound exceeded (high) the control limit for the CCV. The data is acceptable since the compound was not detected in the sample.
$ - This compound exceeded (low) the control limit for the CCV. The compound concentration is estimated and may be biased low.
J - Estimated value between the MDL and the reporting limit (PQL).

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Kyle F. Gross
Laboratory Director

Jose Rocha
QA Officer

QC SUMMARY REPORT

Client: Rocky Mountain Environmental Assoc.
Lab Set ID: 2006731
Project: Peterson Hill Leachate Pond / 08-0084

Contact: Katherine Ware
Dept: ME
QC Type: LCS

Analyte		Result	Units	Method	MDL	Reporting Limit	Amount Spiked	Spike Ref. Amount	%REC	Limits	RPD Ref. Amt	% RPD	RPD Limit	Qual
Lab Sample ID:	**LCS-70817**	Date Analyzed:	07/02/2020 1435h											
Test Code:	6020B-W	Date Prepared:	07/01/2020 850h											
Antimony		209	µg/L	SW6020B	2.68	6.00	200	0	105	85 - 115				
Arsenic		199	µg/L	SW6020B	1.27	4.00	200	0	99.3	85 - 115				
Barium		190	µg/L	SW6020B	1.63	2.00	200	0	95.1	85 - 115				
Cadmium		200	µg/L	SW6020B	0.160	0.700	200	0	100	85 - 115				
Chromium		205	µg/L	SW6020B	8.10	40.0	200	0	102	85 - 115				
Cobalt		202	µg/L	SW6020B	0.476	4.00	200	0	101	85 - 115				
Copper		205	µg/L	SW6020B	3.48	10.0	200	0	103	85 - 115				
Lead		200	µg/L	SW6020B	1.43	2.00	200	0	99.9	85 - 115				
Nickel		209	µg/L	SW6020B	1.38	4.00	200	0	104	85 - 115				
Selenium		203	µg/L	SW6020B	0.862	2.00	200	0	101	85 - 115				
Silver		202	µg/L	SW6020B	0.342	2.00	200	0	101	85 - 115				
Thallium		194	µg/L	SW6020B	0.155	2.00	200	0	97.1	85 - 115				
Tin		1,050	µg/L	SW6020B	7.14	10.0	1,000	0	105	85 - 115				
Zinc		1,050	µg/L	SW6020B	9.88	10.0	1,000	0	105	85 - 115				
Lab Sample ID:	**LCS-70817**	Date Analyzed:	07/02/2020 1652h											
Test Code:	6020B-W	Date Prepared:	07/01/2020 850h											
Beryllium		203	µg/L	SW6020B	0.310	2.00	200	0	102	85 - 115				
Lab Sample ID:	**LCS-70817**	Date Analyzed:	07/07/2020 1453h											
Test Code:	6020B-W	Date Prepared:	07/01/2020 850h											
Vanadium		214	µg/L	SW6020B	12.7	40.0	200	0	107	85 - 115				
Lab Sample ID:	**LCS-70786**	Date Analyzed:	07/01/2020 1352h											
Test Code:	HG-W-7470A	Date Prepared:	06/30/2020 1028h											
Mercury		3.65	µg/L	SW7470A	0.0396	0.0900	3.33	0	110	80 - 120				

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Kyle F. Gross
Laboratory Director

Jose Rocha
QA Officer

QC SUMMARY REPORT

Client: Rocky Mountain Environmental Assoc.
Lab Set ID: 2006731
Project: Peterson Hill Leachate Pond / 08-0084

Contact: Katherine Ware
Dept: ME
QC Type: MBLK

Analyte		Result	Units	Method	MDL	Reporting Limit	Amount Spiked	Spike Ref. Amount	%REC	Limits	RPD Ref. Amt	% RPD	RPD Limit	Qual
Lab Sample ID:	**MB-70817**	Date Analyzed:	07/02/2020 1431h											
Test Code:	6020B-W	Date Prepared:	07/01/2020 850h											
Antimony		< 1.50	µg/L	SW6020B	0.670	1.50								U
Arsenic		< 1.00	µg/L	SW6020B	0.317	1.00								U
Barium		< 0.500	µg/L	SW6020B	0.408	0.500								U
Cadmium		< 0.175	µg/L	SW6020B	0.0400	0.175								U
Chromium		< 10.0	µg/L	SW6020B	2.02	10.0								U
Cobalt		< 1.00	µg/L	SW6020B	0.119	1.00								U
Copper		< 2.50	µg/L	SW6020B	0.870	2.50								U
Lead		< 0.500	µg/L	SW6020B	0.357	0.500								U
Nickel		< 1.00	µg/L	SW6020B	0.344	1.00								U
Selenium		< 0.500	µg/L	SW6020B	0.216	0.500								U
Silver		< 0.500	µg/L	SW6020B	0.0855	0.500								U
Thallium		< 0.500	µg/L	SW6020B	0.0387	0.500								U
Tin		< 2.50	µg/L	SW6020B	1.78	2.50								U
Zinc		< 2.50	µg/L	SW6020B	2.47	2.50								U
Lab Sample ID:	**MB-70817**	Date Analyzed:	07/02/2020 1648h											
Test Code:	6020B-W	Date Prepared:	07/01/2020 850h											
Beryllium		< 0.500	µg/L	SW6020B	0.0775	0.500								U
Lab Sample ID:	**MB-70817**	Date Analyzed:	07/07/2020 1450h											
Test Code:	6020B-W	Date Prepared:	07/01/2020 850h											
Vanadium		< 10.0	µg/L	SW6020B	3.18	10.0								U
Lab Sample ID:	**MB-70786**	Date Analyzed:	07/01/2020 1350h											
Test Code:	HG-W-7470A	Date Prepared:	06/30/2020 1028h											
Mercury		< 0.0900	µg/L	SW7470A	0.0396	0.0900								U

U - This flag indicates the compound was analyzed for but not detected above the MDL.

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Jose Rocha
QA Officer

QC SUMMARY REPORT

Client: Rocky Mountain Environmental Assoc.
Lab Set ID: 2006731
Project: Peterson Hill Leachate Pond / 08-0084

Contact: Katherine Ware
Dept: ME
QC Type: MS

Analyte		Result	Units	Method	MDL	Reporting Limit	Amount Spiked	Spike Ref. Amount	%REC	Limits	RPD Ref. Amt	% RPD	RPD Limit	Qual
Lab Sample ID:	**2006731-001BMS**	Date Analyzed:	07/02/2020 1442h											
Test Code:	6020B-W	Date Prepared:	07/01/2020 850h											
Antimony		218	µg/L	SW6020B	2.68	6.00	200	6.36	106	75 - 125				
Arsenic		274	µg/L	SW6020B	1.27	4.00	200	57.3	108	75 - 125				
Barium		1,010	µg/L	SW6020B	1.63	2.00	200	855	77.9	75 - 125				
Cadmium		201	µg/L	SW6020B	0.160	0.700	200	1.71	99.5	75 - 125				
Chromium		256	µg/L	SW6020B	8.10	40.0	200	63.6	96.0	75 - 125				
Cobalt		211	µg/L	SW6020B	0.476	4.00	200	22.1	94.3	75 - 125				
Copper		185	µg/L	SW6020B	3.48	10.0	200	1.81	91.7	75 - 125				
Lead		194	µg/L	SW6020B	1.43	2.00	200	0.698	96.8	75 - 125				
Nickel		451	µg/L	SW6020B	1.38	4.00	200	259	96.3	75 - 125				
Selenium		217	µg/L	SW6020B	0.862	2.00	200	1.32	108	75 - 125				
Silver		197	µg/L	SW6020B	0.342	2.00	200	0.315	98.1	75 - 125				
Thallium		188	µg/L	SW6020B	0.155	2.00	200	0	93.9	75 - 125				
Tin		1,100	µg/L	SW6020B	7.14	10.0	1,000	11.5	108	75 - 125				
Zinc		1,100	µg/L	SW6020B	9.88	10.0	1,000	87.3	102	75 - 125				
Lab Sample ID:	**2006731-001BMS**	Date Analyzed:	07/02/2020 1720h											
Test Code:	6020B-W	Date Prepared:	07/01/2020 850h											
Beryllium		207	µg/L	SW6020B	0.310	2.00	200	0	104	75 - 125				
Lab Sample ID:	**2006731-001BMS**	Date Analyzed:	07/07/2020 1522h											
Test Code:	6020B-W	Date Prepared:	07/01/2020 850h											
Vanadium		267	µg/L	SW6020B	12.7	40.0	200	50.6	108	75 - 125				
Lab Sample ID:	**2006731-001BMS**	Date Analyzed:	07/01/2020 1454h											
Test Code:	HG-W-7470A	Date Prepared:	06/30/2020 1028h											
Mercury		2.58	µg/L	SW7470A	0.0396	0.0900	3.33	0	77.6	80 - 120				[1]

[1] - Matrix spike recovery indicates matrix interference. The method is in control as indicated by the LCS.

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Kyle F. Gross
Laboratory Director

Jose Rocha
QA Officer

QC SUMMARY REPORT

Client: Rocky Mountain Environmental Assoc.
Lab Set ID: 2006731
Project: Peterson Hill Leachate Pond / 08-0084

Contact: Katherine Ware
Dept: ME
QC Type: MSD

Analyte		Result	Units	Method	MDL	Reporting Limit	Amount Spiked	Spike Ref. Amount	%REC	Limits	RPD Ref. Amt	% RPD	RPD Limit	Qual
Lab Sample ID:	**2006731-001BMSD**	Date Analyzed:	07/02/2020 1445h											
Test Code:	6020B-W	Date Prepared:	07/01/2020 850h											
Antimony		222	µg/L	SW6020B	2.68	6.00	200	6.36	108	75 - 125	218	1.88	20	
Arsenic		278	µg/L	SW6020B	1.27	4.00	200	57.3	110	75 - 125	274	1.67	20	
Barium		1,020	µg/L	SW6020B	1.63	2.00	200	855	83.6	75 - 125	1010	1.12	20	
Cadmium		205	µg/L	SW6020B	0.160	0.700	200	1.71	102	75 - 125	201	2.03	20	
Chromium		257	µg/L	SW6020B	8.10	40.0	200	63.6	96.6	75 - 125	256	0.445	20	
Cobalt		211	µg/L	SW6020B	0.476	4.00	200	22.1	94.4	75 - 125	211	0.0195	20	
Copper		182	µg/L	SW6020B	3.48	10.0	200	1.81	89.9	75 - 125	185	1.97	20	
Lead		193	µg/L	SW6020B	1.43	2.00	200	0.698	96.1	75 - 125	194	0.749	20	
Nickel		455	µg/L	SW6020B	1.38	4.00	200	259	97.9	75 - 125	451	0.736	20	
Selenium		218	µg/L	SW6020B	0.862	2.00	200	1.32	108	75 - 125	217	0.291	20	
Silver		200	µg/L	SW6020B	0.342	2.00	200	0.315	99.8	75 - 125	197	1.69	20	
Thallium		186	µg/L	SW6020B	0.155	2.00	200	0	93.0	75 - 125	188	0.914	20	
Tin		1,110	µg/L	SW6020B	7.14	10.0	1,000	11.5	109	75 - 125	1100	0.973	20	
Zinc		1,100	µg/L	SW6020B	9.88	10.0	1,000	87.3	102	75 - 125	1100	0.0239	20	
Lab Sample ID:	**2006731-001BMSD**	Date Analyzed:	07/02/2020 1723h											
Test Code:	6020B-W	Date Prepared:	07/01/2020 850h											
Beryllium		210	µg/L	SW6020B	0.310	2.00	200	0	105	75 - 125	207	1.04	20	
Lab Sample ID:	**2006731-001BMSD**	Date Analyzed:	07/07/2020 1526h											
Test Code:	6020B-W	Date Prepared:	07/01/2020 850h											
Vanadium		270	µg/L	SW6020B	12.7	40.0	200	50.6	110	75 - 125	267	1.21	20	
Lab Sample ID:	**2006731-001BMSD**	Date Analyzed:	07/01/2020 1456h											
Test Code:	HG-W-7470A	Date Prepared:	06/30/2020 1028h											
Mercury		2.85	µg/L	SW7470A	0.0396	0.0900	3.33	0	85.7	80 - 120	2.59	9.87	20	

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Kyle F. Gross
Laboratory Director

Jose Rocha
QA Officer

QC SUMMARY REPORT

Client: Rocky Mountain Environmental Assoc.
Lab Set ID: 2006731
Project: Peterson Hill Leachate Pond / 08-0084

Contact: Katherine Ware
Dept: MSVOA
QC Type: LCS

Lab Sample ID: **LCS VOC-1 062620B** Date Analyzed: 06/26/2020 1801h
Test Code: 8260D-W

Analyte	Result	Units	Method	MDL	Reporting Limit	Amount Spiked	Spike Ref. Amount	%REC	Limits	RPD Ref. Amt	% RPD	RPD Limit	Qual
1,1,1,2-Tetrachloroethane	20.4	µg/L	SW8260D	0.174	2.00	20.00	0	102	80 - 122				
1,1,1-Trichloroethane	19.7	µg/L	SW8260D	0.326	2.00	20.00	0	98.6	72 - 132				
1,1,2,2-Tetrachloroethane	24.3	µg/L	SW8260D	0.164	2.00	20.00	0	122	68 - 140				
1,1,2-Trichloroethane	21.4	µg/L	SW8260D	0.143	2.00	20.00	0	107	88 - 126				
1,1-Dichloroethane	21.0	µg/L	SW8260D	1.43	2.00	20.00	0	105	78 - 142				
1,1-Dichloroethene	20.2	µg/L	SW8260D	0.844	2.00	20.00	0	101	37 - 144				
1,2,3-Trichloropropane	21.8	µg/L	SW8260D	0.150	2.00	20.00	0	109	75 - 128				
1,2-Dibromo-3-chloropropane	22.6	µg/L	SW8260D	0.295	5.00	20.00	0	113	71 - 129				
1,2-Dibromoethane	20.3	µg/L	SW8260D	0.248	2.00	20.00	0	102	77 - 124				
1,2-Dichlorobenzene	20.7	µg/L	SW8260D	0.155	2.00	20.00	0	104	70 - 130				
1,2-Dichloroethane	20.4	µg/L	SW8260D	0.144	2.00	20.00	0	102	76 - 132				
1,2-Dichloropropane	21.2	µg/L	SW8260D	0.282	2.00	20.00	0	106	81 - 135				
1,4-Dichlorobenzene	20.3	µg/L	SW8260D	0.229	2.00	20.00	0	102	67 - 138				
2-Butanone	26.4	µg/L	SW8260D	1.22	10.0	20.00	0	132	74 - 236				
2-Hexanone	20.4	µg/L	SW8260D	0.225	5.00	20.00	0	102	67 - 190				
4-Methyl-2-pentanone	20.8	µg/L	SW8260D	0.296	5.00	20.00	0	104	68 - 128				
Acetone	23.6	µg/L	SW8260D	2.76	10.0	20.00	0	118	70 - 350				
Acrylonitrile	23.0	µg/L	SW8260D	0.343	10.0	20.00	0	115	66 - 130				
Benzene	20.7	µg/L	SW8260D	0.147	2.00	20.00	0	104	80 - 127				
Bromochloromethane	19.4	µg/L	SW8260D	0.712	2.00	20.00	0	96.8	80 - 130				
Bromodichloromethane	19.9	µg/L	SW8260D	0.138	2.00	20.00	0	99.4	85 - 123				
Bromoform	19.2	µg/L	SW8260D	0.151	2.00	20.00	0	96.0	65 - 122				
Bromomethane	14.3	µg/L	SW8260D	3.08	5.00	20.00	0	71.7	10 - 168				
Carbon disulfide	18.6	µg/L	SW8260D	0.823	2.00	20.00	0	93.0	34 - 178				
Carbon tetrachloride	18.4	µg/L	SW8260D	0.859	2.00	20.00	0	91.8	66 - 143				
Chlorobenzene	19.7	µg/L	SW8260D	0.154	2.00	20.00	0	98.6	74 - 126				
Chloroethane	18.4	µg/L	SW8260D	1.37	2.00	20.00	0	91.8	45 - 154				
Chloroform	19.3	µg/L	SW8260D	0.166	2.00	20.00	0	96.5	79 - 124				

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Kyle F. Gross
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QC SUMMARY REPORT

Client: Rocky Mountain Environmental Assoc.
Lab Set ID: 2006731
Project: Peterson Hill Leachate Pond / 08-0084

Contact: Katherine Ware
Dept: MSVOA
QC Type: LCS

Analyte	Result	Units	Method	MDL	Reporting Limit	Amount Spiked	Spike Ref. Amount	%REC	Limits	RPD Ref. Amt	% RPD	RPD Limit	Qual
Lab Sample ID: LCS VOC-1 062620B Date Analyzed: 06/26/2020 1801h													
Test Code: 8260D-W													
Chloromethane	14.1	µg/L	SW8260D	0.802	3.00	20.00	0	70.6	30 - 149				
cis-1,2-Dichloroethene	19.7	µg/L	SW8260D	0.188	2.00	20.00	0	98.5	70 - 132				
cis-1,3-Dichloropropene	19.1	µg/L	SW8260D	0.859	2.00	20.00	0	95.6	84 - 123				
Dibromochloromethane	19.4	µg/L	SW8260D	0.132	2.00	20.00	0	96.8	75 - 123				
Dibromomethane	19.2	µg/L	SW8260D	0.243	2.00	20.00	0	95.8	85 - 122				
Ethylbenzene	19.6	µg/L	SW8260D	0.164	2.00	20.00	0	98.1	67 - 130				
Iodomethane	13.4	µg/L	SW8260D	2.64	5.00	20.00	0	67.0	32 - 161				
Methylene chloride	20.3	µg/L	SW8260D	0.381	2.00	20.00	0	102	65 - 154				
Styrene	19.3	µg/L	SW8260D	0.133	2.00	20.00	0	96.7	71 - 135				
Tetrachloroethene	16.0	µg/L	SW8260D	0.518	2.00	20.00	0	80.0	58 - 149				
Toluene	20.5	µg/L	SW8260D	0.285	2.00	20.00	0	103	69 - 129				
trans-1,2-Dichloroethene	19.3	µg/L	SW8260D	0.282	2.00	20.00	0	96.4	73 - 146				
trans-1,3-Dichloropropene	18.8	µg/L	SW8260D	0.772	2.00	20.00	0	93.9	63 - 132				
trans-1,4-Dichloro-2-butene	12.0	µg/L	SW8260D	1.08	2.00	20.00	0	60.2	30 - 119				
Trichloroethene	19.1	µg/L	SW8260D	0.180	2.00	20.00	0	95.5	72 - 136				
Trichlorofluoromethane	17.4	µg/L	SW8260D	0.375	2.00	20.00	0	87.1	59 - 152				
Vinyl acetate	32.6	µg/L	SW8260D	7.41	10.0	40.00	0	81.6	15 - 140				
Vinyl chloride	15.9	µg/L	SW8260D	0.205	1.00	20.00	0	79.4	43 - 152				
Xylenes, Total	59.9	µg/L	SW8260D	0.575	2.00	60.00	0	99.8	66 - 142				
Surr: 1,2-Dichloroethane-d4	52.8	µg/L	SW8260D			50.00		106	80 - 136				
Surr: 4-Bromofluorobenzene	50.3	µg/L	SW8260D			50.00		101	85 - 121				
Surr: Dibromofluoromethane	42.7	µg/L	SW8260D			50.00		85.4	78 - 121				
Surr: Toluene-d8	52.2	µg/L	SW8260D			50.00		104	81 - 123				

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QC SUMMARY REPORT

Client: Rocky Mountain Environmental Assoc.
Lab Set ID: 2006731
Project: Peterson Hill Leachate Pond / 08-0084

Contact: Katherine Ware
Dept: MSVOA
QC Type: MBLK

Analyte	Result	Units	Method	MDL	Reporting Limit	Amount Spiked	Spike Ref. Amount	%REC	Limits	RPD Ref. Amt	% RPD	RPD Limit	Qual
Lab Sample ID: MB VOC-1 062620B Date Analyzed: 06/26/2020 1821h													
Test Code: 8260D-W													
1,1,1,2-Tetrachloroethane	< 2.00	µg/L	SW8260D	0.174	2.00								U
1,1,1-Trichloroethane	< 2.00	µg/L	SW8260D	0.326	2.00								U
1,1,2,2-Tetrachloroethane	< 2.00	µg/L	SW8260D	0.164	2.00								U
1,1,2-Trichloroethane	< 2.00	µg/L	SW8260D	0.143	2.00								U
1,1-Dichloroethane	< 2.00	µg/L	SW8260D	1.43	2.00								U
1,1-Dichloroethene	< 2.00	µg/L	SW8260D	0.844	2.00								U
1,2,3-Trichloropropane	< 2.00	µg/L	SW8260D	0.150	2.00								U
1,2-Dibromo-3-chloropropane	< 5.00	µg/L	SW8260D	0.295	5.00								U
1,2-Dibromoethane	< 2.00	µg/L	SW8260D	0.248	2.00								U
1,2-Dichlorobenzene	< 2.00	µg/L	SW8260D	0.155	2.00								U
1,2-Dichloroethane	< 2.00	µg/L	SW8260D	0.144	2.00								U
1,2-Dichloropropane	< 2.00	µg/L	SW8260D	0.282	2.00								U
1,4-Dichlorobenzene	< 2.00	µg/L	SW8260D	0.229	2.00								U
2-Butanone	< 10.0	µg/L	SW8260D	1.22	10.0								U
2-Hexanone	< 5.00	µg/L	SW8260D	0.225	5.00								U
4-Methyl-2-pentanone	< 5.00	µg/L	SW8260D	0.296	5.00								U
Acetone	< 10.0	µg/L	SW8260D	2.76	10.0								U
Acrylonitrile	< 10.0	µg/L	SW8260D	0.343	10.0								U
Benzene	< 2.00	µg/L	SW8260D	0.147	2.00								U
Bromochloromethane	< 2.00	µg/L	SW8260D	0.712	2.00								U
Bromodichloromethane	< 2.00	µg/L	SW8260D	0.138	2.00								U
Bromoform	< 2.00	µg/L	SW8260D	0.151	2.00								U
Bromomethane	< 5.00	µg/L	SW8260D	3.08	5.00								U
Carbon disulfide	< 2.00	µg/L	SW8260D	0.823	2.00								U
Carbon tetrachloride	< 2.00	µg/L	SW8260D	0.859	2.00								U
Chlorobenzene	< 2.00	µg/L	SW8260D	0.154	2.00								U
Chloroethane	< 2.00	µg/L	SW8260D	1.37	2.00								U
Chloroform	< 2.00	µg/L	SW8260D	0.166	2.00								U

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Kyle F. Gross
Laboratory Director

Jose Rocha
QA Officer

QC SUMMARY REPORT

Client: Rocky Mountain Environmental Assoc.
Lab Set ID: 2006731
Project: Peterson Hill Leachate Pond / 08-0084

Contact: Katherine Ware
Dept: MSVOA
QC Type: MBLK

Analyte	Result	Units	Method	MDL	Reporting Limit	Amount Spiked	Spike Ref. Amount	%REC	Limits	RPD Ref. Amt	% RPD	RPD Limit	Qual
Lab Sample ID: MB VOC-1 062620B Date Analyzed: 06/26/2020 1821h													
Test Code: 8260D-W													
Chloromethane	< 3.00	µg/L	SW8260D	0.802	3.00								U
cis-1,2-Dichloroethene	< 2.00	µg/L	SW8260D	0.188	2.00								U
cis-1,3-Dichloropropene	< 2.00	µg/L	SW8260D	0.859	2.00								U
Dibromochloromethane	< 2.00	µg/L	SW8260D	0.132	2.00								U
Dibromomethane	< 2.00	µg/L	SW8260D	0.243	2.00								U
Ethylbenzene	< 2.00	µg/L	SW8260D	0.164	2.00								U
Iodomethane	< 5.00	µg/L	SW8260D	2.64	5.00								U
Methylene chloride	< 2.00	µg/L	SW8260D	0.381	2.00								U
Styrene	< 2.00	µg/L	SW8260D	0.133	2.00								U
Tetrachloroethene	< 2.00	µg/L	SW8260D	0.518	2.00								U
Toluene	< 2.00	µg/L	SW8260D	0.285	2.00								U
trans-1,2-Dichloroethene	< 2.00	µg/L	SW8260D	0.282	2.00								U
trans-1,3-Dichloropropene	< 2.00	µg/L	SW8260D	0.772	2.00								U
trans-1,4-Dichloro-2-butene	< 2.00	µg/L	SW8260D	1.08	2.00								U
Trichloroethene	< 2.00	µg/L	SW8260D	0.180	2.00								U
Trichlorofluoromethane	< 2.00	µg/L	SW8260D	0.375	2.00								U
Vinyl acetate	< 10.0	µg/L	SW8260D	7.41	10.0								U
Vinyl chloride	< 1.00	µg/L	SW8260D	0.205	1.00								U
Xylenes, Total	< 2.00	µg/L	SW8260D	0.575	2.00								U
Surr: 1,2-Dichloroethane-d4	54.9	µg/L	SW8260D			50.00		110	80 - 136				
Surr: 4-Bromofluorobenzene	51.9	µg/L	SW8260D			50.00		104	85 - 121				
Surr: Dibromofluoromethane	45.8	µg/L	SW8260D			50.00		91.7	78 - 121				
Surr: Toluene-d8	53.0	µg/L	SW8260D			50.00		106	81 - 123				

U - This flag indicates the compound was analyzed for but not detected above the MDL.

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Jose Rocha
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QC SUMMARY REPORT

Client: Rocky Mountain Environmental Assoc.
Lab Set ID: 2006731
Project: Peterson Hill Leachate Pond / 08-0084

Contact: Katherine Ware
Dept: MSVOA
QC Type: MS

Analyte	Result	Units	Method	MDL	Reporting Limit	Amount Spiked	Spike Ref. Amount	%REC	Limits	RPD Ref. Amt	% RPD	RPD Limit	Qual
Lab Sample ID: 2006731-001AMS	Date Analyzed:	06/26/2020 2327h											
Test Code: 8260D-W													
1,1,1,2-Tetrachloroethane	231	µg/L	SW8260D	1.74	20.0	200.0	0	116	80 - 122				
1,1,1-Trichloroethane	233	µg/L	SW8260D	3.26	20.0	200.0	0	116	72 - 132				
1,1,2,2-Tetrachloroethane	279	µg/L	SW8260D	1.64	20.0	200.0	0	140	68 - 140				
1,1,2-Trichloroethane	268	µg/L	SW8260D	1.43	20.0	200.0	0	134	88 - 126				1
1,1-Dichloroethane	264	µg/L	SW8260D	14.3	20.0	200.0	0	132	78 - 142				
1,1-Dichloroethene	299	µg/L	SW8260D	8.44	20.0	200.0	0	149	37 - 144				1
1,2,3-Trichloropropane	254	µg/L	SW8260D	1.50	20.0	200.0	0	127	75 - 128				
1,2-Dibromo-3-chloropropane	240	µg/L	SW8260D	2.95	50.0	200.0	0	120	71 - 129				
1,2-Dibromoethane	223	µg/L	SW8260D	2.48	20.0	200.0	0	111	77 - 124				
1,2-Dichlorobenzene	259	µg/L	SW8260D	1.55	20.0	200.0	0	130	70 - 130				
1,2-Dichloroethane	243	µg/L	SW8260D	1.44	20.0	200.0	0	122	76 - 132				
1,2-Dichloropropane	264	µg/L	SW8260D	2.82	20.0	200.0	0	132	81 - 135				
1,4-Dichlorobenzene	250	µg/L	SW8260D	2.29	20.0	200.0	0	125	67 - 138				
2-Butanone	383	µg/L	SW8260D	12.2	100	200.0	87.4	148	74 - 236				
2-Hexanone	211	µg/L	SW8260D	2.25	50.0	200.0	0	106	67 - 190				
4-Methyl-2-pentanone	214	µg/L	SW8260D	2.96	50.0	200.0	0	107	68 - 128				
Acetone	544	µg/L	SW8260D	27.6	100	200.0	163	191	70 - 350				
Acrylonitrile	198	µg/L	SW8260D	3.43	100	200.0	0	98.9	66 - 130				
Benzene	274	µg/L	SW8260D	1.47	20.0	200.0	0	137	80 - 127				1
Bromochloromethane	212	µg/L	SW8260D	7.12	20.0	200.0	0	106	80 - 130				
Bromodichloromethane	233	µg/L	SW8260D	1.38	20.0	200.0	0	117	85 - 123				
Bromoform	207	µg/L	SW8260D	1.51	20.0	200.0	0	104	65 - 122				
Bromomethane	88.3	µg/L	SW8260D	30.8	50.0	200.0	0	44.2	10 - 168				
Carbon disulfide	198	µg/L	SW8260D	8.23	20.0	200.0	0	99.2	34 - 178				
Carbon tetrachloride	157	µg/L	SW8260D	8.59	20.0	200.0	0	78.7	66 - 143				
Chlorobenzene	252	µg/L	SW8260D	1.54	20.0	200.0	0	126	74 - 126				
Chloroethane	177	µg/L	SW8260D	13.7	20.0	200.0	0	88.3	45 - 154				
Chloroform	248	µg/L	SW8260D	1.66	20.0	200.0	0	124	79 - 124				

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Kyle F. Gross
Laboratory Director

Jose Rocha
QA Officer

QC SUMMARY REPORT

Client: Rocky Mountain Environmental Assoc.
Lab Set ID: 2006731
Project: Peterson Hill Leachate Pond / 08-0084

Contact: Katherine Ware
Dept: MSVOA
QC Type: MS

Analyte	Result	Units	Method	MDL	Reporting Limit	Amount Spiked	Spike Ref. Amount	%REC	Limits	RPD Ref. Amt	% RPD	RPD Limit	Qual
Lab Sample ID: 2006731-001AMS	Date Analyzed:	06/26/2020 2327h											
Test Code: 8260D-W													
Chloromethane	142	µg/L	SW8260D	8.02	30.0	200.0	0	70.8	30 - 149				
cis-1,2-Dichloroethene	263	µg/L	SW8260D	1.88	20.0	200.0	0	132	70 - 132				
cis-1,3-Dichloropropene	181	µg/L	SW8260D	8.59	20.0	200.0	0	90.5	84 - 123				
Dibromochloromethane	219	µg/L	SW8260D	1.32	20.0	200.0	0	109	75 - 123				
Dibromomethane	212	µg/L	SW8260D	2.43	20.0	200.0	0	106	85 - 122				
Ethylbenzene	253	µg/L	SW8260D	1.64	20.0	200.0	0	127	67 - 130				
Iodomethane	133	µg/L	SW8260D	26.4	50.0	200.0	0	66.5	32 - 161				
Methylene chloride	256	µg/L	SW8260D	3.81	20.0	200.0	0	128	65 - 154				
Styrene	237	µg/L	SW8260D	1.33	20.0	200.0	0	119	71 - 135				
Tetrachloroethene	239	µg/L	SW8260D	5.18	20.0	200.0	0	120	58 - 149				
Toluene	265	µg/L	SW8260D	2.85	20.0	200.0	0	132	69 - 129				[1]
trans-1,2-Dichloroethene	255	µg/L	SW8260D	2.82	20.0	200.0	0	128	73 - 146				
trans-1,3-Dichloropropene	140	µg/L	SW8260D	7.72	20.0	200.0	0	70.1	63 - 132				
trans-1,4-Dichloro-2-butene	40.0	µg/L	SW8260D	10.8	20.0	200.0	0	20.0	30 - 119				[1]
Trichloroethene	271	µg/L	SW8260D	1.80	20.0	200.0	0	136	72 - 136				
Trichlorofluoromethane	180	µg/L	SW8260D	3.75	20.0	200.0	0	90.0	59 - 152				
Vinyl acetate	220	µg/L	SW8260D	74.1	100	400.0	0	55.0	15 - 140				
Vinyl chloride	160	µg/L	SW8260D	2.05	10.0	200.0	0	80.0	43 - 152				
Xylenes, Total	758	µg/L	SW8260D	5.75	20.0	600.0	0	126	66 - 142				
Surr: 1,2-Dichloroethane-d4	498	µg/L	SW8260D			500.0		99.6	80 - 136				
Surr: 4-Bromofluorobenzene	512	µg/L	SW8260D			500.0		102	85 - 121				
Surr: Dibromofluoromethane	383	µg/L	SW8260D			500.0		76.6	78 - 121				S
Surr: Toluene-d8	534	µg/L	SW8260D			500.0		107	81 - 123				

[1] - Matrix spike recovery indicates matrix interference. The method is in control as indicated by the LCS.
S - Surrogate recoveries outside the control limits. Parent sample yielded similar results indicating matrix interference.

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QA Officer

QC SUMMARY REPORT

Client: Rocky Mountain Environmental Assoc.
Lab Set ID: 2006731
Project: Peterson Hill Leachate Pond / 08-0084

Contact: Katherine Ware
Dept: MSVOA
QC Type: MSD

Analyte	Result	Units	Method	MDL	Reporting Limit	Amount Spiked	Spike Ref. Amount	%REC	Limits	RPD Ref. Amt	% RPD	RPD Limit	Qual
Lab Sample ID: 2006731-001AMSD	Date Analyzed:	06/26/2020 2347h											
Test Code: 8260D-W													
1,1,1,2-Tetrachloroethane	236	µg/L	SW8260D	1.74	20.0	200.0	0	118	80 - 122	231	2.18	35	
1,1,1-Trichloroethane	244	µg/L	SW8260D	3.26	20.0	200.0	0	122	72 - 132	233	4.70	35	
1,1,2,2-Tetrachloroethane	283	µg/L	SW8260D	1.64	20.0	200.0	0	141	68 - 140	279	1.25	35	1
1,1,2-Trichloroethane	269	µg/L	SW8260D	1.43	20.0	200.0	0	135	88 - 126	268	0.633	35	1
1,1-Dichloroethane	264	µg/L	SW8260D	14.3	20.0	200.0	0	132	78 - 142	264	0.227	35	
1,1-Dichloroethene	274	µg/L	SW8260D	8.44	20.0	200.0	0	137	37 - 144	299	8.52	35	
1,2,3-Trichloropropane	261	µg/L	SW8260D	1.50	20.0	200.0	0	131	75 - 128	254	2.60	35	1
1,2-Dibromo-3-chloropropane	266	µg/L	SW8260D	2.95	50.0	200.0	0	133	71 - 129	240	10.3	35	1
1,2-Dibromoethane	237	µg/L	SW8260D	2.48	20.0	200.0	0	118	77 - 124	223	6.13	35	
1,2-Dichlorobenzene	264	µg/L	SW8260D	1.55	20.0	200.0	0	132	70 - 130	259	2.03	35	1
1,2-Dichloroethane	246	µg/L	SW8260D	1.44	20.0	200.0	0	123	76 - 132	243	1.02	35	
1,2-Dichloropropane	267	µg/L	SW8260D	2.82	20.0	200.0	0	133	81 - 135	265	0.828	35	
1,4-Dichlorobenzene	251	µg/L	SW8260D	2.29	20.0	200.0	0	125	67 - 138	250	0.160	35	
2-Butanone	391	µg/L	SW8260D	12.2	100	200.0	87.4	152	74 - 236	383	2.01	35	
2-Hexanone	231	µg/L	SW8260D	2.25	50.0	200.0	0	116	67 - 190	211	8.90	35	
4-Methyl-2-pentanone	224	µg/L	SW8260D	2.96	50.0	200.0	0	112	68 - 128	214	4.89	35	
Acetone	549	µg/L	SW8260D	27.6	100	200.0	163	193	70 - 350	544	0.914	35	
Acrylonitrile	232	µg/L	SW8260D	3.43	100	200.0	0	116	66 - 130	198	15.9	35	
Benzene	264	µg/L	SW8260D	1.47	20.0	200.0	0	132	80 - 127	274	3.60	35	1
Bromochloromethane	203	µg/L	SW8260D	7.12	20.0	200.0	0	102	80 - 130	212	4.38	35	
Bromodichloromethane	236	µg/L	SW8260D	1.38	20.0	200.0	0	118	85 - 123	233	1.07	35	
Bromoform	215	µg/L	SW8260D	1.51	20.0	200.0	0	107	65 - 122	207	3.60	35	
Bromomethane	102	µg/L	SW8260D	30.8	50.0	200.0	0	51.0	10 - 168	88.3	14.3	35	
Carbon disulfide	190	µg/L	SW8260D	8.23	20.0	200.0	0	95.2	34 - 178	198	4.01	35	
Carbon tetrachloride	184	µg/L	SW8260D	8.59	20.0	200.0	0	91.9	66 - 143	157	15.4	35	
Chlorobenzene	248	µg/L	SW8260D	1.54	20.0	200.0	0	124	74 - 126	252	1.56	35	
Chloroethane	158	µg/L	SW8260D	13.7	20.0	200.0	0	79.2	45 - 154	177	10.9	35	
Chloroform	242	µg/L	SW8260D	1.66	20.0	200.0	0	121	79 - 124	248	2.16	35	

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QC SUMMARY REPORT

Client: Rocky Mountain Environmental Assoc.
Lab Set ID: 2006731
Project: Peterson Hill Leachate Pond / 08-0084

Contact: Katherine Ware
Dept: MSVOA
QC Type: MSD

Analyte	Result	Units	Method	MDL	Reporting Limit	Amount Spiked	Spike Ref. Amount	%REC	Limits	RPD Ref. Amt	% RPD	RPD Limit	Qual
Lab Sample ID: 2006731-001AMSD	Date Analyzed:	06/26/2020 2347h											
Test Code: 8260D-W													
Chloromethane	140	µg/L	SW8260D	8.02	30.0	200.0	0	70.2	30 - 149	142	0.780	35	
cis-1,2-Dichloroethene	256	µg/L	SW8260D	1.88	20.0	200.0	0	128	70 - 132	263	2.89	35	
cis-1,3-Dichloropropene	201	µg/L	SW8260D	8.59	20.0	200.0	0	100	84 - 123	181	10.3	35	
Dibromochloromethane	230	µg/L	SW8260D	1.32	20.0	200.0	0	115	75 - 123	219	4.82	35	
Dibromomethane	222	µg/L	SW8260D	2.43	20.0	200.0	0	111	85 - 122	212	4.57	35	
Ethylbenzene	247	µg/L	SW8260D	1.64	20.0	200.0	0	123	67 - 130	253	2.56	35	
Iodomethane	150	µg/L	SW8260D	26.4	50.0	200.0	0	74.9	32 - 161	133	11.8	35	
Methylene chloride	247	µg/L	SW8260D	3.81	20.0	200.0	0	123	65 - 154	256	3.55	35	
Styrene	237	µg/L	SW8260D	1.33	20.0	200.0	0	118	71 - 135	237	0.0844	35	
Tetrachloroethene	224	µg/L	SW8260D	5.18	20.0	200.0	0	112	58 - 149	239	6.35	35	
Toluene	261	µg/L	SW8260D	2.85	20.0	200.0	0	131	69 - 129	265	1.33	35	[1]
trans-1,2-Dichloroethene	250	µg/L	SW8260D	2.82	20.0	200.0	0	125	73 - 146	255	1.98	35	
trans-1,3-Dichloropropene	170	µg/L	SW8260D	7.72	20.0	200.0	0	84.8	63 - 132	140	18.9	35	
trans-1,4-Dichloro-2-butene	75.1	µg/L	SW8260D	10.8	20.0	200.0	0	37.6	30 - 119	40	61.0	35	@
Trichloroethene	258	µg/L	SW8260D	1.80	20.0	200.0	0	129	72 - 136	271	4.95	35	
Trichlorofluoromethane	177	µg/L	SW8260D	3.75	20.0	200.0	0	88.7	59 - 152	180	1.45	35	
Vinyl acetate	261	µg/L	SW8260D	74.1	100	400.0	0	65.3	15 - 140	220	17.2	35	
Vinyl chloride	155	µg/L	SW8260D	2.05	10.0	200.0	0	77.4	43 - 152	160	3.24	35	
Xylenes, Total	738	µg/L	SW8260D	5.75	20.0	600.0	0	123	66 - 142	759	2.81	35	
Surr: 1,2-Dichloroethane-d4	503	µg/L	SW8260D			500.0		101	80 - 136				
Surr: 4-Bromofluorobenzene	519	µg/L	SW8260D			500.0		104	85 - 121				
Surr: Dibromofluoromethane	407	µg/L	SW8260D			500.0		81.4	78 - 121				
Surr: Toluene-d8	527	µg/L	SW8260D			500.0		105	81 - 123				

@ - High RPD due to suspected sample non-homogeneity or matrix interference.
[1] - Matrix spike recovery indicates matrix interference. The method is in control as indicated by the LCS.

All analyses applicable to the CWA, SDWA, and RCRA are performed in accordance to NELAC protocols. Pertinent sampling information is located on the attached COC. Confidential Business Information: This report is provided for the exclusive use of the addressee. Privileges of subsequent use of the name of this company or any member of its staff, or reproduction of this report in connection with the advertisement, promotion or sale of any product or process, or in connection with the re-publication of this report for any purpose other than for the addressee will be granted only on contact. This company accepts no responsibility except for the due performance of inspection and/or analysis in good faith and according to the rules of the trade and of science.

American West Analytical Laboratories

Rpt Emailed: UL GenericEDD QC

WORK ORDER Summary

Work Order: **2006731**

Client: Rocky Mountain Environmental Assoc.

Due Date: 7/10/2020

Client ID: ROC550 **Contact:** Katherine Ware

Project: **Peterson Hill Leachate Pond / 08-0084** **QC Level:** II+ MDL WO Type: Project

Comments: QC 2+. 6020 Metals must be run at a 5X. report to the MDL - Report all analysis in µg/L. Use ppb-All Tests Rpt-Mod. EDD: Generic_Landfill_J. Email COC and reports to group. Footnote report, pH for metals could not be adjusted to < 2 due to matrix.;

DB

Sample ID	Client Sample ID	Collected Date	Received Date	Test Code	Matrix	Sel	Storage	
2006731-001A	**Leachate Pond**	6/23/2020	6/25/2020 1315h	**8260D-W**	Aqueous	☑	VOCFridge	3
				Test Group: 8260D-W-LANDFILL; # of Analytes: 47 / # of Surr: 4				
2006731-001B				**3005A-ICPMS-PR**		☑	DF-Metals	1
				6020B-W		☑	DF-Metals	
				16 SEL Analytes: SB AS BA BE CD CR CO CU PB NI SE AG TL SN V ZN				
				HG-W-7470A		☐	DF-Metals	
				HG-W-PR		☐	DF-Metals	

LABORATORY CHECK: %M ☐ RT ☐ CN ☐ TAT ☐ QC ☐ LUO ☐ HOK_____ HOK_____ HOK_____ COC Emailed_____

American West Analytical Laboratories
3440 S. 700 W. Salt Lake City, UT 84119
Phone # (801) 263-8686 Toll Free # (888) 263-8686
Fax # (801) 263-8687 Email awal@awal-labs.com
www.awal-labs.com

CHAIN OF CUSTODY

All analysis will be conducted using NELAP accredited methods and all data will be reported using AWAL's standard analyte lists and reporting limits (PQL) unless specifically requested otherwise on this Chain of Custody and/or attached documentation.

2006731
AWAL Lab Sample Set #
Page 1 of 1

QC Level:	Turn Around Time:	Unless other arrangements have been made, signed reports will be emailed by **5:00 pm** on the day they are due.	Due Date:
2+	Standard		7/10/20

Client: **Rocky Mountain Environmental**
Address: **482 Constitution**
Idaho Falls, ID 83404
Contact: **Katherine Ware**
Phone #: **208 524-2353** Cell #: **208-317-1631**
Email: katherine.rmea@gmail.com
Project Name: **Peterson Hill Lechate Pond**
Project #: **08-0084**
PO #:
Sampler Name: **Katherine Ware**

X Report Organics down to the MDL
☐ Include EDD:
☐ Lab Filter for:
x Report in ug/L
☐ Field Filtered For:

For Compliance With:
☐ NELAP
☐ RCRA
☐ CWA
☐ SDWA
☐ ELAP / A2LA
☐ NLLAP
☐ Non-Compliance
☐ Other:

	Sample ID:	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Appendix I VOCs (8260)	Total Metals (6010/6020/7470)	Sb, As, Ba, Be, Cd, Cr, Co, Cu, Hg, Pb, Ni,	Se, Ag, Tl, Sn, V, Zn	Mercury (7470)						Known Hazards & Sample Comments
1	Leachate Pond	6/23/2020		4	w	x	x			x						Leachate
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																

Laboratory Use Only

Samples Were: courier
1 Shipped or hand delivered
2 Ambient or Chilled
3 Temperature 3.9 °C
4 Received Broken/Leaking (Improperly Sealed) Y N
5 Properly Preserved Y N Checked at bench
metals
6 Received Within Holding Times Y N

COC Tape Was:
1 Present on Outer Package Y N NA
2 Unbroken on Outer Package Y N NA
3 Present on Sample Y N NA
4 Unbroken on Sample Y N NA

Discrepancies Between Sample Labels and COC Record? Y N

Relinquished by:	Date:	Received by:	Date:
Signature:	6/25/20	Signature:	
Print Name: KATHERINE WARE	Time: 8:18 am	Print Name:	Time:
Relinquished by:	Date:	Received by:	Date:
Signature:		Signature:	
Print Name:	Time:	Print Name:	Time:
Relinquished by:	Date:	Received by:	Date:
Signature:		Signature:	
Print Name:	Time:	Print Name:	Time:
Relinquished by:	Date:	Received by:	Date: 6/25/20
Signature:		Signature: Denise Brown	
Print Name:	Time:	Print Name: Denise Brown	Time: 13:15

Special Instructions:

Report all analysis in µg/L report down to MDL

Lab Set ID: 2006731

pH Lot #: 6387

Preservation Check Sheet

Sample Set Extension and pH

Analysis	Preservative	-001																	
Ammonia	pH <2 H_2SO_4																		
COD	pH <2 H_2SO_4																		
Cyanide	pH >12 NaOH																		
Metals	pH <2 HNO_3	#																	
NO_2/NO_3	pH <2 H_2SO_4																		
O & G	pH <2 HCL																		
Phenols	pH <2 H_2SO_4																		
Sulfide	pH >9 NaOH, Zn Acetate																		
TKN	pH <2 H_2SO_4																		
T PO_4	pH <2 H_2SO_4																		
Cr VI+	pH >9 $(NH_4)_2SO_4$																		

Procedure:

1) Pour a small amount of sample in the sample lid
2) Pour sample from lid gently over wide range pH paper
3) **Do Not** dip the pH paper in the sample bottle or lid
4) If sample is not preserved, properly list its extension and receiving pH in the appropriate column above
5) Flag COC, notify client if requested
6) Place client conversation on COC
7) Samples may be adjusted

Frequency: All samples requiring preservation

* The sample required additional preservative upon receipt.

\+ The sample was received unpreserved.

▲ The sample was received unpreserved and therefore preserved upon receipt.

\# The sample pH was unadjustable to a pH < 2 due to the sample matrix.

• The sample pH was unadjustable to a pH > ____ due to the sample matrix interference.

Appendix C

Pollute Model Setup and Results for Comparative Liner Analysis

C.1 Simulation #1: Prescriptive Liner Setup and Results

POLLUTEv7

Version 7.13

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GAEA Technologies Ltd., R.K. Rowe and J.R. Booker

Appendix C.1 - Newdale Prescribed Liner Run #1

THE DARCY VELOCITY (Flux) THROUGH THE LAYERS Va = 0 ft/year

Layer Properties

Layer	Thickness	Number of Sublayers	Coefficient of Hydrodynamic Dispersion	Matrix Porosity	Distributon Coefficient	Dry Density
Primary Liner (HDPE)	60 mil	1	2E-8 cm2/s	1	0 m3/kg	59 lb/ft3
Recompacted Clay	2 ft	2	6E-6 cm2/s	0.4	0 m3/kg	98 lb/ft3
Rhy Rock, Competent, Fresh	187 ft	38	6E-6 cm2/s	0.12	0 m3/kg	135 lb/ft3
Rhyolite Rock, Fractured	273 ft	19	6E-6 cm2/s	0.4	0 m3/kg	98 lb/ft3
Rhy Rock, Competent, Fresh	10 ft	1	6E-6 cm2/s	0.12	0 m3/kg	135 lb/ft3
Rhy Rock, Fractured	10 ft	5	6E-6 cm2/s	0.4	0 m3/kg	98 lb/ft3
Rhy Rock, Competent, Fresh	150 ft	15	6E-6 cm2/s	0.12	0 m3/kg	135 lb/ft3

Boundary Conditions

Contant Concentration
Source Concentration = 26000 µg/L

Fixed Outflow Bottom Boundary
Landfill Length = 1800 ft
Landfill Width = 1800 ft
Base Thickness = 10 ft
Base Porosity = 0.4
Base Outflow Velocity = 10 ft/day

Laplace Transform Parameters

TAU = 7 **N =** 4000 **SIG =** 0 **RNU =** 400

Calculated Concentrations at Selected Times and Depths

Time year	Depth ft	Concentration µg/L
200	0.000E+00	2.600E+04
	5.000E-03	2.555E+04
	1.005E+00	2.481E+04
	2.005E+00	2.409E+04
	6.926E+00	1.328E+04
	1.185E+01	5.781E+03
	1.677E+01	1.948E+03
	2.169E+01	5.020E+02
	2.661E+01	9.820E+01
	3.153E+01	1.451E+01
	3.645E+01	1.613E+00
	4.137E+01	**1.347E-01**
	4.629E+01	8.436E-03
	5.122E+01	3.957E-04
	5.614E+01	1.397E-05
	6.106E+01	3.993E-07
	6.598E+01	1.949E-08
	7.090E+01	4.085E-09
	7.582E+01	1.191E-09
	8.074E+01	3.302E-10
	8.566E+01	8.504E-11
	9.058E+01	2.032E-11
	9.551E+01	4.503E-12
	1.004E+02	9.255E-13
	1.053E+02	1.764E-13
	1.103E+02	3.118E-14
	1.152E+02	5.108E-15
	1.201E+02	7.758E-16
	1.250E+02	1.092E-16
	1.300E+02	1.425E-17
	1.349E+02	1.724E-18
	1.398E+02	1.933E-19
	1.447E+02	2.012E-20
	1.496E+02	1.949E-21
	1.546E+02	1.770E-22
	1.595E+02	1.539E-23
	1.644E+02	1.356E-24
	1.693E+02	1.355E-25
	1.742E+02	1.717E-26
	1.792E+02	2.711E-27
	1.841E+02	4.664E-28
	1.890E+02	3.876E-29
	1.938E+02	7.020E-30
	1.986E+02	1.226E-30

	2.034E+02	2.059E-31
	2.082E+02	3.317E-32
	2.130E+02	5.129E-33
	2.177E+02	7.608E-34
	2.225E+02	1.083E-34
	2.273E+02	1.480E-35
	2.321E+02	1.942E-36
	2.369E+02	2.451E-37
	2.417E+02	2.980E-38
	2.465E+02	3.505E-39
	2.513E+02	4.019E-40
	2.561E+02	4.556E-41
	2.608E+02	5.223E-42
	2.656E+02	6.248E-43
	2.704E+02	8.048E-44
	2.752E+02	1.131E-44
	2.800E+02	1.712E-45
	2.848E+02	2.709E-46
	2.896E+02	4.352E-47
	2.944E+02	6.956E-48
	2.992E+02	1.093E-48
	3.040E+02	1.680E-49
	3.087E+02	2.514E-50
	3.135E+02	**0.000E+00**
	3.183E+02	0.000E+00
	3.231E+02	0.000E+00
	3.279E+02	0.000E+00
	3.327E+02	0.000E+00
	3.375E+02	0.000E+00
	3.423E+02	0.000E+00
	3.471E+02	0.000E+00
	3.518E+02	0.000E+00
	3.566E+02	0.000E+00
	3.614E+02	0.000E+00
	3.662E+02	0.000E+00
	3.710E+02	0.000E+00
	3.758E+02	0.000E+00
	3.806E+02	0.000E+00
	3.854E+02	0.000E+00
	3.902E+02	0.000E+00
	3.950E+02	0.000E+00
	3.997E+02	0.000E+00
	4.045E+02	0.000E+00
	4.093E+02	0.000E+00
	4.141E+02	0.000E+00
	4.189E+02	0.000E+00
	4.237E+02	0.000E+00
	4.285E+02	0.000E+00
	4.333E+02	0.000E+00
	4.381E+02	0.000E+00
	4.428E+02	0.000E+00
	4.476E+02	0.000E+00
	4.524E+02	0.000E+00
	4.572E+02	0.000E+00
	4.620E+02	0.000E+00
	4.653E+02	0.000E+00
	4.687E+02	0.000E+00

	4.720E+02	0.000E+00
	4.740E+02	0.000E+00
	4.760E+02	0.000E+00
	4.780E+02	0.000E+00
	4.800E+02	0.000E+00
	4.820E+02	0.000E+00
	4.853E+02	0.000E+00
	4.887E+02	0.000E+00
	4.920E+02	0.000E+00
	4.953E+02	0.000E+00
	4.987E+02	0.000E+00
	5.020E+02	0.000E+00
	5.053E+02	0.000E+00
	5.087E+02	0.000E+00
	5.120E+02	0.000E+00
	5.153E+02	0.000E+00
	5.187E+02	0.000E+00
	5.220E+02	0.000E+00
	5.253E+02	0.000E+00
	5.287E+02	0.000E+00
	5.320E+02	0.000E+00
	5.353E+02	0.000E+00
	5.387E+02	0.000E+00
	5.420E+02	0.000E+00
	5.453E+02	0.000E+00
	5.487E+02	0.000E+00
	5.520E+02	0.000E+00
	5.553E+02	0.000E+00
	5.587E+02	0.000E+00
	5.620E+02	0.000E+00
	5.653E+02	0.000E+00
	5.687E+02	0.000E+00
	5.720E+02	0.000E+00
	5.753E+02	0.000E+00
	5.787E+02	0.000E+00
	5.820E+02	0.000E+00
	5.853E+02	0.000E+00
	5.887E+02	0.000E+00
	5.920E+02	0.000E+00
	5.953E+02	0.000E+00
	5.987E+02	0.000E+00
	6.020E+02	0.000E+00
	6.053E+02	0.000E+00
	6.087E+02	0.000E+00
	6.120E+02	0.000E+00
	6.153E+02	0.000E+00
	6.187E+02	0.000E+00
	6.220E+02	0.000E+00
	6.253E+02	0.000E+00
	6.287E+02	0.000E+00
	6.320E+02	0.000E+00

NOTICE

Although this program has been tested and experience would indicate that it is accurate within the limits given by the assumptions of the theory used, we make no warranty as to workability of this software or any other licensed material. No warranties either expressed or implied (including warranties of fitness) shall apply. No responsibility is assumed for any errors, mistakes or misrepresentations that may occur from the use of this computer program. The user accepts full responsibility for assessing the validity and applicability of the results obtained with this program for any specific case.

C.2 Simulation #2: Proposed Alternative Liner Setup and Results

POLLUTEv7

Version 7.13

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Appendix C.2 - Newdale Alternative Liner Run #2

THE DARCY VELOCITY (Flux) THROUGH THE LAYERS Va = 0 ft/year

Layer Properties

Layer	Thickness	Number of Sublayers	Coefficient of Hydrodynamic Dispersion	Matrix Porosity	Distributon Coefficient	Dry Density
Primary Liner (HDPE)	60 mil	1	2E-8 cm2/s	1	0 m3/kg	59 lb/ft3
Geosynthetic Clay Liner (GCL)	10 mm	2	6E-6 cm2/s	0.4	0 m3/kg	98 lb/ft3
Rhy Rock, Competent, Fresh	187 ft	38	6E-6 cm2/s	0.12	0 m3/kg	135 lb/ft3
Rhyolite Rock, Fractured	273 ft	19	6E-6 cm2/s	0.4	0 m3/kg	98 lb/ft3
Rhy Rock, Competent, Fresh	10 ft	1	6E-6 cm2/s	0.12	0 m3/kg	135 lb/ft3
Rhy Rock, Fractured	10 ft	5	6E-6 cm2/s	0.4	0 m3/kg	98 lb/ft3
Rhy Rock, Competent, Fresh	150 ft	15	6E-6 cm2/s	0.12	0 m3/kg	135 lb/ft3

Boundary Conditions

Contant Concentration
Source Concentration = 26000 µg/L

Fixed Outflow Bottom Boundary
Landfill Length = 1800 ft
Landfill Width = 1800 ft
Base Thickness = 10 ft
Base Porosity = 0.4
Base Outflow Velocity = 10 ft/day

Laplace Transform Parameters

TAU = 7 **N =** 4000 **SIG =** 0 **RNU =** 400

Calculated Concentrations at Selected Times and Depths

Time year	Depth ft	Concentration µg/L
200	0.000E+00	2.600E+04
	5.000E-03	2.559E+04
	2.140E-02	2.557E+04
	3.781E-02	2.556E+04
	4.959E+00	1.485E+04
	9.880E+00	6.925E+03
	1.480E+01	2.537E+03
	1.972E+01	7.193E+02
	2.464E+01	1.562E+02
	2.956E+01	2.582E+01
	3.449E+01	3.228E+00
	3.941E+01	**3.044E-01**
	4.433E+01	2.158E-02
	4.925E+01	1.148E-03
	5.417E+01	4.583E-05
	5.909E+01	1.407E-06
	6.401E+01	4.616E-08
	6.893E+01	5.718E-09
	7.385E+01	1.604E-09
	7.877E+01	4.549E-10
	8.370E+01	1.202E-10
	8.862E+01	2.951E-11
	9.354E+01	6.724E-12
	9.846E+01	1.421E-12
	1.034E+02	2.788E-13
	1.083E+02	5.072E-14
	1.132E+02	8.560E-15
	1.181E+02	1.339E-15
	1.231E+02	1.944E-16
	1.280E+02	2.615E-17
	1.329E+02	3.262E-18
	1.378E+02	3.774E-19
	1.427E+02	4.051E-20
	1.477E+02	4.041E-21
	1.526E+02	3.766E-22
	1.575E+02	3.324E-23
	1.624E+02	2.889E-24
	1.674E+02	2.702E-25
	1.723E+02	3.088E-26
	1.772E+02	4.509E-27
	1.821E+02	7.535E-28
	1.870E+02	6.267E-29
	1.918E+02	1.148E-29
	1.966E+02	2.035E-30

	2.014E+02	3.473E-31
	2.062E+02	5.690E-32
	2.110E+02	8.946E-33
	2.158E+02	1.350E-33
	2.206E+02	1.954E-34
	2.254E+02	2.716E-35
	2.301E+02	3.625E-36
	2.349E+02	4.649E-37
	2.397E+02	5.740E-38
	2.445E+02	6.843E-39
	2.493E+02	7.924E-40
	2.541E+02	9.011E-41
	2.589E+02	1.025E-41
	2.637E+02	1.201E-42
	2.685E+02	1.496E-43
	2.732E+02	2.028E-44
	2.780E+02	2.984E-45
	2.828E+02	4.651E-46
	2.876E+02	7.442E-47
	2.924E+02	1.194E-47
	2.972E+02	1.891E-48
	3.020E+02	2.933E-49
	3.068E+02	4.438E-50
	3.116E+02	**0.000E+00**
	3.164E+02	0.000E+00
	3.211E+02	0.000E+00
	3.259E+02	0.000E+00
	3.307E+02	0.000E+00
	3.355E+02	0.000E+00
	3.403E+02	0.000E+00
	3.451E+02	0.000E+00
	3.499E+02	0.000E+00
	3.547E+02	0.000E+00
	3.595E+02	0.000E+00
	3.642E+02	0.000E+00
	3.690E+02	0.000E+00
	3.738E+02	0.000E+00
	3.786E+02	0.000E+00
	3.834E+02	0.000E+00
	3.882E+02	0.000E+00
	3.930E+02	0.000E+00
	3.978E+02	0.000E+00
	4.026E+02	0.000E+00
	4.074E+02	0.000E+00
	4.121E+02	0.000E+00
	4.169E+02	0.000E+00
	4.217E+02	0.000E+00
	4.265E+02	0.000E+00
	4.313E+02	0.000E+00
	4.361E+02	0.000E+00
	4.409E+02	0.000E+00
	4.457E+02	0.000E+00
	4.505E+02	0.000E+00
	4.552E+02	0.000E+00
	4.600E+02	0.000E+00
	4.634E+02	0.000E+00
	4.667E+02	0.000E+00

	4.700E+02	0.000E+00
	4.720E+02	0.000E+00
	4.740E+02	0.000E+00
	4.760E+02	0.000E+00
	4.780E+02	0.000E+00
	4.800E+02	0.000E+00
	4.834E+02	0.000E+00
	4.867E+02	0.000E+00
	4.900E+02	0.000E+00
	4.934E+02	0.000E+00
	4.967E+02	0.000E+00
	5.000E+02	0.000E+00
	5.034E+02	0.000E+00
	5.067E+02	0.000E+00
	5.100E+02	0.000E+00
	5.134E+02	0.000E+00
	5.167E+02	0.000E+00
	5.200E+02	0.000E+00
	5.234E+02	0.000E+00
	5.267E+02	0.000E+00
	5.300E+02	0.000E+00
	5.334E+02	0.000E+00
	5.367E+02	0.000E+00
	5.400E+02	0.000E+00
	5.434E+02	0.000E+00
	5.467E+02	0.000E+00
	5.500E+02	0.000E+00
	5.534E+02	0.000E+00
	5.567E+02	0.000E+00
	5.600E+02	0.000E+00
	5.634E+02	0.000E+00
	5.667E+02	0.000E+00
	5.700E+02	0.000E+00
	5.734E+02	0.000E+00
	5.767E+02	0.000E+00
	5.800E+02	0.000E+00
	5.834E+02	0.000E+00
	5.867E+02	0.000E+00
	5.900E+02	0.000E+00
	5.934E+02	0.000E+00
	5.967E+02	0.000E+00
	6.000E+02	0.000E+00
	6.034E+02	0.000E+00
	6.067E+02	0.000E+00
	6.100E+02	0.000E+00
	6.134E+02	0.000E+00
	6.167E+02	0.000E+00
	6.200E+02	0.000E+00
	6.234E+02	0.000E+00
	6.267E+02	0.000E+00
	6.300E+02	0.000E+00

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Appendix D

Pollute Model Results for Sensitivity Analysis

D.1 Simulation #3: Alternative Liner with Increased Source Concentration

POLLUTEv7

Version 7.13

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Appendix D.1 Simulation #3 Sensitivity Run #1

THE DARCY VELOCITY (Flux) THROUGH THE LAYERS Va = 0 ft/year

Layer Properties

Layer	Thickness	Number of Sublayers	Coefficient of Hydrodynamic Dispersion	Matrix Porosity	Distributon Coefficient	Dry Density
Primary Liner (HDPE)	60 mil	1	2E-8 cm2/s	1	0 m3/kg	59 lb/ft3
Geosynthetic Clay Liner (GCL)	10 mm	2	6E-6 cm2/s	0.4	0 m3/kg	98 lb/ft3
Rhy Rock, Competent, Fresh	187 ft	38	6E-6 cm2/s	0.12	0 m3/kg	135 lb/ft3
Rhyolite Rock, Fractured	273 ft	3	6E-6 cm2/s	0.4	0 m3/kg	98 lb/ft3
Rhy Rock, Competent, Fresh	10 ft	2	6E-6 cm2/s	0.12	0 m3/kg	135 lb/ft3
Rhy Rock, Fractured	10 ft	5	6E-6 cm2/s	0.4	0 m3/kg	98 lb/ft3
Rhy Rock, Competent, Fresh	150 ft	2	6E-6 cm2/s	0.12	0 m3/kg	135 lb/ft3

Boundary Conditions

Contant Concentration

Source Concentration = **52000 µg/L**

Fixed Outflow Bottom Boundary

Landfill Length = 1800 ft
Landfill Width = 1800 ft
Base Thickness = 10 ft
Base Porosity = 0.4
Base Outflow Velocity = 10 ft/day

Laplace Transform Parameters

TAU = 7 **N =** 4000 **SIG =** 0 **RNU =** 400

Calculated Concentrations at Selected Times and Depths

Time year	Depth ft	Concentration µg/L
200	0.000E+00	5.200E+04
	5.000E-03	5.117E+04
	2.140E-02	5.115E+04
	3.781E-02	5.113E+04
	4.959E+00	2.970E+04
	9.880E+00	1.385E+04
	1.480E+01	5.073E+03
	1.972E+01	1.439E+03
	2.464E+01	3.125E+02
	2.956E+01	5.163E+01
	3.449E+01	6.457E+00
	3.941E+01	6.087E-01
	4.433E+01	**4.315E-02**
	4.925E+01	2.295E-03
	5.417E+01	9.166E-05
	5.909E+01	2.814E-06
	6.401E+01	9.232E-08
	6.893E+01	1.144E-08
	7.385E+01	3.208E-09
	7.877E+01	9.098E-10
	8.370E+01	2.405E-10
	8.862E+01	5.903E-11
	9.354E+01	1.345E-11
	9.846E+01	2.843E-12
	1.034E+02	5.576E-13
	1.083E+02	1.014E-13
	1.132E+02	1.712E-14
	1.181E+02	2.679E-15
	1.231E+02	3.887E-16
	1.280E+02	5.230E-17
	1.329E+02	6.525E-18
	1.378E+02	7.548E-19
	1.427E+02	8.102E-20
	1.477E+02	8.083E-21
	1.526E+02	7.532E-22
	1.575E+02	6.648E-23
	1.624E+02	5.778E-24
	1.674E+02	5.404E-25
	1.723E+02	6.175E-26
	1.772E+02	9.017E-27
	1.821E+02	1.507E-27
	1.870E+02	1.253E-28
	1.918E+02	2.296E-29
	1.966E+02	4.071E-30

	2.014E+02	6.946E-31
	2.062E+02	1.138E-31
	2.110E+02	1.789E-32
	2.158E+02	2.699E-33
	2.206E+02	3.908E-34
	2.254E+02	5.432E-35
	2.301E+02	7.249E-36
	2.349E+02	9.298E-37
	2.397E+02	1.148E-37
	2.445E+02	1.369E-38
	2.493E+02	1.585E-39
	2.541E+02	1.802E-40
	2.589E+02	2.051E-41
	2.637E+02	2.401E-42
	2.685E+02	2.992E-43
	2.732E+02	4.055E-44
	2.780E+02	5.968E-45
	2.828E+02	9.301E-46
	2.876E+02	1.488E-46
	2.924E+02	2.388E-47
	2.972E+02	3.782E-48
	3.020E+02	5.866E-49
	3.068E+02	8.875E-50
	3.116E+02	1.307E-50
	3.164E+02	**0.000E+00**
	3.211E+02	0.000E+00
	3.259E+02	0.000E+00
	3.307E+02	0.000E+00
	3.355E+02	0.000E+00
	3.403E+02	0.000E+00
	3.451E+02	0.000E+00
	3.499E+02	0.000E+00
	3.547E+02	0.000E+00
	3.595E+02	0.000E+00
	3.642E+02	0.000E+00
	3.690E+02	0.000E+00
	3.738E+02	0.000E+00
	3.786E+02	0.000E+00
	3.834E+02	0.000E+00
	3.882E+02	0.000E+00
	3.930E+02	0.000E+00
	3.978E+02	0.000E+00
	4.026E+02	0.000E+00
	4.074E+02	0.000E+00
	4.121E+02	0.000E+00
	4.169E+02	0.000E+00
	4.217E+02	0.000E+00
	4.265E+02	0.000E+00
	4.313E+02	0.000E+00
	4.361E+02	0.000E+00
	4.409E+02	0.000E+00
	4.457E+02	0.000E+00
	4.505E+02	0.000E+00
	4.552E+02	0.000E+00
	4.600E+02	0.000E+00
	4.625E+02	0.000E+00
	4.650E+02	0.000E+00

	4.675E+02	0.000E+00
	4.700E+02	0.000E+00
	4.720E+02	0.000E+00
	4.740E+02	0.000E+00
	4.760E+02	0.000E+00
	4.780E+02	0.000E+00
	4.800E+02	0.000E+00
	4.847E+02	0.000E+00
	4.894E+02	0.000E+00
	4.941E+02	0.000E+00
	4.988E+02	0.000E+00
	5.035E+02	0.000E+00
	5.082E+02	0.000E+00
	5.129E+02	0.000E+00
	5.175E+02	0.000E+00
	5.222E+02	0.000E+00
	5.269E+02	0.000E+00
	5.316E+02	0.000E+00
	5.363E+02	0.000E+00
	5.410E+02	0.000E+00
	5.457E+02	0.000E+00
	5.504E+02	0.000E+00
	5.550E+02	0.000E+00
	5.597E+02	0.000E+00
	5.644E+02	0.000E+00
	5.691E+02	0.000E+00
	5.738E+02	0.000E+00
	5.785E+02	0.000E+00
	5.832E+02	0.000E+00
	5.879E+02	0.000E+00
	5.925E+02	0.000E+00
	5.972E+02	0.000E+00
	6.019E+02	0.000E+00
	6.066E+02	0.000E+00
	6.113E+02	0.000E+00
	6.160E+02	0.000E+00
	6.207E+02	0.000E+00
	6.254E+02	0.000E+00
	6.300E+02	0.000E+00

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D.2 Simulation #4: Alternative Liner with Extended Model Run Time

POLLUTEv7

Version 7.13

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Appendix D.2 Simulation #4 Sensitivity Run #2

THE DARCY VELOCITY (Flux) THROUGH THE LAYERS Va = 0 ft/year

Layer Properties

Layer	Thickness	Number of Sublayers	Coefficient of Hydrodynamic Dispersion	Matrix Porosity	Distributon Coefficient	Dry Density
Primary Liner (HDPE)	60 mil	1	2E-8 cm2/s	1	0 m3/kg	59 lb/ft3
Geosynthetic Clay Liner (GCL)	10 mm	2	6E-6 cm2/s	0.4	0 m3/kg	98 lb/ft3
Rhy Rock, Competent, Fresh	187 ft	38	6E-6 cm2/s	0.12	0 m3/kg	135 lb/ft3
Rhyolite Rock, Fractured	273 ft	3	6E-6 cm2/s	0.4	0 m3/kg	98 lb/ft3
Rhy Rock, Competent, Fresh	10 ft	2	6E-6 cm2/s	0.12	0 m3/kg	135 lb/ft3
Rhy Rock, Fractured	10 ft	5	6E-6 cm2/s	0.4	0 m3/kg	98 lb/ft3
Rhy Rock, Competent, Fresh	150 ft	2	6E-6 cm2/s	0.12	0 m3/kg	135 lb/ft3

Boundary Conditions

Contant Concentration
Source Concentration = 26000 µg/L

Fixed Outflow Bottom Boundary
Landfill Length = 1800 ft
Landfill Width = 1800 ft
Base Thickness = 10 ft
Base Porosity = 0.4
Base Outflow Velocity = 10 ft/day

Laplace Transform Parameters

TAU = 7 **N =** 4000 **SIG =** 0 **RNU =** 400

Calculated Concentrations at Selected Times and Depths

Time year	Depth ft	Concentration µg/L
500	0.000E+00	2.600E+04
	5.000E-03	2.574E+04
	2.140E-02	2.573E+04
	3.781E-02	2.572E+04
	4.959E+00	1.873E+04
	9.880E+00	1.253E+04
	1.480E+01	7.663E+03
	1.972E+01	4.257E+03
	2.464E+01	2.140E+03
	2.956E+01	9.702E+02
	3.449E+01	3.957E+02
	3.941E+01	1.449E+02
	4.433E+01	4.754E+01
	4.925E+01	1.396E+01
	5.417E+01	3.666E+00
	5.909E+01	8.597E-01
	6.401E+01	**1.800E-01**
	6.893E+01	3.360E-02
	7.385E+01	5.594E-03
	7.877E+01	8.301E-04
	8.370E+01	1.098E-04
	8.862E+01	1.299E-05
	9.354E+01	1.397E-06
	9.846E+01	1.494E-07
	1.034E+02	2.230E-08
	1.083E+02	6.618E-09
	1.132E+02	2.855E-09
	1.181E+02	1.309E-09
	1.231E+02	5.906E-10
	1.280E+02	2.592E-10
	1.329E+02	1.105E-10
	1.378E+02	4.570E-11
	1.427E+02	1.835E-11
	1.477E+02	7.152E-12
	1.526E+02	2.705E-12
	1.575E+02	9.930E-13
	1.624E+02	3.538E-13
	1.674E+02	1.223E-13
	1.723E+02	4.101E-14
	1.772E+02	1.329E-14
	1.821E+02	4.011E-15
	1.870E+02	5.965E-16
	1.918E+02	1.833E-16
	1.966E+02	5.472E-17

	2.014E+02	1.588E-17
	2.062E+02	4.477E-18
	2.110E+02	1.227E-18
	2.158E+02	3.266E-19
	2.206E+02	8.453E-20
	2.254E+02	2.127E-20
	2.301E+02	5.203E-21
	2.349E+02	1.239E-21
	2.397E+02	2.877E-22
	2.445E+02	6.531E-23
	2.493E+02	1.458E-23
	2.541E+02	3.233E-24
	2.589E+02	7.253E-25
	2.637E+02	1.692E-25
	2.685E+02	4.237E-26
	2.732E+02	1.167E-26
	2.780E+02	3.532E-27
	2.828E+02	1.148E-27
	2.876E+02	3.889E-28
	2.924E+02	1.339E-28
	2.972E+02	4.615E-29
	3.020E+02	1.578E-29
	3.068E+02	5.329E-30
	3.116E+02	1.774E-30
	3.164E+02	5.812E-31
	3.211E+02	1.874E-31
	3.259E+02	5.945E-32
	3.307E+02	1.855E-32
	3.355E+02	5.693E-33
	3.403E+02	1.719E-33
	3.451E+02	5.105E-34
	3.499E+02	1.491E-34
	3.547E+02	4.285E-35
	3.595E+02	1.212E-35
	3.642E+02	3.371E-36
	3.690E+02	9.231E-37
	3.738E+02	2.489E-37
	3.786E+02	6.611E-38
	3.834E+02	1.731E-38
	3.882E+02	4.476E-39
	3.930E+02	1.144E-39
	3.978E+02	2.901E-40
	4.026E+02	7.323E-41
	4.074E+02	1.850E-41
	4.121E+02	4.712E-42
	4.169E+02	1.220E-42
	4.217E+02	3.236E-43
	4.265E+02	8.865E-44
	4.313E+02	2.515E-44
	4.361E+02	7.384E-45
	4.409E+02	2.231E-45
	4.457E+02	6.886E-46
	4.505E+02	2.162E-46
	4.552E+02	7.121E-47
	4.600E+02	3.267E-47
	4.625E+02	1.766E-47
	4.650E+02	9.311E-48

	4.675E+02	4.476E-48
	4.700E+02	1.340E-48
	4.720E+02	8.260E-49
	4.740E+02	5.138E-49
	4.760E+02	3.279E-49
	4.780E+02	2.233E-49
	4.800E+02	1.743E-49
	4.847E+02	5.403E-50
	4.894E+02	1.658E-50
	4.941E+02	**0.000E+00**
	4.988E+02	0.000E+00
	5.035E+02	0.000E+00
	5.082E+02	0.000E+00
	5.129E+02	0.000E+00
	5.175E+02	0.000E+00
	5.222E+02	0.000E+00
	5.269E+02	0.000E+00
	5.316E+02	0.000E+00
	5.363E+02	0.000E+00
	5.410E+02	0.000E+00
	5.457E+02	0.000E+00
	5.504E+02	0.000E+00
	5.550E+02	0.000E+00
	5.597E+02	0.000E+00
	5.644E+02	0.000E+00
	5.691E+02	0.000E+00
	5.738E+02	0.000E+00
	5.785E+02	0.000E+00
	5.832E+02	0.000E+00
	5.879E+02	0.000E+00
	5.925E+02	0.000E+00
	5.972E+02	0.000E+00
	6.019E+02	0.000E+00
	6.066E+02	0.000E+00
	6.113E+02	0.000E+00
	6.160E+02	0.000E+00
	6.207E+02	0.000E+00
	6.254E+02	0.000E+00
	6.300E+02	0.000E+00

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D.3 Simulation #5: Alternative Liner with Increased Source & Extended Run Time

POLLUTEv7

Version 7.13

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Appendix D.3 Simulation #5 Sensitivity Run #3

THE DARCY VELOCITY (Flux) THROUGH THE LAYERS Va = 0 ft/year

Layer Properties

Layer	Thickness	Number of Sublayers	Coefficient of Hydrodynamic Dispersion	Matrix Porosity	Distributon Coefficient	Dry Density
Primary Liner (HDPE)	60 mil	1	2E-8 cm2/s	1	0 m3/kg	59 lb/ft3
Geosynthetic Clay Liner (GCL)	10 mm	2	6E-6 cm2/s	0.4	0 m3/kg	98 lb/ft3
Rhy Rock, Competent, Fresh	187 ft	38	6E-6 cm2/s	0.12	0 m3/kg	135 lb/ft3
Rhyolite Rock, Fractured	273 ft	3	6E-6 cm2/s	0.4	0 m3/kg	98 lb/ft3
Rhy Rock, Competent, Fresh	10 ft	2	6E-6 cm2/s	0.12	0 m3/kg	135 lb/ft3
Rhy Rock, Fractured	10 ft	5	6E-6 cm2/s	0.4	0 m3/kg	98 lb/ft3
Rhy Rock, Competent, Fresh	150 ft	2	6E-6 cm2/s	0.12	0 m3/kg	135 lb/ft3

Boundary Conditions

Contant Concentration

Source Concentration = **52000 µg/L**

Fixed Outflow Bottom Boundary

Landfill Length = 1800 ft
Landfill Width = 1800 ft
Base Thickness = 10 ft
Base Porosity = 0.4
Base Outflow Velocity = 10 ft/day

Laplace Transform Parameters

TAU = 7 **N =** 4000 **SIG =** 0 **RNU =** 400

Calculated Concentrations at Selected Times and Depths

Time year	Depth ft	Concentration µg/L
500	0.000E+00	5.200E+04
	5.000E-03	5.148E+04
	2.140E-02	5.146E+04
	3.781E-02	5.145E+04
	4.959E+00	3.745E+04
	9.880E+00	2.507E+04
	1.480E+01	1.533E+04
	1.972E+01	8.514E+03
	2.464E+01	4.280E+03
	2.956E+01	1.940E+03
	3.449E+01	7.914E+02
	3.941E+01	2.898E+02
	4.433E+01	9.508E+01
	4.925E+01	2.792E+01
	5.417E+01	7.331E+00
	5.909E+01	1.719E+00
	6.401E+01	**3.599E-01**
	6.893E+01	6.720E-02
	7.385E+01	1.119E-02
	7.877E+01	1.660E-03
	8.370E+01	2.196E-04
	8.862E+01	2.598E-05
	9.354E+01	2.793E-06
	9.846E+01	2.987E-07
	1.034E+02	4.460E-08
	1.083E+02	1.324E-08
	1.132E+02	5.709E-09
	1.181E+02	2.617E-09
	1.231E+02	1.181E-09
	1.280E+02	5.184E-10
	1.329E+02	2.209E-10
	1.378E+02	9.140E-11
	1.427E+02	3.670E-11
	1.477E+02	1.430E-11
	1.526E+02	5.410E-12
	1.575E+02	1.986E-12
	1.624E+02	7.075E-13
	1.674E+02	2.446E-13
	1.723E+02	8.201E-14
	1.772E+02	2.659E-14
	1.821E+02	8.021E-15
	1.870E+02	1.193E-15
	1.918E+02	3.665E-16
	1.966E+02	1.094E-16

	2.014E+02	3.175E-17
	2.062E+02	8.953E-18
	2.110E+02	2.453E-18
	2.158E+02	6.532E-19
	2.206E+02	1.691E-19
	2.254E+02	4.253E-20
	2.301E+02	1.041E-20
	2.349E+02	2.478E-21
	2.397E+02	5.754E-22
	2.445E+02	1.306E-22
	2.493E+02	2.915E-23
	2.541E+02	6.466E-24
	2.589E+02	1.451E-24
	2.637E+02	3.383E-25
	2.685E+02	8.474E-26
	2.732E+02	2.334E-26
	2.780E+02	7.064E-27
	2.828E+02	2.297E-27
	2.876E+02	7.779E-28
	2.924E+02	2.678E-28
	2.972E+02	9.230E-29
	3.020E+02	3.156E-29
	3.068E+02	1.066E-29
	3.116E+02	3.547E-30
	3.164E+02	1.162E-30
	3.211E+02	3.748E-31
	3.259E+02	1.189E-31
	3.307E+02	3.710E-32
	3.355E+02	1.139E-32
	3.403E+02	3.438E-33
	3.451E+02	1.021E-33
	3.499E+02	2.982E-34
	3.547E+02	8.571E-35
	3.595E+02	2.423E-35
	3.642E+02	6.742E-36
	3.690E+02	1.846E-36
	3.738E+02	4.978E-37
	3.786E+02	1.322E-37
	3.834E+02	3.463E-38
	3.882E+02	8.951E-39
	3.930E+02	2.289E-39
	3.978E+02	5.802E-40
	4.026E+02	1.465E-40
	4.074E+02	3.700E-41
	4.121E+02	9.424E-42
	4.169E+02	2.439E-42
	4.217E+02	6.472E-43
	4.265E+02	1.773E-43
	4.313E+02	5.031E-44
	4.361E+02	1.477E-44
	4.409E+02	4.462E-45
	4.457E+02	1.377E-45
	4.505E+02	4.325E-46
	4.552E+02	1.424E-46
	4.600E+02	6.533E-47
	4.625E+02	3.533E-47
	4.650E+02	1.862E-47

	4.675E+02	8.952E-48
	4.700E+02	2.680E-48
	4.720E+02	1.652E-48
	4.740E+02	1.028E-48
	4.760E+02	6.558E-49
	4.780E+02	4.465E-49
	4.800E+02	3.486E-49
	4.847E+02	1.081E-49
	4.894E+02	3.315E-50
	4.941E+02	1.007E-50
	4.988E+02	**0.000E+00**
	5.035E+02	0.000E+00
	5.082E+02	0.000E+00
	5.129E+02	0.000E+00
	5.175E+02	0.000E+00
	5.222E+02	0.000E+00
	5.269E+02	0.000E+00
	5.316E+02	0.000E+00
	5.363E+02	0.000E+00
	5.410E+02	0.000E+00
	5.457E+02	0.000E+00
	5.504E+02	0.000E+00
	5.550E+02	0.000E+00
	5.597E+02	0.000E+00
	5.644E+02	0.000E+00
	5.691E+02	0.000E+00
	5.738E+02	0.000E+00
	5.785E+02	0.000E+00
	5.832E+02	0.000E+00
	5.879E+02	0.000E+00
	5.925E+02	0.000E+00
	5.972E+02	0.000E+00
	6.019E+02	0.000E+00
	6.066E+02	0.000E+00
	6.113E+02	0.000E+00
	6.160E+02	0.000E+00
	6.207E+02	0.000E+00
	6.254E+02	0.000E+00
	6.300E+02	0.000E+00

NOTICE

Although this program has been tested and experience would indicate that it is accurate within the limits given by the assumptions of the theory used, we make no warranty as to workability of this software or any other licensed material. No warranties either expressed or implied (including warranties of fitness) shall apply. No responsibility is assumed for any errors, mistakes or misrepresentations that may occur from the use of this computer program. The user accepts full responsibility for assessing the validity and applicability of the results obtained with this program for any specific case.

D.4 Simulation #6: Alternative Liner with Lower Porosity & Extended Run Time

POLLUTEv7

Version 7.13

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Appendix D.4:
Sensitivity Run #6 - Adjust Porosity

THE DARCY VELOCITY (Flux) THROUGH THE LAYERS Va = 0 ft/year

Layer Properties

Layer	Thickness	Number of Sublayers	Coefficient of Hydrodynamic Dispersion	Matrix Porosity	Distributon Coefficient	Dry Density
Primary Liner (HDPE)	60 mil	1	2E-8 cm2/s	1	0 m3/kg	59 lb/ft3
Geosynthetic Clay Liner (GCL)	10 mm	2	6E-6 cm2/s	0.4	0 m3/kg	98 lb/ft3
Rhy Rock, Competent, Fresh	187 ft	38	6E-6 cm2/s	0.1	0 m3/kg	135 lb/ft3
Rhyolite Rock, Fractured	273 ft	3	6E-6 cm2/s	0.1	0 m3/kg	135 lb/ft3
Rhy Rock, Competent, Fresh	10 ft	2	6E-6 cm2/s	0.1	0 m3/kg	135 lb/ft3
Rhy Rock, Fractured	10 ft	5	6E-6 cm2/s	0.1	0 m3/kg	135 lb/ft3
Rhy Rock, Competent, Fresh	150 ft	15	6E-6 cm2/s	0.1	0 m3/kg	135 lb/ft3

Boundary Conditions

Contant Concentration
Source Concentration = 26,000 µg/L

Fixed Outflow Bottom Boundary
Landfill Length = 1800 ft
Landfill Width = 1800 ft
Base Thickness = 10 ft
Base Porosity = 0.4
Base Outflow Velocity = 10 ft/day

Laplace Transform Parameters

TAU = 7 **N =** 4000 **SIG =** 0 **RNU =** 400

Calculated Concentrations at Selected Times and Depths

Time year	Depth ft	Concentration µg/L
500	0.000E+00	2.600E+04
	5.000E-03	2.578E+04
	2.140E-02	2.578E+04
	3.781E-02	2.577E+04
	4.959E+00	1.877E+04
	9.880E+00	1.257E+04
	1.480E+01	7.689E+03
	1.972E+01	4.274E+03
	2.464E+01	2.150E+03
	2.956E+01	9.754E+02
	3.449E+01	3.981E+02
	3.941E+01	1.458E+02
	4.433E+01	4.788E+01
	4.925E+01	1.407E+01
	5.417E+01	3.697E+00
	5.909E+01	8.676E-01
	6.401E+01	**1.817E-01**
	6.893E+01	3.396E-02
	7.385E+01	5.657E-03
	7.877E+01	8.399E-04
	8.370E+01	1.112E-04
	8.862E+01	1.316E-05
	9.354E+01	1.416E-06
	9.846E+01	1.513E-07
	1.034E+02	2.251E-08
	1.083E+02	6.657E-09
	1.132E+02	2.869E-09
	1.181E+02	1.315E-09
	1.231E+02	5.936E-10
	1.280E+02	2.606E-10
	1.329E+02	1.111E-10
	1.378E+02	4.595E-11
	1.427E+02	1.846E-11
	1.477E+02	7.194E-12
	1.526E+02	2.722E-12
	1.575E+02	9.993E-13
	1.624E+02	3.561E-13
	1.674E+02	1.231E-13
	1.723E+02	4.131E-14
	1.772E+02	1.345E-14
	1.821E+02	4.248E-15
	1.870E+02	1.302E-15
	1.918E+02	4.001E-16
	1.966E+02	1.195E-16

	2.014E+02	3.467E-17
	2.062E+02	9.778E-18
	2.110E+02	2.680E-18
	2.158E+02	7.136E-19
	2.206E+02	1.847E-19
	2.254E+02	4.648E-20
	2.301E+02	1.137E-20
	2.349E+02	2.709E-21
	2.397E+02	6.291E-22
	2.445E+02	1.428E-22
	2.493E+02	3.188E-23
	2.541E+02	7.071E-24
	2.589E+02	1.586E-24
	2.637E+02	3.698E-25
	2.685E+02	9.257E-26
	2.732E+02	2.548E-26
	2.780E+02	7.709E-27
	2.828E+02	2.505E-27
	2.876E+02	8.485E-28
	2.924E+02	2.921E-28
	2.972E+02	1.007E-28
	3.020E+02	3.442E-29
	3.068E+02	1.163E-29
	3.116E+02	3.870E-30
	3.164E+02	1.268E-30
	3.211E+02	4.090E-31
	3.259E+02	1.297E-31
	3.307E+02	4.049E-32
	3.355E+02	1.243E-32
	3.403E+02	3.753E-33
	3.451E+02	1.115E-33
	3.499E+02	3.256E-34
	3.547E+02	9.359E-35
	3.595E+02	2.646E-35
	3.642E+02	7.364E-36
	3.690E+02	2.017E-36
	3.738E+02	5.438E-37
	3.786E+02	1.444E-37
	3.834E+02	3.783E-38
	3.882E+02	9.780E-39
	3.930E+02	2.501E-39
	3.978E+02	6.340E-40
	4.026E+02	1.600E-40
	4.074E+02	4.044E-41
	4.121E+02	1.030E-41
	4.169E+02	2.665E-42
	4.217E+02	7.070E-43
	4.265E+02	1.936E-43
	4.313E+02	5.493E-44
	4.361E+02	1.612E-44
	4.409E+02	4.870E-45
	4.457E+02	1.502E-45
	4.505E+02	4.695E-46
	4.552E+02	1.476E-46
	4.600E+02	4.643E-47
	4.625E+02	2.535E-47
	4.650E+02	1.382E-47

	4.675E+02	7.525E-48
	4.700E+02	4.087E-48
	4.720E+02	2.504E-48
	4.740E+02	1.532E-48
	4.760E+02	9.355E-49
	4.780E+02	5.703E-49
	4.800E+02	3.471E-49
	4.834E+02	1.511E-49
	4.867E+02	6.543E-50
	4.900E+02	2.819E-50
	4.934E+02	1.208E-50
	4.967E+02	**0.000E+00**
	5.000E+02	0.000E+00
	5.034E+02	0.000E+00
	5.067E+02	0.000E+00
	5.100E+02	0.000E+00
	5.134E+02	0.000E+00
	5.167E+02	0.000E+00
	5.200E+02	0.000E+00
	5.234E+02	0.000E+00
	5.267E+02	0.000E+00
	5.300E+02	0.000E+00
	5.334E+02	0.000E+00
	5.367E+02	0.000E+00
	5.400E+02	0.000E+00
	5.434E+02	0.000E+00
	5.467E+02	0.000E+00
	5.500E+02	0.000E+00
	5.534E+02	0.000E+00
	5.567E+02	0.000E+00
	5.600E+02	0.000E+00
	5.634E+02	0.000E+00
	5.667E+02	0.000E+00
	5.700E+02	0.000E+00
	5.734E+02	0.000E+00
	5.767E+02	0.000E+00
	5.800E+02	0.000E+00
	5.834E+02	0.000E+00
	5.867E+02	0.000E+00
	5.900E+02	0.000E+00
	5.934E+02	0.000E+00
	5.967E+02	0.000E+00
	6.000E+02	0.000E+00
	6.034E+02	0.000E+00
	6.067E+02	0.000E+00
	6.100E+02	0.000E+00
	6.134E+02	0.000E+00
	6.167E+02	0.000E+00
	6.200E+02	0.000E+00
	6.234E+02	0.000E+00
	6.267E+02	0.000E+00
	6.300E+02	0.000E+00

NOTICE

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APPENDIX F

Life Cycle Summary Table

EIRSWD Landfill

Life Cycle Analysis

Inputs/Assumptions (Color Coded):

In-place Waste Density = 1,200

Description	Volume	Fill Sequence	Cumulative
Airspace in Cell A to El. 5,845' (cy) =	720,000	Stage 1	720,000
Airspace in Cell B to El. 5,845' (cy) =	1,003,000	Stage 2	1,723,000
Fill Cells A and B to El. 5,870' (cy)	441,000	Stage 3	2,164,000
Airspace in Cell C to El. 5,830' (cy) =	696,000	Stage 4	2,860,000
Airspace in Cell D to El. 5,870' (cy) =	1,017,000	Stage 5	3,877,000
Fill Cells C and D to El. 5870' (cy) =	1,397,000	Stage 6	5,274,000
Airspace Cells A-D to El. 5,970' (cy) =	2,059,000	Stage 7	7,333,000
Total Airspace in Landfill (cy) =	7,333,000		

Period	Fiscal Year	Waste Disposed (tons)	Waste Vol (cy)	Cumulative Waste Vol (cy)	Est. Stage Airspace Remaining (cy)	Est. Total Landfill Airspace Remaining (cy)	%Total Airspace Used	Fill Stage
1	2024	7,248	12,080	12,080	707,920	7,320,920	0.2%	Stage #1
2	2025	47,398	78,996	91,076	628,924	7,241,924	1.2%	
3	2026	57,702	96,169	187,245	532,755	7,145,755	2.6%	
4	2027	59,119	98,532	285,777	434,223	7,047,223	3.9%	
5	2028	60,576	100,960	386,737	333,263	6,946,263	5.3%	
6	2029	62,073	103,456	490,192	229,808	6,842,808	6.7%	
7	2030	63,613	106,021	596,214	123,786	6,736,786	8.1%	
8	2031	65,195	108,658	704,872	15,128	6,628,128	9.6%	
9	2032	66,821	111,369	816,241	906,759	6,516,759	11.1%	Stage #2
10	2033	68,493	114,156	930,396	792,604	6,402,604	12.7%	
11	2034	70,212	117,020	1,047,417	675,583	6,285,583	14.3%	
12	2035	71,979	119,966	1,167,383	555,617	6,165,617	15.9%	
13	2036	73,796	122,994	1,290,376	432,624	6,042,624	17.6%	
14	2037	75,664	126,107	1,416,483	306,517	5,916,517	19.3%	
15	2038	77,585	129,308	1,545,791	177,209	5,787,209	21.1%	
16	2039	79,559	132,599	1,678,390	485,610	5,654,610	22.9%	Stage #3
17	2040	81,590	135,983	1,814,373	349,627	5,518,627	24.7%	
18	2041	83,678	139,463	1,953,836	210,164	5,379,164	26.6%	
19	2042	85,825	143,041	2,096,876	67,124	5,236,124	28.6%	
20	2043	88,032	146,721	2,243,597	616,403	5,089,403	30.6%	Stage #4
21	2044	90,303	150,505	2,394,102	465,898	4,938,898	32.6%	
22	2045	92,638	154,396	2,548,498	311,502	4,784,502	34.8%	
23	2046	95,039	158,398	2,706,896	153,104	4,626,104	36.9%	
24	2047	97,509	162,514	2,869,410	1,007,590	4,463,590	39.1%	Stage #5
25	2048	100,049	166,748	3,036,158	840,842	4,296,842	41.4%	
26	2049	102,661	171,102	3,207,260	669,740	4,125,740	43.7%	
27	2050	105,348	175,581	3,382,841	494,159	3,950,159	46.1%	
28	2051	108,112	180,187	3,563,028	313,972	3,769,972	48.6%	
29	2052	110,955	184,926	3,747,954	129,046	3,585,046	51.1%	
30	2053	113,880	189,800	3,937,754	1,336,246	3,395,246	53.7%	Stage #6
31	2054	116,889	194,814	4,132,568	1,141,432	3,200,432	56.4%	
32	2055	119,984	199,973	4,332,541	941,459	3,000,459	59.1%	
33	2056	123,168	205,279	4,537,821	736,179	2,795,179	61.9%	
34	2057	126,443	210,739	4,748,559	525,441	2,584,441	64.8%	
35	2058	129,813	216,355	4,964,915	309,085	2,368,085	67.7%	
36	2059	133,281	222,134	5,187,049	86,951	2,145,951	70.7%	
37	2060	136,848	228,080	5,415,129	1,917,871	1,917,871	73.8%	Stage #7
38	2061	140,519	234,198	5,649,327	1,683,673	1,683,673	77.0%	
39	2062	144,295	240,492	5,889,819	1,443,181	1,443,181	80.3%	
40	2063	148,182	246,969	6,136,788	1,196,212	1,196,212	83.7%	
41	2064	152,181	253,634	6,390,422	942,578	942,578	87.1%	
42	2065	156,296	260,493	6,650,915	682,085	682,085	90.7%	
43	2066	160,530	267,550	6,918,466	414,534	414,534	94.3%	
44	2067	164,888	274,814	7,193,279	139,721	139,721	98.1%	
45	2068	83,833	139,721	7,333,000	0	0	100.0%	

= manually entered tonnage value to fill the landfill in the last year. Approximately 6 months in last year.

APPENDIX G

Leachate Generation and Pond Sizing Calculations

```
FF
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************



PRECIPITATION DATA FILE:    C:\USERS\PUBLIC\DESKTOP\HELP3\DATA4.D4
TEMPERATURE DATA FILE:      C:\USERS\PUBLIC\DESKTOP\HELP3\DATA7.D7
SOLAR RADIATION DATA FILE:  C:\USERS\PUBLIC\DESKTOP\HELP3\DATA13.D13
EVAPOTRANSPIRATION DATA:    C:\USERS\PUBLIC\DESKTOP\HELP3\DATA11.D11
SOIL AND DESIGN DATA FILE:  C:\USERS\PUBLIC\DESKTOP\HELP3\DATA10.D10
OUTPUT DATA FILE:           C:\USERS\PUBLIC\DESKTOP\HELP3\OUTFLOOR.OUT



TIME:  13:51     DATE:   9/14/2022



******************************************************************************

     TITLE:  EIRSWD_Floor_Gravel

******************************************************************************



     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.



                                   LAYER  1
                                   --------

                       TYPE 1 - VERTICAL PERCOLATION LAYER
                           MATERIAL TEXTURE NUMBER  18
             THICKNESS                   =      6.00   INCHES
             POROSITY                    =      0.6710 VOL/VOL
             FIELD CAPACITY              =      0.2920 VOL/VOL
             WILTING POINT               =      0.0770 VOL/VOL
             INITIAL SOIL WATER CONTENT  =      0.3545 VOL/VOL
             EFFECTIVE SAT. HYD. COND.   =  0.100000005000E-02 CM/SEC



                                   LAYER  2
                                   --------

                         TYPE 2 - LATERAL DRAINAGE LAYER
                           MATERIAL TEXTURE NUMBER  21
             THICKNESS                   =     15.00   INCHES
             POROSITY                    =      0.3970 VOL/VOL
```

```
FIELD CAPACITY              =      0.0320 VOL/VOL
WILTING POINT               =      0.0130 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0320 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.300000012000     CM/SEC
SLOPE                       =      3.00   PERCENT
DRAINAGE LENGTH             =    200.0    FEET



                          LAYER  3
                          --------

                TYPE 4 - FLEXIBLE MEMBRANE LINER
                  MATERIAL TEXTURE NUMBER  35
THICKNESS                   =      0.06   INCHES
POROSITY                    =      0.0000 VOL/VOL
FIELD CAPACITY              =      0.0000 VOL/VOL
WILTING POINT               =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY         =      1.00   HOLES/ACRE
FML INSTALLATION DEFECTS    =      2.00   HOLES/ACRE
FML PLACEMENT QUALITY       =  2 - EXCELLENT



                          LAYER  4
                          --------

                  TYPE 3 - BARRIER SOIL LINER
                  MATERIAL TEXTURE NUMBER  17
THICKNESS                   =      0.25   INCHES
POROSITY                    =      0.7500 VOL/VOL
FIELD CAPACITY              =      0.7470 VOL/VOL
WILTING POINT               =      0.4000 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.7500 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.300000003000E-08 CM/SEC



                 GENERAL DESIGN AND EVAPORATIVE ZONE DATA
                 ----------------------------------------

          NOTE:  SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
                   SOIL DATA BASE USING SOIL TEXTURE #18 WITH BARE
                   GROUND CONDITIONS, A SURFACE SLOPE OF  3.% AND
                   A SLOPE LENGTH OF  200. FEET.

        SCS RUNOFF CURVE NUMBER             =     80.50
        FRACTION OF AREA ALLOWING RUNOFF    =      0.0    PERCENT
        AREA PROJECTED ON HORIZONTAL PLANE  =      1.000  ACRES
        EVAPORATIVE ZONE DEPTH              =      2.0    INCHES
        INITIAL WATER IN EVAPORATIVE ZONE   =      0.959  INCHES
        UPPER LIMIT OF EVAPORATIVE STORAGE  =      1.342  INCHES
        LOWER LIMIT OF EVAPORATIVE STORAGE  =      0.154  INCHES
        INITIAL SNOW WATER                  =      0.107  INCHES
        INITIAL WATER IN LAYER MATERIALS    =      2.795  INCHES
        TOTAL INITIAL WATER                 =      2.902  INCHES
        TOTAL SUBSURFACE INFLOW             =      0.00   INCHES/YEAR
```

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
REXBURG IDAHO

STATION LATITUDE	=	43.86 DEGREES
MAXIMUM LEAF AREA INDEX	=	0.00
START OF GROWING SEASON (JULIAN DATE)	=	132
END OF GROWING SEASON (JULIAN DATE)	=	275
EVAPORATIVE ZONE DEPTH	=	2.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	10.20 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	70.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	52.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	43.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	65.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR POCATELLO IDAHO

NORMAL **MEAN** MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.11	0.96	0.99	1.20	1.77	1.45
0.79	0.70	0.84	1.16	0.99	1.07

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR POCATELLO IDAHO

NORMAL **MEAN** MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
19.90	23.60	34.70	43.80	52.00	59.80
66.90	65.90	56.60	45.10	31.10	21.00

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR POCATELLO IDAHO
AND STATION LATITUDE = 42.55 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 20

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	1.12	0.87	0.98	1.02	1.86	1.31
	0.64	0.75	0.62	0.97	0.89	0.97
STD. DEVIATIONS	0.54	0.32	0.45	0.55	0.96	0.80

```
                            0.59     0.64     0.63     0.69     0.43     0.40

  RUNOFF
  ------
    TOTALS                  0.000    0.000    0.000    0.000    0.000    0.000
                            0.000    0.000    0.000    0.000    0.000    0.000

    STD. DEVIATIONS         0.000    0.000    0.000    0.000    0.000    0.000
                            0.000    0.000    0.000    0.000    0.000    0.000

  EVAPOTRANSPIRATION
  ------------------
    TOTALS                  0.614    0.581    0.658    0.789    1.129    0.868
                            0.585    0.397    0.391    0.513    0.512    0.595

    STD. DEVIATIONS         0.112    0.139    0.209    0.416    0.544    0.586
                            0.420    0.268    0.394    0.373    0.232    0.137

  LATERAL DRAINAGE COLLECTED FROM LAYER  2
  ----------------------------------------
    TOTALS                  0.0157   0.0522   1.4160   0.4530   0.6810   0.3991
                            0.1882   0.2237   0.2741   0.4942   0.1774   0.0222

    STD. DEVIATIONS         0.0704   0.1263   0.6335   0.5285   0.4662   0.3579
                            0.2085   0.3165   0.4070   0.4083   0.2751   0.0605

  PERCOLATION/LEAKAGE THROUGH LAYER  4
  -------------------------------------
    TOTALS                  0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                            0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

    STD. DEVIATIONS         0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                            0.0000   0.0000   0.0000   0.0000   0.0000   0.0000


 -------------------------------------------------------------------------------
              AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)
 -------------------------------------------------------------------------------


  DAILY AVERAGE HEAD ON TOP OF LAYER  3
  -------------------------------------
    AVERAGES                0.0020   0.0072   0.1792   0.0592   0.0862   0.0522
                            0.0238   0.0283   0.0358   0.0625   0.0232   0.0028

    STD. DEVIATIONS         0.0089   0.0172   0.0802   0.0691   0.0590   0.0468
                            0.0264   0.0401   0.0532   0.0517   0.0360   0.0077

 *******************************************************************************



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     AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS    1 THROUGH   20
 -------------------------------------------------------------------------------
                                       INCHES            CU. FEET       PERCENT
                                  -------------------   -------------   ---------
  PRECIPITATION                    12.00    (   1.910)      43576.3     100.00

  RUNOFF                            0.000   (  0.0000)          0.00      0.000

  EVAPOTRANSPIRATION                7.632   (  0.9740)      27705.06     63.578

  LATERAL DRAINAGE COLLECTED        4.39667 (  0.95419)     15959.904   36.62516
    FROM LAYER  2
```

```
 PERCOLATION/LEAKAGE THROUGH     0.00000 (  0.00000)         0.012     0.00003
   LAYER  4

 AVERAGE HEAD ON TOP             0.047 (    0.010)
   OF LAYER  3

 CHANGE IN WATER STORAGE        -0.024   (  0.6059)        -88.65     -0.203

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                PEAK DAILY VALUES FOR YEARS    1 THROUGH   20
   ------------------------------------------------------------------------
                                                (INCHES)      (CU. FT.)
                                               ----------   -------------
      PRECIPITATION                              1.42          5154.600

      RUNOFF                                     0.000            0.0000

      DRAINAGE COLLECTED FROM LAYER  2           0.48513       1761.02209

      PERCOLATION/LEAKAGE THROUGH LAYER  4       0.000000         0.00091

      AVERAGE HEAD ON TOP OF LAYER  3            1.903

      MAXIMUM HEAD ON TOP OF LAYER  3            3.375

      LOCATION OF MAXIMUM HEAD IN LAYER  2
            (DISTANCE FROM DRAIN)               22.5 FEET

      SNOW WATER                                 2.31          8402.7275


      MAXIMUM VEG. SOIL WATER (VOL/VOL)                   0.6710

      MINIMUM VEG. SOIL WATER (VOL/VOL)                   0.0770


       ***  Maximum heads are computed using McEnroe's equations.  ***

            Reference:  Maximum Saturated Depth over Landfill Liner
                        by Bruce M. McEnroe, University of Kansas
                        ASCE Journal of Environmental Engineering
                        Vol. 119, No. 2, March 1993, pp. 262-270.


*******************************************************************************



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                  FINAL WATER STORAGE AT END OF YEAR   20
    ---------------------------------------------------------------------
                    LAYER        (INCHES)       (VOL/VOL)
                    -----        --------       ---------
                      1           1.6628         0.2771

                      2           0.4800         0.0320
```

```
                        3            0.0000         0.0000

                        4            0.1875         0.7500

                    SNOW WATER       0.083

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**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************



PRECIPITATION DATA FILE:    C:\USERS\PUBLIC\DESKTOP\HELP3\DATA4.D4
TEMPERATURE DATA FILE:      C:\USERS\PUBLIC\DESKTOP\HELP3\DATA7.D7
SOLAR RADIATION DATA FILE:  C:\USERS\PUBLIC\DESKTOP\HELP3\DATA13.D13
EVAPOTRANSPIRATION DATA:    C:\USERS\PUBLIC\DESKTOP\HELP3\DATA11.D11
SOIL AND DESIGN DATA FILE:  C:\USERS\PUBLIC\DESKTOP\HELP3\DATA10SS.D10
OUTPUT DATA FILE:           C:\USERS\PUBLIC\DESKTOP\HELP3\OUTSS.OUT



TIME:  16:31     DATE:   9/14/2022



******************************************************************************

     TITLE:  EIRSWD_Sideslope

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.



                                   LAYER  1
                                   --------

                       TYPE 1 - VERTICAL PERCOLATION LAYER
                           MATERIAL TEXTURE NUMBER  18
             THICKNESS                  =      6.00   INCHES
             POROSITY                   =      0.6710 VOL/VOL
             FIELD CAPACITY             =      0.2920 VOL/VOL
             WILTING POINT              =      0.0770 VOL/VOL
             INITIAL SOIL WATER CONTENT =      0.3118 VOL/VOL
             EFFECTIVE SAT. HYD. COND.  =  0.100000005000E-02 CM/SEC



                                   LAYER  2
                                   --------

                        TYPE 2 - LATERAL DRAINAGE LAYER
                          MATERIAL TEXTURE NUMBER   6
             THICKNESS                  =     18.00   INCHES
             POROSITY                   =      0.4530 VOL/VOL
```

```
FIELD CAPACITY              =      0.1900 VOL/VOL
WILTING POINT               =      0.0850 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.1902 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.720000011000E-03 CM/SEC
SLOPE                       =     33.00   PERCENT
DRAINAGE LENGTH             =     50.0    FEET



                          LAYER  3
                          --------

                 TYPE 4 - FLEXIBLE MEMBRANE LINER
                   MATERIAL TEXTURE NUMBER  35
THICKNESS                   =      0.06   INCHES
POROSITY                    =      0.0000 VOL/VOL
FIELD CAPACITY              =      0.0000 VOL/VOL
WILTING POINT               =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY         =      1.00   HOLES/ACRE
FML INSTALLATION DEFECTS    =      2.00   HOLES/ACRE
FML PLACEMENT QUALITY       =  2 - EXCELLENT



                          LAYER  4
                          --------

                 TYPE 3 - BARRIER SOIL LINER
                 MATERIAL TEXTURE NUMBER  17
THICKNESS                   =      0.25   INCHES
POROSITY                    =      0.7500 VOL/VOL
FIELD CAPACITY              =      0.7470 VOL/VOL
WILTING POINT               =      0.4000 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.7500 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.300000003000E-08 CM/SEC



                 GENERAL DESIGN AND EVAPORATIVE ZONE DATA
                 ----------------------------------------

        NOTE:  SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
                 SOIL DATA BASE USING SOIL TEXTURE #18 WITH BARE
                 GROUND CONDITIONS, A SURFACE SLOPE OF 33.% AND
                 A SLOPE LENGTH OF  200. FEET.

SCS RUNOFF CURVE NUMBER             =     81.80
FRACTION OF AREA ALLOWING RUNOFF    =    100.0    PERCENT
AREA PROJECTED ON HORIZONTAL PLANE  =      1.000  ACRES
EVAPORATIVE ZONE DEPTH              =      2.0    INCHES
INITIAL WATER IN EVAPORATIVE ZONE   =      0.703  INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE  =      1.342  INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE  =      0.154  INCHES
INITIAL SNOW WATER                  =      0.107  INCHES
INITIAL WATER IN LAYER MATERIALS    =      5.482  INCHES
TOTAL INITIAL WATER                 =      5.589  INCHES
TOTAL SUBSURFACE INFLOW             =      0.00   INCHES/YEAR
```

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
REXBURG IDAHO

STATION LATITUDE	=	43.86 DEGREES
MAXIMUM LEAF AREA INDEX	=	0.00
START OF GROWING SEASON (JULIAN DATE)	=	132
END OF GROWING SEASON (JULIAN DATE)	=	275
EVAPORATIVE ZONE DEPTH	=	2.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	10.20 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	70.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	52.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	43.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	65.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR POCATELLO IDAHO

NORMAL **MEAN** MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.11	0.96	0.99	1.20	1.77	1.45
0.79	0.70	0.84	1.16	0.99	1.07

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR POCATELLO IDAHO

NORMAL **MEAN** MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
19.90	23.60	34.70	43.80	52.00	59.80
66.90	65.90	56.60	45.10	31.10	21.00

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR POCATELLO IDAHO
AND STATION LATITUDE = 42.55 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 20

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	1.12	0.87	0.98	1.02	1.86	1.31
	0.64	0.75	0.62	0.97	0.89	0.97
STD. DEVIATIONS	0.54	0.32	0.45	0.55	0.96	0.80

```
                          0.59     0.64     0.63     0.69     0.43     0.40

  RUNOFF
  ------
    TOTALS                0.057    0.229    0.801    0.054    0.001    0.000
                          0.000    0.000    0.000    0.000    0.029    0.033

    STD. DEVIATIONS       0.111    0.241    0.587    0.174    0.003    0.000
                          0.000    0.000    0.000    0.000    0.097    0.071

  EVAPOTRANSPIRATION
  ------------------
    TOTALS                0.614    0.581    0.549    0.736    1.091    0.911
                          0.550    0.448    0.439    0.454    0.501    0.597

    STD. DEVIATIONS       0.112    0.139    0.163    0.426    0.534    0.628
                          0.367    0.348    0.413    0.351    0.225    0.137

  LATERAL DRAINAGE COLLECTED FROM LAYER  2
  ----------------------------------------
    TOTALS                0.0032   0.0002   0.2500   0.5140   0.5702   0.4992
                          0.3007   0.1698   0.2605   0.4574   0.2470   0.0710

    STD. DEVIATIONS       0.0045   0.0002   0.2111   0.2124   0.3637   0.2166
                          0.2122   0.2272   0.3963   0.3573   0.2349   0.0979

  PERCOLATION/LEAKAGE THROUGH LAYER  4
  -------------------------------------
    TOTALS                0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                          0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

    STD. DEVIATIONS       0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                          0.0000   0.0000   0.0000   0.0000   0.0000   0.0000


-------------------------------------------------------------------------------
              AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)
-------------------------------------------------------------------------------


  DAILY AVERAGE HEAD ON TOP OF LAYER  3
  -------------------------------------
    AVERAGES              0.0043   0.0003   0.3319   0.7052   0.7571   0.6849
                          0.3992   0.2254   0.3575   0.6073   0.3388   0.0943

    STD. DEVIATIONS       0.0060   0.0003   0.2803   0.2915   0.4829   0.2972
                          0.2817   0.3016   0.5438   0.4745   0.3223   0.1300

*******************************************************************************



*******************************************************************************

     AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS    1 THROUGH   20
-------------------------------------------------------------------------------
                                      INCHES            CU. FEET       PERCENT
                                 -------------------   -------------   ---------
 PRECIPITATION                    12.00    (   1.910)      43576.3     100.00

 RUNOFF                            1.203   (  0.6086)       4366.21     10.020

 EVAPOTRANSPIRATION                7.471   (  1.0188)      27119.05     62.233

 LATERAL DRAINAGE COLLECTED        3.34308 (  0.79518)     12135.385   27.84856
   FROM LAYER  2
```

```
 PERCOLATION/LEAKAGE THROUGH     0.00002 (  0.00000)         0.068     0.00016
   LAYER  4

 AVERAGE HEAD ON TOP             0.376 (    0.089)
   OF LAYER  3

 CHANGE IN WATER STORAGE        -0.012   (  0.5521)        -44.37     -0.102

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                PEAK DAILY VALUES FOR YEARS    1 THROUGH   20
   ------------------------------------------------------------------------
                                                (INCHES)      (CU. FT.)
                                               ----------   -------------
      PRECIPITATION                              1.42          5154.600

      RUNOFF                                     0.727         2637.4211

      DRAINAGE COLLECTED FROM LAYER  2           0.11476        416.58337

      PERCOLATION/LEAKAGE THROUGH LAYER  4       0.000001         0.00243

      AVERAGE HEAD ON TOP OF LAYER  3            4.724

      MAXIMUM HEAD ON TOP OF LAYER  3            8.470

      LOCATION OF MAXIMUM HEAD IN LAYER  2
            (DISTANCE FROM DRAIN)                0.3 FEET

      SNOW WATER                                 2.31          8402.7275


      MAXIMUM VEG. SOIL WATER (VOL/VOL)                  0.6066

      MINIMUM VEG. SOIL WATER (VOL/VOL)                  0.0770


       ***  Maximum heads are computed using McEnroe's equations.  ***

            Reference:  Maximum Saturated Depth over Landfill Liner
                        by Bruce M. McEnroe, University of Kansas
                        ASCE Journal of Environmental Engineering
                        Vol. 119, No. 2, March 1993, pp. 262-270.


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                  FINAL WATER STORAGE AT END OF YEAR   20
    ---------------------------------------------------------------------
                    LAYER        (INCHES)       (VOL/VOL)
                    -----        --------       ---------
                      1            1.6359         0.2727

                      2            3.4378         0.1910
```

```
                        3            0.0000         0.0000

                        4            0.1875         0.7500

                    SNOW WATER       0.083

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```

EIRSWD - Regional Landfill (Cell A)

Central Leachate Collector - 8" HDPE Pipe

Calculated By: Duncan Breedlove, PE **Checked By:** Travis Pyle, PE

Orifice Equation:

$$Q_p = C_d A \sqrt{2gH}$$

where,

Q_p = flow rate through one perforation (ft^3/sec)

C_d = coefficient of discharge (round hole) = 0.6

A = cross sectional area of one perforation (ft^2)

g = gravitational constant (ft/sec^2) = 32.2

H = Height of water above the perforation (ft) = 0.0417 0.5 inch (assumed max head build-up over perf)

Design Pipe Diameter, Length and Leachate Flow:

Pipe length (ft) = 600 [Cell A Pipe Length & Peak Flow]

Flow to perfs (gpm) 167.2 0.37 ft^3/sec

Pipe O.D. (inches) 8.625 <8-inch SDR 11 HDPE>

Pipe SDR 11

Pipe I.D. (inches) 6.96

Perf. Hole Diam (in) 0.5

Pipe Surface Area: 1,257 ft^2

%Open Area: 0.17%

DR	Pipe OD (inches)	Pipe Size, ID (inches)	Hole Dia. (inches)	Hole Area (ft^2)	Q_p (ft^3/sec)	Q_p (gpm)	# of Holes per Row	Row Spacing O.C. (in)	# Rows/ Foot	Holes/ Foot	Flow/Foot (gpm)	Total Flow (gpm)	Factor of Safety
1/2-inch Perforations:													
11.0	8	6.96	0.500	0.00136	0.00134	0.601	4	18	0.67	2.7	1.6	962	5.8
Reduce Perf Hole Area by 75% (to account for future clogging)													
11.0	8	6.96	0.500	0.00068	0.00067	0.301	4	18	0.67	2.7	0.8	481	2.9

Notes:

Drill Pattern - 4 holes (min) on 90 degree centers spaced equidistant around the circumference of the pipe. 18-inch spacing between rows; stagger

EIRSWD - Regional Landfill

Side Slope Riser/Sump Pipe Perforation Sizing - 18" HDPE Pipe

Calculated By: Duncan Breedlove, PE **Checked By:** Travis Pyle, PE

Orifice Equation:

$$Q_p = C_d A \sqrt{2gH}$$

where,

Q_p =	flow rate through one perforation (ft^3/sec)			
C_d =	coefficient of discharge (round hole) =	0.6		
A =	cross sectional area of one perforation (ft^2)			
g =	gravitational constant (ft/sec^2) =	32.2		
H =	Height of water above the perforation (ft) =	0.0833	1 inch	(assumed max head build-up over perf)

Design Pipe Diameter, Length and Leachate Flow:

Pipe length (ft) =	50	[Cell A and B Contributions]		Pipe Surface Area:	236 ft^2
Flow to perfs (gpm)	167.2	0.37	ft^3/sec	%Open Area:	0.93%
Pipe O.D. (inches)	18.0	<18-inch SDR 17 HDPE>			
Pipe SDR	17				
Pipe I.D. (inches)	15.76				
Perf. Hole Diam (in)	1.0				

DR	Pipe OD (inches)	Pipe Size, ID (inches)	Hole Dia. (inches)	Hole Area (ft^2)	Q_p (ft^3/sec)	Q_p (gpm)	# of Holes per Row	Row Spacing O.C. (in)	# Rows/ Foot	Holes/ Foot	Flow/Foot (gpm)	Total Flow (gpm)	Factor of Safety
1-inch Perforations:													
17.0	18	15.76	1.00	0.005454	0.007581	3.402	8	12	1.00	8	27.2	1,361	8.1
Reduce Perf Hole Area by 50% (to account for future clogging):													
17.0	18	15.76	1.00	0.002727	0.00379	1.701	8	12	1.00	8	13.6	680	4.1

Notes:

Drill Pattern - 8 holes on 45 degree centers spaced equidistant around the circumference of the pipe. 12-inch spacing between rows.

EIRSWD - Regional Landfill (Cell A)

Leachate Toe Collector - 6" HDPE Pipe

Calculated By: Duncan Breedlove, PE **Checked By:** Travis Pyle, PE

Orifice Equation:

$$Q_p = C_d A \sqrt{2gH}$$

where,

Q_p =	flow rate through one perforation (ft^3/sec)			
C_d =	coefficient of discharge (round hole) =	0.6		
A =	cross sectional area of one perforation (ft^2)			
g =	gravitational constant (ft/sec^2) =	32.2		
H =	Height of water above the perforation (ft) =	0.0417	0.5 inch	(assumed max head build-up over perf)

Design Pipe Diameter, Length and Leachate Flow:

Pipe length (ft) =	1,000	[Cell A Pipe Length & Peak Flow]		Pipe Surface Area:	1,571 ft^2
Flow to perfs (gpm)	56.2	0.13	ft^3/sec	%Open Area:	0.12%
Pipe O.D. (inches)	6.625	<6-inch SDR 11 HDPE>			
Pipe SDR	11				
Pipe I.D. (inches)	5.35				
Perf. Hole Diam (in)	0.5				

DR	Pipe OD (inches)	Pipe Size, ID (inches)	Hole Dia. (inches)	Hole Area (ft^2)	Q_p (ft^3/sec)	Q_p (gpm)	# of Holes per Row	Row Spacing O.C. (in)	# Rows/ Foot	Holes/ Foot	Flow/Foot (gpm)	Total Flow (gpm)	Factor of Safety
1/2-inch Perforations:													
11.0	6	5.35	0.500	0.00136	0.00134	0.601	2	18	0.67	1.3	0.8	802	14.3
Reduce Perf Hole Area by 50% (to account for future clogging):													
11.0	6	5.35	0.500	0.00068	0.00067	0.301	2	18	0.67	1.3	0.4	401	7.1

Note:

Drill Pattern - 4 holes (min) on 90 degree centers spaced equidistant around the circumference of the pipe. 18-inch spacing between rows; stagger

Gravity Water Flow

(http://performancepipe.com)
(800) 527-0662

D_O = Outside Diameter

6	in

DR = Dimension Ratio

11

n = Manning Roughness Coefficient

.0090	psi

S = Slope

0.03	$^h/_L$

Q = Flow Rate

355.99	gpm

Full Pipe Flow

V = Velocity

6.2	fps

Project Name:

EIRSWD Regional Landfill

Engineer:

Travis Pyle, PE

Date:

July 3, 2023

Comments:

Toe Collector Pipe Sizing Check

Performance Pipe makes no warranty or representations as to the accuracy of the information contained herein. This document should not be substituted for the judgment of a professional engineer in determining the suitability of a pipe for a given project as the methodology herein may not accurately represent the site conditions or be inclusive of all parameters that must be considered.

By using any of the information contained herein, the user agrees said information is being provided for convenience only, without any warranty or guarantee of any kind whatsoever, and the information is being accepted and used at the user's sole risk. Users are encouraged to take steps to verify any such information to their reasonable satisfaction, including seeking advice from a professional engineer.

Gravity Water Flow

(http://performancepipe.com)
(800) 527-0662

D_O = Outside Diameter

8	in

DR = Dimension Ratio

11

n = Manning Roughness Coefficient

.0090	psi

S = Slope

0.024	$^h/_L$

Q = Flow Rate

685.74	gpm

Full Pipe Flow

V = Velocity

6.72	fps

Project Name:

EIRSWD Regional Landfill

Engineer:

Travis Pyle, PE

Date:

July 3, 2023

Comments:

Central Collector Pipe Sizing Check

Performance Pipe makes no warranty or representations as to the accuracy of the information contained herein. This document should not be substituted for the judgment of a professional engineer in determining the suitability of a pipe for a given project as the methodology herein may not accurately represent the site conditions or be inclusive of all parameters that must be considered.

By using any of the information contained herein, the user agrees said information is being provided for convenience only, without any warranty or guarantee of any kind whatsoever, and the information is being accepted and used at the user's sole risk. Users are encouraged to take steps to verify any such information to their reasonable satisfaction, including seeking advice from a professional engineer.

EIRSWD - REGIONAL LANDFILL DESIGN

Leachate Water Balance Calculation - Summary

Calculated By: Travis Pyle, PE/Great West	**Checked By: Michelle Langdon, PE**
Date: July 5, 2023	**Date: July 5, 2023**

1. Leachate generation rates for the cell floor and side slopes under normal (average) and storm preciptation rates - See attached

See Attached Calculation Summary for 0.5' Waste Over Floor and Sideslopes.

2. Simulated precipitation rates (from HELP) for normal and storm years with estimated surface evaporation rates for the leachate pond.

Data/Description	January	February	March	April	May	June	July	August	September	October	November	December	Total
Rainfall in Average Year (in)	1.11	0.96	0.99	1.2	1.77	1.45	0.79	0.7	0.84	1.16	0.99	1.07	13.03
Rainfall in Storm Year (in)	1.66	1.19	1.43	1.57	2.82	2.11	1.23	1.39	1.25	1.66	1.32	1.37	19.00
FWS Pond Evap (in)	0.4	0.8	1.6	2.8	4.8	6.0	7.6	6.4	4.4	2.4	1.6	1.2	40.0
0.9 Ratio Saline to Fresh Water Evap (in)	0.4	0.7	1.4	2.5	4.3	5.4	6.8	5.8	4.0	2.2	1.4	1.1	36.0

3a. Leachate Pond #1 Parameters (shaded cells are user input).

Bottom Length (ft)	255		
Bottom Width (ft)	255		
Bottom Area (ft^2) - A1	65,025		
Top of Water - Length (ft)	276		
Top of Water - Width (ft)	276		
Top of Water Area (ft^2) - A2	76,176		
Max. Water Depth	3.5		
Total Depth of Pond (1.5' of Freeboard)	5		
Side Slope (X:1)	3		
Top of Pond - Length	285		
Top of Pond - Width	285		
Top of Pond Area (ft^2)	81,225	→	1.9 acres
Max. Water Volume (ft^3)	246,845	→	1,846,397 gallons
Precip Catchment Area (ft^2)	81,225		
Avg Evap Surface Area (ft^2)	70,601		

3b. Leachate Pond #2 (shaded cells are user input).

Bottom Length (ft)	255		
Bottom Width (ft)	255		
Bottom Area (ft^2) - A1	65,025		
Top of Water - Length (ft)	276		
Top of Water - Width (ft)	276		
Top of Water Area (ft^2) - A2	76,176		
Max. Water Depth	3.5		
Total Depth of Pond (1.5' of Freeboard)	5		
Side Slope (X:1)	3		
Top of Pond - Length	285		
Top of Pond - Width	285		
Top of Pond Area (ft^2)	81,225	→	1.9 acres
Max. Water Volume (ft^3)	246,845	→	1,846,397 gallons
Precip Catchment Area (ft^2)	81,225		
Avg Evap Surface Area (ft^2)	70,601		

*Ponds are approximately 2 acres each (planar) area.

3,692,794 gallons (total)

4. Water Balance Results Summary (from yearly water balance tables)

Pond Capacity	Maximum Monthly Volume (ft^3)	OK or OVERFLOW?
Year 1 (average year)	67,974	OK
Year 2 (storm year)	220,595	OK
Year 3 (average year)	416,983	OK
Year 4 (average year)	470,403	OK
Year 5 (average year)	404,214	OK

5. Factor of Safety Calculation (max. water volume divided by max monthly volume from the water balance, see steps 4 and 5 above)

Factor of Safety =	1.4	<including 18" freeboard for emergency storage>

A1 =	76,176	<max water surface>
A2 =	81,225	<top of pond liner - catchment area>
Volume (ft3) =	78,701	
Volume (gals)	588,687	each pond
Emergency Storage Volume (gal) =	1,177,373	total

EIRSWD - REGIONAL LANDFILL DESIGN

Leachate Water Balance Yearly Calculations

Calculated By: Travis Pyle, PE/Great West **Checked By:**
Date: **Date:**

Floor Area (AC) = 5.6		
Sideslope (AC) = 7.1	**12.7**	***<based on Cell B - largest (worst case)>***

YEAR 1 WATER BALANCE - AVERAGE YEAR

Cell A is Opened - 6" Waste over the Floor and Sideslopes

	POND INPUTS						POND DEDUCTIONS				
Month	**Direct Pond Precip (ft^3) Pond #1**	**Direct Pond Precip (ft^3) Pond #2**	**Leachate In Landfill Floor (ft^3)**	**Leachate In Landfill Sideslope (ft^3)**	**Leachate Runoff From Sideslope to Floor (ft^3)**	**Total Pond Inputs (ft^3)**	**Direct Pond Surface Evap (ft^3) Pond #1**	**Direct Pond Surface Evap (ft^3) Pond #2**	**Total pond Deductions (ft^3)**	**Total Inputs - Total Deducts**	**Volume in Pond (ft^3)**
January	7,513	7,513	319	82	1,469	16,897	2,118	2,118	4,236	12,661	12,661
February	6,498	6,498	1,061	5	5,902	19,964	4,236	4,236	8,472	11,492	24,154
March	6,701	6,701	28,784	6,443	1,392	50,022	8,472	8,472	16,944	33,077	57,231
April	8,123	8,123	9,209	13,247	26	38,727	14,826	14,826	29,652	9,074	66,305
May	11,981	11,981	13,843	14,696	0	52,501	25,416	25,416	50,832	1,668	67,974
June	9,815	9,815	8,113	12,866	0	40,608	31,770	31,770	63,540	-22,932	45,041
July	5,347	5,347	3,826	7,750	0	22,270	40,242	40,242	80,485	-58,214	0
August	4,738	4,738	4,547	4,376	0	18,400	33,888	33,888	67,776	-49,377	0
September	5,686	5,686	5,572	6,714	0	23,657	23,298	23,298	46,596	-22,939	0
October	7,852	7,852	10,046	11,789	0	37,538	12,708	12,708	25,416	12,122	12,122
November	6,701	6,701	3,606	6,366	747	24,122	8,472	8,472	16,944	7,178	19,300
December	7,243	7,243	451	1,830	851	17,617	6,354	6,354	12,708	4,909	24,208
TOTAL	**88,197**	**88,197**	**89,378**	**86,164**	**10,387**	**362,323**	**211,802**	**211,802**	**423,603**	**-61,280**	
										Max Vol. =	**67,974**
										Min. Vol. =	**0**

YEAR 2 WATER BALANCE - STORM YEAR

Existing Cell A Open and still 6" Waste on Floor / Sideslope

	POND INPUTS						POND DEDUCTIONS				
Month	**Direct Pond Precip (ft^3) Pond #1**	**Direct Pond Precip (ft^3) Pond #2**	**Leachate In Landfill Floor (ft^3)**	**Leachate In Landfill Sideslope (ft^3)**	**Leachate Runoff From Sideslope to Floor (ft^3)**	**Total Pond Inputs (ft^3)**	**Direct Pond Surface Evap (ft^3) Pond #1**	**Direct Pond Surface Evap (ft^3) Pond #2**	**Total pond Deductions (ft^3)**	**Total Inputs - Total Deducts**	**Volume in Pond (ft^3)**
January	11,236	11,236	1,750	198	4,330	28,751	2,118	2,118	4,236	24,515	48,723
February	8,055	8,055	3,629	10	12,113	31,862	4,236	4,236	8,472	23,390	72,113
March	9,679	9,679	41,662	11,884	16,520	89,425	8,472	8,472	16,944	72,481	144,594
April	10,627	10,627	19,952	18,722	4,510	64,438	14,826	14,826	29,652	34,785	179,379
May	19,088	19,088	23,320	24,069	77	85,643	25,416	25,416	50,832	34,810	214,190
June	14,282	14,282	15,388	18,448	0	62,401	31,770	31,770	63,540	-1,140	213,050
July	8,326	8,326	8,064	13,219	0	37,934	40,242	40,242	80,485	-42,550	170,500
August	9,409	9,409	10,981	10,232	0	40,030	33,888	33,888	67,776	-27,746	142,753
September	8,461	8,461	13,845	16,928	0	47,695	23,298	23,298	46,596	1,099	143,852
October	11,236	11,236	18,346	20,997	0	61,816	12,708	12,708	25,416	36,399	180,251
November	8,935	8,935	9,198	12,420	3,247	42,735	8,472	8,472	16,944	25,791	206,043
December	9,273	9,273	1,681	4,353	2,680	27,261	6,354	6,354	12,708	14,553	220,595
TOTAL	**128,606**	**128,606**	**167,818**	**151,481**	**43,479**	**619,990**	**211,802**	**211,802**	**423,603**	**196,387**	
										Max Vol. =	**220,595**
										Min. Vol. =	**48,723**

YEAR 3 WATER BALANCE - AVERAGE YEAR

Existing Cell A and still 6" Waste on Floor / Sideslope

	POND INPUTS						POND DEDUCTIONS				
Month	**Direct Pond Precip (ft^3) Pond #1**	**Direct Pond Precip (ft^3) Pond #2**	**Leachate In Landfill Floor (ft^3)**	**Leachate In Landfill Sideslope (ft^3)**	**Leachate Runoff From Sideslope to Floor (ft^3)**	**Total Pond Inputs (ft^3)**	**Direct Pond Surface Evap (ft^3) Pond #1**	**Direct Pond Surface Evap (ft^3) Pond #2**	**Total pond Deductions (ft^3)**	**Total Inputs - Total Deducts**	**Volume in Pond (ft^3)**
January	11,236	11,236	1,750	198	4,330	28,751	2,118	2,118	4,236	24,515	245,110
February	8,055	8,055	3,629	10	12,113	31,862	4,236	4,236	8,472	23,390	268,500
March	9,679	9,679	41,662	11,884	16,520	89,425	8,472	8,472	16,944	72,481	340,981
April	10,627	10,627	19,952	18,722	4,510	64,438	14,826	14,826	29,652	34,785	375,766
May	19,088	19,088	23,320	24,069	77	85,643	25,416	25,416	50,832	34,810	410,577
June	14,282	14,282	15,388	18,448	0	62,401	31,770	31,770	63,540	-1,140	409,437
July	8,326	8,326	8,064	13,219	0	37,934	40,242	40,242	80,485	-42,550	366,887
August	9,409	9,409	10,981	10,232	0	40,030	33,888	33,888	67,776	-27,746	339,140
September	8,461	8,461	13,845	16,928	0	47,695	23,298	23,298	46,596	1,099	340,239
October	11,236	11,236	18,346	20,997	0	61,816	12,708	12,708	25,416	36,399	376,638
November	8,935	8,935	9,198	12,420	3,247	42,735	8,472	8,472	16,944	25,791	402,430
December	9,273	9,273	1,681	4,353	2,680	27,261	6,354	6,354	12,708	14,553	416,983
TOTAL	**128,606**	**128,606**	**167,818**	**151,481**	**43,479**	**619,990**	**211,802**	**211,802**	**423,603**	**196,387**	
										Max Vol. =	**416,983**
										Min. Vol. =	**245,110**

YEAR 4 WATER BALANCE - AVERAGE YEAR

Existing Cell A and still 6" Waste on Floor / Sideslope

	POND INPUTS						POND DEDUCTIONS				
Month	**Direct Pond Precip (ft^3) Pond #1**	**Direct Pond Precip (ft^3) Pond #2**	**Leachate In Landfill Floor (ft^3)**	**Leachate In Landfill Sideslope (ft^3)**	**Leachate Runoff From Sideslope to Floor (ft^3)**	**Total Pond Inputs (ft^3)**	**Direct Pond Surface Evap (ft^3) Pond #1**	**Direct Pond Surface Evap (ft^3) Pond #2**	**Total pond Deductions (ft^3)**	**Total Inputs - Total Deducts**	**Volume in Pond (ft^3)**
January	7,513	7,513	319	82	1,469	16,897	2,118	2,118	4,236	12,661	415,091
February	6,498	6,498	1,061	5	5,902	19,964	4,236	4,236	8,472	11,492	426,583
March	6,701	6,701	28,784	6,443	1,392	50,022	8,472	8,472	16,944	33,077	459,661
April	8,123	8,123	9,209	13,247	26	38,727	14,826	14,826	29,652	9,074	468,735
May	11,981	11,981	13,843	14,696	0	52,501	25,416	25,416	50,832	1,668	470,403
June	9,815	9,815	8,113	12,866	0	40,608	31,770	31,770	63,540	-22,932	447,471
July	5,347	5,347	3,826	7,750	0	22,270	40,242	40,242	80,485	-58,214	389,257
August	4,738	4,738	4,547	4,376	0	18,400	33,888	33,888	67,776	-49,377	339,880
September	5,686	5,686	5,572	6,714	0	23,657	23,298	23,298	46,596	-22,939	316,941
October	7,852	7,852	10,046	11,789	0	37,538	12,708	12,708	25,416	12,122	329,063
November	6,701	6,701	3,606	6,366	747	24,122	8,472	8,472	16,944	7,178	336,241
December	7,243	7,243	451	1,830	851	17,617	6,354	6,354	12,708	4,909	341,149
TOTAL	**88,197**	**88,197**	**89,378**	**86,164**	**10,387**	**362,323**	**211,802**	**211,802**	**423,603**	**-61,280**	
										Max Vol. =	**470,403**
										Min. Vol. =	**316,941**

YEAR 5 WATER BALANCE - AVERAGE YEAR

Existing Cell A and still 6" Waste on Floor / Sideslope

	POND INPUTS						POND DEDUCTIONS				
Month	**Precip (ft^3)**	**Direct Precip - Additional Pond**	**Leachate In Landfill Floor (ft^3)**	**Leachate In Landfill Sideslope (ft^3)**	**Leachate Runoff From Sideslope to Floor (ft^3)**	**Total Pond Inputs (ft^3)**	**Direct Pond Surface Evap (ft^3)**	**Direct Surface Evap - Additional Ponds**	**Total pond Deductions (ft^3)**	**Total Inputs - Total Deducts**	**Volume in Pond (ft^3)**
January	7,513	7,513	319	82	1,469	16,897	2,118	2,118	4,236	12,661	348,902
February	6,498	6,498	1,061	5	5,902	19,964	4,236	4,236	8,472	11,492	360,394
March	6,701	6,701	28,784	6,443	1,392	50,022	8,472	8,472	16,944	33,077	393,472
April	8,123	8,123	9,209	13,247	26	38,727	14,826	14,826	29,652	9,074	402,546
May	11,981	11,981	13,843	14,696	0	52,501	25,416	25,416	50,832	1,668	404,214
June	9,815	9,815	8,113	12,866	0	40,608	31,770	31,770	63,540	-22,932	381,282
July	5,347	5,347	3,826	7,750	0	22,270	40,242	40,242	80,485	-58,214	323,068
August	4,738	4,738	4,547	4,376	0	18,400	33,888	33,888	67,776	-49,377	273,691
September	5,686	5,686	5,572	6,714	0	23,657	23,298	23,298	46,596	-22,939	250,752
October	7,852	7,852	10,046	11,789	0	37,538	12,708	12,708	25,416	12,122	262,874
November	6,701	6,701	3,606	6,366	747	24,122	8,472	8,472	16,944	7,178	270,051
December	7,243	7,243	451	1,830	851	17,617	6,354	6,354	12,708	4,909	274,960
TOTAL	**88,197**	**88,197**	**89,378**	**86,164**	**10,387**	**362,323**	**211,802**	**211,802**	**423,603**	**-61,280**	
										Max Vol. =	**404,214**
										Min. Vol. =	**250,752**

APPENDIX H

Stormwater Evaluation

TECHNICAL MEMORANDUM

EIRSWD Regional Landfill Stormwater Analysis

PREPARED FOR:	EIRSWD
PREPARED BY:	Michelle Langdon, PE/Great West
REVIEWED BY:	Travis Pyle, PE/Great West
DATE:	July 5, 2023
PROJECT NUMBER:	4-20133
REVISION NO.:	0
APPROVED BY:	Travis Pyle, PE/Great West

1.0 Introduction

This technical memorandum presents the design criteria and approach for the design of stormwater control systems for the Eastern Idaho Regional Solid Waste District (EIRSWD) Regional Landfill.

1.1 Regulatory Requirements

This stormwater design has been prepared following the requirements of the Idaho Code Title 39, Chapter 74, Idaho Code (Idaho Solid Waste Facilities Act), which incorporates by reference the Federal regulations – 40 CFR Part 258 (Criteria for Municipal Solid Waste Landfills). Specifically, 39-7414, Standards for Operation require the design, construction and maintenance of run-on / run-off control systems as per 40 CFR 258.26, to prevent all run-on of surface waters and other liquids resulting from a maximum flow from a 25-year storm into the active portion of the landfill and to control the collection of run-off from a 24-hour, 25-year event.

Also incorporated into the approach are the guidance in the Idaho Catalog of Storm Water Best Management Practices. Idaho's goals for managing stormwater from development include:

- Manage runoff quantities and flow to mimic predevelopment conditions and minimize damage to property and natural resources.
- Manage development sites to minimize the amount of sediment and other contaminants in runoff.
- Manage development to preserve the stability and integrity of drainage ways and stream corridors.

1.2 Pre-Development Conditions

The pre-development site conditions consist largely of agricultural land. The site topography is hilly with a good stand of vegetation (agricultural crops). Stormwater flows downslope generally towards the north and into drainages that run parallel to the main road.

1.3 Post-Development Conditions

The post-development site conditions will include a landfill and support facilities consisting of buildings, paved roads, and gravel roads. Run-on from upgradient areas of the property will be routed around the landfill and into the existing natural drainages. Stormwater that runs off from the developed area (not waste areas) will be detained onsite. Stormwater control structures will consist of stormwater run-on interceptor ditches, run-off control and conveyance ditches, culverts, and retention basins.

1.4 Design Approach

The stormwater structures collect and convey stormwater from two separate drainage basins. Stormwater is conveyed to a separate retention pond for each basin, as shown in **Attachment 1**. Each stormwater pond was designed to retain the 25-year, 24-hour storm event, with enough freeboard to retain the 100-year, 24-hour storm. Stormwater infrastructure, including ponds, ditches and culverts were designed to capture and convey stormwater from the fully developed and closed landfill as the worst-case condition to manage maximum run-off.

2.0 Stormwater Calculations

2.1 Site Hydrology

Stormwater flows were calculated using the program WinTR-55 (see **Attachment 2** for output files). This program utilizes the 'urban hydrology for small watersheds', as outlined in TR-55. Peak flows for the 25-year and 100-year storms were calculated utilizing the following criteria. Input values are shown in **Table 1** below.

- **Drainage Basins –** Two drainage basins were identified that would contribute to stormwater flows. The drainage basins were broken up into sub-areas based on the type of cover material present.
- **Land Cover/Land Use (C coefficient) –** The cover types for the basins included gravel on roads, in ditches and around buildings, and poor stands of vegetation for slopes and the landfill final cover. It is anticipated that the cover will have good vegetation growth. However, to account for the diminished infiltration on the landfill cover due to the geomembrane under the soil, the robustness of the vegetation

was changed to 'fair' to account for the additional runoff. The runoff "C" coefficients were chosen based on the ground cover types.

- **IDF Curves –** Intensity, Duration, Frequency (IDF) curves for the site were interpolated from the NOAA Precipitation-Frequency Atlas for the Western United States and input into the WinTR-55 program. The IDF curve used was the Type II rainfall distribution for the Rexburg area.
- **Time of Concentration T_c.** The T_c for each drainage basin was calculated by using the maximum travel distance for stormwater for each basin, the average slope of the travel path, and the Manning's roughness coefficient (n) for the drainage basin ground cover type.

The inputs and calculated T_c values are shown in **Table 1**. For basins where the T_c is less than the minimum of 0.10 hours required in the calculation, the program defaults to use 0.10 hours.

Table 1 – T_c Calculations and Input Values

Basin	Impervious Area (acres)	Pervious Area (acres)	Total Area (acres)	T_c
1 (West)	10.6	42.1	52.7	0.115
2 (East)	8.8	0.0	8.8	0.100

Peak flows and runoff for both the 25-year and 100-year storm events were calculated for each basin by the WinTR-55 program and are shown in **Table 2**.

Table 2 – Basin Flows and Runoff

Basin	Peak Flow		Runoff	
	25-Year (cfs)	100-Year (cfs)	25-Year (in)	100-Year (in)
1 (West)	66.0	97.0	1.06	1.57
2 (East)	15.8	22.6	1.19	1.72

2.2 Site Hydraulics

2.2.1 Ditch and Culvert Sizing Calculations

Hydraulic calculations were completed utilizing Bently's FlowMaster software (see **Attachment 3** for output files). The software uses the Manning's equation to calculate the minimum ditch depth and culvert size for gravity flow. The calculations require the peak flow, ditch and culvert slopes, ditch geometry, and ditch armoring or culvert material. All ditches will be riprap lined and are designed as V-notched ditches with side slopes of 2-horizontal to 1-vertical (2H:1V). Ditches and culverts were sized to accommodate the 25-year storm event with enough freeboard for the 100-year storm event. These required depths are shown in **Table 3**.

Table 3 – Ditch Flow Depths for 100-year Storm

Basin	Normal Depth (in) (25-Year)	Normal Depth (in) (100-Year)	25 Year Freeboard (in)
Ditches – 1% Slope	24.6	28.4	11.4
Ditches – 5% slope	23.3	26.9	12.7
Culverts	14.6	19.9	9.4

2.2.2 Pond Sizing Calculations

The ponds for the site were designed to retain all runoff from the 25-year, 24-hour design storm with enough freeboard for the 100-year, 24-hour event. Using the runoff depth from WinTR-55 and the basin areas, the total volume of stormwater to be retained from each basin was calculated. These stormwater volumes were then used to size the ponds for each basin. **Table 4** shows the runoff volumes.

Table 4 – Pond Sizing

Basin ID	Runoff (in)		Basin Area (sf)	Runoff Volume (cy)	
	25-Year	100-Year		25-Year	100-Year
1 (West)	1.06	1.57	2,297,002	7,543	11,102
2 (East)	1.19	1.72	384,444	1,416	2,037

Attachment 1

Stormwater Basins

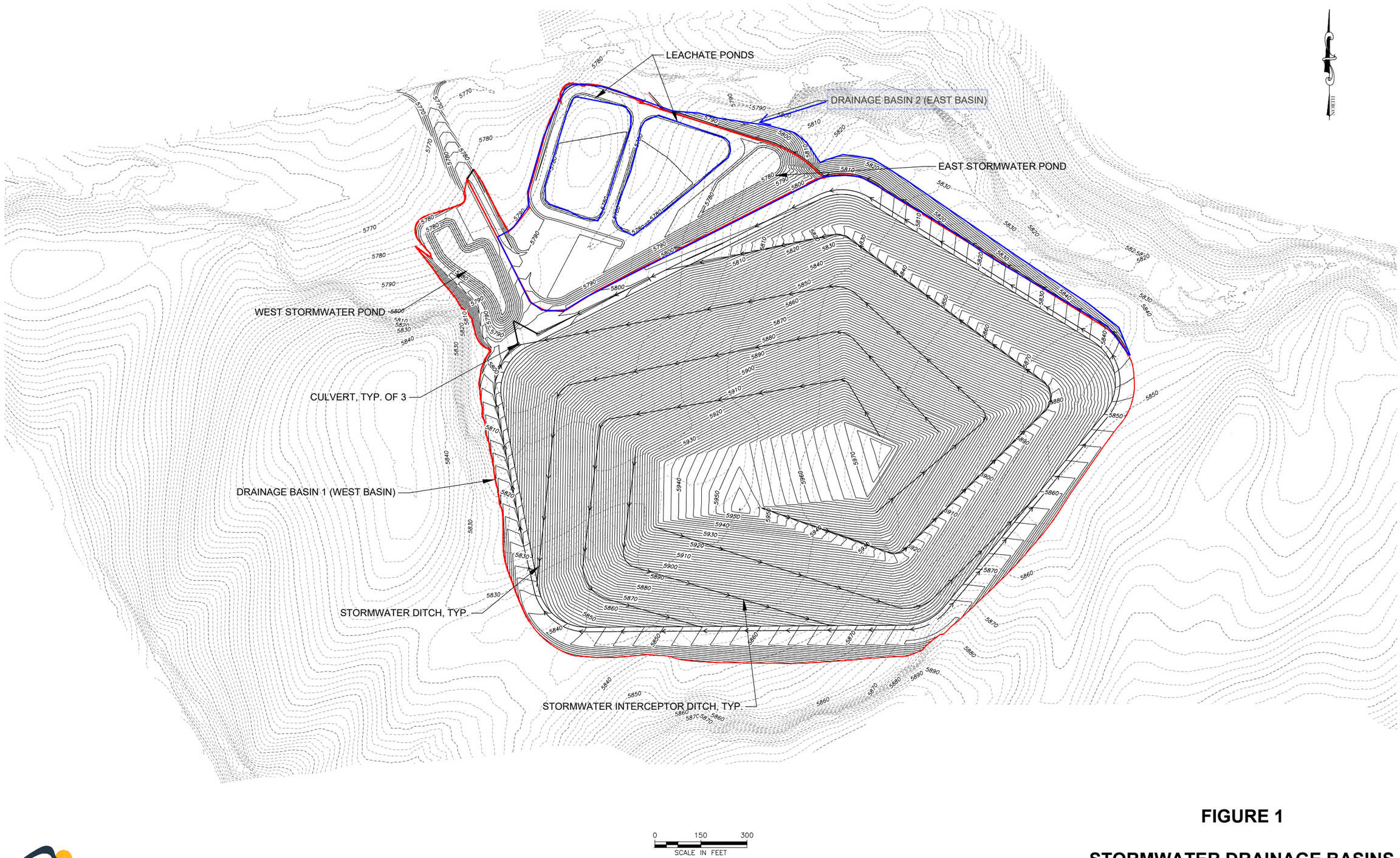

FIGURE 1

STORMWATER DRAINAGE BASINS

EASTERN IDAHO REGIONAL SOLID WASTE DISTRICT
REGIONAL LANDFILL MASTER PLAN

GreatWest ENGINEERING

Y:\shared\Boise Projects\4-20133-E Idaho SW District Landfill Design And Engineering Support\CADD 4-20133\Exhibits\4-20133 Stormwater Figure.dwg

Attachment 2

WinTR-55 Output Files

```
WinTR-20 Printed Page File      Beginning of Input Data List
TR20.inp

WinTR-20: Version 1.10                  0         0         0.05
EIRSWD
Cell A Pond Sizing

SUB-AREA:
          East Pond Outlet              .00816    79.       .216

STREAM REACH:

STORM ANALYSIS:
          25-Yr                         2.2       Type II   2
          100-Yr                        2.8       Type II   2

STRUCTURE RATING:


GLOBAL OUTPUT:
          2         0.05                YYYYN     YYYYNN



WinTR-20 Printed Page File      End of Input Data List
```

EIRSWD
Cell A Pond Sizing

Name of printed page file:
TR20.out

STORM 25-Yr

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
East Pond	0.008		0.641		12.04	4.19	513.13

Line Start Time (hr)	Flow Values @ time increment of 0.014 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.523	0.05	0.06	0.06	0.07	0.08	0.09	0.10
11.619	0.11	0.13	0.15	0.17	0.20	0.24	0.28
11.714	0.32	0.37	0.43	0.50	0.57	0.66	0.75
11.810	0.86	0.98	1.12	1.28	1.47	1.69	1.94
11.905	2.21	2.50	2.79	3.07	3.34	3.57	3.78
12.001	3.95	4.07	4.15	4.19	4.17	4.09	3.95
12.096	3.76	3.53	3.29	3.04	2.78	2.54	2.32
12.192	2.11	1.92	1.77	1.64	1.53	1.43	1.35
12.287	1.28	1.21	1.15	1.10	1.06	1.02	0.98
12.383	0.94	0.91	0.88	0.86	0.83	0.81	0.78
12.478	0.76	0.74	0.72	0.70	0.68	0.66	0.64
12.574	0.63	0.61	0.60	0.58	0.57	0.56	0.55
12.669	0.54	0.53	0.52	0.51	0.50	0.50	0.49
12.765	0.49	0.48	0.48	0.47	0.47	0.46	0.46
12.860	0.45	0.45	0.45	0.44	0.44	0.43	0.43
12.956	0.43	0.42	0.42	0.41	0.41	0.41	0.40
13.051	0.40	0.40	0.39	0.39	0.38	0.38	0.38
13.147	0.38	0.37	0.37	0.37	0.36	0.36	0.36
13.242	0.36	0.35	0.35	0.35	0.35	0.35	0.34
13.338	0.34	0.34	0.34	0.33	0.33	0.33	0.33
13.433	0.33	0.32	0.32	0.32	0.32	0.32	0.31
13.529	0.31	0.31	0.31	0.31	0.30	0.30	0.30
13.624	0.30	0.30	0.29	0.29	0.29	0.29	0.29
13.720	0.28	0.28	0.28	0.28	0.28	0.28	0.28
13.815	0.27	0.27	0.27	0.27	0.27	0.27	0.26
13.911	0.26	0.26	0.26	0.26	0.26	0.25	0.25
14.006	0.25	0.25	0.25	0.25	0.25	0.24	0.24
14.102	0.24	0.24	0.24	0.24	0.24	0.24	0.23
14.197	0.23	0.23	0.23	0.23	0.23	0.23	0.23
14.293	0.23	0.23	0.23	0.23	0.23	0.23	0.23
14.388	0.22	0.22	0.22	0.22	0.22	0.22	0.22
14.484	0.22	0.22	0.22	0.22	0.22	0.22	0.22
14.579	0.22	0.22	0.22	0.22	0.22	0.21	0.21
14.675	0.21	0.21	0.21	0.21	0.21	0.21	0.21

14.770	0.21	0.21	0.21	0.21	0.21	0.21	0.21
14.866	0.21	0.21	0.21	0.20	0.20	0.20	0.20
14.961	0.20	0.20	0.20	0.20	0.20	0.20	0.20
15.057	0.20	0.20	0.20	0.20	0.20	0.20	0.20
15.152	0.20	0.19	0.19	0.19	0.19	0.19	0.19
15.248	0.19	0.19	0.19	0.19	0.19	0.19	0.19

EIRSWD
Cell A Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.014 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
15.343	0.19	0.19	0.19	0.19	0.19	0.18	0.18
15.439	0.18	0.18	0.18	0.18	0.18	0.18	0.18
15.534	0.18	0.18	0.18	0.18	0.18	0.18	0.18
15.630	0.18	0.17	0.17	0.17	0.17	0.17	0.17
15.725	0.17	0.17	0.17	0.17	0.17	0.17	0.17
15.820	0.17	0.17	0.17	0.17	0.17	0.16	0.16
15.916	0.16	0.16	0.16	0.16	0.16	0.16	0.16
16.011	0.16	0.16	0.16	0.16	0.16	0.16	0.16
16.107	0.16	0.15	0.15	0.15	0.15	0.15	0.15
16.202	0.15	0.15	0.15	0.15	0.15	0.15	0.15
16.298	0.15	0.15	0.15	0.15	0.15	0.15	0.15
16.393	0.15	0.15	0.15	0.15	0.15	0.15	0.15
16.489	0.15	0.15	0.15	0.15	0.15	0.15	0.15
16.584	0.15	0.15	0.15	0.15	0.15	0.15	0.15
16.680	0.15	0.15	0.14	0.14	0.14	0.14	0.14
16.775	0.14	0.14	0.14	0.14	0.14	0.14	0.14
16.871	0.14	0.14	0.14	0.14	0.14	0.14	0.14
16.966	0.14	0.14	0.14	0.14	0.14	0.14	0.14
17.062	0.14	0.14	0.14	0.14	0.14	0.14	0.14
17.157	0.14	0.14	0.14	0.14	0.14	0.14	0.14
17.253	0.14	0.14	0.14	0.14	0.14	0.14	0.14
17.348	0.14	0.14	0.14	0.13	0.13	0.13	0.13
17.444	0.13	0.13	0.13	0.13	0.13	0.13	0.13
17.539	0.13	0.13	0.13	0.13	0.13	0.13	0.13
17.635	0.13	0.13	0.13	0.13	0.13	0.13	0.13
17.730	0.13	0.13	0.13	0.13	0.13	0.13	0.13
17.826	0.13	0.13	0.13	0.13	0.13	0.13	0.13
17.921	0.13	0.13	0.13	0.13	0.13	0.13	0.13
18.017	0.13	0.13	0.12	0.12	0.12	0.12	0.12
18.112	0.12	0.12	0.12	0.12	0.12	0.12	0.12
18.208	0.12	0.12	0.12	0.12	0.12	0.12	0.12
18.303	0.12	0.12	0.12	0.12	0.12	0.12	0.12
18.399	0.12	0.12	0.12	0.12	0.12	0.12	0.12
18.494	0.12	0.12	0.12	0.12	0.12	0.12	0.12
18.590	0.12	0.12	0.12	0.12	0.12	0.12	0.12
18.685	0.11	0.11	0.11	0.11	0.11	0.11	0.11
18.781	0.11	0.11	0.11	0.11	0.11	0.11	0.11
18.876	0.11	0.11	0.11	0.11	0.11	0.11	0.11
18.972	0.11	0.11	0.11	0.11	0.11	0.11	0.11
19.067	0.11	0.11	0.11	0.11	0.11	0.11	0.11
19.163	0.11	0.11	0.11	0.11	0.11	0.11	0.11
19.258	0.11	0.11	0.11	0.11	0.10	0.10	0.10
19.354	0.10	0.10	0.10	0.10	0.10	0.10	0.10
19.449	0.10	0.10	0.10	0.10	0.10	0.10	0.10
19.545	0.10	0.10	0.10	0.10	0.10	0.10	0.10
19.640	0.10	0.10	0.10	0.10	0.10	0.10	0.10
19.736	0.10	0.10	0.10	0.10	0.10	0.10	0.10
19.831	0.10	0.10	0.10	0.10	0.10	0.10	0.10
19.927	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.022	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.118	0.09	0.09	0.09	0.09	0.09	0.09	0.09

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing

STORM 25-Yr

SUB-AREA:
East Pond Outlet .00816 79. .216

STREAM REACH:

EIRSWD
Cell A Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.014 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
20.213	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.309	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.404	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.500	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.595	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.691	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.786	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.882	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.977	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.073	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.168	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.264	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.359	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.455	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.550	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.646	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.741	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.837	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.932	0.09	0.09	0.09	0.09	0.09	0.09	0.09
22.028	0.09	0.09	0.09	0.09	0.09	0.09	0.09
22.123	0.09	0.09	0.09	0.09	0.09	0.09	0.09
22.219	0.09	0.09	0.09	0.09	0.08	0.08	0.08
22.314	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.410	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.505	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.601	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.696	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.792	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.887	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.983	0.08	0.08	0.08	0.08	0.08	0.08	0.08

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing
STORM 25-Yr
SUB-AREA:
East Pond Outlet .00816 79. .216

STREAM REACH:

23.078	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.174	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.269	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.365	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.460	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.556	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.651	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.747	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.842	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.938	0.08	0.08	0.08	0.08	0.08	0.08	0.08
24.033	0.08	0.08	0.07	0.07	0.07	0.06	0.06
24.129	0.05						

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
OUTLET	0.008		0.641		12.04	4.19	513.13

EIRSWD
Cell A Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.014 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.523	0.05	0.06	0.06	0.07	0.08	0.09	0.10
11.619	0.11	0.13	0.15	0.17	0.20	0.24	0.28
11.714	0.32	0.37	0.43	0.50	0.57	0.66	0.75
11.810	0.86	0.98	1.12	1.28	1.47	1.69	1.94
11.905	2.21	2.50	2.79	3.07	3.34	3.57	3.78
12.001	3.95	4.07	4.15	4.19	4.17	4.09	3.95
12.096	3.76	3.53	3.29	3.04	2.78	2.54	2.32

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing

STORM 25-Yr

SUB-AREA:
East Pond Outlet .00816 79. .216

STREAM REACH:

12.192	2.11	1.92	1.77	1.64	1.53	1.43	1.35
12.287	1.28	1.21	1.15	1.10	1.06	1.02	0.98
12.383	0.94	0.91	0.88	0.86	0.83	0.81	0.78
12.478	0.76	0.74	0.72	0.70	0.68	0.66	0.64
12.574	0.63	0.61	0.60	0.58	0.57	0.56	0.55
12.669	0.54	0.53	0.52	0.51	0.50	0.50	0.49
12.765	0.49	0.48	0.48	0.47	0.47	0.46	0.46
12.860	0.45	0.45	0.45	0.44	0.44	0.43	0.43
12.956	0.43	0.42	0.42	0.41	0.41	0.41	0.40
13.051	0.40	0.40	0.39	0.39	0.38	0.38	0.38
13.147	0.38	0.37	0.37	0.37	0.36	0.36	0.36
13.242	0.36	0.35	0.35	0.35	0.35	0.35	0.34
13.338	0.34	0.34	0.34	0.33	0.33	0.33	0.33
13.433	0.33	0.32	0.32	0.32	0.32	0.32	0.31
13.529	0.31	0.31	0.31	0.31	0.30	0.30	0.30
13.624	0.30	0.30	0.29	0.29	0.29	0.29	0.29
13.720	0.28	0.28	0.28	0.28	0.28	0.28	0.28
13.815	0.27	0.27	0.27	0.27	0.27	0.27	0.26
13.911	0.26	0.26	0.26	0.26	0.26	0.25	0.25
14.006	0.25	0.25	0.25	0.25	0.25	0.24	0.24
14.102	0.24	0.24	0.24	0.24	0.24	0.24	0.23
14.197	0.23	0.23	0.23	0.23	0.23	0.23	0.23
14.293	0.23	0.23	0.23	0.23	0.23	0.23	0.23
14.388	0.22	0.22	0.22	0.22	0.22	0.22	0.22
14.484	0.22	0.22	0.22	0.22	0.22	0.22	0.22
14.579	0.22	0.22	0.22	0.22	0.22	0.21	0.21
14.675	0.21	0.21	0.21	0.21	0.21	0.21	0.21
14.770	0.21	0.21	0.21	0.21	0.21	0.21	0.21
14.866	0.21	0.21	0.21	0.20	0.20	0.20	0.20
14.961	0.20	0.20	0.20	0.20	0.20	0.20	0.20
15.057	0.20	0.20	0.20	0.20	0.20	0.20	0.20
15.152	0.20	0.19	0.19	0.19	0.19	0.19	0.19
15.248	0.19	0.19	0.19	0.19	0.19	0.19	0.19
15.343	0.19	0.19	0.19	0.19	0.19	0.18	0.18
15.439	0.18	0.18	0.18	0.18	0.18	0.18	0.18
15.534	0.18	0.18	0.18	0.18	0.18	0.18	0.18
15.630	0.18	0.17	0.17	0.17	0.17	0.17	0.17
15.725	0.17	0.17	0.17	0.17	0.17	0.17	0.17

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing
STORM 25-Yr
SUB-AREA:
East Pond Outlet .00816 79. .216

STREAM REACH:

15.820	0.17	0.17	0.17	0.17	0.17	0.16	0.16
15.916	0.16	0.16	0.16	0.16	0.16	0.16	0.16
16.011	0.16	0.16	0.16	0.16	0.16	0.16	0.16
16.107	0.16	0.15	0.15	0.15	0.15	0.15	0.15
16.202	0.15	0.15	0.15	0.15	0.15	0.15	0.15
16.298	0.15	0.15	0.15	0.15	0.15	0.15	0.15

EIRSWD
Cell A Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.014 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
16.393	0.15	0.15	0.15	0.15	0.15	0.15	0.15
16.489	0.15	0.15	0.15	0.15	0.15	0.15	0.15
16.584	0.15	0.15	0.15	0.15	0.15	0.15	0.15
16.680	0.15	0.15	0.14	0.14	0.14	0.14	0.14
16.775	0.14	0.14	0.14	0.14	0.14	0.14	0.14
16.871	0.14	0.14	0.14	0.14	0.14	0.14	0.14
16.966	0.14	0.14	0.14	0.14	0.14	0.14	0.14
17.062	0.14	0.14	0.14	0.14	0.14	0.14	0.14
17.157	0.14	0.14	0.14	0.14	0.14	0.14	0.14
17.253	0.14	0.14	0.14	0.14	0.14	0.14	0.14
17.348	0.14	0.14	0.14	0.13	0.13	0.13	0.13
17.444	0.13	0.13	0.13	0.13	0.13	0.13	0.13
17.539	0.13	0.13	0.13	0.13	0.13	0.13	0.13
17.635	0.13	0.13	0.13	0.13	0.13	0.13	0.13
17.730	0.13	0.13	0.13	0.13	0.13	0.13	0.13
17.826	0.13	0.13	0.13	0.13	0.13	0.13	0.13
17.921	0.13	0.13	0.13	0.13	0.13	0.13	0.13
18.017	0.13	0.13	0.12	0.12	0.12	0.12	0.12
18.112	0.12	0.12	0.12	0.12	0.12	0.12	0.12
18.208	0.12	0.12	0.12	0.12	0.12	0.12	0.12
18.303	0.12	0.12	0.12	0.12	0.12	0.12	0.12
18.399	0.12	0.12	0.12	0.12	0.12	0.12	0.12

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing

STORM 25-Yr

SUB-AREA:
East Pond Outlet .00816 79. .216

STREAM REACH:

18.494	0.12	0.12	0.12	0.12	0.12	0.12	0.12
18.590	0.12	0.12	0.12	0.12	0.12	0.12	0.12
18.685	0.11	0.11	0.11	0.11	0.11	0.11	0.11
18.781	0.11	0.11	0.11	0.11	0.11	0.11	0.11
18.876	0.11	0.11	0.11	0.11	0.11	0.11	0.11
18.972	0.11	0.11	0.11	0.11	0.11	0.11	0.11
19.067	0.11	0.11	0.11	0.11	0.11	0.11	0.11
19.163	0.11	0.11	0.11	0.11	0.11	0.11	0.11
19.258	0.11	0.11	0.11	0.11	0.10	0.10	0.10
19.354	0.10	0.10	0.10	0.10	0.10	0.10	0.10
19.449	0.10	0.10	0.10	0.10	0.10	0.10	0.10
19.545	0.10	0.10	0.10	0.10	0.10	0.10	0.10
19.640	0.10	0.10	0.10	0.10	0.10	0.10	0.10
19.736	0.10	0.10	0.10	0.10	0.10	0.10	0.10
19.831	0.10	0.10	0.10	0.10	0.10	0.10	0.10
19.927	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.022	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.118	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.213	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.309	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.404	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.500	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.595	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.691	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.786	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.882	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.977	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.073	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.168	0.09	0.09	0.09	0.09	0.09	0.09	0.09

EIRSWD
Cell A Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.014 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing

STORM 25-Yr

SUB-AREA:
East Pond Outlet .00816 79. .216

STREAM REACH:

21.264	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.359	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.455	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.550	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.646	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.741	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.837	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.932	0.09	0.09	0.09	0.09	0.09	0.09	0.09
22.028	0.09	0.09	0.09	0.09	0.09	0.09	0.09
22.123	0.09	0.09	0.09	0.09	0.09	0.09	0.09
22.219	0.09	0.09	0.09	0.09	0.08	0.08	0.08
22.314	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.410	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.505	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.601	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.696	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.792	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.887	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.983	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.078	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.174	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.269	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.365	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.460	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.556	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.651	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.747	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.842	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.938	0.08	0.08	0.08	0.08	0.08	0.08	0.08
24.033	0.08	0.08	0.07	0.07	0.07	0.06	0.06
24.129	0.05						

STORM 100-Yr

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing
STORM 100-Yr
SUB-AREA:
East Pond Outlet .00816 79. .216

STREAM REACH:

East Pond 0.008 1.042 12.04 7.01 858.76

Line Start Time (hr)	Flow Values @ time increment of 0.014 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
10.904	0.05	0.05	0.05	0.06	0.06	0.06	0.06
11.000	0.07	0.07	0.07	0.07	0.07	0.08	0.08
11.095	0.08	0.08	0.09	0.09	0.09	0.10	0.10
11.191	0.10	0.11	0.11	0.12	0.12	0.12	0.13
11.286	0.13	0.14	0.14	0.15	0.15	0.16	0.16
11.382	0.17	0.17	0.18	0.18	0.19	0.19	0.20
11.477	0.21	0.21	0.22	0.23	0.24	0.25	0.26

Line Start Time (hr)	Flow Values @ time increment of 0.014 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.573	0.28	0.31	0.33	0.37	0.41	0.45	0.50
11.668	0.56	0.64	0.72	0.81	0.91	1.03	1.15
11.764	1.29	1.45	1.62	1.81	2.01	2.24	2.50
11.859	2.80	3.14	3.53	3.97	4.43	4.89	5.34
11.955	5.76	6.13	6.44	6.69	6.87	6.98	7.01
12.050	6.96	6.83	6.60	6.29	5.91	5.50	5.08
12.146	4.66	4.25	3.87	3.51	3.19	2.92	2.70
12.241	2.50	2.34	2.19	2.06	1.95	1.85	1.76
12.337	1.68	1.61	1.55	1.49	1.44	1.39	1.35
12.432	1.30	1.27	1.23	1.19	1.16	1.12	1.09
12.528	1.06	1.03	1.00	0.98	0.95	0.93	0.90
12.623	0.88	0.86	0.84	0.83	0.81	0.80	0.79
12.719	0.78	0.77	0.76	0.75	0.74	0.73	0.72
12.814	0.72	0.71	0.70	0.69	0.69	0.68	0.68

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing

STORM 100-Yr

SUB-AREA:
East Pond Outlet .00816 79. .216

STREAM REACH:

12.910	0.67	0.66	0.66	0.65	0.64	0.64	0.63
13.005	0.63	0.62	0.61	0.61	0.60	0.60	0.59
13.101	0.59	0.58	0.58	0.57	0.57	0.56	0.56
13.196	0.55	0.55	0.55	0.54	0.54	0.53	0.53
13.292	0.53	0.52	0.52	0.52	0.51	0.51	0.51
13.387	0.50	0.50	0.50	0.49	0.49	0.49	0.48
13.483	0.48	0.48	0.47	0.47	0.47	0.46	0.46
13.578	0.46	0.46	0.45	0.45	0.45	0.44	0.44
13.674	0.44	0.43	0.43	0.43	0.43	0.42	0.42
13.769	0.42	0.42	0.41	0.41	0.41	0.41	0.40
13.865	0.40	0.40	0.40	0.40	0.39	0.39	0.39
13.960	0.39	0.38	0.38	0.38	0.38	0.37	0.37
14.056	0.37	0.37	0.36	0.36	0.36	0.36	0.36
14.151	0.36	0.35	0.35	0.35	0.35	0.35	0.35
14.247	0.35	0.34	0.34	0.34	0.34	0.34	0.34
14.342	0.34	0.34	0.34	0.34	0.34	0.33	0.33
14.438	0.33	0.33	0.33	0.33	0.33	0.33	0.33
14.533	0.33	0.33	0.33	0.33	0.32	0.32	0.32
14.629	0.32	0.32	0.32	0.32	0.32	0.32	0.32
14.724	0.32	0.32	0.31	0.31	0.31	0.31	0.31
14.820	0.31	0.31	0.31	0.31	0.31	0.31	0.31
14.915	0.30	0.30	0.30	0.30	0.30	0.30	0.30
15.011	0.30	0.30	0.30	0.30	0.30	0.29	0.29
15.106	0.29	0.29	0.29	0.29	0.29	0.29	0.29
15.202	0.29	0.29	0.29	0.28	0.28	0.28	0.28
15.297	0.28	0.28	0.28	0.28	0.28	0.28	0.28
15.393	0.28	0.27	0.27	0.27	0.27	0.27	0.27
15.488	0.27	0.27	0.27	0.27	0.27	0.26	0.26
15.584	0.26	0.26	0.26	0.26	0.26	0.26	0.26
15.679	0.26	0.26	0.26	0.25	0.25	0.25	0.25
15.775	0.25	0.25	0.25	0.25	0.25	0.25	0.25
15.870	0.24	0.24	0.24	0.24	0.24	0.24	0.24
15.966	0.24	0.24	0.24	0.24	0.24	0.23	0.23
16.061	0.23	0.23	0.23	0.23	0.23	0.23	0.23
16.157	0.23	0.23	0.23	0.23	0.23	0.23	0.22
16.252	0.22	0.22	0.22	0.22	0.22	0.22	0.22
16.348	0.22	0.22	0.22	0.22	0.22	0.22	0.22

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing
STORM 100-Yr
SUB-AREA:
East Pond Outlet .00816 79. .216

STREAM REACH:

EIRSWD
Cell A Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.014 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
16.443	0.22	0.22	0.22	0.22	0.22	0.22	0.22
16.538	0.22	0.22	0.22	0.22	0.22	0.22	0.22
16.634	0.22	0.22	0.21	0.21	0.21	0.21	0.21
16.729	0.21	0.21	0.21	0.21	0.21	0.21	0.21
16.825	0.21	0.21	0.21	0.21	0.21	0.21	0.21
16.920	0.21	0.21	0.21	0.21	0.21	0.21	0.21
17.016	0.21	0.21	0.21	0.21	0.21	0.21	0.21
17.111	0.20	0.20	0.20	0.20	0.20	0.20	0.20
17.207	0.20	0.20	0.20	0.20	0.20	0.20	0.20
17.302	0.20	0.20	0.20	0.20	0.20	0.20	0.20
17.398	0.20	0.20	0.20	0.20	0.20	0.20	0.20
17.493	0.20	0.20	0.20	0.20	0.20	0.19	0.19
17.589	0.19	0.19	0.19	0.19	0.19	0.19	0.19
17.684	0.19	0.19	0.19	0.19	0.19	0.19	0.19
17.780	0.19	0.19	0.19	0.19	0.19	0.19	0.19
17.875	0.19	0.19	0.19	0.19	0.19	0.19	0.19
17.971	0.19	0.19	0.18	0.18	0.18	0.18	0.18
18.066	0.18	0.18	0.18	0.18	0.18	0.18	0.18
18.162	0.18	0.18	0.18	0.18	0.18	0.18	0.18
18.257	0.18	0.18	0.18	0.18	0.18	0.18	0.18
18.353	0.18	0.18	0.18	0.18	0.18	0.17	0.17
18.448	0.17	0.17	0.17	0.17	0.17	0.17	0.17
18.544	0.17	0.17	0.17	0.17	0.17	0.17	0.17
18.639	0.17	0.17	0.17	0.17	0.17	0.17	0.17
18.735	0.17	0.17	0.17	0.17	0.17	0.17	0.17
18.830	0.17	0.16	0.16	0.16	0.16	0.16	0.16
18.926	0.16	0.16	0.16	0.16	0.16	0.16	0.16
19.021	0.16	0.16	0.16	0.16	0.16	0.16	0.16
19.117	0.16	0.16	0.16	0.16	0.16	0.16	0.16

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing
STORM 100-Yr
SUB-AREA:
East Pond Outlet .00816 79. .216

STREAM REACH:

19.212	0.16	0.16	0.16	0.15	0.15	0.15	0.15
19.308	0.15	0.15	0.15	0.15	0.15	0.15	0.15
19.403	0.15	0.15	0.15	0.15	0.15	0.15	0.15
19.499	0.15	0.15	0.15	0.15	0.15	0.15	0.15
19.594	0.15	0.15	0.15	0.15	0.15	0.15	0.14
19.690	0.14	0.14	0.14	0.14	0.14	0.14	0.14
19.785	0.14	0.14	0.14	0.14	0.14	0.14	0.14
19.881	0.14	0.14	0.14	0.14	0.14	0.14	0.14
19.976	0.14	0.14	0.14	0.14	0.14	0.14	0.14
20.072	0.14	0.13	0.13	0.13	0.13	0.13	0.13
20.167	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.263	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.358	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.454	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.549	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.645	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.740	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.836	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.931	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.027	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.122	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.218	0.13	0.13	0.13	0.13	0.13	0.13	0.13

EIRSWD
Cell A Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.014 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
21.313	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.409	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.504	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.600	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.695	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.791	0.13	0.13	0.13	0.13	0.13	0.13	0.13

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing
STORM 100-Yr
SUB-AREA:
East Pond Outlet .00816 79. .216

STREAM REACH:

21.886	0.13	0.13	0.13	0.13	0.13	0.13	0.12
21.982	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.077	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.173	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.268	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.364	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.459	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.555	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.650	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.746	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.841	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.937	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.032	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.128	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.223	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.319	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.414	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.510	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.605	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.701	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.796	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.892	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.987	0.12	0.12	0.12	0.11	0.11	0.11	0.11
24.083	0.10	0.09	0.08	0.08	0.07	0.06	0.05

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
OUTLET	0.008		1.042		12.04	7.01	858.76

Line Start Time (hr)	Flow Values @ time increment of 0.014 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
10.904	0.05	0.05	0.05	0.06	0.06	0.06	0.06
11.000	0.07	0.07	0.07	0.07	0.07	0.08	0.08
11.095	0.08	0.08	0.09	0.09	0.09	0.10	0.10

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing
STORM 100-Yr
SUB-AREA:
East Pond Outlet .00816 79. .216

STREAM REACH:

11.191	0.10	0.11	0.11	0.12	0.12	0.12	0.13
11.286	0.13	0.14	0.14	0.15	0.15	0.16	0.16
11.382	0.17	0.17	0.18	0.18	0.19	0.19	0.20
11.477	0.21	0.21	0.22	0.23	0.24	0.25	0.26
11.573	0.28	0.31	0.33	0.37	0.41	0.45	0.50
11.668	0.56	0.64	0.72	0.81	0.91	1.03	1.15
11.764	1.29	1.45	1.62	1.81	2.01	2.24	2.50

EIRSWD
Cell A Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.014 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.859	2.80	3.14	3.53	3.97	4.43	4.89	5.34
11.955	5.76	6.13	6.44	6.69	6.87	6.98	7.01
12.050	6.96	6.83	6.60	6.29	5.91	5.50	5.08
12.146	4.66	4.25	3.87	3.51	3.19	2.92	2.70
12.241	2.50	2.34	2.19	2.06	1.95	1.85	1.76
12.337	1.68	1.61	1.55	1.49	1.44	1.39	1.35
12.432	1.30	1.27	1.23	1.19	1.16	1.12	1.09
12.528	1.06	1.03	1.00	0.98	0.95	0.93	0.90
12.623	0.88	0.86	0.84	0.83	0.81	0.80	0.79
12.719	0.78	0.77	0.76	0.75	0.74	0.73	0.72
12.814	0.72	0.71	0.70	0.69	0.69	0.68	0.68
12.910	0.67	0.66	0.66	0.65	0.64	0.64	0.63
13.005	0.63	0.62	0.61	0.61	0.60	0.60	0.59
13.101	0.59	0.58	0.58	0.57	0.57	0.56	0.56
13.196	0.55	0.55	0.55	0.54	0.54	0.53	0.53
13.292	0.53	0.52	0.52	0.52	0.51	0.51	0.51
13.387	0.50	0.50	0.50	0.49	0.49	0.49	0.48
13.483	0.48	0.48	0.47	0.47	0.47	0.46	0.46
13.578	0.46	0.46	0.45	0.45	0.45	0.44	0.44
13.674	0.44	0.43	0.43	0.43	0.43	0.42	0.42
13.769	0.42	0.42	0.41	0.41	0.41	0.41	0.40

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing
STORM 100-Yr
SUB-AREA:
East Pond Outlet .00816 79. .216

STREAM REACH:

13.865	0.40	0.40	0.40	0.40	0.39	0.39	0.39
13.960	0.39	0.38	0.38	0.38	0.38	0.37	0.37
14.056	0.37	0.37	0.36	0.36	0.36	0.36	0.36
14.151	0.36	0.35	0.35	0.35	0.35	0.35	0.35
14.247	0.35	0.34	0.34	0.34	0.34	0.34	0.34
14.342	0.34	0.34	0.34	0.34	0.34	0.33	0.33
14.438	0.33	0.33	0.33	0.33	0.33	0.33	0.33
14.533	0.33	0.33	0.33	0.33	0.32	0.32	0.32
14.629	0.32	0.32	0.32	0.32	0.32	0.32	0.32
14.724	0.32	0.32	0.31	0.31	0.31	0.31	0.31
14.820	0.31	0.31	0.31	0.31	0.31	0.31	0.31
14.915	0.30	0.30	0.30	0.30	0.30	0.30	0.30
15.011	0.30	0.30	0.30	0.30	0.30	0.29	0.29
15.106	0.29	0.29	0.29	0.29	0.29	0.29	0.29
15.202	0.29	0.29	0.29	0.28	0.28	0.28	0.28
15.297	0.28	0.28	0.28	0.28	0.28	0.28	0.28
15.393	0.28	0.27	0.27	0.27	0.27	0.27	0.27
15.488	0.27	0.27	0.27	0.27	0.27	0.26	0.26
15.584	0.26	0.26	0.26	0.26	0.26	0.26	0.26
15.679	0.26	0.26	0.26	0.25	0.25	0.25	0.25
15.775	0.25	0.25	0.25	0.25	0.25	0.25	0.25
15.870	0.24	0.24	0.24	0.24	0.24	0.24	0.24
15.966	0.24	0.24	0.24	0.24	0.24	0.23	0.23
16.061	0.23	0.23	0.23	0.23	0.23	0.23	0.23
16.157	0.23	0.23	0.23	0.23	0.23	0.23	0.22
16.252	0.22	0.22	0.22	0.22	0.22	0.22	0.22
16.348	0.22	0.22	0.22	0.22	0.22	0.22	0.22
16.443	0.22	0.22	0.22	0.22	0.22	0.22	0.22
16.538	0.22	0.22	0.22	0.22	0.22	0.22	0.22
16.634	0.22	0.22	0.21	0.21	0.21	0.21	0.21

EIRSWD
Cell A Pond Sizing

Line
Start Time ---------- Flow Values @ time increment of 0.014 hr ----------

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing

STORM 100-Yr

SUB-AREA:
East Pond Outlet .00816 79. .216

STREAM REACH:

(hr)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
16.729	0.21	0.21	0.21	0.21	0.21	0.21	0.21
16.825	0.21	0.21	0.21	0.21	0.21	0.21	0.21
16.920	0.21	0.21	0.21	0.21	0.21	0.21	0.21
17.016	0.21	0.21	0.21	0.21	0.21	0.21	0.21
17.111	0.20	0.20	0.20	0.20	0.20	0.20	0.20
17.207	0.20	0.20	0.20	0.20	0.20	0.20	0.20
17.302	0.20	0.20	0.20	0.20	0.20	0.20	0.20
17.398	0.20	0.20	0.20	0.20	0.20	0.20	0.20
17.493	0.20	0.20	0.20	0.20	0.20	0.19	0.19
17.589	0.19	0.19	0.19	0.19	0.19	0.19	0.19
17.684	0.19	0.19	0.19	0.19	0.19	0.19	0.19
17.780	0.19	0.19	0.19	0.19	0.19	0.19	0.19
17.875	0.19	0.19	0.19	0.19	0.19	0.19	0.19
17.971	0.19	0.19	0.18	0.18	0.18	0.18	0.18
18.066	0.18	0.18	0.18	0.18	0.18	0.18	0.18
18.162	0.18	0.18	0.18	0.18	0.18	0.18	0.18
18.257	0.18	0.18	0.18	0.18	0.18	0.18	0.18
18.353	0.18	0.18	0.18	0.18	0.18	0.17	0.17
18.448	0.17	0.17	0.17	0.17	0.17	0.17	0.17
18.544	0.17	0.17	0.17	0.17	0.17	0.17	0.17
18.639	0.17	0.17	0.17	0.17	0.17	0.17	0.17
18.735	0.17	0.17	0.17	0.17	0.17	0.17	0.17
18.830	0.17	0.16	0.16	0.16	0.16	0.16	0.16
18.926	0.16	0.16	0.16	0.16	0.16	0.16	0.16
19.021	0.16	0.16	0.16	0.16	0.16	0.16	0.16
19.117	0.16	0.16	0.16	0.16	0.16	0.16	0.16
19.212	0.16	0.16	0.16	0.15	0.15	0.15	0.15
19.308	0.15	0.15	0.15	0.15	0.15	0.15	0.15
19.403	0.15	0.15	0.15	0.15	0.15	0.15	0.15
19.499	0.15	0.15	0.15	0.15	0.15	0.15	0.15
19.594	0.15	0.15	0.15	0.15	0.15	0.15	0.14
19.690	0.14	0.14	0.14	0.14	0.14	0.14	0.14
19.785	0.14	0.14	0.14	0.14	0.14	0.14	0.14
19.881	0.14	0.14	0.14	0.14	0.14	0.14	0.14
19.976	0.14	0.14	0.14	0.14	0.14	0.14	0.14
20.072	0.14	0.13	0.13	0.13	0.13	0.13	0.13

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing
STORM 100-Yr
SUB-AREA:
East Pond Outlet .00816 79. .216

STREAM REACH:

20.167	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.263	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.358	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.454	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.549	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.645	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.740	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.836	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.931	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.027	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.122	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.218	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.313	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.409	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.504	0.13	0.13	0.13	0.13	0.13	0.13	0.13

EIRSWD
Cell A Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.014 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
21.600	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.695	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.791	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.886	0.13	0.13	0.13	0.13	0.13	0.13	0.12
21.982	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.077	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.173	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.268	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.364	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.459	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.555	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.650	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.746	0.12	0.12	0.12	0.12	0.12	0.12	0.12

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing

STORM 100-Yr

SUB-AREA:
East Pond Outlet .00816 79. .216

STREAM REACH:

22.841	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.937	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.032	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.128	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.223	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.319	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.414	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.510	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.605	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.701	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.796	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.892	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.987	0.12	0.12	0.12	0.11	0.11	0.11	0.11
24.083	0.10	0.09	0.08	0.08	0.07	0.06	0.05

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing
STORM 100-Yr
SUB-AREA:
East Pond Outlet .00816 79. .216

STREAM REACH:

EIRSWD
Cell A Pond Sizing

Area or Reach Identifier	Drainage Area (sq mi)	Alternate	Peak Flow by Storm 25-Yr (cfs)	100-Yr (cfs)	(cfs)	(cfs)	(cfs)
East Pond	0.008		4.19	7.01			
OUTLET	0.008		4.19	7.01			

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WinTR-20: Version 1.10                  0         0         0.05
D                                                                                    (continued)
Cell A Pond Sizing
                                           STORM 100-Yr
SUB-AREA:
          East Pond Outlet              .00816    79.       .216

STREAM REACH:
```

WinTR-55 Current Data Description

--- Identification Data ---

User: AMR
Project: EIRSWD
SubTitle: Cell A Pond Sizing
State: Idaho
County: Madison
Filename: Y:\Shared\Boise Projects\4-20133-E Idaho SW District Landfill Design And Engineering Support\Pr

Date: 7/3/2023
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
East Pond		Outlet	5.22	79	.216

Total area: 5.22 (ac)

--- Storm Data --

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
1.2	1.6	1.8	2.2	2.5	2.8	1.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type II
Dimensionless Unit Hydrograph: <standard>

EIRSWD
Cell A Pond Sizing
Madison County, Idaho

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
1.2	1.6	1.8	2.2	2.5	2.8	1.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type II
Dimensionless Unit Hydrograph: <standard>

AMR

EIRSWD
Cell A Pond Sizing
Madison County, Idaho

Watershed Peak Table

Sub-Area or Reach Identifier	Peak Flow by Rainfall Return Period 25-Yr (cfs)	100-Yr (cfs)
SUBAREAS		
East Pond	4.19	7.01
REACHES		
OUTLET	4.19	7.01

AMR EIRSWD
Cell A Pond Sizing
Madison County, Idaho

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 25-Yr (cfs) (hr)	100-Yr (cfs) (hr)
SUBAREAS		
East Pond	4.19 12.04	7.01 12.04
REACHES		
OUTLET	4.19	7.01

AMR

EIRSWD
Cell A Pond Sizing
Madison County, Idaho

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
East Pond	5.22	0.216	79	Outlet	

Total Area: 5.22 (ac)

EIRSWD
Cell A Pond Sizing
Madison County, Idaho

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
East Pond							
SHEET	100	0.0538	0.150				0.180
SHALLOW	452	0.0540	0.050				0.033
SHALLOW	101	0.3330	0.050				0.003
						Time of Concentration	.216

EIRSWD
Cell A Pond Sizing
Madison County, Idaho

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use	Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
East Pond	Open space; grass cover 50% to 75% (fair)	C	5.22	79
	Total Area / Weighted Curve Number		5.22	79

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WinTR-20 Printed Page File      Beginning of Input Data List
TR20.inp

WinTR-20: Version 1.10                  0         0         0.05
EIRSWD
Cell A Pond Sizing

SUB-AREA:
          South PondOutlet              .0132     79.       .304

STREAM REACH:

STORM ANALYSIS:
          25-Yr                         2.2       Type II   2
          100-Yr                        2.8       Type II   2

STRUCTURE RATING:


GLOBAL OUTPUT:
          2         0.05                YYYYN     YYYYNN


WinTR-20 Printed Page File      End of Input Data List
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EIRSWD
Cell A Pond Sizing

Name of printed page file:
TR20.out

STORM 25-Yr

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
South Pond	0.013		0.642		12.09	5.86	444.21

Line Start Time (hr)	Flow Values @ time increment of 0.019 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.490	0.05	0.06	0.06	0.07	0.08	0.09	0.11
11.624	0.13	0.16	0.19	0.23	0.28	0.35	0.43
11.759	0.52	0.64	0.78	0.94	1.15	1.39	1.68
11.893	2.03	2.44	2.89	3.38	3.89	4.38	4.84
12.027	5.23	5.54	5.75	5.86	5.85	5.71	5.47
12.162	5.16	4.81	4.44	4.08	3.73	3.40	3.10
12.296	2.84	2.62	2.43	2.27	2.13	2.00	1.88
12.431	1.78	1.69	1.60	1.53	1.45	1.39	1.33
12.565	1.27	1.22	1.17	1.12	1.08	1.04	1.01
12.699	0.97	0.94	0.92	0.89	0.87	0.85	0.83
12.834	0.81	0.80	0.78	0.77	0.75	0.74	0.73
12.968	0.72	0.71	0.70	0.69	0.68	0.67	0.66
13.103	0.66	0.65	0.64	0.63	0.62	0.62	0.61
13.237	0.60	0.60	0.59	0.58	0.58	0.57	0.57
13.371	0.56	0.56	0.55	0.55	0.54	0.54	0.53
13.506	0.53	0.52	0.52	0.51	0.51	0.50	0.50
13.640	0.49	0.49	0.49	0.48	0.48	0.47	0.47
13.775	0.46	0.46	0.46	0.45	0.45	0.45	0.44
13.909	0.44	0.43	0.43	0.43	0.42	0.42	0.42
14.043	0.41	0.41	0.41	0.40	0.40	0.40	0.39
14.178	0.39	0.39	0.39	0.38	0.38	0.38	0.38
14.312	0.38	0.37	0.37	0.37	0.37	0.37	0.37
14.447	0.36	0.36	0.36	0.36	0.36	0.36	0.36
14.581	0.36	0.35	0.35	0.35	0.35	0.35	0.35
14.715	0.35	0.35	0.35	0.34	0.34	0.34	0.34
14.850	0.34	0.34	0.34	0.34	0.33	0.33	0.33
14.984	0.33	0.33	0.33	0.33	0.33	0.32	0.32
15.119	0.32	0.32	0.32	0.32	0.32	0.32	0.31
15.253	0.31	0.31	0.31	0.31	0.31	0.31	0.31
15.387	0.30	0.30	0.30	0.30	0.30	0.30	0.30
15.522	0.30	0.29	0.29	0.29	0.29	0.29	0.29
15.656	0.29	0.29	0.28	0.28	0.28	0.28	0.28
15.791	0.28	0.28	0.27	0.27	0.27	0.27	0.27
15.925	0.27	0.27	0.27	0.26	0.26	0.26	0.26

16.059	0.26	0.26	0.26	0.26	0.25	0.25	0.25
16.194	0.25	0.25	0.25	0.25	0.25	0.25	0.25
16.328	0.25	0.24	0.24	0.24	0.24	0.24	0.24
16.463	0.24	0.24	0.24	0.24	0.24	0.24	0.24
16.597	0.24	0.24	0.24	0.24	0.24	0.24	0.24
16.731	0.24	0.23	0.23	0.23	0.23	0.23	0.23

EIRSWD
Cell A Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.019 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
16.866	0.23	0.23	0.23	0.23	0.23	0.23	0.23
17.000	0.23	0.23	0.23	0.23	0.23	0.23	0.23
17.135	0.23	0.23	0.23	0.22	0.22	0.22	0.22
17.269	0.22	0.22	0.22	0.22	0.22	0.22	0.22
17.403	0.22	0.22	0.22	0.22	0.22	0.22	0.22
17.538	0.22	0.22	0.22	0.21	0.21	0.21	0.21
17.672	0.21	0.21	0.21	0.21	0.21	0.21	0.21
17.807	0.21	0.21	0.21	0.21	0.21	0.21	0.21
17.941	0.21	0.21	0.21	0.21	0.20	0.20	0.20
18.075	0.20	0.20	0.20	0.20	0.20	0.20	0.20
18.210	0.20	0.20	0.20	0.20	0.20	0.20	0.20
18.344	0.20	0.20	0.20	0.20	0.19	0.19	0.19
18.479	0.19	0.19	0.19	0.19	0.19	0.19	0.19
18.613	0.19	0.19	0.19	0.19	0.19	0.19	0.19
18.747	0.19	0.19	0.19	0.18	0.18	0.18	0.18
18.882	0.18	0.18	0.18	0.18	0.18	0.18	0.18
19.016	0.18	0.18	0.18	0.18	0.18	0.18	0.18
19.151	0.18	0.18	0.17	0.17	0.17	0.17	0.17
19.285	0.17	0.17	0.17	0.17	0.17	0.17	0.17
19.419	0.17	0.17	0.17	0.17	0.17	0.17	0.17
19.554	0.17	0.16	0.16	0.16	0.16	0.16	0.16
19.688	0.16	0.16	0.16	0.16	0.16	0.16	0.16
19.823	0.16	0.16	0.16	0.16	0.16	0.16	0.16
19.957	0.15	0.15	0.15	0.15	0.15	0.15	0.15
20.091	0.15	0.15	0.15	0.15	0.15	0.15	0.15
20.226	0.15	0.15	0.15	0.15	0.15	0.15	0.15
20.360	0.15	0.15	0.15	0.15	0.15	0.15	0.15
20.495	0.15	0.15	0.15	0.15	0.15	0.15	0.15
20.629	0.15	0.15	0.15	0.15	0.14	0.14	0.14
20.763	0.14	0.14	0.14	0.14	0.14	0.14	0.14
20.898	0.14	0.14	0.14	0.14	0.14	0.14	0.14
21.032	0.14	0.14	0.14	0.14	0.14	0.14	0.14
21.167	0.14	0.14	0.14	0.14	0.14	0.14	0.14
21.301	0.14	0.14	0.14	0.14	0.14	0.14	0.14
21.435	0.14	0.14	0.14	0.14	0.14	0.14	0.14
21.570	0.14	0.14	0.14	0.14	0.14	0.14	0.14
21.704	0.14	0.14	0.14	0.14	0.14	0.14	0.14
21.839	0.14	0.14	0.14	0.14	0.14	0.14	0.14
21.973	0.14	0.14	0.14	0.14	0.14	0.14	0.14
22.107	0.14	0.14	0.14	0.14	0.14	0.14	0.14
22.242	0.14	0.14	0.14	0.14	0.14	0.14	0.14
22.376	0.14	0.14	0.14	0.14	0.14	0.14	0.14
22.511	0.14	0.14	0.14	0.14	0.14	0.14	0.14
22.645	0.14	0.14	0.14	0.14	0.14	0.14	0.14
22.779	0.14	0.14	0.14	0.14	0.14	0.13	0.13
22.914	0.13	0.13	0.13	0.13	0.13	0.13	0.13
23.048	0.13	0.13	0.13	0.13	0.13	0.13	0.13
23.183	0.13	0.13	0.13	0.13	0.13	0.13	0.13
23.317	0.13	0.13	0.13	0.13	0.13	0.13	0.13
23.451	0.13	0.13	0.13	0.13	0.13	0.13	0.13
23.586	0.13	0.13	0.13	0.13	0.13	0.13	0.13

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing

STORM 25-Yr

SUB-AREA:
South PondOutlet .0132 79. .304

STREAM REACH:

EIRSWD
Cell A Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.019 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
23.720	0.13	0.13	0.13	0.13	0.13	0.13	0.13
23.855	0.13	0.13	0.13	0.13	0.13	0.13	0.13
23.989	0.13	0.13	0.13	0.13	0.12	0.12	0.12
24.123	0.11	0.10	0.09	0.08	0.07	0.06	0.05

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
OUTLET	0.013		0.642		12.09	5.86	444.21

Line Start Time (hr)	Flow Values @ time increment of 0.019 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.490	0.05	0.06	0.06	0.07	0.08	0.09	0.11
11.624	0.13	0.16	0.19	0.23	0.28	0.35	0.43
11.759	0.52	0.64	0.78	0.94	1.15	1.39	1.68
11.893	2.03	2.44	2.89	3.38	3.89	4.38	4.84
12.027	5.23	5.54	5.75	5.86	5.85	5.71	5.47
12.162	5.16	4.81	4.44	4.08	3.73	3.40	3.10
12.296	2.84	2.62	2.43	2.27	2.13	2.00	1.88
12.431	1.78	1.69	1.60	1.53	1.45	1.39	1.33
12.565	1.27	1.22	1.17	1.12	1.08	1.04	1.01
12.699	0.97	0.94	0.92	0.89	0.87	0.85	0.83
12.834	0.81	0.80	0.78	0.77	0.75	0.74	0.73
12.968	0.72	0.71	0.70	0.69	0.68	0.67	0.66
13.103	0.66	0.65	0.64	0.63	0.62	0.62	0.61
13.237	0.60	0.60	0.59	0.58	0.58	0.57	0.57
13.371	0.56	0.56	0.55	0.55	0.54	0.54	0.53

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing

STORM 25-Yr

SUB-AREA:
South PondOutlet .0132 79. .304

STREAM REACH:

13.506	0.53	0.52	0.52	0.51	0.51	0.50	0.50
13.640	0.49	0.49	0.49	0.48	0.48	0.47	0.47
13.775	0.46	0.46	0.46	0.45	0.45	0.45	0.44
13.909	0.44	0.43	0.43	0.43	0.42	0.42	0.42
14.043	0.41	0.41	0.41	0.40	0.40	0.40	0.39
14.178	0.39	0.39	0.39	0.38	0.38	0.38	0.38
14.312	0.38	0.37	0.37	0.37	0.37	0.37	0.37
14.447	0.36	0.36	0.36	0.36	0.36	0.36	0.36
14.581	0.36	0.35	0.35	0.35	0.35	0.35	0.35
14.715	0.35	0.35	0.35	0.34	0.34	0.34	0.34
14.850	0.34	0.34	0.34	0.34	0.33	0.33	0.33
14.984	0.33	0.33	0.33	0.33	0.33	0.32	0.32
15.119	0.32	0.32	0.32	0.32	0.32	0.32	0.31
15.253	0.31	0.31	0.31	0.31	0.31	0.31	0.31
15.387	0.30	0.30	0.30	0.30	0.30	0.30	0.30
15.522	0.30	0.29	0.29	0.29	0.29	0.29	0.29
15.656	0.29	0.29	0.28	0.28	0.28	0.28	0.28
15.791	0.28	0.28	0.27	0.27	0.27	0.27	0.27
15.925	0.27	0.27	0.27	0.26	0.26	0.26	0.26
16.059	0.26	0.26	0.26	0.26	0.25	0.25	0.25
16.194	0.25	0.25	0.25	0.25	0.25	0.25	0.25

Line Start Time (hr)	Flow Values @ time increment of 0.019 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
16.328	0.25	0.24	0.24	0.24	0.24	0.24	0.24
16.463	0.24	0.24	0.24	0.24	0.24	0.24	0.24
16.597	0.24	0.24	0.24	0.24	0.24	0.24	0.24
16.731	0.24	0.23	0.23	0.23	0.23	0.23	0.23
16.866	0.23	0.23	0.23	0.23	0.23	0.23	0.23
17.000	0.23	0.23	0.23	0.23	0.23	0.23	0.23
17.135	0.23	0.23	0.23	0.22	0.22	0.22	0.22

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing
STORM 25-Yr
SUB-AREA:
South PondOutlet .0132 79. .304

STREAM REACH:

17.269	0.22	0.22	0.22	0.22	0.22	0.22	0.22
17.403	0.22	0.22	0.22	0.22	0.22	0.22	0.22
17.538	0.22	0.22	0.22	0.21	0.21	0.21	0.21
17.672	0.21	0.21	0.21	0.21	0.21	0.21	0.21
17.807	0.21	0.21	0.21	0.21	0.21	0.21	0.21
17.941	0.21	0.21	0.21	0.21	0.20	0.20	0.20
18.075	0.20	0.20	0.20	0.20	0.20	0.20	0.20
18.210	0.20	0.20	0.20	0.20	0.20	0.20	0.20
18.344	0.20	0.20	0.20	0.20	0.19	0.19	0.19
18.479	0.19	0.19	0.19	0.19	0.19	0.19	0.19
18.613	0.19	0.19	0.19	0.19	0.19	0.19	0.19
18.747	0.19	0.19	0.19	0.18	0.18	0.18	0.18
18.882	0.18	0.18	0.18	0.18	0.18	0.18	0.18
19.016	0.18	0.18	0.18	0.18	0.18	0.18	0.18
19.151	0.18	0.18	0.17	0.17	0.17	0.17	0.17
19.285	0.17	0.17	0.17	0.17	0.17	0.17	0.17
19.419	0.17	0.17	0.17	0.17	0.17	0.17	0.17
19.554	0.17	0.16	0.16	0.16	0.16	0.16	0.16
19.688	0.16	0.16	0.16	0.16	0.16	0.16	0.16
19.823	0.16	0.16	0.16	0.16	0.16	0.16	0.16
19.957	0.15	0.15	0.15	0.15	0.15	0.15	0.15
20.091	0.15	0.15	0.15	0.15	0.15	0.15	0.15
20.226	0.15	0.15	0.15	0.15	0.15	0.15	0.15
20.360	0.15	0.15	0.15	0.15	0.15	0.15	0.15
20.495	0.15	0.15	0.15	0.15	0.15	0.15	0.15
20.629	0.15	0.15	0.15	0.15	0.14	0.14	0.14
20.763	0.14	0.14	0.14	0.14	0.14	0.14	0.14
20.898	0.14	0.14	0.14	0.14	0.14	0.14	0.14
21.032	0.14	0.14	0.14	0.14	0.14	0.14	0.14
21.167	0.14	0.14	0.14	0.14	0.14	0.14	0.14
21.301	0.14	0.14	0.14	0.14	0.14	0.14	0.14
21.435	0.14	0.14	0.14	0.14	0.14	0.14	0.14
21.570	0.14	0.14	0.14	0.14	0.14	0.14	0.14
21.704	0.14	0.14	0.14	0.14	0.14	0.14	0.14
21.839	0.14	0.14	0.14	0.14	0.14	0.14	0.14
21.973	0.14	0.14	0.14	0.14	0.14	0.14	0.14
22.107	0.14	0.14	0.14	0.14	0.14	0.14	0.14
22.242	0.14	0.14	0.14	0.14	0.14	0.14	0.14

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing

STORM 25-Yr

SUB-AREA:
South PondOutlet .0132 79. .304

STREAM REACH:

22.376	0.14	0.14	0.14	0.14	0.14	0.14	0.14
22.511	0.14	0.14	0.14	0.14	0.14	0.14	0.14
22.645	0.14	0.14	0.14	0.14	0.14	0.14	0.14
22.779	0.14	0.14	0.14	0.14	0.14	0.13	0.13
22.914	0.13	0.13	0.13	0.13	0.13	0.13	0.13
23.048	0.13	0.13	0.13	0.13	0.13	0.13	0.13

EIRSWD
Cell A Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.019 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
23.183	0.13	0.13	0.13	0.13	0.13	0.13	0.13
23.317	0.13	0.13	0.13	0.13	0.13	0.13	0.13
23.451	0.13	0.13	0.13	0.13	0.13	0.13	0.13
23.586	0.13	0.13	0.13	0.13	0.13	0.13	0.13
23.720	0.13	0.13	0.13	0.13	0.13	0.13	0.13
23.855	0.13	0.13	0.13	0.13	0.13	0.13	0.13
23.989	0.13	0.13	0.13	0.13	0.12	0.12	0.12
24.123	0.11	0.10	0.09	0.08	0.07	0.06	0.05

STORM 100-Yr

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
South Pond	0.013		1.043		12.09	9.92	751.25

Line Start Time (hr)	Flow Values @ time increment of 0.019 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
10.823	0.05	0.06	0.06	0.06	0.07	0.07	0.08

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing
STORM 100-Yr
SUB-AREA:
South PondOutlet .0132 79. .304

STREAM REACH:

10.957	0.08	0.08	0.09	0.09	0.10	0.10	0.11
11.092	0.11	0.12	0.12	0.13	0.14	0.14	0.15
11.226	0.16	0.17	0.17	0.18	0.19	0.20	0.21
11.361	0.22	0.23	0.24	0.25	0.26	0.28	0.29
11.495	0.30	0.32	0.33	0.35	0.38	0.41	0.45
11.629	0.50	0.57	0.65	0.75	0.87	1.02	1.20
11.764	1.41	1.65	1.93	2.25	2.64	3.10	3.63
11.898	4.24	4.95	5.71	6.51	7.30	8.05	8.72
12.033	9.25	9.64	9.87	9.92	9.76	9.41	8.93
12.167	8.35	7.73	7.11	6.50	5.92	5.38	4.89
12.301	4.48	4.12	3.82	3.56	3.33	3.12	2.93
12.436	2.77	2.62	2.48	2.36	2.25	2.14	2.04
12.570	1.95	1.87	1.79	1.72	1.65	1.59	1.54
12.705	1.48	1.44	1.40	1.36	1.32	1.29	1.26
12.839	1.23	1.21	1.19	1.17	1.15	1.13	1.11
12.973	1.10	1.08	1.06	1.05	1.04	1.02	1.01
13.108	0.99	0.98	0.97	0.96	0.94	0.93	0.92
13.242	0.91	0.90	0.89	0.88	0.87	0.87	0.86
13.377	0.85	0.84	0.83	0.83	0.82	0.81	0.80
13.511	0.79	0.79	0.78	0.77	0.76	0.76	0.75
13.645	0.74	0.74	0.73	0.72	0.72	0.71	0.70
13.780	0.70	0.69	0.69	0.68	0.67	0.67	0.66
13.914	0.66	0.65	0.65	0.64	0.63	0.63	0.62
14.049	0.62	0.61	0.61	0.60	0.60	0.59	0.59
14.183	0.58	0.58	0.58	0.57	0.57	0.57	0.56
14.317	0.56	0.56	0.56	0.55	0.55	0.55	0.55
14.452	0.55	0.54	0.54	0.54	0.54	0.54	0.53
14.586	0.53	0.53	0.53	0.53	0.52	0.52	0.52
14.721	0.52	0.52	0.51	0.51	0.51	0.51	0.51

EIRSWD
Cell A Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.019 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing

STORM 100-Yr

SUB-AREA:
South PondOutlet .0132 79. .304

STREAM REACH:

14.855	0.51	0.50	0.50	0.50	0.50	0.50	0.49
14.989	0.49	0.49	0.49	0.49	0.48	0.48	0.48
15.124	0.48	0.48	0.48	0.47	0.47	0.47	0.47
15.258	0.47	0.46	0.46	0.46	0.46	0.46	0.45
15.393	0.45	0.45	0.45	0.45	0.44	0.44	0.44
15.527	0.44	0.44	0.43	0.43	0.43	0.43	0.43
15.661	0.42	0.42	0.42	0.42	0.42	0.41	0.41
15.796	0.41	0.41	0.41	0.40	0.40	0.40	0.40
15.930	0.40	0.39	0.39	0.39	0.39	0.39	0.38
16.065	0.38	0.38	0.38	0.38	0.38	0.37	0.37
16.199	0.37	0.37	0.37	0.37	0.37	0.36	0.36
16.333	0.36	0.36	0.36	0.36	0.36	0.36	0.36
16.468	0.36	0.36	0.36	0.35	0.35	0.35	0.35
16.602	0.35	0.35	0.35	0.35	0.35	0.35	0.35
16.737	0.35	0.35	0.35	0.35	0.34	0.34	0.34
16.871	0.34	0.34	0.34	0.34	0.34	0.34	0.34
17.005	0.34	0.34	0.34	0.34	0.33	0.33	0.33
17.140	0.33	0.33	0.33	0.33	0.33	0.33	0.33
17.274	0.33	0.33	0.33	0.33	0.33	0.32	0.32
17.409	0.32	0.32	0.32	0.32	0.32	0.32	0.32
17.543	0.32	0.32	0.32	0.32	0.32	0.31	0.31
17.677	0.31	0.31	0.31	0.31	0.31	0.31	0.31
17.812	0.31	0.31	0.31	0.31	0.31	0.30	0.30
17.946	0.30	0.30	0.30	0.30	0.30	0.30	0.30
18.081	0.30	0.30	0.30	0.30	0.30	0.29	0.29
18.215	0.29	0.29	0.29	0.29	0.29	0.29	0.29
18.349	0.29	0.29	0.29	0.29	0.29	0.28	0.28
18.484	0.28	0.28	0.28	0.28	0.28	0.28	0.28
18.618	0.28	0.28	0.28	0.28	0.27	0.27	0.27
18.753	0.27	0.27	0.27	0.27	0.27	0.27	0.27
18.887	0.27	0.27	0.27	0.27	0.26	0.26	0.26
19.021	0.26	0.26	0.26	0.26	0.26	0.26	0.26
19.156	0.26	0.26	0.26	0.26	0.25	0.25	0.25
19.290	0.25	0.25	0.25	0.25	0.25	0.25	0.25
19.425	0.25	0.25	0.25	0.24	0.24	0.24	0.24
19.559	0.24	0.24	0.24	0.24	0.24	0.24	0.24
19.693	0.24	0.24	0.23	0.23	0.23	0.23	0.23

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing
STORM 100-Yr
SUB-AREA:
South PondOutlet .0132 79. .304

STREAM REACH:

19.828	0.23	0.23	0.23	0.23	0.23	0.23	0.23
19.962	0.23	0.22	0.22	0.22	0.22	0.22	0.22
20.097	0.22	0.22	0.22	0.22	0.22	0.22	0.22
20.231	0.22	0.22	0.22	0.22	0.22	0.21	0.21
20.365	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.500	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.634	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.769	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.903	0.21	0.21	0.21	0.21	0.21	0.21	0.21
21.037	0.21	0.21	0.21	0.21	0.21	0.21	0.21
21.172	0.21	0.21	0.21	0.21	0.21	0.21	0.21
21.306	0.21	0.21	0.21	0.21	0.21	0.21	0.21
21.441	0.21	0.21	0.21	0.21	0.21	0.21	0.21
21.575	0.21	0.21	0.21	0.20	0.20	0.20	0.20

EIRSWD
Cell A Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.019 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
21.709	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.844	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.978	0.20	0.20	0.20	0.20	0.20	0.20	0.20
22.113	0.20	0.20	0.20	0.20	0.20	0.20	0.20
22.247	0.20	0.20	0.20	0.20	0.20	0.20	0.20
22.381	0.20	0.20	0.20	0.20	0.20	0.20	0.20
22.516	0.20	0.20	0.20	0.20	0.20	0.20	0.20
22.650	0.20	0.20	0.20	0.20	0.20	0.20	0.20
22.785	0.20	0.20	0.20	0.20	0.20	0.20	0.20
22.919	0.20	0.20	0.20	0.20	0.20	0.20	0.19
23.053	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.188	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.322	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.457	0.19	0.19	0.19	0.19	0.19	0.19	0.19

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing
STORM 100-Yr
SUB-AREA:
South PondOutlet .0132 79. .304

STREAM REACH:

23.591	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.725	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.860	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.994	0.19	0.19	0.19	0.18	0.18	0.17	0.17
24.129	0.15	0.14	0.13	0.11	0.10	0.09	0.07
24.263	0.06	0.05					

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
OUTLET	0.013		1.043		12.09	9.92	751.25

Line Start Time (hr)	Flow Values @ time increment of 0.019 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
10.823	0.05	0.06	0.06	0.06	0.07	0.07	0.08
10.957	0.08	0.08	0.09	0.09	0.10	0.10	0.11
11.092	0.11	0.12	0.12	0.13	0.14	0.14	0.15
11.226	0.16	0.17	0.17	0.18	0.19	0.20	0.21
11.361	0.22	0.23	0.24	0.25	0.26	0.28	0.29
11.495	0.30	0.32	0.33	0.35	0.38	0.41	0.45
11.629	0.50	0.57	0.65	0.75	0.87	1.02	1.20
11.764	1.41	1.65	1.93	2.25	2.64	3.10	3.63
11.898	4.24	4.95	5.71	6.51	7.30	8.05	8.72
12.033	9.25	9.64	9.87	9.92	9.76	9.41	8.93
12.167	8.35	7.73	7.11	6.50	5.92	5.38	4.89
12.301	4.48	4.12	3.82	3.56	3.33	3.12	2.93
12.436	2.77	2.62	2.48	2.36	2.25	2.14	2.04
12.570	1.95	1.87	1.79	1.72	1.65	1.59	1.54
12.705	1.48	1.44	1.40	1.36	1.32	1.29	1.26
12.839	1.23	1.21	1.19	1.17	1.15	1.13	1.11
12.973	1.10	1.08	1.06	1.05	1.04	1.02	1.01
13.108	0.99	0.98	0.97	0.96	0.94	0.93	0.92
13.242	0.91	0.90	0.89	0.88	0.87	0.87	0.86
13.377	0.85	0.84	0.83	0.83	0.82	0.81	0.80

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing
STORM 100-Yr
SUB-AREA:
South PondOutlet .0132 79. .304

STREAM REACH:

EIRSWD
Cell A Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.019 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
13.511	0.79	0.79	0.78	0.77	0.76	0.76	0.75
13.645	0.74	0.74	0.73	0.72	0.72	0.71	0.70
13.780	0.70	0.69	0.69	0.68	0.67	0.67	0.66
13.914	0.66	0.65	0.65	0.64	0.63	0.63	0.62
14.049	0.62	0.61	0.61	0.60	0.60	0.59	0.59
14.183	0.58	0.58	0.58	0.57	0.57	0.57	0.56
14.317	0.56	0.56	0.56	0.55	0.55	0.55	0.55
14.452	0.55	0.54	0.54	0.54	0.54	0.54	0.53
14.586	0.53	0.53	0.53	0.53	0.52	0.52	0.52
14.721	0.52	0.52	0.51	0.51	0.51	0.51	0.51
14.855	0.51	0.50	0.50	0.50	0.50	0.50	0.49
14.989	0.49	0.49	0.49	0.49	0.48	0.48	0.48
15.124	0.48	0.48	0.48	0.47	0.47	0.47	0.47
15.258	0.47	0.46	0.46	0.46	0.46	0.46	0.45
15.393	0.45	0.45	0.45	0.45	0.44	0.44	0.44
15.527	0.44	0.44	0.43	0.43	0.43	0.43	0.43
15.661	0.42	0.42	0.42	0.42	0.42	0.41	0.41
15.796	0.41	0.41	0.41	0.40	0.40	0.40	0.40
15.930	0.40	0.39	0.39	0.39	0.39	0.39	0.38
16.065	0.38	0.38	0.38	0.38	0.38	0.37	0.37
16.199	0.37	0.37	0.37	0.37	0.37	0.36	0.36
16.333	0.36	0.36	0.36	0.36	0.36	0.36	0.36
16.468	0.36	0.36	0.36	0.35	0.35	0.35	0.35
16.602	0.35	0.35	0.35	0.35	0.35	0.35	0.35
16.737	0.35	0.35	0.35	0.35	0.34	0.34	0.34
16.871	0.34	0.34	0.34	0.34	0.34	0.34	0.34
17.005	0.34	0.34	0.34	0.34	0.33	0.33	0.33
17.140	0.33	0.33	0.33	0.33	0.33	0.33	0.33
17.274	0.33	0.33	0.33	0.33	0.33	0.32	0.32

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing
STORM 100-Yr
SUB-AREA:
South PondOutlet .0132 79. .304

STREAM REACH:

17.409	0.32	0.32	0.32	0.32	0.32	0.32	0.32
17.543	0.32	0.32	0.32	0.32	0.32	0.31	0.31
17.677	0.31	0.31	0.31	0.31	0.31	0.31	0.31
17.812	0.31	0.31	0.31	0.31	0.31	0.30	0.30
17.946	0.30	0.30	0.30	0.30	0.30	0.30	0.30
18.081	0.30	0.30	0.30	0.30	0.30	0.29	0.29
18.215	0.29	0.29	0.29	0.29	0.29	0.29	0.29
18.349	0.29	0.29	0.29	0.29	0.29	0.28	0.28
18.484	0.28	0.28	0.28	0.28	0.28	0.28	0.28
18.618	0.28	0.28	0.28	0.28	0.27	0.27	0.27
18.753	0.27	0.27	0.27	0.27	0.27	0.27	0.27
18.887	0.27	0.27	0.27	0.27	0.26	0.26	0.26
19.021	0.26	0.26	0.26	0.26	0.26	0.26	0.26
19.156	0.26	0.26	0.26	0.26	0.25	0.25	0.25
19.290	0.25	0.25	0.25	0.25	0.25	0.25	0.25
19.425	0.25	0.25	0.25	0.24	0.24	0.24	0.24
19.559	0.24	0.24	0.24	0.24	0.24	0.24	0.24
19.693	0.24	0.24	0.23	0.23	0.23	0.23	0.23
19.828	0.23	0.23	0.23	0.23	0.23	0.23	0.23
19.962	0.23	0.22	0.22	0.22	0.22	0.22	0.22
20.097	0.22	0.22	0.22	0.22	0.22	0.22	0.22
20.231	0.22	0.22	0.22	0.22	0.22	0.21	0.21

EIRSWD
Cell A Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.019 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
20.365	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.500	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.634	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.769	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.903	0.21	0.21	0.21	0.21	0.21	0.21	0.21
21.037	0.21	0.21	0.21	0.21	0.21	0.21	0.21

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing

STORM 100-Yr

SUB-AREA:
South PondOutlet .0132 79. .304

STREAM REACH:

21.172	0.21	0.21	0.21	0.21	0.21	0.21	0.21
21.306	0.21	0.21	0.21	0.21	0.21	0.21	0.21
21.441	0.21	0.21	0.21	0.21	0.21	0.21	0.21
21.575	0.21	0.21	0.21	0.20	0.20	0.20	0.20
21.709	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.844	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.978	0.20	0.20	0.20	0.20	0.20	0.20	0.20
22.113	0.20	0.20	0.20	0.20	0.20	0.20	0.20
22.247	0.20	0.20	0.20	0.20	0.20	0.20	0.20
22.381	0.20	0.20	0.20	0.20	0.20	0.20	0.20
22.516	0.20	0.20	0.20	0.20	0.20	0.20	0.20
22.650	0.20	0.20	0.20	0.20	0.20	0.20	0.20
22.785	0.20	0.20	0.20	0.20	0.20	0.20	0.20
22.919	0.20	0.20	0.20	0.20	0.20	0.20	0.19
23.053	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.188	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.322	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.457	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.591	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.725	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.860	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.994	0.19	0.19	0.19	0.18	0.18	0.17	0.17
24.129	0.15	0.14	0.13	0.11	0.10	0.09	0.07
24.263	0.06	0.05					

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WinTR-20: Version 1.10                  0         0         0.05
D                                                                                    (continued)
Cell A Pond Sizing
                                           STORM 100-Yr
SUB-AREA:
          South PondOutlet              .0132     79.       .304

STREAM REACH:
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EIRSWD
Cell A Pond Sizing

Area or Reach Identifier	Drainage Area (sq mi)	Alternate	Peak Flow by Storm 25-Yr (cfs)	100-Yr (cfs)	(cfs)	(cfs)	(cfs)
South Pond	0.013		5.86	9.92			
OUTLET	0.013		5.86	9.92			

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WinTR-20: Version 1.10                  0         0         0.05
D                                                                                    (continued)
Cell A Pond Sizing
                                           STORM 100-Yr
SUB-AREA:
          South PondOutlet              .0132     79.       .304

STREAM REACH:
```

WinTR-55 Current Data Description

--- Identification Data ---

User: AMR
Project: EIRSWD
SubTitle: Cell A Pond Sizing
State: Idaho
County: Madison
Filename: Y:\Shared\Boise Projects\4-20133-E Idaho SW District Landfill Design And Engineering Support\Pr

Date: 7/3/2023
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
South Pond		Outlet	8.45	79	.304

Total area: 8.45 (ac)

--- Storm Data --

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
1.2	1.6	1.8	2.2	2.5	2.8	1.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type II
Dimensionless Unit Hydrograph: <standard>

EIRSWD
Cell A Pond Sizing
Madison County, Idaho

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
1.2	1.6	1.8	2.2	2.5	2.8	1.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type II
Dimensionless Unit Hydrograph: <standard>

AMR

EIRSWD
Cell A Pond Sizing
Madison County, Idaho

Watershed Peak Table

Sub-Area or Reach Identifier	Peak Flow by Rainfall Return Period 25-Yr (cfs)	100-Yr (cfs)
SUBAREAS		
South Pond	5.86	9.92
REACHES		
OUTLET	5.86	9.92

AMR EIRSWD
Cell A Pond Sizing
Madison County, Idaho

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 25-Yr (cfs)	(hr)	100-Yr (cfs)	(hr)
SUBAREAS				
South Pond	5.86	12.09	9.92	12.09
REACHES				
OUTLET	5.86		9.92	

EIRSWD
Cell A Pond Sizing
Madison County, Idaho

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
South Pond	8.45	0.304	79	Outlet	

Total Area: 8.45 (ac)

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
South Pond							
SHEET	100	0.0230	0.150				0.252
SHALLOW	458	0.0230	0.050				0.052
						Time of Concentration	.304

EIRSWD
Cell A Pond Sizing
Madison County, Idaho

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use	Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
South Pond	Open space; grass cover 50% to 75% (fair)	C	8.45	79
	Total Area / Weighted Curve Number		8.45	79
			====	==

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WinTR-20 Printed Page File      Beginning of Input Data List
TR20.inp

WinTR-20: Version 1.10                  0         0         0.05
EIRSWD
Cell A Pond Sizing

SUB-AREA:
          West Pond Outlet              .00811    79.       .118

STREAM REACH:

STORM ANALYSIS:
          25-Yr                         2.2       Type II   2
          100-Yr                        2.8       Type II   2

STRUCTURE RATING:


GLOBAL OUTPUT:
          2         0.05                YYYYN     YYYYNN


WinTR-20 Printed Page File      End of Input Data List
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EIRSWD
Cell A Pond Sizing

Name of printed page file:
TR20.out

STORM 25-Yr

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
West Pond	0.008		0.642		11.97	4.71	580.80

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.452	0.05	0.05	0.05	0.06	0.06	0.06	0.06
11.504	0.06	0.07	0.07	0.07	0.08	0.08	0.09
11.556	0.10	0.11	0.12	0.13	0.14	0.16	0.17
11.608	0.18	0.19	0.20	0.22	0.24	0.26	0.29
11.661	0.32	0.36	0.39	0.43	0.47	0.50	0.54
11.713	0.58	0.62	0.66	0.71	0.77	0.84	0.91
11.765	0.99	1.07	1.15	1.23	1.32	1.40	1.48
11.817	1.58	1.68	1.80	1.95	2.12	2.31	2.53
11.869	2.76	2.99	3.23	3.46	3.69	3.91	4.11
11.921	4.29	4.44	4.55	4.63	4.68	4.71	4.71
11.974	4.70	4.69	4.67	4.65	4.64	4.62	4.58
12.026	4.52	4.43	4.29	4.10	3.87	3.61	3.33
12.078	3.06	2.79	2.54	2.32	2.11	1.94	1.79
12.130	1.67	1.56	1.47	1.40	1.32	1.26	1.21
12.182	1.16	1.12	1.09	1.06	1.03	1.01	0.99
12.234	0.97	0.96	0.94	0.92	0.91	0.89	0.88
12.287	0.87	0.85	0.84	0.84	0.83	0.82	0.81
12.339	0.80	0.79	0.78	0.77	0.76	0.75	0.74
12.391	0.73	0.73	0.72	0.71	0.70	0.70	0.69
12.443	0.68	0.67	0.66	0.65	0.64	0.63	0.62
12.495	0.61	0.60	0.60	0.59	0.58	0.58	0.57
12.547	0.56	0.56	0.55	0.54	0.53	0.53	0.52
12.600	0.52	0.51	0.51	0.50	0.50	0.50	0.49
12.652	0.49	0.49	0.48	0.48	0.48	0.47	0.47
12.704	0.47	0.47	0.47	0.46	0.46	0.46	0.46
12.756	0.46	0.45	0.45	0.45	0.45	0.44	0.44
12.808	0.44	0.44	0.44	0.44	0.43	0.43	0.43
12.860	0.43	0.43	0.42	0.42	0.42	0.42	0.41
12.913	0.41	0.41	0.41	0.41	0.41	0.40	0.40
12.965	0.40	0.40	0.39	0.39	0.39	0.39	0.39
13.017	0.38	0.38	0.38	0.38	0.38	0.38	0.37
13.069	0.37	0.37	0.37	0.37	0.36	0.36	0.36
13.121	0.36	0.36	0.36	0.36	0.36	0.35	0.35
13.173	0.35	0.35	0.35	0.35	0.35	0.35	0.35

13.226	0.34	0.34	0.34	0.34	0.34	0.34	0.34
13.278	0.34	0.33	0.33	0.33	0.33	0.33	0.33
13.330	0.33	0.33	0.33	0.33	0.32	0.32	0.32
13.382	0.32	0.32	0.32	0.32	0.32	0.31	0.31
13.434	0.31	0.31	0.31	0.31	0.31	0.31	0.31
13.486	0.30	0.30	0.30	0.30	0.30	0.30	0.30

EIRSWD
Cell A Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
13.539	0.30	0.30	0.29	0.29	0.29	0.29	0.29
13.591	0.29	0.29	0.29	0.29	0.29	0.28	0.28
13.643	0.28	0.28	0.28	0.28	0.28	0.28	0.28
13.695	0.28	0.28	0.27	0.27	0.27	0.27	0.27
13.747	0.27	0.27	0.27	0.27	0.27	0.27	0.27
13.799	0.26	0.26	0.26	0.26	0.26	0.26	0.26
13.852	0.26	0.26	0.26	0.26	0.26	0.25	0.25
13.904	0.25	0.25	0.25	0.25	0.25	0.25	0.25
13.956	0.25	0.25	0.25	0.24	0.24	0.24	0.24
14.008	0.24	0.24	0.24	0.24	0.24	0.24	0.24
14.060	0.24	0.24	0.23	0.23	0.23	0.23	0.23
14.112	0.23	0.23	0.23	0.23	0.23	0.23	0.23
14.165	0.23	0.23	0.23	0.23	0.23	0.23	0.23
14.217	0.23	0.23	0.23	0.23	0.23	0.23	0.23
14.269	0.22	0.22	0.22	0.22	0.22	0.22	0.22
14.321	0.22	0.22	0.22	0.22	0.22	0.22	0.22
14.373	0.22	0.22	0.22	0.22	0.22	0.22	0.22
14.425	0.22	0.22	0.22	0.22	0.22	0.22	0.22
14.478	0.22	0.22	0.22	0.22	0.22	0.22	0.22
14.530	0.22	0.22	0.21	0.21	0.21	0.21	0.21
14.582	0.21	0.21	0.21	0.21	0.21	0.21	0.21
14.634	0.21	0.21	0.21	0.21	0.21	0.21	0.21
14.686	0.21	0.21	0.21	0.21	0.21	0.21	0.21
14.738	0.21	0.21	0.21	0.21	0.21	0.21	0.21
14.791	0.20	0.20	0.20	0.20	0.20	0.20	0.20
14.843	0.20	0.20	0.20	0.20	0.20	0.20	0.20
14.895	0.20	0.20	0.20	0.20	0.20	0.20	0.20
14.947	0.20	0.20	0.20	0.20	0.20	0.20	0.20
14.999	0.20	0.20	0.20	0.20	0.20	0.20	0.20
15.051	0.19	0.19	0.19	0.19	0.19	0.19	0.19
15.104	0.19	0.19	0.19	0.19	0.19	0.19	0.19
15.156	0.19	0.19	0.19	0.19	0.19	0.19	0.19
15.208	0.19	0.19	0.19	0.19	0.19	0.19	0.19
15.260	0.19	0.19	0.19	0.19	0.19	0.18	0.18
15.312	0.18	0.18	0.18	0.18	0.18	0.18	0.18
15.364	0.18	0.18	0.18	0.18	0.18	0.18	0.18
15.417	0.18	0.18	0.18	0.18	0.18	0.18	0.18
15.469	0.18	0.18	0.18	0.18	0.18	0.18	0.18
15.521	0.18	0.18	0.18	0.18	0.17	0.17	0.17
15.573	0.17	0.17	0.17	0.17	0.17	0.17	0.17
15.625	0.17	0.17	0.17	0.17	0.17	0.17	0.17
15.678	0.17	0.17	0.17	0.17	0.17	0.17	0.17
15.730	0.17	0.17	0.17	0.17	0.17	0.17	0.16
15.782	0.16	0.16	0.16	0.16	0.16	0.16	0.16
15.834	0.16	0.16	0.16	0.16	0.16	0.16	0.16
15.886	0.16	0.16	0.16	0.16	0.16	0.16	0.16
15.938	0.16	0.16	0.16	0.16	0.16	0.16	0.16
15.991	0.16	0.16	0.15	0.15	0.15	0.15	0.15
16.043	0.15	0.15	0.15	0.15	0.15	0.15	0.15
16.095	0.15	0.15	0.15	0.15	0.15	0.15	0.15
16.147	0.15	0.15	0.15	0.15	0.15	0.15	0.15

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing

STORM 25-Yr

SUB-AREA:
West Pond Outlet .00811 79. .118

STREAM REACH:

EIRSWD
Cell A Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
16.199	0.15	0.15	0.15	0.15	0.15	0.15	0.15
16.251	0.15	0.15	0.15	0.15	0.15	0.15	0.15
16.304	0.15	0.15	0.15	0.15	0.15	0.15	0.15
16.356	0.15	0.15	0.15	0.15	0.15	0.15	0.15
16.408	0.15	0.15	0.15	0.15	0.15	0.15	0.15
16.460	0.15	0.15	0.15	0.15	0.15	0.15	0.15
16.512	0.15	0.15	0.15	0.15	0.15	0.15	0.15
16.564	0.14	0.14	0.14	0.14	0.14	0.14	0.14
16.617	0.14	0.14	0.14	0.14	0.14	0.14	0.14
16.669	0.14	0.14	0.14	0.14	0.14	0.14	0.14
16.721	0.14	0.14	0.14	0.14	0.14	0.14	0.14
16.773	0.14	0.14	0.14	0.14	0.14	0.14	0.14
16.825	0.14	0.14	0.14	0.14	0.14	0.14	0.14
16.877	0.14	0.14	0.14	0.14	0.14	0.14	0.14
16.930	0.14	0.14	0.14	0.14	0.14	0.14	0.14
16.982	0.14	0.14	0.14	0.14	0.14	0.14	0.14
17.034	0.14	0.14	0.14	0.14	0.14	0.14	0.14
17.086	0.14	0.14	0.14	0.14	0.14	0.14	0.14
17.138	0.14	0.14	0.14	0.14	0.14	0.14	0.14
17.190	0.14	0.14	0.14	0.14	0.14	0.14	0.14
17.243	0.14	0.13	0.13	0.13	0.13	0.13	0.13
17.295	0.13	0.13	0.13	0.13	0.13	0.13	0.13
17.347	0.13	0.13	0.13	0.13	0.13	0.13	0.13
17.399	0.13	0.13	0.13	0.13	0.13	0.13	0.13
17.451	0.13	0.13	0.13	0.13	0.13	0.13	0.13
17.503	0.13	0.13	0.13	0.13	0.13	0.13	0.13
17.556	0.13	0.13	0.13	0.13	0.13	0.13	0.13
17.608	0.13	0.13	0.13	0.13	0.13	0.13	0.13
17.660	0.13	0.13	0.13	0.13	0.13	0.13	0.13
17.712	0.13	0.13	0.13	0.13	0.13	0.13	0.13

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing
STORM 25-Yr
SUB-AREA:
West Pond Outlet .00811 79. .118

STREAM REACH:

17.764	0.13	0.13	0.13	0.13	0.13	0.13	0.13
17.816	0.13	0.13	0.13	0.13	0.13	0.13	0.13
17.869	0.13	0.13	0.13	0.13	0.13	0.13	0.13
17.921	0.13	0.12	0.12	0.12	0.12	0.12	0.12
17.973	0.12	0.12	0.12	0.12	0.12	0.12	0.12
18.025	0.12	0.12	0.12	0.12	0.12	0.12	0.12
18.077	0.12	0.12	0.12	0.12	0.12	0.12	0.12
18.129	0.12	0.12	0.12	0.12	0.12	0.12	0.12
18.182	0.12	0.12	0.12	0.12	0.12	0.12	0.12
18.234	0.12	0.12	0.12	0.12	0.12	0.12	0.12
18.286	0.12	0.12	0.12	0.12	0.12	0.12	0.12
18.338	0.12	0.12	0.12	0.12	0.12	0.12	0.12
18.390	0.12	0.12	0.12	0.12	0.12	0.12	0.12
18.442	0.12	0.12	0.12	0.12	0.12	0.12	0.12
18.495	0.12	0.12	0.12	0.12	0.12	0.12	0.12
18.547	0.12	0.12	0.12	0.11	0.11	0.11	0.11
18.599	0.11	0.11	0.11	0.11	0.11	0.11	0.11
18.651	0.11	0.11	0.11	0.11	0.11	0.11	0.11
18.703	0.11	0.11	0.11	0.11	0.11	0.11	0.11
18.755	0.11	0.11	0.11	0.11	0.11	0.11	0.11
18.808	0.11	0.11	0.11	0.11	0.11	0.11	0.11

EIRSWD
Cell A Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
18.860	0.11	0.11	0.11	0.11	0.11	0.11	0.11
18.912	0.11	0.11	0.11	0.11	0.11	0.11	0.11
18.964	0.11	0.11	0.11	0.11	0.11	0.11	0.11
19.016	0.11	0.11	0.11	0.11	0.11	0.11	0.11
19.068	0.11	0.11	0.11	0.11	0.11	0.11	0.11
19.121	0.11	0.11	0.11	0.11	0.11	0.11	0.11
19.173	0.11	0.11	0.11	0.10	0.10	0.10	0.10

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing

STORM 25-Yr

SUB-AREA:
West Pond Outlet .00811 79. .118

STREAM REACH:

19.225	0.10	0.10	0.10	0.10	0.10	0.10	0.10
19.277	0.10	0.10	0.10	0.10	0.10	0.10	0.10
19.329	0.10	0.10	0.10	0.10	0.10	0.10	0.10
19.381	0.10	0.10	0.10	0.10	0.10	0.10	0.10
19.434	0.10	0.10	0.10	0.10	0.10	0.10	0.10
19.486	0.10	0.10	0.10	0.10	0.10	0.10	0.10
19.538	0.10	0.10	0.10	0.10	0.10	0.10	0.10
19.590	0.10	0.10	0.10	0.10	0.10	0.10	0.10
19.642	0.10	0.10	0.10	0.10	0.10	0.10	0.10
19.694	0.10	0.10	0.10	0.10	0.10	0.10	0.10
19.747	0.10	0.10	0.10	0.10	0.10	0.10	0.10
19.799	0.10	0.09	0.09	0.09	0.09	0.09	0.09
19.851	0.09	0.09	0.09	0.09	0.09	0.09	0.09
19.903	0.09	0.09	0.09	0.09	0.09	0.09	0.09
19.955	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.007	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.060	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.112	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.164	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.216	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.268	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.320	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.373	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.425	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.477	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.529	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.581	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.634	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.686	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.738	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.790	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.842	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.894	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.947	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.999	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.051	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.103	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.155	0.09	0.09	0.09	0.09	0.09	0.09	0.09

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing
STORM 25-Yr
SUB-AREA:
West Pond Outlet .00811 79. .118

STREAM REACH:

21.207	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.260	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.312	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.364	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.416	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.468	0.09	0.09	0.09	0.09	0.09	0.09	0.09

EIRSWD
Cell A Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
21.520	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.573	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.625	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.677	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.729	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.781	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.833	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.886	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.938	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.990	0.09	0.08	0.08	0.08	0.08	0.08	0.08
22.042	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.094	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.146	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.199	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.251	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.303	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.355	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.407	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.459	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.512	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.564	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.616	0.08	0.08	0.08	0.08	0.08	0.08	0.08

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing
STORM 25-Yr
SUB-AREA:
West Pond Outlet .00811 79. .118

STREAM REACH:

22.668	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.720	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.772	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.825	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.877	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.929	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.981	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.033	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.085	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.138	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.190	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.242	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.294	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.346	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.398	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.451	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.503	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.555	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.607	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.659	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.711	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.764	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.816	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.868	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.920	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.972	0.08	0.08	0.08	0.08	0.08	0.08	0.08
24.024	0.08	0.07	0.07	0.07	0.06	0.06	0.05

EIRSWD
Cell A Pond Sizing

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing

STORM 25-Yr

SUB-AREA:
West Pond Outlet .00811 79. .118

STREAM REACH:

OUTLET 0.008 0.642 11.97 4.71 580.80

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.452	0.05	0.05	0.05	0.06	0.06	0.06	0.06
11.504	0.06	0.07	0.07	0.07	0.08	0.08	0.09
11.556	0.10	0.11	0.12	0.13	0.14	0.16	0.17
11.608	0.18	0.19	0.20	0.22	0.24	0.26	0.29
11.661	0.32	0.36	0.39	0.43	0.47	0.50	0.54
11.713	0.58	0.62	0.66	0.71	0.77	0.84	0.91
11.765	0.99	1.07	1.15	1.23	1.32	1.40	1.48
11.817	1.58	1.68	1.80	1.95	2.12	2.31	2.53
11.869	2.76	2.99	3.23	3.46	3.69	3.91	4.11
11.921	4.29	4.44	4.55	4.63	4.68	4.71	4.71
11.974	4.70	4.69	4.67	4.65	4.64	4.62	4.58
12.026	4.52	4.43	4.29	4.10	3.87	3.61	3.33
12.078	3.06	2.79	2.54	2.32	2.11	1.94	1.79
12.130	1.67	1.56	1.47	1.40	1.32	1.26	1.21
12.182	1.16	1.12	1.09	1.06	1.03	1.01	0.99
12.234	0.97	0.96	0.94	0.92	0.91	0.89	0.88
12.287	0.87	0.85	0.84	0.84	0.83	0.82	0.81
12.339	0.80	0.79	0.78	0.77	0.76	0.75	0.74
12.391	0.73	0.73	0.72	0.71	0.70	0.70	0.69
12.443	0.68	0.67	0.66	0.65	0.64	0.63	0.62
12.495	0.61	0.60	0.60	0.59	0.58	0.58	0.57
12.547	0.56	0.56	0.55	0.54	0.53	0.53	0.52
12.600	0.52	0.51	0.51	0.50	0.50	0.50	0.49
12.652	0.49	0.49	0.48	0.48	0.48	0.47	0.47
12.704	0.47	0.47	0.47	0.46	0.46	0.46	0.46
12.756	0.46	0.45	0.45	0.45	0.45	0.44	0.44
12.808	0.44	0.44	0.44	0.44	0.43	0.43	0.43
12.860	0.43	0.43	0.42	0.42	0.42	0.42	0.41
12.913	0.41	0.41	0.41	0.41	0.41	0.40	0.40
12.965	0.40	0.40	0.39	0.39	0.39	0.39	0.39
13.017	0.38	0.38	0.38	0.38	0.38	0.38	0.37

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing
STORM 25-Yr
SUB-AREA:
West Pond Outlet .00811 79. .118

STREAM REACH:

13.069	0.37	0.37	0.37	0.37	0.36	0.36	0.36
13.121	0.36	0.36	0.36	0.36	0.36	0.35	0.35
13.173	0.35	0.35	0.35	0.35	0.35	0.35	0.35
13.226	0.34	0.34	0.34	0.34	0.34	0.34	0.34
13.278	0.34	0.33	0.33	0.33	0.33	0.33	0.33
13.330	0.33	0.33	0.33	0.33	0.32	0.32	0.32
13.382	0.32	0.32	0.32	0.32	0.32	0.31	0.31
13.434	0.31	0.31	0.31	0.31	0.31	0.31	0.31
13.486	0.30	0.30	0.30	0.30	0.30	0.30	0.30
13.539	0.30	0.30	0.29	0.29	0.29	0.29	0.29
13.591	0.29	0.29	0.29	0.29	0.29	0.28	0.28
13.643	0.28	0.28	0.28	0.28	0.28	0.28	0.28
13.695	0.28	0.28	0.27	0.27	0.27	0.27	0.27
13.747	0.27	0.27	0.27	0.27	0.27	0.27	0.27

EIRSWD
Cell A Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
13.799	0.26	0.26	0.26	0.26	0.26	0.26	0.26
13.852	0.26	0.26	0.26	0.26	0.26	0.25	0.25
13.904	0.25	0.25	0.25	0.25	0.25	0.25	0.25
13.956	0.25	0.25	0.25	0.24	0.24	0.24	0.24
14.008	0.24	0.24	0.24	0.24	0.24	0.24	0.24
14.060	0.24	0.24	0.23	0.23	0.23	0.23	0.23
14.112	0.23	0.23	0.23	0.23	0.23	0.23	0.23
14.165	0.23	0.23	0.23	0.23	0.23	0.23	0.23
14.217	0.23	0.23	0.23	0.23	0.23	0.23	0.23
14.269	0.22	0.22	0.22	0.22	0.22	0.22	0.22
14.321	0.22	0.22	0.22	0.22	0.22	0.22	0.22
14.373	0.22	0.22	0.22	0.22	0.22	0.22	0.22
14.425	0.22	0.22	0.22	0.22	0.22	0.22	0.22
14.478	0.22	0.22	0.22	0.22	0.22	0.22	0.22

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing

STORM 25-Yr

SUB-AREA:
West Pond Outlet .00811 79. .118

STREAM REACH:

14.530	0.22	0.22	0.21	0.21	0.21	0.21	0.21
14.582	0.21	0.21	0.21	0.21	0.21	0.21	0.21
14.634	0.21	0.21	0.21	0.21	0.21	0.21	0.21
14.686	0.21	0.21	0.21	0.21	0.21	0.21	0.21
14.738	0.21	0.21	0.21	0.21	0.21	0.21	0.21
14.791	0.20	0.20	0.20	0.20	0.20	0.20	0.20
14.843	0.20	0.20	0.20	0.20	0.20	0.20	0.20
14.895	0.20	0.20	0.20	0.20	0.20	0.20	0.20
14.947	0.20	0.20	0.20	0.20	0.20	0.20	0.20
14.999	0.20	0.20	0.20	0.20	0.20	0.20	0.20
15.051	0.19	0.19	0.19	0.19	0.19	0.19	0.19
15.104	0.19	0.19	0.19	0.19	0.19	0.19	0.19
15.156	0.19	0.19	0.19	0.19	0.19	0.19	0.19
15.208	0.19	0.19	0.19	0.19	0.19	0.19	0.19
15.260	0.19	0.19	0.19	0.19	0.19	0.18	0.18
15.312	0.18	0.18	0.18	0.18	0.18	0.18	0.18
15.364	0.18	0.18	0.18	0.18	0.18	0.18	0.18
15.417	0.18	0.18	0.18	0.18	0.18	0.18	0.18
15.469	0.18	0.18	0.18	0.18	0.18	0.18	0.18
15.521	0.18	0.18	0.18	0.18	0.17	0.17	0.17
15.573	0.17	0.17	0.17	0.17	0.17	0.17	0.17
15.625	0.17	0.17	0.17	0.17	0.17	0.17	0.17
15.678	0.17	0.17	0.17	0.17	0.17	0.17	0.17
15.730	0.17	0.17	0.17	0.17	0.17	0.17	0.16
15.782	0.16	0.16	0.16	0.16	0.16	0.16	0.16
15.834	0.16	0.16	0.16	0.16	0.16	0.16	0.16
15.886	0.16	0.16	0.16	0.16	0.16	0.16	0.16
15.938	0.16	0.16	0.16	0.16	0.16	0.16	0.16
15.991	0.16	0.16	0.15	0.15	0.15	0.15	0.15
16.043	0.15	0.15	0.15	0.15	0.15	0.15	0.15
16.095	0.15	0.15	0.15	0.15	0.15	0.15	0.15
16.147	0.15	0.15	0.15	0.15	0.15	0.15	0.15
16.199	0.15	0.15	0.15	0.15	0.15	0.15	0.15
16.251	0.15	0.15	0.15	0.15	0.15	0.15	0.15
16.304	0.15	0.15	0.15	0.15	0.15	0.15	0.15
16.356	0.15	0.15	0.15	0.15	0.15	0.15	0.15
16.408	0.15	0.15	0.15	0.15	0.15	0.15	0.15

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing
STORM 25-Yr
SUB-AREA:
West Pond Outlet .00811 79. .118

STREAM REACH:

EIRSWD
Cell A Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
16.460	0.15	0.15	0.15	0.15	0.15	0.15	0.15
16.512	0.15	0.15	0.15	0.15	0.15	0.15	0.15
16.564	0.14	0.14	0.14	0.14	0.14	0.14	0.14
16.617	0.14	0.14	0.14	0.14	0.14	0.14	0.14
16.669	0.14	0.14	0.14	0.14	0.14	0.14	0.14
16.721	0.14	0.14	0.14	0.14	0.14	0.14	0.14
16.773	0.14	0.14	0.14	0.14	0.14	0.14	0.14
16.825	0.14	0.14	0.14	0.14	0.14	0.14	0.14
16.877	0.14	0.14	0.14	0.14	0.14	0.14	0.14
16.930	0.14	0.14	0.14	0.14	0.14	0.14	0.14
16.982	0.14	0.14	0.14	0.14	0.14	0.14	0.14
17.034	0.14	0.14	0.14	0.14	0.14	0.14	0.14
17.086	0.14	0.14	0.14	0.14	0.14	0.14	0.14
17.138	0.14	0.14	0.14	0.14	0.14	0.14	0.14
17.190	0.14	0.14	0.14	0.14	0.14	0.14	0.14
17.243	0.14	0.13	0.13	0.13	0.13	0.13	0.13
17.295	0.13	0.13	0.13	0.13	0.13	0.13	0.13
17.347	0.13	0.13	0.13	0.13	0.13	0.13	0.13
17.399	0.13	0.13	0.13	0.13	0.13	0.13	0.13
17.451	0.13	0.13	0.13	0.13	0.13	0.13	0.13
17.503	0.13	0.13	0.13	0.13	0.13	0.13	0.13
17.556	0.13	0.13	0.13	0.13	0.13	0.13	0.13
17.608	0.13	0.13	0.13	0.13	0.13	0.13	0.13
17.660	0.13	0.13	0.13	0.13	0.13	0.13	0.13
17.712	0.13	0.13	0.13	0.13	0.13	0.13	0.13
17.764	0.13	0.13	0.13	0.13	0.13	0.13	0.13
17.816	0.13	0.13	0.13	0.13	0.13	0.13	0.13
17.869	0.13	0.13	0.13	0.13	0.13	0.13	0.13
17.921	0.13	0.12	0.12	0.12	0.12	0.12	0.12

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing
STORM 25-Yr
SUB-AREA:
West Pond Outlet .00811 79. .118

STREAM REACH:

17.973	0.12	0.12	0.12	0.12	0.12	0.12	0.12
18.025	0.12	0.12	0.12	0.12	0.12	0.12	0.12
18.077	0.12	0.12	0.12	0.12	0.12	0.12	0.12
18.129	0.12	0.12	0.12	0.12	0.12	0.12	0.12
18.182	0.12	0.12	0.12	0.12	0.12	0.12	0.12
18.234	0.12	0.12	0.12	0.12	0.12	0.12	0.12
18.286	0.12	0.12	0.12	0.12	0.12	0.12	0.12
18.338	0.12	0.12	0.12	0.12	0.12	0.12	0.12
18.390	0.12	0.12	0.12	0.12	0.12	0.12	0.12
18.442	0.12	0.12	0.12	0.12	0.12	0.12	0.12
18.495	0.12	0.12	0.12	0.12	0.12	0.12	0.12
18.547	0.12	0.12	0.12	0.11	0.11	0.11	0.11
18.599	0.11	0.11	0.11	0.11	0.11	0.11	0.11
18.651	0.11	0.11	0.11	0.11	0.11	0.11	0.11
18.703	0.11	0.11	0.11	0.11	0.11	0.11	0.11
18.755	0.11	0.11	0.11	0.11	0.11	0.11	0.11
18.808	0.11	0.11	0.11	0.11	0.11	0.11	0.11
18.860	0.11	0.11	0.11	0.11	0.11	0.11	0.11
18.912	0.11	0.11	0.11	0.11	0.11	0.11	0.11
18.964	0.11	0.11	0.11	0.11	0.11	0.11	0.11
19.016	0.11	0.11	0.11	0.11	0.11	0.11	0.11
19.068	0.11	0.11	0.11	0.11	0.11	0.11	0.11

EIRSWD
Cell A Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
19.121	0.11	0.11	0.11	0.11	0.11	0.11	0.11
19.173	0.11	0.11	0.11	0.10	0.10	0.10	0.10
19.225	0.10	0.10	0.10	0.10	0.10	0.10	0.10
19.277	0.10	0.10	0.10	0.10	0.10	0.10	0.10
19.329	0.10	0.10	0.10	0.10	0.10	0.10	0.10
19.381	0.10	0.10	0.10	0.10	0.10	0.10	0.10

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing

STORM 25-Yr

SUB-AREA:
West Pond Outlet .00811 79. .118

STREAM REACH:

19.434	0.10	0.10	0.10	0.10	0.10	0.10	0.10
19.486	0.10	0.10	0.10	0.10	0.10	0.10	0.10
19.538	0.10	0.10	0.10	0.10	0.10	0.10	0.10
19.590	0.10	0.10	0.10	0.10	0.10	0.10	0.10
19.642	0.10	0.10	0.10	0.10	0.10	0.10	0.10
19.694	0.10	0.10	0.10	0.10	0.10	0.10	0.10
19.747	0.10	0.10	0.10	0.10	0.10	0.10	0.10
19.799	0.10	0.09	0.09	0.09	0.09	0.09	0.09
19.851	0.09	0.09	0.09	0.09	0.09	0.09	0.09
19.903	0.09	0.09	0.09	0.09	0.09	0.09	0.09
19.955	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.007	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.060	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.112	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.164	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.216	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.268	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.320	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.373	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.425	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.477	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.529	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.581	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.634	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.686	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.738	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.790	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.842	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.894	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.947	0.09	0.09	0.09	0.09	0.09	0.09	0.09
20.999	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.051	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.103	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.155	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.207	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.260	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.312	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.364	0.09	0.09	0.09	0.09	0.09	0.09	0.09

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing
STORM 25-Yr
SUB-AREA:
West Pond Outlet .00811 79. .118

STREAM REACH:

21.416	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.468	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.520	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.573	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.625	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.677	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.729	0.09	0.09	0.09	0.09	0.09	0.09	0.09

EIRSWD
Cell A Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
21.781	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.833	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.886	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.938	0.09	0.09	0.09	0.09	0.09	0.09	0.09
21.990	0.09	0.08	0.08	0.08	0.08	0.08	0.08
22.042	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.094	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.146	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.199	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.251	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.303	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.355	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.407	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.459	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.512	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.564	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.616	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.668	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.720	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.772	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.825	0.08	0.08	0.08	0.08	0.08	0.08	0.08

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing

STORM 25-Yr

SUB-AREA:
West Pond Outlet .00811 79. .118

STREAM REACH:

22.877	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.929	0.08	0.08	0.08	0.08	0.08	0.08	0.08
22.981	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.033	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.085	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.138	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.190	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.242	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.294	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.346	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.398	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.451	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.503	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.555	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.607	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.659	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.711	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.764	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.816	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.868	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.920	0.08	0.08	0.08	0.08	0.08	0.08	0.08
23.972	0.08	0.08	0.08	0.08	0.08	0.08	0.08
24.024	0.08	0.07	0.07	0.07	0.06	0.06	0.05

STORM 100-Yr

EIRSWD
Cell A Pond Sizing

Area or Reach	Drainage Area	Rain Gage ID or	Runoff Amount	Peak Flow Elevation	Time	Rate	Rate

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing
STORM 100-Yr
SUB-AREA:
West Pond Outlet .00811 79. .118

STREAM REACH:

Identifier	(sq mi)	Location	(in)	(ft)	(hr)	(cfs)	(csm)
West Pond	0.008		1.042		11.95	7.93	977.56

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
10.827	0.05	0.05	0.05	0.05	0.05	0.06	0.06
10.879	0.06	0.06	0.06	0.06	0.06	0.06	0.06
10.931	0.07	0.07	0.07	0.07	0.07	0.07	0.07
10.984	0.07	0.08	0.08	0.08	0.08	0.08	0.08
11.036	0.08	0.08	0.09	0.09	0.09	0.09	0.09
11.088	0.10	0.10	0.10	0.10	0.10	0.10	0.11
11.140	0.11	0.11	0.11	0.11	0.12	0.12	0.12
11.192	0.12	0.13	0.13	0.13	0.13	0.14	0.14
11.244	0.14	0.14	0.15	0.15	0.15	0.15	0.16
11.297	0.16	0.16	0.17	0.17	0.17	0.17	0.18
11.349	0.18	0.18	0.19	0.19	0.19	0.20	0.20
11.401	0.20	0.21	0.21	0.21	0.22	0.22	0.22
11.453	0.23	0.23	0.23	0.24	0.24	0.25	0.25
11.505	0.25	0.26	0.27	0.28	0.29	0.31	0.33
11.557	0.35	0.38	0.41	0.44	0.47	0.49	0.52
11.610	0.55	0.57	0.61	0.64	0.69	0.75	0.81
11.662	0.88	0.96	1.04	1.11	1.19	1.26	1.33
11.714	1.40	1.48	1.56	1.65	1.76	1.88	2.02
11.766	2.16	2.30	2.45	2.59	2.73	2.87	3.01
11.818	3.17	3.34	3.54	3.79	4.08	4.41	4.76
11.870	5.13	5.51	5.89	6.26	6.61	6.94	7.23
11.923	7.48	7.67	7.82	7.90	7.93	7.92	7.88
11.975	7.83	7.76	7.70	7.64	7.58	7.51	7.42
12.027	7.30	7.11	6.85	6.52	6.12	5.69	5.25
12.079	4.81	4.38	3.98	3.62	3.30	3.02	2.80
12.131	2.61	2.44	2.30	2.18	2.07	1.97	1.88
12.184	1.81	1.75	1.69	1.65	1.61	1.57	1.54
12.236	1.51	1.48	1.46	1.43	1.40	1.38	1.36
12.288	1.34	1.32	1.31	1.29	1.28	1.27	1.25
12.340	1.24	1.22	1.21	1.19	1.17	1.16	1.14

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing
STORM 100-Yr
SUB-AREA:
West Pond Outlet .00811 79. .118

STREAM REACH:

12.392	1.13	1.12	1.10	1.09	1.08	1.07	1.06
12.444	1.05	1.03	1.01	1.00	0.98	0.96	0.95
12.497	0.94	0.92	0.91	0.90	0.89	0.88	0.87
12.549	0.86	0.85	0.84	0.83	0.82	0.81	0.80
12.601	0.79	0.78	0.77	0.77	0.76	0.76	0.75
12.653	0.75	0.74	0.74	0.73	0.73	0.72	0.72
12.705	0.72	0.71	0.71	0.71	0.71	0.70	0.70
12.757	0.70	0.69	0.69	0.68	0.68	0.68	0.67
12.810	0.67	0.67	0.67	0.66	0.66	0.66	0.65
12.862	0.65	0.65	0.64	0.64	0.64	0.63	0.63
12.914	0.63	0.63	0.62	0.62	0.62	0.61	0.61
12.966	0.61	0.60	0.60	0.59	0.59	0.59	0.59
13.018	0.58	0.58	0.58	0.58	0.57	0.57	0.57
13.070	0.56	0.56	0.56	0.55	0.55	0.55	0.55
13.123	0.55	0.54	0.54	0.54	0.54	0.54	0.53

EIRSWD
Cell A Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
13.175	0.53	0.53	0.53	0.53	0.52	0.52	0.52
13.227	0.52	0.52	0.52	0.52	0.51	0.51	0.51
13.279	0.51	0.51	0.50	0.50	0.50	0.50	0.50
13.331	0.50	0.49	0.49	0.49	0.49	0.49	0.48
13.383	0.48	0.48	0.48	0.48	0.48	0.47	0.47
13.436	0.47	0.47	0.47	0.47	0.46	0.46	0.46
13.488	0.46	0.46	0.45	0.45	0.45	0.45	0.45
13.540	0.45	0.45	0.44	0.44	0.44	0.44	0.44
13.592	0.43	0.43	0.43	0.43	0.43	0.43	0.43
13.644	0.43	0.42	0.42	0.42	0.42	0.42	0.42
13.696	0.42	0.41	0.41	0.41	0.41	0.41	0.41
13.749	0.41	0.41	0.40	0.40	0.40	0.40	0.40
13.801	0.40	0.40	0.39	0.39	0.39	0.39	0.39

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing

STORM 100-Yr

SUB-AREA:
West Pond Outlet .00811 79. .118

STREAM REACH:

13.853	0.39	0.39	0.39	0.38	0.38	0.38	0.38
13.905	0.38	0.38	0.38	0.38	0.37	0.37	0.37
13.957	0.37	0.37	0.37	0.37	0.36	0.36	0.36
14.009	0.36	0.36	0.36	0.36	0.36	0.36	0.35
14.062	0.35	0.35	0.35	0.35	0.35	0.35	0.35
14.114	0.35	0.35	0.35	0.35	0.34	0.34	0.34
14.166	0.34	0.34	0.34	0.34	0.34	0.34	0.34
14.218	0.34	0.34	0.34	0.34	0.34	0.34	0.34
14.270	0.34	0.34	0.34	0.33	0.33	0.33	0.33
14.322	0.33	0.33	0.33	0.33	0.33	0.33	0.33
14.375	0.33	0.33	0.33	0.33	0.33	0.33	0.33
14.427	0.33	0.33	0.33	0.33	0.33	0.32	0.32
14.479	0.32	0.32	0.32	0.32	0.32	0.32	0.32
14.531	0.32	0.32	0.32	0.32	0.32	0.32	0.32
14.583	0.32	0.32	0.32	0.32	0.32	0.32	0.32
14.635	0.31	0.31	0.31	0.31	0.31	0.31	0.31
14.688	0.31	0.31	0.31	0.31	0.31	0.31	0.31
14.740	0.31	0.31	0.31	0.31	0.31	0.31	0.31
14.792	0.31	0.30	0.30	0.30	0.30	0.30	0.30
14.844	0.30	0.30	0.30	0.30	0.30	0.30	0.30
14.896	0.30	0.30	0.30	0.30	0.30	0.30	0.30
14.948	0.30	0.30	0.30	0.29	0.29	0.29	0.29
15.001	0.29	0.29	0.29	0.29	0.29	0.29	0.29
15.053	0.29	0.29	0.29	0.29	0.29	0.29	0.29
15.105	0.29	0.29	0.29	0.29	0.29	0.28	0.28
15.157	0.28	0.28	0.28	0.28	0.28	0.28	0.28
15.209	0.28	0.28	0.28	0.28	0.28	0.28	0.28
15.261	0.28	0.28	0.28	0.28	0.27	0.27	0.27
15.314	0.27	0.27	0.27	0.27	0.27	0.27	0.27
15.366	0.27	0.27	0.27	0.27	0.27	0.27	0.27
15.418	0.27	0.27	0.27	0.27	0.27	0.26	0.26
15.470	0.26	0.26	0.26	0.26	0.26	0.26	0.26
15.522	0.26	0.26	0.26	0.26	0.26	0.26	0.26
15.574	0.26	0.26	0.26	0.26	0.26	0.25	0.25
15.627	0.25	0.25	0.25	0.25	0.25	0.25	0.25
15.679	0.25	0.25	0.25	0.25	0.25	0.25	0.25
15.731	0.25	0.25	0.25	0.25	0.25	0.24	0.24
15.783	0.24	0.24	0.24	0.24	0.24	0.24	0.24

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing
STORM 100-Yr
SUB-AREA:
West Pond Outlet .00811 79. .118

STREAM REACH:

EIRSWD
Cell A Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
15.835	0.24	0.24	0.24	0.24	0.24	0.24	0.24
15.887	0.24	0.24	0.24	0.24	0.24	0.24	0.23
15.940	0.23	0.23	0.23	0.23	0.23	0.23	0.23
15.992	0.23	0.23	0.23	0.23	0.23	0.23	0.23
16.044	0.23	0.23	0.23	0.23	0.23	0.23	0.23
16.096	0.22	0.22	0.22	0.22	0.22	0.22	0.22
16.148	0.22	0.22	0.22	0.22	0.22	0.22	0.22
16.200	0.22	0.22	0.22	0.22	0.22	0.22	0.22
16.253	0.22	0.22	0.22	0.22	0.22	0.22	0.22
16.305	0.22	0.22	0.22	0.22	0.22	0.22	0.22
16.357	0.22	0.22	0.22	0.22	0.22	0.22	0.22
16.409	0.22	0.22	0.22	0.22	0.22	0.22	0.22
16.461	0.22	0.22	0.22	0.22	0.22	0.22	0.22
16.513	0.22	0.22	0.21	0.21	0.21	0.21	0.21
16.566	0.21	0.21	0.21	0.21	0.21	0.21	0.21
16.618	0.21	0.21	0.21	0.21	0.21	0.21	0.21
16.670	0.21	0.21	0.21	0.21	0.21	0.21	0.21
16.722	0.21	0.21	0.21	0.21	0.21	0.21	0.21
16.774	0.21	0.21	0.21	0.21	0.21	0.21	0.21
16.826	0.21	0.21	0.21	0.21	0.21	0.21	0.21
16.879	0.21	0.21	0.21	0.21	0.21	0.21	0.21
16.931	0.21	0.21	0.21	0.21	0.21	0.21	0.20
16.983	0.20	0.20	0.20	0.20	0.20	0.20	0.20
17.035	0.20	0.20	0.20	0.20	0.20	0.20	0.20
17.087	0.20	0.20	0.20	0.20	0.20	0.20	0.20
17.139	0.20	0.20	0.20	0.20	0.20	0.20	0.20
17.192	0.20	0.20	0.20	0.20	0.20	0.20	0.20
17.244	0.20	0.20	0.20	0.20	0.20	0.20	0.20

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing
STORM 100-Yr
SUB-AREA:
West Pond Outlet .00811 79. .118

STREAM REACH:

17.296	0.20	0.20	0.20	0.20	0.20	0.20	0.20
17.348	0.20	0.20	0.20	0.20	0.20	0.20	0.20
17.400	0.20	0.20	0.19	0.19	0.19	0.19	0.19
17.453	0.19	0.19	0.19	0.19	0.19	0.19	0.19
17.505	0.19	0.19	0.19	0.19	0.19	0.19	0.19
17.557	0.19	0.19	0.19	0.19	0.19	0.19	0.19
17.609	0.19	0.19	0.19	0.19	0.19	0.19	0.19
17.661	0.19	0.19	0.19	0.19	0.19	0.19	0.19
17.713	0.19	0.19	0.19	0.19	0.19	0.19	0.19
17.766	0.19	0.19	0.19	0.19	0.19	0.19	0.19
17.818	0.19	0.19	0.19	0.19	0.19	0.19	0.18
17.870	0.18	0.18	0.18	0.18	0.18	0.18	0.18
17.922	0.18	0.18	0.18	0.18	0.18	0.18	0.18
17.974	0.18	0.18	0.18	0.18	0.18	0.18	0.18
18.026	0.18	0.18	0.18	0.18	0.18	0.18	0.18
18.079	0.18	0.18	0.18	0.18	0.18	0.18	0.18
18.131	0.18	0.18	0.18	0.18	0.18	0.18	0.18
18.183	0.18	0.18	0.18	0.18	0.18	0.18	0.18
18.235	0.18	0.18	0.18	0.18	0.18	0.18	0.18
18.287	0.18	0.17	0.17	0.17	0.17	0.17	0.17
18.339	0.17	0.17	0.17	0.17	0.17	0.17	0.17
18.392	0.17	0.17	0.17	0.17	0.17	0.17	0.17
18.444	0.17	0.17	0.17	0.17	0.17	0.17	0.17

EIRSWD
Cell A Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
18.496	0.17	0.17	0.17	0.17	0.17	0.17	0.17
18.548	0.17	0.17	0.17	0.17	0.17	0.17	0.17
18.600	0.17	0.17	0.17	0.17	0.17	0.17	0.17
18.652	0.17	0.17	0.17	0.17	0.17	0.17	0.17
18.705	0.17	0.17	0.17	0.16	0.16	0.16	0.16

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing

STORM 100-Yr

SUB-AREA:
West Pond Outlet .00811 79. .118

STREAM REACH:

18.757	0.16	0.16	0.16	0.16	0.16	0.16	0.16
18.809	0.16	0.16	0.16	0.16	0.16	0.16	0.16
18.861	0.16	0.16	0.16	0.16	0.16	0.16	0.16
18.913	0.16	0.16	0.16	0.16	0.16	0.16	0.16
18.965	0.16	0.16	0.16	0.16	0.16	0.16	0.16
19.018	0.16	0.16	0.16	0.16	0.16	0.16	0.16
19.070	0.16	0.16	0.16	0.16	0.16	0.16	0.16
19.122	0.16	0.16	0.16	0.16	0.15	0.15	0.15
19.174	0.15	0.15	0.15	0.15	0.15	0.15	0.15
19.226	0.15	0.15	0.15	0.15	0.15	0.15	0.15
19.278	0.15	0.15	0.15	0.15	0.15	0.15	0.15
19.331	0.15	0.15	0.15	0.15	0.15	0.15	0.15
19.383	0.15	0.15	0.15	0.15	0.15	0.15	0.15
19.435	0.15	0.15	0.15	0.15	0.15	0.15	0.15
19.487	0.15	0.15	0.15	0.15	0.15	0.15	0.15
19.539	0.15	0.15	0.15	0.14	0.14	0.14	0.14
19.591	0.14	0.14	0.14	0.14	0.14	0.14	0.14
19.644	0.14	0.14	0.14	0.14	0.14	0.14	0.14
19.696	0.14	0.14	0.14	0.14	0.14	0.14	0.14
19.748	0.14	0.14	0.14	0.14	0.14	0.14	0.14
19.800	0.14	0.14	0.14	0.14	0.14	0.14	0.14
19.852	0.14	0.14	0.14	0.14	0.14	0.14	0.14
19.904	0.14	0.14	0.14	0.14	0.14	0.14	0.14
19.957	0.14	0.14	0.13	0.13	0.13	0.13	0.13
20.009	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.061	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.113	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.165	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.217	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.270	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.322	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.374	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.426	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.478	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.530	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.583	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.635	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.687	0.13	0.13	0.13	0.13	0.13	0.13	0.13

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing
STORM 100-Yr
SUB-AREA:
West Pond Outlet .00811 79. .118

STREAM REACH:

20.739	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.791	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.843	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.896	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.948	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.000	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.052	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.104	0.13	0.13	0.13	0.13	0.13	0.13	0.13

EIRSWD
Cell A Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
21.156	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.209	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.261	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.313	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.365	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.417	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.469	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.522	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.574	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.626	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.678	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.730	0.13	0.13	0.12	0.12	0.12	0.12	0.12
21.782	0.12	0.12	0.12	0.12	0.12	0.12	0.12
21.835	0.12	0.12	0.12	0.12	0.12	0.12	0.12
21.887	0.12	0.12	0.12	0.12	0.12	0.12	0.12
21.939	0.12	0.12	0.12	0.12	0.12	0.12	0.12
21.991	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.043	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.096	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.148	0.12	0.12	0.12	0.12	0.12	0.12	0.12

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing

STORM 100-Yr

SUB-AREA:
West Pond Outlet .00811 79. .118

STREAM REACH:

22.200	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.252	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.304	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.356	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.409	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.461	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.513	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.565	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.617	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.669	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.722	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.774	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.826	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.878	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.930	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.982	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.035	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.087	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.139	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.191	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.243	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.295	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.348	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.400	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.452	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.504	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.556	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.608	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.661	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.713	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.765	0.12	0.12	0.12	0.12	0.12	0.12	0.12

EIRSWD
Cell A Pond Sizing

Line

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing
STORM 100-Yr
SUB-AREA:
West Pond Outlet .00811 79. .118

STREAM REACH:

Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
23.817	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.869	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.921	0.12	0.12	0.12	0.12	0.12	0.11	0.11
23.974	0.11	0.11	0.11	0.11	0.11	0.11	0.11
24.026	0.11	0.11	0.10	0.10	0.09	0.08	0.07
24.078	0.06	0.06					

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
OUTLET	0.008		1.042		11.95	7.93	977.56

Line

Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
10.827	0.05	0.05	0.05	0.05	0.05	0.06	0.06
10.879	0.06	0.06	0.06	0.06	0.06	0.06	0.06
10.931	0.07	0.07	0.07	0.07	0.07	0.07	0.07
10.984	0.07	0.08	0.08	0.08	0.08	0.08	0.08
11.036	0.08	0.08	0.09	0.09	0.09	0.09	0.09
11.088	0.10	0.10	0.10	0.10	0.10	0.10	0.11
11.140	0.11	0.11	0.11	0.11	0.12	0.12	0.12
11.192	0.12	0.13	0.13	0.13	0.13	0.14	0.14
11.244	0.14	0.14	0.15	0.15	0.15	0.15	0.16
11.297	0.16	0.16	0.17	0.17	0.17	0.17	0.18
11.349	0.18	0.18	0.19	0.19	0.19	0.20	0.20
11.401	0.20	0.21	0.21	0.21	0.22	0.22	0.22
11.453	0.23	0.23	0.23	0.24	0.24	0.25	0.25
11.505	0.25	0.26	0.27	0.28	0.29	0.31	0.33
11.557	0.35	0.38	0.41	0.44	0.47	0.49	0.52
11.610	0.55	0.57	0.61	0.64	0.69	0.75	0.81
11.662	0.88	0.96	1.04	1.11	1.19	1.26	1.33
11.714	1.40	1.48	1.56	1.65	1.76	1.88	2.02

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing
STORM 100-Yr
SUB-AREA:
West Pond Outlet .00811 79. .118

STREAM REACH:

11.766	2.16	2.30	2.45	2.59	2.73	2.87	3.01
11.818	3.17	3.34	3.54	3.79	4.08	4.41	4.76
11.870	5.13	5.51	5.89	6.26	6.61	6.94	7.23
11.923	7.48	7.67	7.82	7.90	7.93	7.92	7.88
11.975	7.83	7.76	7.70	7.64	7.58	7.51	7.42
12.027	7.30	7.11	6.85	6.52	6.12	5.69	5.25
12.079	4.81	4.38	3.98	3.62	3.30	3.02	2.80
12.131	2.61	2.44	2.30	2.18	2.07	1.97	1.88
12.184	1.81	1.75	1.69	1.65	1.61	1.57	1.54
12.236	1.51	1.48	1.46	1.43	1.40	1.38	1.36
12.288	1.34	1.32	1.31	1.29	1.28	1.27	1.25
12.340	1.24	1.22	1.21	1.19	1.17	1.16	1.14
12.392	1.13	1.12	1.10	1.09	1.08	1.07	1.06
12.444	1.05	1.03	1.01	1.00	0.98	0.96	0.95
12.497	0.94	0.92	0.91	0.90	0.89	0.88	0.87
12.549	0.86	0.85	0.84	0.83	0.82	0.81	0.80

EIRSWD
Cell A Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
12.601	0.79	0.78	0.77	0.77	0.76	0.76	0.75
12.653	0.75	0.74	0.74	0.73	0.73	0.72	0.72
12.705	0.72	0.71	0.71	0.71	0.71	0.70	0.70
12.757	0.70	0.69	0.69	0.68	0.68	0.68	0.67
12.810	0.67	0.67	0.67	0.66	0.66	0.66	0.65
12.862	0.65	0.65	0.64	0.64	0.64	0.63	0.63
12.914	0.63	0.63	0.62	0.62	0.62	0.61	0.61
12.966	0.61	0.60	0.60	0.59	0.59	0.59	0.59
13.018	0.58	0.58	0.58	0.58	0.57	0.57	0.57
13.070	0.56	0.56	0.56	0.55	0.55	0.55	0.55
13.123	0.55	0.54	0.54	0.54	0.54	0.54	0.53
13.175	0.53	0.53	0.53	0.53	0.52	0.52	0.52

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing

STORM 100-Yr

SUB-AREA:
West Pond Outlet .00811 79. .118

STREAM REACH:

13.227	0.52	0.52	0.52	0.52	0.51	0.51	0.51
13.279	0.51	0.51	0.50	0.50	0.50	0.50	0.50
13.331	0.50	0.49	0.49	0.49	0.49	0.49	0.48
13.383	0.48	0.48	0.48	0.48	0.48	0.47	0.47
13.436	0.47	0.47	0.47	0.47	0.46	0.46	0.46
13.488	0.46	0.46	0.45	0.45	0.45	0.45	0.45
13.540	0.45	0.45	0.44	0.44	0.44	0.44	0.44
13.592	0.43	0.43	0.43	0.43	0.43	0.43	0.43
13.644	0.43	0.42	0.42	0.42	0.42	0.42	0.42
13.696	0.42	0.41	0.41	0.41	0.41	0.41	0.41
13.749	0.41	0.41	0.40	0.40	0.40	0.40	0.40
13.801	0.40	0.40	0.39	0.39	0.39	0.39	0.39
13.853	0.39	0.39	0.39	0.38	0.38	0.38	0.38
13.905	0.38	0.38	0.38	0.38	0.37	0.37	0.37
13.957	0.37	0.37	0.37	0.37	0.36	0.36	0.36
14.009	0.36	0.36	0.36	0.36	0.36	0.36	0.35
14.062	0.35	0.35	0.35	0.35	0.35	0.35	0.35
14.114	0.35	0.35	0.35	0.35	0.34	0.34	0.34
14.166	0.34	0.34	0.34	0.34	0.34	0.34	0.34
14.218	0.34	0.34	0.34	0.34	0.34	0.34	0.34
14.270	0.34	0.34	0.34	0.33	0.33	0.33	0.33
14.322	0.33	0.33	0.33	0.33	0.33	0.33	0.33
14.375	0.33	0.33	0.33	0.33	0.33	0.33	0.33
14.427	0.33	0.33	0.33	0.33	0.33	0.32	0.32
14.479	0.32	0.32	0.32	0.32	0.32	0.32	0.32
14.531	0.32	0.32	0.32	0.32	0.32	0.32	0.32
14.583	0.32	0.32	0.32	0.32	0.32	0.32	0.32
14.635	0.31	0.31	0.31	0.31	0.31	0.31	0.31
14.688	0.31	0.31	0.31	0.31	0.31	0.31	0.31
14.740	0.31	0.31	0.31	0.31	0.31	0.31	0.31
14.792	0.31	0.30	0.30	0.30	0.30	0.30	0.30
14.844	0.30	0.30	0.30	0.30	0.30	0.30	0.30
14.896	0.30	0.30	0.30	0.30	0.30	0.30	0.30
14.948	0.30	0.30	0.30	0.29	0.29	0.29	0.29
15.001	0.29	0.29	0.29	0.29	0.29	0.29	0.29
15.053	0.29	0.29	0.29	0.29	0.29	0.29	0.29
15.105	0.29	0.29	0.29	0.29	0.29	0.28	0.28
15.157	0.28	0.28	0.28	0.28	0.28	0.28	0.28

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing
STORM 100-Yr
SUB-AREA:
West Pond Outlet .00811 79. .118

STREAM REACH:

15.209	0.28	0.28	0.28	0.28	0.28	0.28	0.28

EIRSWD
Cell A Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
15.261	0.28	0.28	0.28	0.28	0.27	0.27	0.27
15.314	0.27	0.27	0.27	0.27	0.27	0.27	0.27
15.366	0.27	0.27	0.27	0.27	0.27	0.27	0.27
15.418	0.27	0.27	0.27	0.27	0.27	0.26	0.26
15.470	0.26	0.26	0.26	0.26	0.26	0.26	0.26
15.522	0.26	0.26	0.26	0.26	0.26	0.26	0.26
15.574	0.26	0.26	0.26	0.26	0.26	0.25	0.25
15.627	0.25	0.25	0.25	0.25	0.25	0.25	0.25
15.679	0.25	0.25	0.25	0.25	0.25	0.25	0.25
15.731	0.25	0.25	0.25	0.25	0.25	0.24	0.24
15.783	0.24	0.24	0.24	0.24	0.24	0.24	0.24
15.835	0.24	0.24	0.24	0.24	0.24	0.24	0.24
15.887	0.24	0.24	0.24	0.24	0.24	0.24	0.23
15.940	0.23	0.23	0.23	0.23	0.23	0.23	0.23
15.992	0.23	0.23	0.23	0.23	0.23	0.23	0.23
16.044	0.23	0.23	0.23	0.23	0.23	0.23	0.23
16.096	0.22	0.22	0.22	0.22	0.22	0.22	0.22
16.148	0.22	0.22	0.22	0.22	0.22	0.22	0.22
16.200	0.22	0.22	0.22	0.22	0.22	0.22	0.22
16.253	0.22	0.22	0.22	0.22	0.22	0.22	0.22
16.305	0.22	0.22	0.22	0.22	0.22	0.22	0.22
16.357	0.22	0.22	0.22	0.22	0.22	0.22	0.22
16.409	0.22	0.22	0.22	0.22	0.22	0.22	0.22
16.461	0.22	0.22	0.22	0.22	0.22	0.22	0.22
16.513	0.22	0.22	0.21	0.21	0.21	0.21	0.21
16.566	0.21	0.21	0.21	0.21	0.21	0.21	0.21
16.618	0.21	0.21	0.21	0.21	0.21	0.21	0.21

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing

STORM 100-Yr

SUB-AREA:
West Pond Outlet .00811 79. .118

STREAM REACH:

16.670	0.21	0.21	0.21	0.21	0.21	0.21	0.21
16.722	0.21	0.21	0.21	0.21	0.21	0.21	0.21
16.774	0.21	0.21	0.21	0.21	0.21	0.21	0.21
16.826	0.21	0.21	0.21	0.21	0.21	0.21	0.21
16.879	0.21	0.21	0.21	0.21	0.21	0.21	0.21
16.931	0.21	0.21	0.21	0.21	0.21	0.21	0.20
16.983	0.20	0.20	0.20	0.20	0.20	0.20	0.20
17.035	0.20	0.20	0.20	0.20	0.20	0.20	0.20
17.087	0.20	0.20	0.20	0.20	0.20	0.20	0.20
17.139	0.20	0.20	0.20	0.20	0.20	0.20	0.20
17.192	0.20	0.20	0.20	0.20	0.20	0.20	0.20
17.244	0.20	0.20	0.20	0.20	0.20	0.20	0.20
17.296	0.20	0.20	0.20	0.20	0.20	0.20	0.20
17.348	0.20	0.20	0.20	0.20	0.20	0.20	0.20
17.400	0.20	0.20	0.19	0.19	0.19	0.19	0.19
17.453	0.19	0.19	0.19	0.19	0.19	0.19	0.19
17.505	0.19	0.19	0.19	0.19	0.19	0.19	0.19
17.557	0.19	0.19	0.19	0.19	0.19	0.19	0.19
17.609	0.19	0.19	0.19	0.19	0.19	0.19	0.19
17.661	0.19	0.19	0.19	0.19	0.19	0.19	0.19
17.713	0.19	0.19	0.19	0.19	0.19	0.19	0.19
17.766	0.19	0.19	0.19	0.19	0.19	0.19	0.19
17.818	0.19	0.19	0.19	0.19	0.19	0.19	0.18
17.870	0.18	0.18	0.18	0.18	0.18	0.18	0.18

EIRSWD
Cell A Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
17.922	0.18	0.18	0.18	0.18	0.18	0.18	0.18
17.974	0.18	0.18	0.18	0.18	0.18	0.18	0.18
18.026	0.18	0.18	0.18	0.18	0.18	0.18	0.18
18.079	0.18	0.18	0.18	0.18	0.18	0.18	0.18

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing

STORM 100-Yr

SUB-AREA:
West Pond Outlet .00811 79. .118

STREAM REACH:

18.131	0.18	0.18	0.18	0.18	0.18	0.18	0.18
18.183	0.18	0.18	0.18	0.18	0.18	0.18	0.18
18.235	0.18	0.18	0.18	0.18	0.18	0.18	0.18
18.287	0.18	0.17	0.17	0.17	0.17	0.17	0.17
18.339	0.17	0.17	0.17	0.17	0.17	0.17	0.17
18.392	0.17	0.17	0.17	0.17	0.17	0.17	0.17
18.444	0.17	0.17	0.17	0.17	0.17	0.17	0.17
18.496	0.17	0.17	0.17	0.17	0.17	0.17	0.17
18.548	0.17	0.17	0.17	0.17	0.17	0.17	0.17
18.600	0.17	0.17	0.17	0.17	0.17	0.17	0.17
18.652	0.17	0.17	0.17	0.17	0.17	0.17	0.17
18.705	0.17	0.17	0.17	0.16	0.16	0.16	0.16
18.757	0.16	0.16	0.16	0.16	0.16	0.16	0.16
18.809	0.16	0.16	0.16	0.16	0.16	0.16	0.16
18.861	0.16	0.16	0.16	0.16	0.16	0.16	0.16
18.913	0.16	0.16	0.16	0.16	0.16	0.16	0.16
18.965	0.16	0.16	0.16	0.16	0.16	0.16	0.16
19.018	0.16	0.16	0.16	0.16	0.16	0.16	0.16
19.070	0.16	0.16	0.16	0.16	0.16	0.16	0.16
19.122	0.16	0.16	0.16	0.16	0.15	0.15	0.15
19.174	0.15	0.15	0.15	0.15	0.15	0.15	0.15
19.226	0.15	0.15	0.15	0.15	0.15	0.15	0.15
19.278	0.15	0.15	0.15	0.15	0.15	0.15	0.15
19.331	0.15	0.15	0.15	0.15	0.15	0.15	0.15
19.383	0.15	0.15	0.15	0.15	0.15	0.15	0.15
19.435	0.15	0.15	0.15	0.15	0.15	0.15	0.15
19.487	0.15	0.15	0.15	0.15	0.15	0.15	0.15
19.539	0.15	0.15	0.15	0.14	0.14	0.14	0.14
19.591	0.14	0.14	0.14	0.14	0.14	0.14	0.14
19.644	0.14	0.14	0.14	0.14	0.14	0.14	0.14
19.696	0.14	0.14	0.14	0.14	0.14	0.14	0.14
19.748	0.14	0.14	0.14	0.14	0.14	0.14	0.14
19.800	0.14	0.14	0.14	0.14	0.14	0.14	0.14
19.852	0.14	0.14	0.14	0.14	0.14	0.14	0.14
19.904	0.14	0.14	0.14	0.14	0.14	0.14	0.14
19.957	0.14	0.14	0.13	0.13	0.13	0.13	0.13
20.009	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.061	0.13	0.13	0.13	0.13	0.13	0.13	0.13

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing
STORM 100-Yr
SUB-AREA:
West Pond Outlet .00811 79. .118

STREAM REACH:

20.113	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.165	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.217	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.270	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.322	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.374	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.426	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.478	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.530	0.13	0.13	0.13	0.13	0.13	0.13	0.13

EIRSWD
Cell A Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
20.583	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.635	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.687	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.739	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.791	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.843	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.896	0.13	0.13	0.13	0.13	0.13	0.13	0.13
20.948	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.000	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.052	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.104	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.156	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.209	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.261	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.313	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.365	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.417	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.469	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.522	0.13	0.13	0.13	0.13	0.13	0.13	0.13

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing

STORM 100-Yr

SUB-AREA:
West Pond Outlet .00811 79. .118

STREAM REACH:

21.574	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.626	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.678	0.13	0.13	0.13	0.13	0.13	0.13	0.13
21.730	0.13	0.13	0.12	0.12	0.12	0.12	0.12
21.782	0.12	0.12	0.12	0.12	0.12	0.12	0.12
21.835	0.12	0.12	0.12	0.12	0.12	0.12	0.12
21.887	0.12	0.12	0.12	0.12	0.12	0.12	0.12
21.939	0.12	0.12	0.12	0.12	0.12	0.12	0.12
21.991	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.043	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.096	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.148	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.200	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.252	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.304	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.356	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.409	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.461	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.513	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.565	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.617	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.669	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.722	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.774	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.826	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.878	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.930	0.12	0.12	0.12	0.12	0.12	0.12	0.12
22.982	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.035	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.087	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.139	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.191	0.12	0.12	0.12	0.12	0.12	0.12	0.12

EIRSWD
Cell A Pond Sizing

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Cell A Pond Sizing
STORM 100-Yr
SUB-AREA:
West Pond Outlet .00811 79. .118

STREAM REACH:
Line
Start Time ---------- Flow Values @ time increment of 0.007 hr ----------

(hr)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
23.243	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.295	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.348	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.400	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.452	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.504	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.556	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.608	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.661	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.713	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.765	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.817	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.869	0.12	0.12	0.12	0.12	0.12	0.12	0.12
23.921	0.12	0.12	0.12	0.12	0.12	0.11	0.11
23.974	0.11	0.11	0.11	0.11	0.11	0.11	0.11
24.026	0.11	0.11	0.10	0.10	0.09	0.08	0.07
24.078	0.06	0.06					

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WinTR-20: Version 1.10                  0         0         0.05
D                                                                                    (continued)
Cell A Pond Sizing
                                           STORM 100-Yr
SUB-AREA:
          West Pond Outlet              .00811    79.       .118

STREAM REACH:
```


EIRSWD
Cell A Pond Sizing

Area or Reach Identifier	Drainage Area (sq mi)	Alternate	Peak Flow by Storm 25-Yr (cfs)	100-Yr (cfs)	(cfs)	(cfs)	(cfs)
West Pond	0.008		4.71	7.93			
OUTLET	0.008		4.71	7.93			

```
WinTR-20: Version 1.10                  0         0         0.05
D                                                                                    (continued)
Cell A Pond Sizing
                                           STORM 100-Yr
SUB-AREA:
          West Pond Outlet              .00811    79.       .118

STREAM REACH:
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WinTR-20: Version 1.10                  0         0         0.05
D                                                                                    (continued)
Cell A Pond Sizing
                                           STORM 100-Yr
SUB-AREA:
          West Pond Outlet              .00811    79.       .118

STREAM REACH:
```

WinTR-55 Current Data Description

--- Identification Data ---

User: AMR
Project: EIRSWD
SubTitle: Cell A Pond Sizing
State: Idaho
County: Madison
Filename: Y:\Shared\Boise Projects\4-20133-E Idaho SW District Landfill Design And Engineering Support\Pr

Date: 7/3/2023
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
West Pond	Pond2	Outlet	5.19	79	.118

Total area: 5.19 (ac)

--- Storm Data --

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
1.2	1.6	1.8	2.2	2.5	2.8	1.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type II
Dimensionless Unit Hydrograph: <standard>

EIRSWD
Cell A Pond Sizing
Madison County, Idaho

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
1.2	1.6	1.8	2.2	2.5	2.8	1.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type II
Dimensionless Unit Hydrograph: <standard>

AMR

EIRSWD
Cell A Pond Sizing
Madison County, Idaho

Watershed Peak Table

Sub-Area or Reach Identifier	Peak Flow by Rainfall Return Period 25-Yr (cfs)	100-Yr (cfs)
SUBAREAS		
West Pond	4.71	7.93
REACHES		
OUTLET	4.71	7.93

AMR EIRSWD
Cell A Pond Sizing
Madison County, Idaho

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 25-Yr (cfs) (hr)	100-Yr (cfs) (hr)
SUBAREAS		
West Pond	4.71 11.97	7.93 11.95
REACHES		
OUTLET	4.71	7.93

AMR

EIRSWD
Cell A Pond Sizing
Madison County, Idaho

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
West Pond	5.19	0.118	79	Outlet	Pond2

Total Area: 5.19 (ac)

EIRSWD
Cell A Pond Sizing
Madison County, Idaho

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
West Pond							
SHEET	100	0.3330	0.150				0.087
SHALLOW	106	0.3330	0.050				0.003
CHANNEL	279	0.0287	0.022	8.00	8.90	11.071	0.007
CHANNEL	408	0.0074	0.022	8.00	8.90	5.397	0.021
						Time of Concentration	.118

EIRSWD
Cell A Pond Sizing
Madison County, Idaho

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use	Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
West Pond	Open space; grass cover 50% to 75% (fair)	C	5.19	79
	Total Area / Weighted Curve Number		5.19	79
			====	==

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WinTR-20 Printed Page File      Beginning of Input Data List
TR20.inp

WinTR-20: Version 1.10                  0         0         0.05
EIRSWD
Pond Sizing

SUB-AREA:
          East Pond Outlet              .01375    89.       .115

STREAM REACH:

STORM ANALYSIS:
          25-Yr                         2.2       Type II   2
          100-Yr                        2.8       Type II   2

STRUCTURE RATING:


GLOBAL OUTPUT:
          2         0.05                YYYYN     YYYYNN


WinTR-20 Printed Page File      End of Input Data List
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EIRSWD
Pond Sizing

Name of printed page file:
TR20.out

STORM 25-Yr

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
East Pond	0.014		1.193		11.95	15.78	1147.80

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
8.824	0.05	0.05	0.05	0.05	0.05	0.05	0.05
8.874	0.05	0.05	0.06	0.06	0.06	0.06	0.06
8.925	0.06	0.06	0.06	0.06	0.06	0.06	0.06
8.976	0.06	0.06	0.06	0.06	0.06	0.06	0.06
9.027	0.07	0.07	0.07	0.07	0.07	0.07	0.07
9.078	0.07	0.07	0.07	0.07	0.07	0.07	0.07
9.129	0.07	0.07	0.07	0.07	0.07	0.07	0.08
9.179	0.08	0.08	0.08	0.08	0.08	0.08	0.08
9.230	0.08	0.08	0.08	0.08	0.08	0.08	0.08
9.281	0.08	0.08	0.08	0.08	0.08	0.08	0.08
9.332	0.08	0.08	0.09	0.09	0.09	0.09	0.09
9.383	0.09	0.09	0.09	0.09	0.09	0.09	0.09
9.434	0.09	0.09	0.09	0.09	0.09	0.09	0.09
9.485	0.09	0.09	0.09	0.09	0.09	0.10	0.10
9.535	0.10	0.10	0.10	0.10	0.10	0.10	0.10
9.586	0.10	0.10	0.10	0.10	0.10	0.10	0.10
9.637	0.10	0.11	0.11	0.11	0.11	0.11	0.11
9.688	0.11	0.11	0.11	0.11	0.11	0.11	0.11
9.739	0.12	0.12	0.12	0.12	0.12	0.12	0.12
9.790	0.12	0.12	0.12	0.12	0.12	0.13	0.13
9.840	0.13	0.13	0.13	0.13	0.13	0.13	0.13
9.891	0.13	0.14	0.14	0.14	0.14	0.14	0.14
9.942	0.14	0.14	0.14	0.14	0.14	0.15	0.15
9.993	0.15	0.15	0.15	0.15	0.15	0.15	0.15
10.044	0.15	0.16	0.16	0.16	0.16	0.16	0.16
10.095	0.16	0.16	0.16	0.17	0.17	0.17	0.17
10.145	0.17	0.17	0.17	0.18	0.18	0.18	0.18
10.196	0.18	0.18	0.18	0.18	0.19	0.19	0.19
10.247	0.19	0.19	0.19	0.19	0.20	0.20	0.20
10.298	0.20	0.20	0.20	0.20	0.21	0.21	0.21
10.349	0.21	0.21	0.21	0.22	0.22	0.22	0.22
10.400	0.22	0.22	0.22	0.23	0.23	0.23	0.23
10.451	0.23	0.23	0.24	0.24	0.24	0.24	0.24
10.501	0.24	0.25	0.25	0.25	0.25	0.25	0.25

10.552	0.26	0.26	0.26	0.26	0.27	0.27	0.27
10.603	0.27	0.27	0.28	0.28	0.28	0.28	0.28
10.654	0.29	0.29	0.29	0.29	0.30	0.30	0.30
10.705	0.30	0.31	0.31	0.31	0.31	0.32	0.32
10.756	0.32	0.32	0.33	0.33	0.33	0.34	0.34
10.806	0.34	0.34	0.35	0.35	0.35	0.35	0.36

EIRSWD
Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
10.857	0.36	0.36	0.37	0.37	0.37	0.38	0.38
10.908	0.38	0.38	0.39	0.39	0.39	0.39	0.40
10.959	0.40	0.40	0.41	0.41	0.41	0.42	0.42
11.010	0.42	0.43	0.43	0.43	0.44	0.44	0.45
11.061	0.45	0.46	0.46	0.47	0.47	0.47	0.48
11.111	0.48	0.49	0.49	0.50	0.50	0.51	0.51
11.162	0.52	0.53	0.54	0.54	0.55	0.55	0.56
11.213	0.57	0.57	0.58	0.58	0.59	0.60	0.60
11.264	0.61	0.62	0.63	0.64	0.64	0.65	0.66
11.315	0.66	0.67	0.67	0.68	0.69	0.70	0.70
11.366	0.71	0.72	0.73	0.74	0.75	0.75	0.76
11.417	0.77	0.77	0.78	0.79	0.80	0.80	0.81
11.467	0.82	0.83	0.84	0.85	0.86	0.87	0.88
11.518	0.89	0.92	0.95	1.00	1.06	1.13	1.21
11.569	1.29	1.37	1.45	1.53	1.60	1.67	1.74
11.620	1.81	1.90	2.00	2.14	2.29	2.47	2.65
11.671	2.84	3.03	3.22	3.39	3.55	3.71	3.86
11.722	4.02	4.19	4.39	4.62	4.88	5.17	5.47
11.772	5.77	6.07	6.35	6.63	6.88	7.14	7.41
11.823	7.71	8.07	8.50	9.03	9.64	10.29	10.98
11.874	11.68	12.37	13.02	13.65	14.23	14.73	15.14
11.925	15.46	15.67	15.78	15.78	15.70	15.55	15.36
11.976	15.14	14.92	14.72	14.52	14.34	14.14	13.91
12.027	13.61	13.21	12.68	12.02	11.26	10.44	9.60
12.077	8.77	7.98	7.24	6.57	5.98	5.47	5.06
12.128	4.71	4.41	4.14	3.91	3.71	3.53	3.38
12.179	3.24	3.12	3.02	2.94	2.86	2.80	2.74
12.230	2.69	2.64	2.59	2.54	2.49	2.45	2.41
12.281	2.37	2.34	2.31	2.28	2.26	2.23	2.21
12.332	2.19	2.17	2.14	2.11	2.08	2.05	2.02
12.383	2.00	1.97	1.95	1.93	1.91	1.89	1.87
12.433	1.85	1.83	1.80	1.78	1.75	1.72	1.69
12.484	1.66	1.64	1.61	1.59	1.57	1.56	1.54
12.535	1.53	1.51	1.49	1.47	1.45	1.43	1.41
12.586	1.39	1.37	1.36	1.35	1.34	1.33	1.32
12.637	1.31	1.30	1.29	1.28	1.27	1.26	1.26
12.688	1.25	1.24	1.24	1.23	1.23	1.22	1.22
12.738	1.21	1.21	1.20	1.19	1.19	1.18	1.17
12.789	1.17	1.16	1.16	1.15	1.15	1.14	1.14
12.840	1.13	1.13	1.12	1.11	1.11	1.10	1.09
12.891	1.09	1.08	1.08	1.07	1.07	1.07	1.06
12.942	1.06	1.05	1.04	1.04	1.03	1.02	1.02
12.993	1.01	1.01	1.00	1.00	0.99	0.99	0.99
13.043	0.98	0.98	0.97	0.96	0.96	0.95	0.95
13.094	0.94	0.94	0.94	0.93	0.93	0.93	0.92
13.145	0.92	0.92	0.91	0.91	0.91	0.90	0.90
13.196	0.89	0.89	0.89	0.89	0.89	0.88	0.88
13.247	0.88	0.87	0.87	0.87	0.86	0.86	0.86
13.298	0.85	0.85	0.85	0.85	0.84	0.84	0.84
13.349	0.83	0.83	0.83	0.82	0.82	0.82	0.81
13.399	0.81	0.81	0.81	0.80	0.80	0.80	0.80

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 25-Yr

SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

EIRSWD
Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
13.450	0.79	0.79	0.78	0.78	0.78	0.77	0.77
13.501	0.77	0.77	0.76	0.76	0.76	0.76	0.75
13.552	0.75	0.75	0.74	0.74	0.74	0.73	0.73
13.603	0.73	0.73	0.73	0.72	0.72	0.72	0.72
13.654	0.71	0.71	0.71	0.71	0.70	0.70	0.70
13.704	0.70	0.70	0.69	0.69	0.69	0.69	0.69
13.755	0.68	0.68	0.68	0.68	0.67	0.67	0.67
13.806	0.67	0.66	0.66	0.66	0.66	0.66	0.65
13.857	0.65	0.65	0.65	0.64	0.64	0.64	0.64
13.908	0.64	0.63	0.63	0.63	0.63	0.63	0.62
13.959	0.62	0.62	0.62	0.61	0.61	0.61	0.61
14.009	0.60	0.60	0.60	0.60	0.60	0.60	0.60
14.060	0.59	0.59	0.59	0.59	0.59	0.58	0.58
14.111	0.58	0.58	0.58	0.58	0.58	0.58	0.58
14.162	0.57	0.57	0.57	0.57	0.57	0.57	0.57
14.213	0.57	0.57	0.57	0.57	0.57	0.56	0.56
14.264	0.56	0.56	0.56	0.56	0.56	0.56	0.56
14.315	0.56	0.56	0.56	0.56	0.56	0.55	0.55
14.365	0.55	0.55	0.55	0.55	0.55	0.55	0.55
14.416	0.55	0.55	0.55	0.55	0.54	0.54	0.54
14.467	0.54	0.54	0.54	0.54	0.54	0.54	0.54
14.518	0.54	0.54	0.54	0.54	0.53	0.53	0.53
14.569	0.53	0.53	0.53	0.53	0.53	0.53	0.53
14.620	0.53	0.53	0.52	0.52	0.52	0.52	0.52
14.670	0.52	0.52	0.52	0.52	0.52	0.52	0.52
14.721	0.52	0.52	0.52	0.51	0.51	0.51	0.51
14.772	0.51	0.51	0.51	0.51	0.51	0.51	0.51
14.823	0.50	0.50	0.50	0.50	0.50	0.50	0.50
14.874	0.50	0.50	0.50	0.50	0.50	0.50	0.50
14.925	0.49	0.49	0.49	0.49	0.49	0.49	0.49

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 25-Yr

SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

14.975	0.49	0.49	0.49	0.49	0.49	0.48	0.48
15.026	0.48	0.48	0.48	0.48	0.48	0.48	0.48
15.077	0.48	0.48	0.48	0.48	0.48	0.47	0.47
15.128	0.47	0.47	0.47	0.47	0.47	0.47	0.47
15.179	0.47	0.47	0.47	0.46	0.46	0.46	0.46
15.230	0.46	0.46	0.46	0.46	0.46	0.46	0.46
15.281	0.46	0.46	0.45	0.45	0.45	0.45	0.45
15.331	0.45	0.45	0.45	0.45	0.45	0.45	0.45
15.382	0.45	0.44	0.44	0.44	0.44	0.44	0.44
15.433	0.44	0.44	0.44	0.44	0.44	0.44	0.44
15.484	0.43	0.43	0.43	0.43	0.43	0.43	0.43
15.535	0.43	0.43	0.43	0.43	0.43	0.43	0.42
15.586	0.42	0.42	0.42	0.42	0.42	0.42	0.42
15.636	0.42	0.42	0.42	0.42	0.41	0.41	0.41
15.687	0.41	0.41	0.41	0.41	0.41	0.41	0.41
15.738	0.41	0.41	0.41	0.41	0.40	0.40	0.40
15.789	0.40	0.40	0.40	0.40	0.40	0.40	0.40
15.840	0.40	0.40	0.39	0.39	0.39	0.39	0.39
15.891	0.39	0.39	0.39	0.39	0.39	0.39	0.39
15.941	0.39	0.38	0.38	0.38	0.38	0.38	0.38
15.992	0.38	0.38	0.38	0.38	0.38	0.38	0.37

EIRSWD
Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
16.043	0.37	0.37	0.37	0.37	0.37	0.37	0.37
16.094	0.37	0.37	0.37	0.37	0.37	0.37	0.37
16.145	0.37	0.37	0.37	0.37	0.37	0.37	0.37
16.196	0.36	0.36	0.36	0.36	0.36	0.36	0.36
16.247	0.36	0.36	0.36	0.36	0.36	0.36	0.36
16.297	0.36	0.36	0.36	0.36	0.36	0.36	0.36
16.348	0.36	0.36	0.36	0.36	0.36	0.36	0.36

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing
STORM 25-Yr
SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

16.399	0.36	0.36	0.36	0.36	0.36	0.36	0.36
16.450	0.36	0.35	0.35	0.35	0.35	0.35	0.35
16.501	0.35	0.35	0.35	0.35	0.35	0.35	0.35
16.552	0.35	0.35	0.35	0.35	0.35	0.35	0.35
16.602	0.35	0.35	0.35	0.35	0.35	0.35	0.35
16.653	0.35	0.35	0.35	0.35	0.35	0.35	0.35
16.704	0.35	0.35	0.35	0.35	0.34	0.34	0.34
16.755	0.34	0.34	0.34	0.34	0.34	0.34	0.34
16.806	0.34	0.34	0.34	0.34	0.34	0.34	0.34
16.857	0.34	0.34	0.34	0.34	0.34	0.34	0.34
16.907	0.34	0.34	0.34	0.34	0.34	0.34	0.34
16.958	0.34	0.34	0.34	0.34	0.33	0.33	0.33
17.009	0.33	0.33	0.33	0.33	0.33	0.33	0.33
17.060	0.33	0.33	0.33	0.33	0.33	0.33	0.33
17.111	0.33	0.33	0.33	0.33	0.33	0.33	0.33
17.162	0.33	0.33	0.33	0.33	0.33	0.33	0.33
17.213	0.33	0.33	0.33	0.33	0.33	0.32	0.32
17.263	0.32	0.32	0.32	0.32	0.32	0.32	0.32
17.314	0.32	0.32	0.32	0.32	0.32	0.32	0.32
17.365	0.32	0.32	0.32	0.32	0.32	0.32	0.32
17.416	0.32	0.32	0.32	0.32	0.32	0.32	0.32
17.467	0.32	0.32	0.32	0.32	0.32	0.32	0.32
17.518	0.31	0.31	0.31	0.31	0.31	0.31	0.31
17.568	0.31	0.31	0.31	0.31	0.31	0.31	0.31
17.619	0.31	0.31	0.31	0.31	0.31	0.31	0.31
17.670	0.31	0.31	0.31	0.31	0.31	0.31	0.31
17.721	0.31	0.31	0.31	0.31	0.31	0.31	0.31
17.772	0.30	0.30	0.30	0.30	0.30	0.30	0.30
17.823	0.30	0.30	0.30	0.30	0.30	0.30	0.30
17.873	0.30	0.30	0.30	0.30	0.30	0.30	0.30
17.924	0.30	0.30	0.30	0.30	0.30	0.30	0.30
17.975	0.30	0.30	0.30	0.30	0.30	0.30	0.29
18.026	0.29	0.29	0.29	0.29	0.29	0.29	0.29
18.077	0.29	0.29	0.29	0.29	0.29	0.29	0.29
18.128	0.29	0.29	0.29	0.29	0.29	0.29	0.29
18.179	0.29	0.29	0.29	0.29	0.29	0.29	0.29
18.229	0.29	0.29	0.29	0.29	0.29	0.29	0.29
18.280	0.28	0.28	0.28	0.28	0.28	0.28	0.28

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing
STORM 25-Yr
SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

18.331	0.28	0.28	0.28	0.28	0.28	0.28	0.28
18.382	0.28	0.28	0.28	0.28	0.28	0.28	0.28
18.433	0.28	0.28	0.28	0.28	0.28	0.28	0.28
18.484	0.28	0.28	0.28	0.28	0.28	0.28	0.28
18.534	0.28	0.28	0.27	0.27	0.27	0.27	0.27
18.585	0.27	0.27	0.27	0.27	0.27	0.27	0.27

EIRSWD
Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
18.636	0.27	0.27	0.27	0.27	0.27	0.27	0.27
18.687	0.27	0.27	0.27	0.27	0.27	0.27	0.27
18.738	0.27	0.27	0.27	0.27	0.27	0.27	0.27
18.789	0.26	0.26	0.26	0.26	0.26	0.26	0.26
18.839	0.26	0.26	0.26	0.26	0.26	0.26	0.26
18.890	0.26	0.26	0.26	0.26	0.26	0.26	0.26
18.941	0.26	0.26	0.26	0.26	0.26	0.26	0.26
18.992	0.26	0.26	0.26	0.26	0.26	0.26	0.26
19.043	0.25	0.25	0.25	0.25	0.25	0.25	0.25
19.094	0.25	0.25	0.25	0.25	0.25	0.25	0.25
19.145	0.25	0.25	0.25	0.25	0.25	0.25	0.25
19.195	0.25	0.25	0.25	0.25	0.25	0.25	0.25
19.246	0.25	0.25	0.25	0.25	0.25	0.25	0.24
19.297	0.24	0.24	0.24	0.24	0.24	0.24	0.24
19.348	0.24	0.24	0.24	0.24	0.24	0.24	0.24
19.399	0.24	0.24	0.24	0.24	0.24	0.24	0.24
19.450	0.24	0.24	0.24	0.24	0.24	0.24	0.24
19.500	0.24	0.24	0.24	0.24	0.24	0.24	0.24
19.551	0.23	0.23	0.23	0.23	0.23	0.23	0.23
19.602	0.23	0.23	0.23	0.23	0.23	0.23	0.23
19.653	0.23	0.23	0.23	0.23	0.23	0.23	0.23
19.704	0.23	0.23	0.23	0.23	0.23	0.23	0.23

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 25-Yr

SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

19.755	0.23	0.23	0.23	0.23	0.23	0.22	0.22
19.805	0.22	0.22	0.22	0.22	0.22	0.22	0.22
19.856	0.22	0.22	0.22	0.22	0.22	0.22	0.22
19.907	0.22	0.22	0.22	0.22	0.22	0.22	0.22
19.958	0.22	0.22	0.22	0.22	0.22	0.22	0.22
20.009	0.22	0.22	0.22	0.22	0.22	0.21	0.21
20.060	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.111	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.161	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.212	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.263	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.314	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.365	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.416	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.466	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.517	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.568	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.619	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.670	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.721	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.771	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.822	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.873	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.924	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.975	0.21	0.21	0.21	0.21	0.21	0.21	0.21
21.026	0.21	0.21	0.21	0.21	0.21	0.21	0.21
21.077	0.21	0.21	0.21	0.21	0.21	0.21	0.21
21.127	0.21	0.21	0.21	0.21	0.21	0.21	0.20
21.178	0.20	0.20	0.20	0.20	0.20	0.20	0.20

EIRSWD
Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 25-Yr

SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

21.229	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.280	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.331	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.382	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.432	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.483	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.534	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.585	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.636	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.687	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.737	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.788	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.839	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.890	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.941	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.992	0.20	0.20	0.20	0.20	0.20	0.20	0.20
22.043	0.20	0.20	0.20	0.20	0.20	0.20	0.20
22.093	0.20	0.20	0.20	0.20	0.20	0.20	0.20
22.144	0.20	0.20	0.20	0.20	0.20	0.20	0.20
22.195	0.20	0.20	0.20	0.20	0.20	0.20	0.20
22.246	0.20	0.20	0.20	0.20	0.20	0.20	0.20
22.297	0.20	0.20	0.20	0.20	0.20	0.20	0.20
22.348	0.20	0.20	0.20	0.20	0.20	0.20	0.20
22.398	0.20	0.20	0.20	0.20	0.20	0.20	0.20
22.449	0.20	0.20	0.19	0.19	0.19	0.19	0.19
22.500	0.19	0.19	0.19	0.19	0.19	0.19	0.19
22.551	0.19	0.19	0.19	0.19	0.19	0.19	0.19
22.602	0.19	0.19	0.19	0.19	0.19	0.19	0.19
22.653	0.19	0.19	0.19	0.19	0.19	0.19	0.19
22.703	0.19	0.19	0.19	0.19	0.19	0.19	0.19
22.754	0.19	0.19	0.19	0.19	0.19	0.19	0.19
22.805	0.19	0.19	0.19	0.19	0.19	0.19	0.19
22.856	0.19	0.19	0.19	0.19	0.19	0.19	0.19
22.907	0.19	0.19	0.19	0.19	0.19	0.19	0.19
22.958	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.009	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.059	0.19	0.19	0.19	0.19	0.19	0.19	0.19

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing
STORM 25-Yr
SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

23.110	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.161	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.212	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.263	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.314	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.364	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.415	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.466	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.517	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.568	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.619	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.669	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.720	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.771	0.18	0.18	0.18	0.18	0.18	0.18	0.18

EIRSWD
Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
23.822	0.18	0.18	0.18	0.18	0.18	0.18	0.18
23.873	0.18	0.18	0.18	0.18	0.18	0.18	0.18
23.924	0.18	0.18	0.18	0.18	0.18	0.18	0.18
23.975	0.18	0.18	0.18	0.18	0.18	0.18	0.18
24.025	0.18	0.17	0.16	0.15	0.14	0.13	0.11
24.076	0.10	0.09	0.08	0.06	0.05		

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
OUTLET	0.014		1.193		11.95	15.78	1147.80

Line

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 25-Yr

SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
8.824	0.05	0.05	0.05	0.05	0.05	0.05	0.05
8.874	0.05	0.05	0.06	0.06	0.06	0.06	0.06
8.925	0.06	0.06	0.06	0.06	0.06	0.06	0.06
8.976	0.06	0.06	0.06	0.06	0.06	0.06	0.06
9.027	0.07	0.07	0.07	0.07	0.07	0.07	0.07
9.078	0.07	0.07	0.07	0.07	0.07	0.07	0.07
9.129	0.07	0.07	0.07	0.07	0.07	0.07	0.08
9.179	0.08	0.08	0.08	0.08	0.08	0.08	0.08
9.230	0.08	0.08	0.08	0.08	0.08	0.08	0.08
9.281	0.08	0.08	0.08	0.08	0.08	0.08	0.08
9.332	0.08	0.08	0.09	0.09	0.09	0.09	0.09
9.383	0.09	0.09	0.09	0.09	0.09	0.09	0.09
9.434	0.09	0.09	0.09	0.09	0.09	0.09	0.09
9.485	0.09	0.09	0.09	0.09	0.09	0.10	0.10
9.535	0.10	0.10	0.10	0.10	0.10	0.10	0.10
9.586	0.10	0.10	0.10	0.10	0.10	0.10	0.10
9.637	0.10	0.11	0.11	0.11	0.11	0.11	0.11
9.688	0.11	0.11	0.11	0.11	0.11	0.11	0.11
9.739	0.12	0.12	0.12	0.12	0.12	0.12	0.12
9.790	0.12	0.12	0.12	0.12	0.12	0.13	0.13
9.840	0.13	0.13	0.13	0.13	0.13	0.13	0.13
9.891	0.13	0.14	0.14	0.14	0.14	0.14	0.14
9.942	0.14	0.14	0.14	0.14	0.14	0.15	0.15
9.993	0.15	0.15	0.15	0.15	0.15	0.15	0.15
10.044	0.15	0.16	0.16	0.16	0.16	0.16	0.16
10.095	0.16	0.16	0.16	0.17	0.17	0.17	0.17
10.145	0.17	0.17	0.17	0.18	0.18	0.18	0.18
10.196	0.18	0.18	0.18	0.18	0.19	0.19	0.19
10.247	0.19	0.19	0.19	0.19	0.20	0.20	0.20
10.298	0.20	0.20	0.20	0.20	0.21	0.21	0.21
10.349	0.21	0.21	0.21	0.22	0.22	0.22	0.22
10.400	0.22	0.22	0.22	0.23	0.23	0.23	0.23
10.451	0.23	0.23	0.24	0.24	0.24	0.24	0.24
10.501	0.24	0.25	0.25	0.25	0.25	0.25	0.25

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing
STORM 25-Yr
SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

EIRSWD
Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
10.552	0.26	0.26	0.26	0.26	0.27	0.27	0.27
10.603	0.27	0.27	0.28	0.28	0.28	0.28	0.28
10.654	0.29	0.29	0.29	0.29	0.30	0.30	0.30
10.705	0.30	0.31	0.31	0.31	0.31	0.32	0.32
10.756	0.32	0.32	0.33	0.33	0.33	0.34	0.34
10.806	0.34	0.34	0.35	0.35	0.35	0.35	0.36
10.857	0.36	0.36	0.37	0.37	0.37	0.38	0.38
10.908	0.38	0.38	0.39	0.39	0.39	0.39	0.40
10.959	0.40	0.40	0.41	0.41	0.41	0.42	0.42
11.010	0.42	0.43	0.43	0.43	0.44	0.44	0.45
11.061	0.45	0.46	0.46	0.47	0.47	0.47	0.48
11.111	0.48	0.49	0.49	0.50	0.50	0.51	0.51
11.162	0.52	0.53	0.54	0.54	0.55	0.55	0.56
11.213	0.57	0.57	0.58	0.58	0.59	0.60	0.60
11.264	0.61	0.62	0.63	0.64	0.64	0.65	0.66
11.315	0.66	0.67	0.67	0.68	0.69	0.70	0.70
11.366	0.71	0.72	0.73	0.74	0.75	0.75	0.76
11.417	0.77	0.77	0.78	0.79	0.80	0.80	0.81
11.467	0.82	0.83	0.84	0.85	0.86	0.87	0.88
11.518	0.89	0.92	0.95	1.00	1.06	1.13	1.21
11.569	1.29	1.37	1.45	1.53	1.60	1.67	1.74
11.620	1.81	1.90	2.00	2.14	2.29	2.47	2.65
11.671	2.84	3.03	3.22	3.39	3.55	3.71	3.86
11.722	4.02	4.19	4.39	4.62	4.88	5.17	5.47
11.772	5.77	6.07	6.35	6.63	6.88	7.14	7.41
11.823	7.71	8.07	8.50	9.03	9.64	10.29	10.98
11.874	11.68	12.37	13.02	13.65	14.23	14.73	15.14
11.925	15.46	15.67	15.78	15.78	15.70	15.55	15.36
11.976	15.14	14.92	14.72	14.52	14.34	14.14	13.91

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 25-Yr

SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

12.027	13.61	13.21	12.68	12.02	11.26	10.44	9.60
12.077	8.77	7.98	7.24	6.57	5.98	5.47	5.06
12.128	4.71	4.41	4.14	3.91	3.71	3.53	3.38
12.179	3.24	3.12	3.02	2.94	2.86	2.80	2.74
12.230	2.69	2.64	2.59	2.54	2.49	2.45	2.41
12.281	2.37	2.34	2.31	2.28	2.26	2.23	2.21
12.332	2.19	2.17	2.14	2.11	2.08	2.05	2.02
12.383	2.00	1.97	1.95	1.93	1.91	1.89	1.87
12.433	1.85	1.83	1.80	1.78	1.75	1.72	1.69
12.484	1.66	1.64	1.61	1.59	1.57	1.56	1.54
12.535	1.53	1.51	1.49	1.47	1.45	1.43	1.41
12.586	1.39	1.37	1.36	1.35	1.34	1.33	1.32
12.637	1.31	1.30	1.29	1.28	1.27	1.26	1.26
12.688	1.25	1.24	1.24	1.23	1.23	1.22	1.22
12.738	1.21	1.21	1.20	1.19	1.19	1.18	1.17
12.789	1.17	1.16	1.16	1.15	1.15	1.14	1.14
12.840	1.13	1.13	1.12	1.11	1.11	1.10	1.09
12.891	1.09	1.08	1.08	1.07	1.07	1.07	1.06
12.942	1.06	1.05	1.04	1.04	1.03	1.02	1.02
12.993	1.01	1.01	1.00	1.00	0.99	0.99	0.99
13.043	0.98	0.98	0.97	0.96	0.96	0.95	0.95
13.094	0.94	0.94	0.94	0.93	0.93	0.93	0.92

EIRSWD
Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
13.145	0.92	0.92	0.91	0.91	0.91	0.90	0.90
13.196	0.89	0.89	0.89	0.89	0.89	0.88	0.88
13.247	0.88	0.87	0.87	0.87	0.86	0.86	0.86
13.298	0.85	0.85	0.85	0.85	0.84	0.84	0.84
13.349	0.83	0.83	0.83	0.82	0.82	0.82	0.81
13.399	0.81	0.81	0.81	0.80	0.80	0.80	0.80

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 25-Yr

SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

13.450	0.79	0.79	0.78	0.78	0.78	0.77	0.77
13.501	0.77	0.77	0.76	0.76	0.76	0.76	0.75
13.552	0.75	0.75	0.74	0.74	0.74	0.73	0.73
13.603	0.73	0.73	0.73	0.72	0.72	0.72	0.72
13.654	0.71	0.71	0.71	0.71	0.70	0.70	0.70
13.704	0.70	0.70	0.69	0.69	0.69	0.69	0.69
13.755	0.68	0.68	0.68	0.68	0.67	0.67	0.67
13.806	0.67	0.66	0.66	0.66	0.66	0.66	0.65
13.857	0.65	0.65	0.65	0.64	0.64	0.64	0.64
13.908	0.64	0.63	0.63	0.63	0.63	0.63	0.62
13.959	0.62	0.62	0.62	0.61	0.61	0.61	0.61
14.009	0.60	0.60	0.60	0.60	0.60	0.60	0.60
14.060	0.59	0.59	0.59	0.59	0.59	0.58	0.58
14.111	0.58	0.58	0.58	0.58	0.58	0.58	0.58
14.162	0.57	0.57	0.57	0.57	0.57	0.57	0.57
14.213	0.57	0.57	0.57	0.57	0.57	0.56	0.56
14.264	0.56	0.56	0.56	0.56	0.56	0.56	0.56
14.315	0.56	0.56	0.56	0.56	0.56	0.55	0.55
14.365	0.55	0.55	0.55	0.55	0.55	0.55	0.55
14.416	0.55	0.55	0.55	0.55	0.54	0.54	0.54
14.467	0.54	0.54	0.54	0.54	0.54	0.54	0.54
14.518	0.54	0.54	0.54	0.54	0.53	0.53	0.53
14.569	0.53	0.53	0.53	0.53	0.53	0.53	0.53
14.620	0.53	0.53	0.52	0.52	0.52	0.52	0.52
14.670	0.52	0.52	0.52	0.52	0.52	0.52	0.52
14.721	0.52	0.52	0.52	0.51	0.51	0.51	0.51
14.772	0.51	0.51	0.51	0.51	0.51	0.51	0.51
14.823	0.50	0.50	0.50	0.50	0.50	0.50	0.50
14.874	0.50	0.50	0.50	0.50	0.50	0.50	0.50
14.925	0.49	0.49	0.49	0.49	0.49	0.49	0.49
14.975	0.49	0.49	0.49	0.49	0.49	0.48	0.48
15.026	0.48	0.48	0.48	0.48	0.48	0.48	0.48
15.077	0.48	0.48	0.48	0.48	0.48	0.47	0.47
15.128	0.47	0.47	0.47	0.47	0.47	0.47	0.47
15.179	0.47	0.47	0.47	0.46	0.46	0.46	0.46
15.230	0.46	0.46	0.46	0.46	0.46	0.46	0.46
15.281	0.46	0.46	0.45	0.45	0.45	0.45	0.45
15.331	0.45	0.45	0.45	0.45	0.45	0.45	0.45

WinTR-20 Printed Page File Beginning of Input Data List
TR20.inp

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 25-Yr

SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

15.382	0.45	0.44	0.44	0.44	0.44	0.44	0.44
15.433	0.44	0.44	0.44	0.44	0.44	0.44	0.44
15.484	0.43	0.43	0.43	0.43	0.43	0.43	0.43
15.535	0.43	0.43	0.43	0.43	0.43	0.43	0.42
15.586	0.42	0.42	0.42	0.42	0.42	0.42	0.42
15.636	0.42	0.42	0.42	0.42	0.41	0.41	0.41
15.687	0.41	0.41	0.41	0.41	0.41	0.41	0.41

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EIRSWD
Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
15.738	0.41	0.41	0.41	0.41	0.40	0.40	0.40
15.789	0.40	0.40	0.40	0.40	0.40	0.40	0.40
15.840	0.40	0.40	0.39	0.39	0.39	0.39	0.39
15.891	0.39	0.39	0.39	0.39	0.39	0.39	0.39
15.941	0.39	0.38	0.38	0.38	0.38	0.38	0.38
15.992	0.38	0.38	0.38	0.38	0.38	0.38	0.37
16.043	0.37	0.37	0.37	0.37	0.37	0.37	0.37
16.094	0.37	0.37	0.37	0.37	0.37	0.37	0.37
16.145	0.37	0.37	0.37	0.37	0.37	0.37	0.37
16.196	0.36	0.36	0.36	0.36	0.36	0.36	0.36
16.247	0.36	0.36	0.36	0.36	0.36	0.36	0.36
16.297	0.36	0.36	0.36	0.36	0.36	0.36	0.36
16.348	0.36	0.36	0.36	0.36	0.36	0.36	0.36
16.399	0.36	0.36	0.36	0.36	0.36	0.36	0.36
16.450	0.36	0.35	0.35	0.35	0.35	0.35	0.35
16.501	0.35	0.35	0.35	0.35	0.35	0.35	0.35
16.552	0.35	0.35	0.35	0.35	0.35	0.35	0.35
16.602	0.35	0.35	0.35	0.35	0.35	0.35	0.35
16.653	0.35	0.35	0.35	0.35	0.35	0.35	0.35
16.704	0.35	0.35	0.35	0.35	0.34	0.34	0.34
16.755	0.34	0.34	0.34	0.34	0.34	0.34	0.34

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 25-Yr

SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

16.806	0.34	0.34	0.34	0.34	0.34	0.34	0.34
16.857	0.34	0.34	0.34	0.34	0.34	0.34	0.34
16.907	0.34	0.34	0.34	0.34	0.34	0.34	0.34
16.958	0.34	0.34	0.34	0.34	0.33	0.33	0.33
17.009	0.33	0.33	0.33	0.33	0.33	0.33	0.33
17.060	0.33	0.33	0.33	0.33	0.33	0.33	0.33
17.111	0.33	0.33	0.33	0.33	0.33	0.33	0.33
17.162	0.33	0.33	0.33	0.33	0.33	0.33	0.33
17.213	0.33	0.33	0.33	0.33	0.33	0.32	0.32
17.263	0.32	0.32	0.32	0.32	0.32	0.32	0.32
17.314	0.32	0.32	0.32	0.32	0.32	0.32	0.32
17.365	0.32	0.32	0.32	0.32	0.32	0.32	0.32
17.416	0.32	0.32	0.32	0.32	0.32	0.32	0.32
17.467	0.32	0.32	0.32	0.32	0.32	0.32	0.32
17.518	0.31	0.31	0.31	0.31	0.31	0.31	0.31
17.568	0.31	0.31	0.31	0.31	0.31	0.31	0.31
17.619	0.31	0.31	0.31	0.31	0.31	0.31	0.31
17.670	0.31	0.31	0.31	0.31	0.31	0.31	0.31
17.721	0.31	0.31	0.31	0.31	0.31	0.31	0.31
17.772	0.30	0.30	0.30	0.30	0.30	0.30	0.30
17.823	0.30	0.30	0.30	0.30	0.30	0.30	0.30
17.873	0.30	0.30	0.30	0.30	0.30	0.30	0.30
17.924	0.30	0.30	0.30	0.30	0.30	0.30	0.30
17.975	0.30	0.30	0.30	0.30	0.30	0.30	0.29
18.026	0.29	0.29	0.29	0.29	0.29	0.29	0.29
18.077	0.29	0.29	0.29	0.29	0.29	0.29	0.29
18.128	0.29	0.29	0.29	0.29	0.29	0.29	0.29
18.179	0.29	0.29	0.29	0.29	0.29	0.29	0.29
18.229	0.29	0.29	0.29	0.29	0.29	0.29	0.29
18.280	0.28	0.28	0.28	0.28	0.28	0.28	0.28

EIRSWD
Pond Sizing

Line
Start Time ---------- Flow Values @ time increment of 0.007 hr ----------

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 25-Yr

SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

(hr)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
18.331	0.28	0.28	0.28	0.28	0.28	0.28	0.28
18.382	0.28	0.28	0.28	0.28	0.28	0.28	0.28
18.433	0.28	0.28	0.28	0.28	0.28	0.28	0.28
18.484	0.28	0.28	0.28	0.28	0.28	0.28	0.28
18.534	0.28	0.28	0.27	0.27	0.27	0.27	0.27
18.585	0.27	0.27	0.27	0.27	0.27	0.27	0.27
18.636	0.27	0.27	0.27	0.27	0.27	0.27	0.27
18.687	0.27	0.27	0.27	0.27	0.27	0.27	0.27
18.738	0.27	0.27	0.27	0.27	0.27	0.27	0.27
18.789	0.26	0.26	0.26	0.26	0.26	0.26	0.26
18.839	0.26	0.26	0.26	0.26	0.26	0.26	0.26
18.890	0.26	0.26	0.26	0.26	0.26	0.26	0.26
18.941	0.26	0.26	0.26	0.26	0.26	0.26	0.26
18.992	0.26	0.26	0.26	0.26	0.26	0.26	0.26
19.043	0.25	0.25	0.25	0.25	0.25	0.25	0.25
19.094	0.25	0.25	0.25	0.25	0.25	0.25	0.25
19.145	0.25	0.25	0.25	0.25	0.25	0.25	0.25
19.195	0.25	0.25	0.25	0.25	0.25	0.25	0.25
19.246	0.25	0.25	0.25	0.25	0.25	0.25	0.24
19.297	0.24	0.24	0.24	0.24	0.24	0.24	0.24
19.348	0.24	0.24	0.24	0.24	0.24	0.24	0.24
19.399	0.24	0.24	0.24	0.24	0.24	0.24	0.24
19.450	0.24	0.24	0.24	0.24	0.24	0.24	0.24
19.500	0.24	0.24	0.24	0.24	0.24	0.24	0.24
19.551	0.23	0.23	0.23	0.23	0.23	0.23	0.23
19.602	0.23	0.23	0.23	0.23	0.23	0.23	0.23
19.653	0.23	0.23	0.23	0.23	0.23	0.23	0.23
19.704	0.23	0.23	0.23	0.23	0.23	0.23	0.23
19.755	0.23	0.23	0.23	0.23	0.23	0.22	0.22
19.805	0.22	0.22	0.22	0.22	0.22	0.22	0.22
19.856	0.22	0.22	0.22	0.22	0.22	0.22	0.22
19.907	0.22	0.22	0.22	0.22	0.22	0.22	0.22
19.958	0.22	0.22	0.22	0.22	0.22	0.22	0.22
20.009	0.22	0.22	0.22	0.22	0.22	0.21	0.21
20.060	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.111	0.21	0.21	0.21	0.21	0.21	0.21	0.21

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 25-Yr

SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

20.161	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.212	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.263	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.314	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.365	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.416	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.466	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.517	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.568	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.619	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.670	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.721	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.771	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.822	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.873	0.21	0.21	0.21	0.21	0.21	0.21	0.21

EIRSWD
Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
20.924	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.975	0.21	0.21	0.21	0.21	0.21	0.21	0.21
21.026	0.21	0.21	0.21	0.21	0.21	0.21	0.21
21.077	0.21	0.21	0.21	0.21	0.21	0.21	0.21
21.127	0.21	0.21	0.21	0.21	0.21	0.21	0.20
21.178	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.229	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.280	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.331	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.382	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.432	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.483	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.534	0.20	0.20	0.20	0.20	0.20	0.20	0.20

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing
STORM 25-Yr
SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

21.585	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.636	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.687	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.737	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.788	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.839	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.890	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.941	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.992	0.20	0.20	0.20	0.20	0.20	0.20	0.20
22.043	0.20	0.20	0.20	0.20	0.20	0.20	0.20
22.093	0.20	0.20	0.20	0.20	0.20	0.20	0.20
22.144	0.20	0.20	0.20	0.20	0.20	0.20	0.20
22.195	0.20	0.20	0.20	0.20	0.20	0.20	0.20
22.246	0.20	0.20	0.20	0.20	0.20	0.20	0.20
22.297	0.20	0.20	0.20	0.20	0.20	0.20	0.20
22.348	0.20	0.20	0.20	0.20	0.20	0.20	0.20
22.398	0.20	0.20	0.20	0.20	0.20	0.20	0.20
22.449	0.20	0.20	0.19	0.19	0.19	0.19	0.19
22.500	0.19	0.19	0.19	0.19	0.19	0.19	0.19
22.551	0.19	0.19	0.19	0.19	0.19	0.19	0.19
22.602	0.19	0.19	0.19	0.19	0.19	0.19	0.19
22.653	0.19	0.19	0.19	0.19	0.19	0.19	0.19
22.703	0.19	0.19	0.19	0.19	0.19	0.19	0.19
22.754	0.19	0.19	0.19	0.19	0.19	0.19	0.19
22.805	0.19	0.19	0.19	0.19	0.19	0.19	0.19
22.856	0.19	0.19	0.19	0.19	0.19	0.19	0.19
22.907	0.19	0.19	0.19	0.19	0.19	0.19	0.19
22.958	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.009	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.059	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.110	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.161	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.212	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.263	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.314	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.364	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.415	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.466	0.19	0.19	0.19	0.19	0.19	0.19	0.19

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 25-Yr

SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

EIRSWD
Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
23.517	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.568	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.619	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.669	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.720	0.19	0.19	0.19	0.19	0.19	0.19	0.19
23.771	0.18	0.18	0.18	0.18	0.18	0.18	0.18
23.822	0.18	0.18	0.18	0.18	0.18	0.18	0.18
23.873	0.18	0.18	0.18	0.18	0.18	0.18	0.18
23.924	0.18	0.18	0.18	0.18	0.18	0.18	0.18
23.975	0.18	0.18	0.18	0.18	0.18	0.18	0.18
24.025	0.18	0.17	0.16	0.15	0.14	0.13	0.11
24.076	0.10	0.09	0.08	0.06	0.05		

STORM 100-Yr

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
East Pond	0.014		1.717		11.94	22.61	1644.36

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
7.669	0.05	0.05	0.05	0.05	0.05	0.05	0.05
7.720	0.05	0.05	0.05	0.05	0.05	0.05	0.05
7.771	0.05	0.06	0.06	0.06	0.06	0.06	0.06

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 100-Yr

SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

7.822	0.06	0.06	0.06	0.06	0.06	0.06	0.06
7.872	0.06	0.06	0.06	0.06	0.06	0.06	0.06
7.923	0.06	0.06	0.06	0.06	0.06	0.06	0.06
7.974	0.07	0.07	0.07	0.07	0.07	0.07	0.07
8.025	0.07	0.07	0.07	0.07	0.07	0.07	0.07
8.076	0.07	0.07	0.07	0.07	0.07	0.07	0.07
8.127	0.07	0.07	0.07	0.08	0.08	0.08	0.08
8.177	0.08	0.08	0.08	0.08	0.08	0.08	0.08
8.228	0.08	0.08	0.08	0.08	0.08	0.09	0.09
8.279	0.09	0.09	0.09	0.09	0.09	0.09	0.09
8.330	0.09	0.09	0.09	0.09	0.09	0.09	0.09
8.381	0.10	0.10	0.10	0.10	0.10	0.10	0.10
8.432	0.10	0.10	0.10	0.10	0.10	0.10	0.10
8.482	0.11	0.11	0.11	0.11	0.11	0.11	0.11
8.533	0.11	0.11	0.11	0.11	0.11	0.11	0.11
8.584	0.12	0.12	0.12	0.12	0.12	0.12	0.12
8.635	0.12	0.12	0.12	0.12	0.12	0.12	0.13
8.686	0.13	0.13	0.13	0.13	0.13	0.13	0.13
8.737	0.13	0.13	0.13	0.13	0.14	0.14	0.14
8.788	0.14	0.14	0.14	0.14	0.14	0.14	0.14
8.838	0.14	0.14	0.15	0.15	0.15	0.15	0.15
8.889	0.15	0.15	0.15	0.15	0.15	0.15	0.16
8.940	0.16	0.16	0.16	0.16	0.16	0.16	0.16

EIRSWD
Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
8.991	0.16	0.16	0.16	0.17	0.17	0.17	0.17
9.042	0.17	0.17	0.17	0.17	0.17	0.17	0.17
9.093	0.17	0.18	0.18	0.18	0.18	0.18	0.18
9.143	0.18	0.18	0.18	0.18	0.18	0.18	0.18
9.194	0.18	0.18	0.18	0.19	0.19	0.19	0.19

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing
STORM 100-Yr
SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

9.245	0.19	0.19	0.19	0.19	0.19	0.19	0.19
9.296	0.19	0.19	0.19	0.19	0.19	0.19	0.20
9.347	0.20	0.20	0.20	0.20	0.20	0.20	0.20
9.398	0.20	0.20	0.20	0.20	0.20	0.20	0.20
9.448	0.20	0.20	0.20	0.20	0.21	0.21	0.21
9.499	0.21	0.21	0.21	0.21	0.21	0.21	0.21
9.550	0.21	0.21	0.21	0.21	0.22	0.22	0.22
9.601	0.22	0.22	0.22	0.22	0.22	0.22	0.22
9.652	0.23	0.23	0.23	0.23	0.23	0.23	0.23
9.703	0.23	0.24	0.24	0.24	0.24	0.24	0.24
9.754	0.24	0.25	0.25	0.25	0.25	0.25	0.25
9.804	0.25	0.26	0.26	0.26	0.26	0.26	0.26
9.855	0.26	0.27	0.27	0.27	0.27	0.27	0.27
9.906	0.28	0.28	0.28	0.28	0.28	0.28	0.28
9.957	0.29	0.29	0.29	0.29	0.29	0.29	0.30
10.008	0.30	0.30	0.30	0.30	0.30	0.30	0.31
10.059	0.31	0.31	0.31	0.31	0.32	0.32	0.32
10.109	0.32	0.32	0.33	0.33	0.33	0.33	0.33
10.160	0.34	0.34	0.34	0.34	0.35	0.35	0.35
10.211	0.35	0.35	0.36	0.36	0.36	0.36	0.36
10.262	0.37	0.37	0.37	0.38	0.38	0.38	0.38
10.313	0.38	0.39	0.39	0.39	0.39	0.40	0.40
10.364	0.40	0.40	0.41	0.41	0.41	0.41	0.42
10.414	0.42	0.42	0.42	0.42	0.43	0.43	0.43
10.465	0.44	0.44	0.44	0.44	0.45	0.45	0.45
10.516	0.45	0.46	0.46	0.46	0.46	0.47	0.47
10.567	0.48	0.48	0.48	0.49	0.49	0.49	0.49
10.618	0.50	0.50	0.50	0.51	0.51	0.52	0.52
10.669	0.52	0.53	0.53	0.54	0.54	0.54	0.55
10.720	0.55	0.55	0.56	0.56	0.57	0.57	0.58
10.770	0.58	0.59	0.59	0.59	0.60	0.60	0.61
10.821	0.61	0.61	0.62	0.62	0.63	0.63	0.64
10.872	0.64	0.65	0.65	0.66	0.66	0.66	0.67
10.923	0.67	0.68	0.68	0.68	0.69	0.69	0.70
10.974	0.71	0.71	0.72	0.72	0.72	0.73	0.73
11.025	0.74	0.74	0.75	0.76	0.76	0.77	0.78
11.075	0.79	0.79	0.80	0.81	0.81	0.82	0.83
11.126	0.83	0.84	0.85	0.86	0.87	0.88	0.89

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 100-Yr

SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

11.177	0.90	0.91	0.92	0.93	0.94	0.95	0.96
11.228	0.97	0.98	0.99	1.00	1.01	1.02	1.03
11.279	1.05	1.06	1.07	1.08	1.09	1.10	1.11
11.330	1.11	1.12	1.14	1.15	1.16	1.17	1.19
11.380	1.20	1.21	1.22	1.23	1.24	1.25	1.26
11.431	1.27	1.28	1.30	1.31	1.32	1.34	1.35
11.482	1.37	1.38	1.39	1.40	1.42	1.45	1.49
11.533	1.54	1.62	1.71	1.83	1.95	2.08	2.21

EIRSWD
Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.584	2.33	2.45	2.56	2.66	2.77	2.88	3.01
11.635	3.18	3.38	3.62	3.89	4.18	4.47	4.75
11.686	5.03	5.29	5.53	5.76	5.99	6.22	6.47
11.736	6.76	7.10	7.49	7.91	8.35	8.78	9.21
11.787	9.62	10.01	10.38	10.74	11.12	11.54	12.05
11.838	12.66	13.41	14.27	15.20	16.17	17.14	18.09
11.889	19.01	19.86	20.65	21.32	21.85	22.25	22.51
11.940	22.61	22.56	22.39	22.14	21.82	21.48	21.14
11.991	20.80	20.50	20.20	19.89	19.54	19.09	18.50
12.041	17.73	16.78	15.70	14.54	13.36	12.20	11.09
12.092	10.06	9.12	8.29	7.59	7.02	6.53	6.11
12.143	5.74	5.42	5.14	4.89	4.67	4.48	4.32
12.194	4.18	4.06	3.95	3.86	3.78	3.71	3.64
12.245	3.57	3.50	3.44	3.38	3.32	3.27	3.22
12.296	3.18	3.14	3.11	3.08	3.05	3.02	2.98
12.346	2.94	2.90	2.86	2.82	2.78	2.75	2.71
12.397	2.68	2.65	2.63	2.60	2.57	2.55	2.51
12.448	2.48	2.44	2.40	2.36	2.32	2.28	2.25
12.499	2.21	2.19	2.16	2.14	2.12	2.09	2.07
12.550	2.04	2.01	1.98	1.96	1.93	1.91	1.88

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 100-Yr

SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

12.601	1.86	1.85	1.83	1.82	1.81	1.79	1.78
12.652	1.77	1.76	1.74	1.73	1.72	1.71	1.70
12.702	1.69	1.69	1.68	1.67	1.67	1.66	1.65
12.753	1.64	1.63	1.62	1.61	1.60	1.60	1.59
12.804	1.58	1.58	1.57	1.56	1.56	1.55	1.54
12.855	1.53	1.52	1.51	1.51	1.50	1.49	1.48
12.906	1.48	1.47	1.46	1.46	1.45	1.44	1.44
12.957	1.43	1.42	1.41	1.40	1.39	1.38	1.37
13.007	1.37	1.36	1.36	1.35	1.35	1.34	1.33
13.058	1.32	1.32	1.31	1.30	1.30	1.29	1.28
13.109	1.28	1.27	1.27	1.27	1.26	1.26	1.25
13.160	1.25	1.24	1.24	1.23	1.23	1.22	1.22
13.211	1.21	1.21	1.21	1.20	1.20	1.20	1.19
13.262	1.19	1.18	1.18	1.17	1.17	1.16	1.16
13.312	1.16	1.15	1.15	1.15	1.14	1.14	1.13
13.363	1.13	1.12	1.12	1.11	1.11	1.10	1.10
13.414	1.10	1.09	1.09	1.09	1.08	1.08	1.07
13.465	1.07	1.06	1.06	1.05	1.05	1.05	1.04
13.516	1.04	1.04	1.03	1.03	1.03	1.02	1.02
13.567	1.01	1.01	1.00	1.00	1.00	0.99	0.99
13.618	0.99	0.98	0.98	0.98	0.98	0.97	0.97
13.668	0.96	0.96	0.96	0.95	0.95	0.95	0.95
13.719	0.94	0.94	0.94	0.94	0.93	0.93	0.93
13.770	0.92	0.92	0.91	0.91	0.91	0.91	0.90
13.821	0.90	0.90	0.90	0.89	0.89	0.89	0.88
13.872	0.88	0.88	0.87	0.87	0.87	0.86	0.86
13.923	0.86	0.86	0.85	0.85	0.85	0.84	0.84
13.973	0.84	0.83	0.83	0.83	0.82	0.82	0.82
14.024	0.82	0.82	0.81	0.81	0.81	0.81	0.80
14.075	0.80	0.80	0.80	0.79	0.79	0.79	0.79
14.126	0.79	0.79	0.79	0.78	0.78	0.78	0.78

EIRSWD
Pond Sizing

Line

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing
STORM 100-Yr
SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
14.177	0.78	0.78	0.77	0.77	0.77	0.77	0.77
14.228	0.77	0.77	0.77	0.77	0.77	0.76	0.76
14.278	0.76	0.76	0.76	0.76	0.76	0.76	0.76
14.329	0.76	0.76	0.75	0.75	0.75	0.75	0.75
14.380	0.75	0.75	0.75	0.74	0.74	0.74	0.74
14.431	0.74	0.74	0.74	0.74	0.74	0.74	0.73
14.482	0.73	0.73	0.73	0.73	0.73	0.73	0.73
14.533	0.73	0.73	0.73	0.72	0.72	0.72	0.72
14.584	0.72	0.72	0.72	0.71	0.71	0.71	0.71
14.634	0.71	0.71	0.71	0.71	0.71	0.71	0.70
14.685	0.70	0.70	0.70	0.70	0.70	0.70	0.70
14.736	0.70	0.70	0.70	0.69	0.69	0.69	0.69
14.787	0.69	0.69	0.69	0.69	0.68	0.68	0.68
14.838	0.68	0.68	0.68	0.68	0.68	0.68	0.68
14.889	0.67	0.67	0.67	0.67	0.67	0.67	0.67
14.939	0.67	0.67	0.67	0.66	0.66	0.66	0.66
14.990	0.66	0.66	0.66	0.66	0.66	0.65	0.65
15.041	0.65	0.65	0.65	0.65	0.65	0.65	0.65
15.092	0.65	0.64	0.64	0.64	0.64	0.64	0.64
15.143	0.64	0.64	0.64	0.63	0.63	0.63	0.63
15.194	0.63	0.63	0.63	0.63	0.63	0.63	0.62
15.244	0.62	0.62	0.62	0.62	0.62	0.62	0.62
15.295	0.62	0.61	0.61	0.61	0.61	0.61	0.61
15.346	0.61	0.61	0.61	0.61	0.60	0.60	0.60
15.397	0.60	0.60	0.60	0.60	0.60	0.60	0.59
15.448	0.59	0.59	0.59	0.59	0.59	0.59	0.59
15.499	0.59	0.58	0.58	0.58	0.58	0.58	0.58
15.550	0.58	0.58	0.58	0.57	0.57	0.57	0.57
15.600	0.57	0.57	0.57	0.57	0.57	0.57	0.56
15.651	0.56	0.56	0.56	0.56	0.56	0.56	0.56
15.702	0.56	0.56	0.55	0.55	0.55	0.55	0.55
15.753	0.55	0.55	0.55	0.54	0.54	0.54	0.54
15.804	0.54	0.54	0.54	0.54	0.54	0.54	0.53
15.855	0.53	0.53	0.53	0.53	0.53	0.53	0.53
15.905	0.53	0.53	0.52	0.52	0.52	0.52	0.52

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 100-Yr

SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

15.956	0.52	0.52	0.52	0.51	0.51	0.51	0.51
16.007	0.51	0.51	0.51	0.51	0.51	0.51	0.50
16.058	0.50	0.50	0.50	0.50	0.50	0.50	0.50
16.109	0.50	0.50	0.50	0.50	0.50	0.50	0.50
16.160	0.50	0.49	0.49	0.49	0.49	0.49	0.49
16.210	0.49	0.49	0.49	0.49	0.49	0.49	0.49
16.261	0.49	0.49	0.49	0.49	0.49	0.49	0.49
16.312	0.49	0.49	0.49	0.49	0.49	0.49	0.48
16.363	0.48	0.48	0.48	0.48	0.48	0.48	0.48
16.414	0.48	0.48	0.48	0.48	0.48	0.48	0.48
16.465	0.48	0.48	0.48	0.48	0.48	0.48	0.48
16.516	0.48	0.48	0.48	0.48	0.48	0.47	0.47
16.566	0.47	0.47	0.47	0.47	0.47	0.47	0.47
16.617	0.47	0.47	0.47	0.47	0.47	0.47	0.47
16.668	0.47	0.47	0.47	0.47	0.47	0.47	0.47
16.719	0.47	0.47	0.47	0.47	0.46	0.46	0.46

EIRSWD
Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
16.770	0.46	0.46	0.46	0.46	0.46	0.46	0.46
16.821	0.46	0.46	0.46	0.46	0.46	0.46	0.46
16.871	0.46	0.46	0.46	0.46	0.46	0.46	0.46
16.922	0.46	0.46	0.45	0.45	0.45	0.45	0.45
16.973	0.45	0.45	0.45	0.45	0.45	0.45	0.45
17.024	0.45	0.45	0.45	0.45	0.45	0.45	0.45
17.075	0.45	0.45	0.45	0.45	0.45	0.45	0.45
17.126	0.44	0.44	0.44	0.44	0.44	0.44	0.44
17.176	0.44	0.44	0.44	0.44	0.44	0.44	0.44
17.227	0.44	0.44	0.44	0.44	0.44	0.44	0.44
17.278	0.44	0.44	0.44	0.44	0.44	0.43	0.43
17.329	0.43	0.43	0.43	0.43	0.43	0.43	0.43

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 100-Yr

SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

17.380	0.43	0.43	0.43	0.43	0.43	0.43	0.43
17.431	0.43	0.43	0.43	0.43	0.43	0.43	0.43
17.482	0.43	0.43	0.42	0.42	0.42	0.42	0.42
17.532	0.42	0.42	0.42	0.42	0.42	0.42	0.42
17.583	0.42	0.42	0.42	0.42	0.42	0.42	0.42
17.634	0.42	0.42	0.42	0.42	0.42	0.42	0.42
17.685	0.41	0.41	0.41	0.41	0.41	0.41	0.41
17.736	0.41	0.41	0.41	0.41	0.41	0.41	0.41
17.787	0.41	0.41	0.41	0.41	0.41	0.41	0.41
17.837	0.41	0.41	0.41	0.41	0.41	0.40	0.40
17.888	0.40	0.40	0.40	0.40	0.40	0.40	0.40
17.939	0.40	0.40	0.40	0.40	0.40	0.40	0.40
17.990	0.40	0.40	0.40	0.40	0.40	0.40	0.40
18.041	0.40	0.40	0.40	0.39	0.39	0.39	0.39
18.092	0.39	0.39	0.39	0.39	0.39	0.39	0.39
18.142	0.39	0.39	0.39	0.39	0.39	0.39	0.39
18.193	0.39	0.39	0.39	0.39	0.39	0.39	0.39
18.244	0.39	0.38	0.38	0.38	0.38	0.38	0.38
18.295	0.38	0.38	0.38	0.38	0.38	0.38	0.38
18.346	0.38	0.38	0.38	0.38	0.38	0.38	0.38
18.397	0.38	0.38	0.38	0.38	0.38	0.38	0.37
18.448	0.37	0.37	0.37	0.37	0.37	0.37	0.37
18.498	0.37	0.37	0.37	0.37	0.37	0.37	0.37
18.549	0.37	0.37	0.37	0.37	0.37	0.37	0.37
18.600	0.37	0.37	0.37	0.36	0.36	0.36	0.36
18.651	0.36	0.36	0.36	0.36	0.36	0.36	0.36
18.702	0.36	0.36	0.36	0.36	0.36	0.36	0.36
18.753	0.36	0.36	0.36	0.36	0.36	0.36	0.36
18.803	0.36	0.35	0.35	0.35	0.35	0.35	0.35
18.854	0.35	0.35	0.35	0.35	0.35	0.35	0.35
18.905	0.35	0.35	0.35	0.35	0.35	0.35	0.35
18.956	0.35	0.35	0.35	0.35	0.35	0.34	0.34
19.007	0.34	0.34	0.34	0.34	0.34	0.34	0.34
19.058	0.34	0.34	0.34	0.34	0.34	0.34	0.34
19.108	0.34	0.34	0.34	0.34	0.34	0.34	0.34
19.159	0.34	0.34	0.34	0.33	0.33	0.33	0.33
19.210	0.33	0.33	0.33	0.33	0.33	0.33	0.33
19.261	0.33	0.33	0.33	0.33	0.33	0.33	0.33

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 100-Yr

SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

19.312	0.33	0.33	0.33	0.33	0.33	0.33	0.33

EIRSWD
Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
19.363	0.33	0.32	0.32	0.32	0.32	0.32	0.32
19.414	0.32	0.32	0.32	0.32	0.32	0.32	0.32
19.464	0.32	0.32	0.32	0.32	0.32	0.32	0.32
19.515	0.32	0.32	0.32	0.32	0.32	0.32	0.32
19.566	0.31	0.31	0.31	0.31	0.31	0.31	0.31
19.617	0.31	0.31	0.31	0.31	0.31	0.31	0.31
19.668	0.31	0.31	0.31	0.31	0.31	0.31	0.31
19.719	0.31	0.31	0.31	0.31	0.31	0.30	0.30
19.769	0.30	0.30	0.30	0.30	0.30	0.30	0.30
19.820	0.30	0.30	0.30	0.30	0.30	0.30	0.30
19.871	0.30	0.30	0.30	0.30	0.30	0.30	0.30
19.922	0.30	0.30	0.29	0.29	0.29	0.29	0.29
19.973	0.29	0.29	0.29	0.29	0.29	0.29	0.29
20.024	0.29	0.29	0.29	0.29	0.29	0.29	0.29
20.074	0.29	0.29	0.29	0.29	0.29	0.29	0.29
20.125	0.29	0.29	0.29	0.29	0.29	0.29	0.29
20.176	0.29	0.29	0.28	0.28	0.28	0.28	0.28
20.227	0.28	0.28	0.28	0.28	0.28	0.28	0.28
20.278	0.28	0.28	0.28	0.28	0.28	0.28	0.28
20.329	0.28	0.28	0.28	0.28	0.28	0.28	0.28
20.380	0.28	0.28	0.28	0.28	0.28	0.28	0.28
20.430	0.28	0.28	0.28	0.28	0.28	0.28	0.28
20.481	0.28	0.28	0.28	0.28	0.28	0.28	0.28
20.532	0.28	0.28	0.28	0.28	0.28	0.28	0.28
20.583	0.28	0.28	0.28	0.28	0.28	0.28	0.28
20.634	0.28	0.28	0.28	0.28	0.28	0.28	0.28
20.685	0.28	0.28	0.28	0.28	0.28	0.28	0.28

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 100-Yr

SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

20.735	0.28	0.28	0.28	0.28	0.28	0.28	0.28
20.786	0.28	0.28	0.28	0.28	0.28	0.28	0.28
20.837	0.28	0.28	0.28	0.28	0.28	0.28	0.28
20.888	0.28	0.28	0.28	0.28	0.28	0.28	0.28
20.939	0.28	0.28	0.28	0.28	0.28	0.28	0.28
20.990	0.28	0.28	0.28	0.28	0.28	0.28	0.28
21.040	0.28	0.28	0.28	0.28	0.28	0.28	0.28
21.091	0.28	0.28	0.28	0.28	0.28	0.28	0.28
21.142	0.28	0.28	0.28	0.28	0.27	0.27	0.27
21.193	0.27	0.27	0.27	0.27	0.27	0.27	0.27
21.244	0.27	0.27	0.27	0.27	0.27	0.27	0.27
21.295	0.27	0.27	0.27	0.27	0.27	0.27	0.27
21.346	0.27	0.27	0.27	0.27	0.27	0.27	0.27
21.396	0.27	0.27	0.27	0.27	0.27	0.27	0.27
21.447	0.27	0.27	0.27	0.27	0.27	0.27	0.27
21.498	0.27	0.27	0.27	0.27	0.27	0.27	0.27
21.549	0.27	0.27	0.27	0.27	0.27	0.27	0.27
21.600	0.27	0.27	0.27	0.27	0.27	0.27	0.27
21.651	0.27	0.27	0.27	0.27	0.27	0.27	0.27
21.701	0.27	0.27	0.27	0.27	0.27	0.27	0.27
21.752	0.27	0.27	0.27	0.27	0.27	0.27	0.27
21.803	0.27	0.27	0.27	0.27	0.27	0.27	0.27
21.854	0.27	0.27	0.27	0.27	0.27	0.27	0.27
21.905	0.27	0.27	0.27	0.27	0.27	0.27	0.27

EIRSWD
Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
21.956	0.27	0.27	0.27	0.27	0.27	0.27	0.27
22.006	0.27	0.27	0.27	0.27	0.27	0.27	0.27
22.057	0.27	0.27	0.27	0.27	0.27	0.27	0.27
22.108	0.27	0.27	0.27	0.27	0.27	0.27	0.26

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 100-Yr

SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

22.159	0.26	0.26	0.26	0.26	0.26	0.26	0.26
22.210	0.26	0.26	0.26	0.26	0.26	0.26	0.26
22.261	0.26	0.26	0.26	0.26	0.26	0.26	0.26
22.312	0.26	0.26	0.26	0.26	0.26	0.26	0.26
22.362	0.26	0.26	0.26	0.26	0.26	0.26	0.26
22.413	0.26	0.26	0.26	0.26	0.26	0.26	0.26
22.464	0.26	0.26	0.26	0.26	0.26	0.26	0.26
22.515	0.26	0.26	0.26	0.26	0.26	0.26	0.26
22.566	0.26	0.26	0.26	0.26	0.26	0.26	0.26
22.617	0.26	0.26	0.26	0.26	0.26	0.26	0.26
22.667	0.26	0.26	0.26	0.26	0.26	0.26	0.26
22.718	0.26	0.26	0.26	0.26	0.26	0.26	0.26
22.769	0.26	0.26	0.26	0.26	0.26	0.26	0.26
22.820	0.26	0.26	0.26	0.26	0.26	0.26	0.26
22.871	0.26	0.26	0.26	0.26	0.26	0.26	0.26
22.922	0.26	0.26	0.26	0.26	0.26	0.26	0.26
22.972	0.26	0.26	0.26	0.26	0.26	0.26	0.26
23.023	0.26	0.26	0.26	0.26	0.25	0.25	0.25
23.074	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.125	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.176	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.227	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.278	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.328	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.379	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.430	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.481	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.532	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.583	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.633	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.684	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.735	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.786	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.837	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.888	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.938	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.989	0.25	0.24	0.24	0.24	0.24	0.24	0.23
24.040	0.22	0.20	0.19	0.17	0.15	0.13	0.12

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing
STORM 100-Yr
SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:
24.091 0.10 0.09 0.07 0.06 0.05

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
OUTLET	0.014		1.717		11.94	22.61	1644.36

EIRSWD
Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
7.669	0.05	0.05	0.05	0.05	0.05	0.05	0.05
7.720	0.05	0.05	0.05	0.05	0.05	0.05	0.05
7.771	0.05	0.06	0.06	0.06	0.06	0.06	0.06
7.822	0.06	0.06	0.06	0.06	0.06	0.06	0.06
7.872	0.06	0.06	0.06	0.06	0.06	0.06	0.06
7.923	0.06	0.06	0.06	0.06	0.06	0.06	0.06
7.974	0.07	0.07	0.07	0.07	0.07	0.07	0.07
8.025	0.07	0.07	0.07	0.07	0.07	0.07	0.07
8.076	0.07	0.07	0.07	0.07	0.07	0.07	0.07
8.127	0.07	0.07	0.07	0.08	0.08	0.08	0.08
8.177	0.08	0.08	0.08	0.08	0.08	0.08	0.08
8.228	0.08	0.08	0.08	0.08	0.08	0.09	0.09
8.279	0.09	0.09	0.09	0.09	0.09	0.09	0.09
8.330	0.09	0.09	0.09	0.09	0.09	0.09	0.09
8.381	0.10	0.10	0.10	0.10	0.10	0.10	0.10
8.432	0.10	0.10	0.10	0.10	0.10	0.10	0.10
8.482	0.11	0.11	0.11	0.11	0.11	0.11	0.11
8.533	0.11	0.11	0.11	0.11	0.11	0.11	0.11
8.584	0.12	0.12	0.12	0.12	0.12	0.12	0.12

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 100-Yr

SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

8.635	0.12	0.12	0.12	0.12	0.12	0.12	0.13
8.686	0.13	0.13	0.13	0.13	0.13	0.13	0.13
8.737	0.13	0.13	0.13	0.13	0.14	0.14	0.14
8.788	0.14	0.14	0.14	0.14	0.14	0.14	0.14
8.838	0.14	0.14	0.15	0.15	0.15	0.15	0.15
8.889	0.15	0.15	0.15	0.15	0.15	0.15	0.16
8.940	0.16	0.16	0.16	0.16	0.16	0.16	0.16
8.991	0.16	0.16	0.16	0.17	0.17	0.17	0.17
9.042	0.17	0.17	0.17	0.17	0.17	0.17	0.17
9.093	0.17	0.18	0.18	0.18	0.18	0.18	0.18
9.143	0.18	0.18	0.18	0.18	0.18	0.18	0.18
9.194	0.18	0.18	0.18	0.19	0.19	0.19	0.19
9.245	0.19	0.19	0.19	0.19	0.19	0.19	0.19
9.296	0.19	0.19	0.19	0.19	0.19	0.19	0.20
9.347	0.20	0.20	0.20	0.20	0.20	0.20	0.20
9.398	0.20	0.20	0.20	0.20	0.20	0.20	0.20
9.448	0.20	0.20	0.20	0.20	0.21	0.21	0.21
9.499	0.21	0.21	0.21	0.21	0.21	0.21	0.21
9.550	0.21	0.21	0.21	0.21	0.22	0.22	0.22
9.601	0.22	0.22	0.22	0.22	0.22	0.22	0.22
9.652	0.23	0.23	0.23	0.23	0.23	0.23	0.23
9.703	0.23	0.24	0.24	0.24	0.24	0.24	0.24
9.754	0.24	0.25	0.25	0.25	0.25	0.25	0.25
9.804	0.25	0.26	0.26	0.26	0.26	0.26	0.26
9.855	0.26	0.27	0.27	0.27	0.27	0.27	0.27
9.906	0.28	0.28	0.28	0.28	0.28	0.28	0.28
9.957	0.29	0.29	0.29	0.29	0.29	0.29	0.30
10.008	0.30	0.30	0.30	0.30	0.30	0.30	0.31
10.059	0.31	0.31	0.31	0.31	0.32	0.32	0.32
10.109	0.32	0.32	0.33	0.33	0.33	0.33	0.33
10.160	0.34	0.34	0.34	0.34	0.35	0.35	0.35
10.211	0.35	0.35	0.36	0.36	0.36	0.36	0.36

EIRSWD
Pond Sizing

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing
STORM 100-Yr
SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:
Line
Start Time ---------- Flow Values @ time increment of 0.007 hr ----------

(hr)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
10.262	0.37	0.37	0.37	0.38	0.38	0.38	0.38
10.313	0.38	0.39	0.39	0.39	0.39	0.40	0.40
10.364	0.40	0.40	0.41	0.41	0.41	0.41	0.42
10.414	0.42	0.42	0.42	0.42	0.43	0.43	0.43
10.465	0.44	0.44	0.44	0.44	0.45	0.45	0.45
10.516	0.45	0.46	0.46	0.46	0.46	0.47	0.47
10.567	0.48	0.48	0.48	0.49	0.49	0.49	0.49
10.618	0.50	0.50	0.50	0.51	0.51	0.52	0.52
10.669	0.52	0.53	0.53	0.54	0.54	0.54	0.55
10.720	0.55	0.55	0.56	0.56	0.57	0.57	0.58
10.770	0.58	0.59	0.59	0.59	0.60	0.60	0.61
10.821	0.61	0.61	0.62	0.62	0.63	0.63	0.64
10.872	0.64	0.65	0.65	0.66	0.66	0.66	0.67
10.923	0.67	0.68	0.68	0.68	0.69	0.69	0.70
10.974	0.71	0.71	0.72	0.72	0.72	0.73	0.73
11.025	0.74	0.74	0.75	0.76	0.76	0.77	0.78
11.075	0.79	0.79	0.80	0.81	0.81	0.82	0.83
11.126	0.83	0.84	0.85	0.86	0.87	0.88	0.89
11.177	0.90	0.91	0.92	0.93	0.94	0.95	0.96
11.228	0.97	0.98	0.99	1.00	1.01	1.02	1.03
11.279	1.05	1.06	1.07	1.08	1.09	1.10	1.11
11.330	1.11	1.12	1.14	1.15	1.16	1.17	1.19
11.380	1.20	1.21	1.22	1.23	1.24	1.25	1.26
11.431	1.27	1.28	1.30	1.31	1.32	1.34	1.35
11.482	1.37	1.38	1.39	1.40	1.42	1.45	1.49
11.533	1.54	1.62	1.71	1.83	1.95	2.08	2.21
11.584	2.33	2.45	2.56	2.66	2.77	2.88	3.01
11.635	3.18	3.38	3.62	3.89	4.18	4.47	4.75
11.686	5.03	5.29	5.53	5.76	5.99	6.22	6.47
11.736	6.76	7.10	7.49	7.91	8.35	8.78	9.21
11.787	9.62	10.01	10.38	10.74	11.12	11.54	12.05
11.838	12.66	13.41	14.27	15.20	16.17	17.14	18.09
11.889	19.01	19.86	20.65	21.32	21.85	22.25	22.51
11.940	22.61	22.56	22.39	22.14	21.82	21.48	21.14

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 100-Yr

SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

11.991	20.80	20.50	20.20	19.89	19.54	19.09	18.50
12.041	17.73	16.78	15.70	14.54	13.36	12.20	11.09
12.092	10.06	9.12	8.29	7.59	7.02	6.53	6.11
12.143	5.74	5.42	5.14	4.89	4.67	4.48	4.32
12.194	4.18	4.06	3.95	3.86	3.78	3.71	3.64
12.245	3.57	3.50	3.44	3.38	3.32	3.27	3.22
12.296	3.18	3.14	3.11	3.08	3.05	3.02	2.98
12.346	2.94	2.90	2.86	2.82	2.78	2.75	2.71
12.397	2.68	2.65	2.63	2.60	2.57	2.55	2.51
12.448	2.48	2.44	2.40	2.36	2.32	2.28	2.25
12.499	2.21	2.19	2.16	2.14	2.12	2.09	2.07
12.550	2.04	2.01	1.98	1.96	1.93	1.91	1.88
12.601	1.86	1.85	1.83	1.82	1.81	1.79	1.78
12.652	1.77	1.76	1.74	1.73	1.72	1.71	1.70
12.702	1.69	1.69	1.68	1.67	1.67	1.66	1.65
12.753	1.64	1.63	1.62	1.61	1.60	1.60	1.59
12.804	1.58	1.58	1.57	1.56	1.56	1.55	1.54

EIRSWD
Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
12.855	1.53	1.52	1.51	1.51	1.50	1.49	1.48
12.906	1.48	1.47	1.46	1.46	1.45	1.44	1.44
12.957	1.43	1.42	1.41	1.40	1.39	1.38	1.37
13.007	1.37	1.36	1.36	1.35	1.35	1.34	1.33
13.058	1.32	1.32	1.31	1.30	1.30	1.29	1.28
13.109	1.28	1.27	1.27	1.27	1.26	1.26	1.25
13.160	1.25	1.24	1.24	1.23	1.23	1.22	1.22
13.211	1.21	1.21	1.21	1.20	1.20	1.20	1.19
13.262	1.19	1.18	1.18	1.17	1.17	1.16	1.16
13.312	1.16	1.15	1.15	1.15	1.14	1.14	1.13
13.363	1.13	1.12	1.12	1.11	1.11	1.10	1.10

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 100-Yr

SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

13.414	1.10	1.09	1.09	1.09	1.08	1.08	1.07
13.465	1.07	1.06	1.06	1.05	1.05	1.05	1.04
13.516	1.04	1.04	1.03	1.03	1.03	1.02	1.02
13.567	1.01	1.01	1.00	1.00	1.00	0.99	0.99
13.618	0.99	0.98	0.98	0.98	0.98	0.97	0.97
13.668	0.96	0.96	0.96	0.95	0.95	0.95	0.95
13.719	0.94	0.94	0.94	0.94	0.93	0.93	0.93
13.770	0.92	0.92	0.91	0.91	0.91	0.91	0.90
13.821	0.90	0.90	0.90	0.89	0.89	0.89	0.88
13.872	0.88	0.88	0.87	0.87	0.87	0.86	0.86
13.923	0.86	0.86	0.85	0.85	0.85	0.84	0.84
13.973	0.84	0.83	0.83	0.83	0.82	0.82	0.82
14.024	0.82	0.82	0.81	0.81	0.81	0.81	0.80
14.075	0.80	0.80	0.80	0.79	0.79	0.79	0.79
14.126	0.79	0.79	0.79	0.78	0.78	0.78	0.78
14.177	0.78	0.78	0.77	0.77	0.77	0.77	0.77
14.228	0.77	0.77	0.77	0.77	0.77	0.76	0.76
14.278	0.76	0.76	0.76	0.76	0.76	0.76	0.76
14.329	0.76	0.76	0.75	0.75	0.75	0.75	0.75
14.380	0.75	0.75	0.75	0.74	0.74	0.74	0.74
14.431	0.74	0.74	0.74	0.74	0.74	0.74	0.73
14.482	0.73	0.73	0.73	0.73	0.73	0.73	0.73
14.533	0.73	0.73	0.73	0.72	0.72	0.72	0.72
14.584	0.72	0.72	0.72	0.71	0.71	0.71	0.71
14.634	0.71	0.71	0.71	0.71	0.71	0.71	0.70
14.685	0.70	0.70	0.70	0.70	0.70	0.70	0.70
14.736	0.70	0.70	0.70	0.69	0.69	0.69	0.69
14.787	0.69	0.69	0.69	0.69	0.68	0.68	0.68
14.838	0.68	0.68	0.68	0.68	0.68	0.68	0.68
14.889	0.67	0.67	0.67	0.67	0.67	0.67	0.67
14.939	0.67	0.67	0.67	0.66	0.66	0.66	0.66
14.990	0.66	0.66	0.66	0.66	0.66	0.65	0.65
15.041	0.65	0.65	0.65	0.65	0.65	0.65	0.65
15.092	0.65	0.64	0.64	0.64	0.64	0.64	0.64
15.143	0.64	0.64	0.64	0.63	0.63	0.63	0.63
15.194	0.63	0.63	0.63	0.63	0.63	0.63	0.62
15.244	0.62	0.62	0.62	0.62	0.62	0.62	0.62
15.295	0.62	0.61	0.61	0.61	0.61	0.61	0.61

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing
STORM 100-Yr
SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

15.346	0.61	0.61	0.61	0.61	0.60	0.60	0.60
15.397	0.60	0.60	0.60	0.60	0.60	0.60	0.59

EIRSWD
Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
15.448	0.59	0.59	0.59	0.59	0.59	0.59	0.59
15.499	0.59	0.58	0.58	0.58	0.58	0.58	0.58
15.550	0.58	0.58	0.58	0.57	0.57	0.57	0.57
15.600	0.57	0.57	0.57	0.57	0.57	0.57	0.56
15.651	0.56	0.56	0.56	0.56	0.56	0.56	0.56
15.702	0.56	0.56	0.55	0.55	0.55	0.55	0.55
15.753	0.55	0.55	0.55	0.54	0.54	0.54	0.54
15.804	0.54	0.54	0.54	0.54	0.54	0.54	0.53
15.855	0.53	0.53	0.53	0.53	0.53	0.53	0.53
15.905	0.53	0.53	0.52	0.52	0.52	0.52	0.52
15.956	0.52	0.52	0.52	0.51	0.51	0.51	0.51
16.007	0.51	0.51	0.51	0.51	0.51	0.51	0.50
16.058	0.50	0.50	0.50	0.50	0.50	0.50	0.50
16.109	0.50	0.50	0.50	0.50	0.50	0.50	0.50
16.160	0.50	0.49	0.49	0.49	0.49	0.49	0.49
16.210	0.49	0.49	0.49	0.49	0.49	0.49	0.49
16.261	0.49	0.49	0.49	0.49	0.49	0.49	0.49
16.312	0.49	0.49	0.49	0.49	0.49	0.49	0.48
16.363	0.48	0.48	0.48	0.48	0.48	0.48	0.48
16.414	0.48	0.48	0.48	0.48	0.48	0.48	0.48
16.465	0.48	0.48	0.48	0.48	0.48	0.48	0.48
16.516	0.48	0.48	0.48	0.48	0.48	0.47	0.47
16.566	0.47	0.47	0.47	0.47	0.47	0.47	0.47
16.617	0.47	0.47	0.47	0.47	0.47	0.47	0.47
16.668	0.47	0.47	0.47	0.47	0.47	0.47	0.47
16.719	0.47	0.47	0.47	0.47	0.46	0.46	0.46

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 100-Yr

SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

16.770	0.46	0.46	0.46	0.46	0.46	0.46	0.46
16.821	0.46	0.46	0.46	0.46	0.46	0.46	0.46
16.871	0.46	0.46	0.46	0.46	0.46	0.46	0.46
16.922	0.46	0.46	0.45	0.45	0.45	0.45	0.45
16.973	0.45	0.45	0.45	0.45	0.45	0.45	0.45
17.024	0.45	0.45	0.45	0.45	0.45	0.45	0.45
17.075	0.45	0.45	0.45	0.45	0.45	0.45	0.45
17.126	0.44	0.44	0.44	0.44	0.44	0.44	0.44
17.176	0.44	0.44	0.44	0.44	0.44	0.44	0.44
17.227	0.44	0.44	0.44	0.44	0.44	0.44	0.44
17.278	0.44	0.44	0.44	0.44	0.44	0.43	0.43
17.329	0.43	0.43	0.43	0.43	0.43	0.43	0.43
17.380	0.43	0.43	0.43	0.43	0.43	0.43	0.43
17.431	0.43	0.43	0.43	0.43	0.43	0.43	0.43
17.482	0.43	0.43	0.42	0.42	0.42	0.42	0.42
17.532	0.42	0.42	0.42	0.42	0.42	0.42	0.42
17.583	0.42	0.42	0.42	0.42	0.42	0.42	0.42
17.634	0.42	0.42	0.42	0.42	0.42	0.42	0.42
17.685	0.41	0.41	0.41	0.41	0.41	0.41	0.41
17.736	0.41	0.41	0.41	0.41	0.41	0.41	0.41
17.787	0.41	0.41	0.41	0.41	0.41	0.41	0.41
17.837	0.41	0.41	0.41	0.41	0.41	0.40	0.40
17.888	0.40	0.40	0.40	0.40	0.40	0.40	0.40
17.939	0.40	0.40	0.40	0.40	0.40	0.40	0.40
17.990	0.40	0.40	0.40	0.40	0.40	0.40	0.40

EIRSWD
Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
18.041	0.40	0.40	0.40	0.39	0.39	0.39	0.39
18.092	0.39	0.39	0.39	0.39	0.39	0.39	0.39
18.142	0.39	0.39	0.39	0.39	0.39	0.39	0.39

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 100-Yr

SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

18.193	0.39	0.39	0.39	0.39	0.39	0.39	0.39
18.244	0.39	0.38	0.38	0.38	0.38	0.38	0.38
18.295	0.38	0.38	0.38	0.38	0.38	0.38	0.38
18.346	0.38	0.38	0.38	0.38	0.38	0.38	0.38
18.397	0.38	0.38	0.38	0.38	0.38	0.38	0.37
18.448	0.37	0.37	0.37	0.37	0.37	0.37	0.37
18.498	0.37	0.37	0.37	0.37	0.37	0.37	0.37
18.549	0.37	0.37	0.37	0.37	0.37	0.37	0.37
18.600	0.37	0.37	0.37	0.36	0.36	0.36	0.36
18.651	0.36	0.36	0.36	0.36	0.36	0.36	0.36
18.702	0.36	0.36	0.36	0.36	0.36	0.36	0.36
18.753	0.36	0.36	0.36	0.36	0.36	0.36	0.36
18.803	0.36	0.35	0.35	0.35	0.35	0.35	0.35
18.854	0.35	0.35	0.35	0.35	0.35	0.35	0.35
18.905	0.35	0.35	0.35	0.35	0.35	0.35	0.35
18.956	0.35	0.35	0.35	0.35	0.35	0.34	0.34
19.007	0.34	0.34	0.34	0.34	0.34	0.34	0.34
19.058	0.34	0.34	0.34	0.34	0.34	0.34	0.34
19.108	0.34	0.34	0.34	0.34	0.34	0.34	0.34
19.159	0.34	0.34	0.34	0.33	0.33	0.33	0.33
19.210	0.33	0.33	0.33	0.33	0.33	0.33	0.33
19.261	0.33	0.33	0.33	0.33	0.33	0.33	0.33
19.312	0.33	0.33	0.33	0.33	0.33	0.33	0.33
19.363	0.33	0.32	0.32	0.32	0.32	0.32	0.32
19.414	0.32	0.32	0.32	0.32	0.32	0.32	0.32
19.464	0.32	0.32	0.32	0.32	0.32	0.32	0.32
19.515	0.32	0.32	0.32	0.32	0.32	0.32	0.32
19.566	0.31	0.31	0.31	0.31	0.31	0.31	0.31
19.617	0.31	0.31	0.31	0.31	0.31	0.31	0.31
19.668	0.31	0.31	0.31	0.31	0.31	0.31	0.31
19.719	0.31	0.31	0.31	0.31	0.31	0.30	0.30
19.769	0.30	0.30	0.30	0.30	0.30	0.30	0.30
19.820	0.30	0.30	0.30	0.30	0.30	0.30	0.30
19.871	0.30	0.30	0.30	0.30	0.30	0.30	0.30
19.922	0.30	0.30	0.29	0.29	0.29	0.29	0.29
19.973	0.29	0.29	0.29	0.29	0.29	0.29	0.29
20.024	0.29	0.29	0.29	0.29	0.29	0.29	0.29
20.074	0.29	0.29	0.29	0.29	0.29	0.29	0.29

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 100-Yr

SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

20.125	0.29	0.29	0.29	0.29	0.29	0.29	0.29
20.176	0.29	0.29	0.28	0.28	0.28	0.28	0.28
20.227	0.28	0.28	0.28	0.28	0.28	0.28	0.28
20.278	0.28	0.28	0.28	0.28	0.28	0.28	0.28
20.329	0.28	0.28	0.28	0.28	0.28	0.28	0.28
20.380	0.28	0.28	0.28	0.28	0.28	0.28	0.28
20.430	0.28	0.28	0.28	0.28	0.28	0.28	0.28
20.481	0.28	0.28	0.28	0.28	0.28	0.28	0.28
20.532	0.28	0.28	0.28	0.28	0.28	0.28	0.28
20.583	0.28	0.28	0.28	0.28	0.28	0.28	0.28

EIRSWD
Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
20.634	0.28	0.28	0.28	0.28	0.28	0.28	0.28
20.685	0.28	0.28	0.28	0.28	0.28	0.28	0.28
20.735	0.28	0.28	0.28	0.28	0.28	0.28	0.28
20.786	0.28	0.28	0.28	0.28	0.28	0.28	0.28
20.837	0.28	0.28	0.28	0.28	0.28	0.28	0.28
20.888	0.28	0.28	0.28	0.28	0.28	0.28	0.28
20.939	0.28	0.28	0.28	0.28	0.28	0.28	0.28
20.990	0.28	0.28	0.28	0.28	0.28	0.28	0.28
21.040	0.28	0.28	0.28	0.28	0.28	0.28	0.28
21.091	0.28	0.28	0.28	0.28	0.28	0.28	0.28
21.142	0.28	0.28	0.28	0.28	0.27	0.27	0.27
21.193	0.27	0.27	0.27	0.27	0.27	0.27	0.27
21.244	0.27	0.27	0.27	0.27	0.27	0.27	0.27
21.295	0.27	0.27	0.27	0.27	0.27	0.27	0.27
21.346	0.27	0.27	0.27	0.27	0.27	0.27	0.27
21.396	0.27	0.27	0.27	0.27	0.27	0.27	0.27
21.447	0.27	0.27	0.27	0.27	0.27	0.27	0.27
21.498	0.27	0.27	0.27	0.27	0.27	0.27	0.27

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 100-Yr

SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

21.549	0.27	0.27	0.27	0.27	0.27	0.27	0.27
21.600	0.27	0.27	0.27	0.27	0.27	0.27	0.27
21.651	0.27	0.27	0.27	0.27	0.27	0.27	0.27
21.701	0.27	0.27	0.27	0.27	0.27	0.27	0.27
21.752	0.27	0.27	0.27	0.27	0.27	0.27	0.27
21.803	0.27	0.27	0.27	0.27	0.27	0.27	0.27
21.854	0.27	0.27	0.27	0.27	0.27	0.27	0.27
21.905	0.27	0.27	0.27	0.27	0.27	0.27	0.27
21.956	0.27	0.27	0.27	0.27	0.27	0.27	0.27
22.006	0.27	0.27	0.27	0.27	0.27	0.27	0.27
22.057	0.27	0.27	0.27	0.27	0.27	0.27	0.27
22.108	0.27	0.27	0.27	0.27	0.27	0.27	0.26
22.159	0.26	0.26	0.26	0.26	0.26	0.26	0.26
22.210	0.26	0.26	0.26	0.26	0.26	0.26	0.26
22.261	0.26	0.26	0.26	0.26	0.26	0.26	0.26
22.312	0.26	0.26	0.26	0.26	0.26	0.26	0.26
22.362	0.26	0.26	0.26	0.26	0.26	0.26	0.26
22.413	0.26	0.26	0.26	0.26	0.26	0.26	0.26
22.464	0.26	0.26	0.26	0.26	0.26	0.26	0.26
22.515	0.26	0.26	0.26	0.26	0.26	0.26	0.26
22.566	0.26	0.26	0.26	0.26	0.26	0.26	0.26
22.617	0.26	0.26	0.26	0.26	0.26	0.26	0.26
22.667	0.26	0.26	0.26	0.26	0.26	0.26	0.26
22.718	0.26	0.26	0.26	0.26	0.26	0.26	0.26
22.769	0.26	0.26	0.26	0.26	0.26	0.26	0.26
22.820	0.26	0.26	0.26	0.26	0.26	0.26	0.26
22.871	0.26	0.26	0.26	0.26	0.26	0.26	0.26
22.922	0.26	0.26	0.26	0.26	0.26	0.26	0.26
22.972	0.26	0.26	0.26	0.26	0.26	0.26	0.26
23.023	0.26	0.26	0.26	0.26	0.25	0.25	0.25
23.074	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.125	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.176	0.25	0.25	0.25	0.25	0.25	0.25	0.25

EIRSWD
Pond Sizing

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing
STORM 100-Yr
SUB-AREA:
East Pond Outlet .01375 89. .115

STREAM REACH:

Line Start Time (hr)	Flow Values @ time increment of 0.007 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
23.227	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.278	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.328	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.379	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.430	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.481	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.532	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.583	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.633	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.684	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.735	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.786	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.837	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.888	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.938	0.25	0.25	0.25	0.25	0.25	0.25	0.25
23.989	0.25	0.24	0.24	0.24	0.24	0.24	0.23
24.040	0.22	0.20	0.19	0.17	0.15	0.13	0.12
24.091	0.10	0.09	0.07	0.06	0.05		

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WinTR-20: Version 1.10                  0         0         0.05
D                                                                                    (continued)
Pond Sizing
                                           STORM 100-Yr
SUB-AREA:
          East Pond Outlet              .01375    89.       .115

STREAM REACH:
```


EIRSWD
Pond Sizing

Area or Reach Identifier	Drainage Area (sq mi)	Alternate	Peak Flow by Storm 25-Yr (cfs)	100-Yr (cfs)	(cfs)	(cfs)	(cfs)
East Pond	0.014		15.78	22.61			
OUTLET	0.014		15.78	22.61			

```
WinTR-20: Version 1.10                  0         0         0.05
D                                                                                    (continued)
Pond Sizing
                                           STORM 100-Yr
SUB-AREA:
          East Pond Outlet              .01375    89.       .115

STREAM REACH:
```

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WinTR-20: Version 1.10                  0         0         0.05
D                                                                                    (continued)
Pond Sizing
                                           STORM 100-Yr
SUB-AREA:
          East Pond Outlet              .01375    89.       .115

STREAM REACH:
```

WinTR-55 Current Data Description

--- Identification Data ---

User: AMR
Project: EIRSWD
SubTitle: Pond Sizing
State: Idaho
County: Madison
Filename: Y:\Shared\Boise Projects\4-20133-E Idaho SW District Landfill Design And Engineering Support\Pr

Date: 7/3/2023
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
East Pond	Pond2	Outlet	8.8	89	.115

Total area: 8.80 (ac)

--- Storm Data --

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
1.2	1.6	1.8	2.2	2.5	2.8	1.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type II
Dimensionless Unit Hydrograph: <standard>

EIRSWD
Pond Sizing
Madison County, Idaho

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
1.2	1.6	1.8	2.2	2.5	2.8	1.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type II
Dimensionless Unit Hydrograph: <standard>

AMR

EIRSWD
Pond Sizing
Madison County, Idaho

Watershed Peak Table

Sub-Area or Reach Identifier	Peak Flow by Rainfall Return Period 25-Yr (cfs)	100-Yr (cfs)
SUBAREAS		
East Pond	15.78	22.61
REACHES		
OUTLET	15.78	22.61

AMR

EIRSWD
Pond Sizing
Madison County, Idaho

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 25-Yr (cfs)	(hr)	100-Yr (cfs)	(hr)
SUBAREAS				
East Pond	15.78	11.95	22.61	11.94
REACHES				
OUTLET	15.78		22.61	

AMR

EIRSWD
Pond Sizing
Madison County, Idaho

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
East Pond	8.80	0.115	89	Outlet	Pond2

Total Area: 8.80 (ac)

EIRSWD
Pond Sizing
Madison County, Idaho

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
East Pond							
SHEET	100	0.0200	0.011				0.033
SHALLOW	850	0.0200	0.025				0.082
						Time of Concentration	.115

EIRSWD
Pond Sizing
Madison County, Idaho

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use	Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
East Pond	Gravel (w/ right-of-way)	C	8.8	89
	Total Area / Weighted Curve Number		8.8	89

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WinTR-20 Printed Page File      Beginning of Input Data List
TR20.inp

WinTR-20: Version 1.10                  0         0         0.05
EIRSWD
Pond Sizing

SUB-AREA:
          West Pond Outlet              .08234    87.       .287

STREAM REACH:

STORM ANALYSIS:
          25-Yr                         2.2       Type II   2
          100-Yr                        2.8       Type II   2

STRUCTURE RATING:


GLOBAL OUTPUT:
          2         0.05                YYYYN     YYYYNN


WinTR-20 Printed Page File      End of Input Data List
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EIRSWD
Pond Sizing

Name of printed page file:
TR20.out

STORM 25-Yr

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
West Pond	0.082		1.064		12.07	66.04	802.02

Line Start Time (hr)	Flow Values @ time increment of 0.018 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
9.010	0.05	0.06	0.06	0.07	0.07	0.08	0.08
9.137	0.09	0.10	0.10	0.11	0.11	0.12	0.13
9.264	0.13	0.14	0.14	0.15	0.16	0.16	0.17
9.391	0.17	0.18	0.19	0.19	0.20	0.20	0.21
9.518	0.22	0.22	0.23	0.23	0.24	0.25	0.25
9.645	0.26	0.27	0.27	0.28	0.29	0.29	0.30
9.771	0.31	0.32	0.33	0.34	0.34	0.35	0.36
9.898	0.37	0.38	0.39	0.40	0.41	0.42	0.43
10.025	0.44	0.45	0.46	0.47	0.49	0.50	0.51
10.152	0.52	0.53	0.55	0.56	0.57	0.59	0.60
10.279	0.62	0.63	0.65	0.66	0.68	0.69	0.71
10.406	0.73	0.74	0.76	0.78	0.80	0.81	0.83
10.533	0.85	0.87	0.89	0.91	0.93	0.95	0.97
10.660	1.00	1.02	1.04	1.07	1.09	1.12	1.15
10.787	1.17	1.20	1.23	1.26	1.29	1.32	1.35
10.913	1.38	1.42	1.45	1.48	1.52	1.55	1.59
11.040	1.62	1.66	1.70	1.74	1.78	1.83	1.88
11.167	1.93	1.98	2.03	2.09	2.15	2.22	2.28
11.294	2.35	2.42	2.50	2.58	2.65	2.73	2.82
11.421	2.90	2.99	3.08	3.17	3.26	3.36	3.48
11.548	3.63	3.82	4.06	4.37	4.77	5.27	5.89
11.675	6.63	7.50	8.56	9.80	11.23	12.83	14.62
11.802	16.63	18.91	21.56	24.57	27.98	31.87	36.26
11.929	40.99	45.86	50.64	55.09	59.03	62.18	64.44
12.055	65.75	66.04	65.12	62.99	59.92	56.17	52.05
12.182	47.86	43.70	39.75	36.06	32.66	29.66	27.14
12.309	25.02	23.17	21.55	20.13	18.87	17.74	16.73
12.436	15.83	15.02	14.27	13.60	12.97	12.39	11.84
12.563	11.34	10.87	10.44	10.04	9.66	9.31	8.99
12.690	8.69	8.43	8.18	7.96	7.76	7.58	7.42
12.817	7.27	7.13	7.01	6.89	6.78	6.69	6.59
12.944	6.50	6.41	6.32	6.24	6.15	6.07	5.99
13.070	5.91	5.83	5.76	5.69	5.61	5.55	5.48
13.197	5.42	5.36	5.30	5.25	5.19	5.14	5.09

13.324	5.05	5.00	4.95	4.91	4.86	4.82	4.77
13.451	4.73	4.69	4.64	4.60	4.56	4.52	4.47
13.578	4.43	4.39	4.35	4.31	4.27	4.23	4.20
13.705	4.16	4.12	4.09	4.05	4.02	3.99	3.96
13.832	3.92	3.89	3.86	3.83	3.80	3.77	3.73
13.959	3.70	3.67	3.64	3.61	3.58	3.55	3.52

EIRSWD
Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.018 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
14.086	3.49	3.46	3.44	3.41	3.39	3.36	3.34
14.212	3.32	3.30	3.28	3.27	3.25	3.23	3.22
14.339	3.21	3.19	3.18	3.17	3.16	3.15	3.13
14.466	3.12	3.11	3.10	3.09	3.08	3.07	3.06
14.593	3.05	3.04	3.02	3.01	3.00	2.99	2.98
14.720	2.97	2.96	2.95	2.94	2.93	2.92	2.91
14.847	2.90	2.89	2.88	2.87	2.86	2.85	2.84
14.974	2.82	2.81	2.80	2.79	2.78	2.77	2.76
15.101	2.75	2.74	2.73	2.72	2.71	2.70	2.69
15.227	2.68	2.67	2.65	2.64	2.63	2.62	2.61
15.354	2.60	2.59	2.58	2.57	2.56	2.55	2.54
15.481	2.53	2.51	2.50	2.49	2.48	2.47	2.46
15.608	2.45	2.44	2.43	2.42	2.41	2.40	2.38
15.735	2.37	2.36	2.35	2.34	2.33	2.32	2.31
15.862	2.30	2.29	2.28	2.26	2.25	2.24	2.23
15.989	2.22	2.21	2.20	2.19	2.18	2.17	2.16
16.116	2.15	2.14	2.13	2.12	2.11	2.10	2.10
16.243	2.09	2.08	2.08	2.07	2.07	2.06	2.06
16.369	2.05	2.05	2.04	2.04	2.03	2.03	2.03
16.496	2.02	2.02	2.01	2.01	2.01	2.00	2.00
16.623	1.99	1.99	1.99	1.98	1.98	1.97	1.97
16.750	1.97	1.96	1.96	1.96	1.95	1.95	1.94
16.877	1.94	1.94	1.93	1.93	1.93	1.92	1.92
17.004	1.91	1.91	1.91	1.90	1.90	1.89	1.89
17.131	1.89	1.88	1.88	1.88	1.87	1.87	1.86
17.258	1.86	1.86	1.85	1.85	1.84	1.84	1.84
17.385	1.83	1.83	1.83	1.82	1.82	1.81	1.81
17.511	1.81	1.80	1.80	1.79	1.79	1.79	1.78
17.638	1.78	1.77	1.77	1.77	1.76	1.76	1.76
17.765	1.75	1.75	1.74	1.74	1.74	1.73	1.73
17.892	1.72	1.72	1.72	1.71	1.71	1.70	1.70
18.019	1.70	1.69	1.69	1.68	1.68	1.68	1.67
18.146	1.67	1.66	1.66	1.66	1.65	1.65	1.64
18.273	1.64	1.64	1.63	1.63	1.63	1.62	1.62
18.400	1.61	1.61	1.61	1.60	1.60	1.59	1.59
18.526	1.59	1.58	1.58	1.57	1.57	1.57	1.56
18.653	1.56	1.55	1.55	1.55	1.54	1.54	1.53
18.780	1.53	1.53	1.52	1.52	1.51	1.51	1.51
18.907	1.50	1.50	1.49	1.49	1.49	1.48	1.48
19.034	1.47	1.47	1.47	1.46	1.46	1.45	1.45
19.161	1.45	1.44	1.44	1.43	1.43	1.42	1.42
19.288	1.42	1.41	1.41	1.40	1.40	1.40	1.39
19.415	1.39	1.38	1.38	1.38	1.37	1.37	1.36
19.542	1.36	1.36	1.35	1.35	1.34	1.34	1.34
19.668	1.33	1.33	1.32	1.32	1.32	1.31	1.31
19.795	1.30	1.30	1.30	1.29	1.29	1.28	1.28
19.922	1.27	1.27	1.27	1.26	1.26	1.25	1.25
20.049	1.25	1.24	1.24	1.23	1.23	1.23	1.22
20.176	1.22	1.22	1.22	1.21	1.21	1.21	1.21
20.303	1.21	1.21	1.20	1.20	1.20	1.20	1.20
20.430	1.20	1.20	1.20	1.20	1.20	1.19	1.19

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 25-Yr

SUB-AREA:
West Pond Outlet .08234 87. .287

STREAM REACH:

EIRSWD
Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.018 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
20.557	1.19	1.19	1.19	1.19	1.19	1.19	1.19
20.684	1.19	1.19	1.19	1.19	1.18	1.18	1.18
20.810	1.18	1.18	1.18	1.18	1.18	1.18	1.18
20.937	1.18	1.18	1.18	1.17	1.17	1.17	1.17
21.064	1.17	1.17	1.17	1.17	1.17	1.17	1.17
21.191	1.17	1.17	1.16	1.16	1.16	1.16	1.16
21.318	1.16	1.16	1.16	1.16	1.16	1.16	1.16
21.445	1.16	1.15	1.15	1.15	1.15	1.15	1.15
21.572	1.15	1.15	1.15	1.15	1.15	1.15	1.15
21.699	1.14	1.14	1.14	1.14	1.14	1.14	1.14
21.825	1.14	1.14	1.14	1.14	1.14	1.14	1.14
21.952	1.13	1.13	1.13	1.13	1.13	1.13	1.13
22.079	1.13	1.13	1.13	1.13	1.13	1.13	1.12
22.206	1.12	1.12	1.12	1.12	1.12	1.12	1.12
22.333	1.12	1.12	1.12	1.12	1.12	1.11	1.11
22.460	1.11	1.11	1.11	1.11	1.11	1.11	1.11
22.587	1.11	1.11	1.11	1.11	1.10	1.10	1.10
22.714	1.10	1.10	1.10	1.10	1.10	1.10	1.10
22.841	1.10	1.10	1.09	1.09	1.09	1.09	1.09
22.967	1.09	1.09	1.09	1.09	1.09	1.09	1.09
23.094	1.09	1.08	1.08	1.08	1.08	1.08	1.08
23.221	1.08	1.08	1.08	1.08	1.08	1.08	1.08
23.348	1.07	1.07	1.07	1.07	1.07	1.07	1.07
23.475	1.07	1.07	1.07	1.07	1.07	1.07	1.06
23.602	1.06	1.06	1.06	1.06	1.06	1.06	1.06
23.729	1.06	1.06	1.06	1.06	1.06	1.05	1.05
23.856	1.05	1.05	1.05	1.05	1.05	1.05	1.05
23.983	1.05	1.05	1.04	1.03	1.02	0.99	0.96
24.109	0.90	0.84	0.77	0.69	0.61	0.53	0.46
24.236	0.39	0.33	0.28	0.24	0.20	0.17	0.14

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 25-Yr

SUB-AREA:
West Pond Outlet .08234 87. .287

STREAM REACH:
24.363 0.12 0.10 0.09 0.07 0.06 0.05

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
OUTLET	0.082		1.064		12.07	66.04	802.02

Line Start Time (hr)	Flow Values @ time increment of 0.018 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
9.010	0.05	0.06	0.06	0.07	0.07	0.08	0.08
9.137	0.09	0.10	0.10	0.11	0.11	0.12	0.13
9.264	0.13	0.14	0.14	0.15	0.16	0.16	0.17
9.391	0.17	0.18	0.19	0.19	0.20	0.20	0.21
9.518	0.22	0.22	0.23	0.23	0.24	0.25	0.25
9.645	0.26	0.27	0.27	0.28	0.29	0.29	0.30
9.771	0.31	0.32	0.33	0.34	0.34	0.35	0.36
9.898	0.37	0.38	0.39	0.40	0.41	0.42	0.43
10.025	0.44	0.45	0.46	0.47	0.49	0.50	0.51

EIRSWD
Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.018 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
10.152	0.52	0.53	0.55	0.56	0.57	0.59	0.60
10.279	0.62	0.63	0.65	0.66	0.68	0.69	0.71
10.406	0.73	0.74	0.76	0.78	0.80	0.81	0.83
10.533	0.85	0.87	0.89	0.91	0.93	0.95	0.97
10.660	1.00	1.02	1.04	1.07	1.09	1.12	1.15
10.787	1.17	1.20	1.23	1.26	1.29	1.32	1.35
10.913	1.38	1.42	1.45	1.48	1.52	1.55	1.59

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 25-Yr

SUB-AREA:
West Pond Outlet .08234 87. .287

STREAM REACH:

11.040	1.62	1.66	1.70	1.74	1.78	1.83	1.88
11.167	1.93	1.98	2.03	2.09	2.15	2.22	2.28
11.294	2.35	2.42	2.50	2.58	2.65	2.73	2.82
11.421	2.90	2.99	3.08	3.17	3.26	3.36	3.48
11.548	3.63	3.82	4.06	4.37	4.77	5.27	5.89
11.675	6.63	7.50	8.56	9.80	11.23	12.83	14.62
11.802	16.63	18.91	21.56	24.57	27.98	31.87	36.26
11.929	40.99	45.86	50.64	55.09	59.03	62.18	64.44
12.055	65.75	66.04	65.12	62.99	59.92	56.17	52.05
12.182	47.86	43.70	39.75	36.06	32.66	29.66	27.14
12.309	25.02	23.17	21.55	20.13	18.87	17.74	16.73
12.436	15.83	15.02	14.27	13.60	12.97	12.39	11.84
12.563	11.34	10.87	10.44	10.04	9.66	9.31	8.99
12.690	8.69	8.43	8.18	7.96	7.76	7.58	7.42
12.817	7.27	7.13	7.01	6.89	6.78	6.69	6.59
12.944	6.50	6.41	6.32	6.24	6.15	6.07	5.99
13.070	5.91	5.83	5.76	5.69	5.61	5.55	5.48
13.197	5.42	5.36	5.30	5.25	5.19	5.14	5.09
13.324	5.05	5.00	4.95	4.91	4.86	4.82	4.77
13.451	4.73	4.69	4.64	4.60	4.56	4.52	4.47
13.578	4.43	4.39	4.35	4.31	4.27	4.23	4.20
13.705	4.16	4.12	4.09	4.05	4.02	3.99	3.96
13.832	3.92	3.89	3.86	3.83	3.80	3.77	3.73
13.959	3.70	3.67	3.64	3.61	3.58	3.55	3.52
14.086	3.49	3.46	3.44	3.41	3.39	3.36	3.34
14.212	3.32	3.30	3.28	3.27	3.25	3.23	3.22
14.339	3.21	3.19	3.18	3.17	3.16	3.15	3.13
14.466	3.12	3.11	3.10	3.09	3.08	3.07	3.06
14.593	3.05	3.04	3.02	3.01	3.00	2.99	2.98
14.720	2.97	2.96	2.95	2.94	2.93	2.92	2.91
14.847	2.90	2.89	2.88	2.87	2.86	2.85	2.84
14.974	2.82	2.81	2.80	2.79	2.78	2.77	2.76
15.101	2.75	2.74	2.73	2.72	2.71	2.70	2.69
15.227	2.68	2.67	2.65	2.64	2.63	2.62	2.61
15.354	2.60	2.59	2.58	2.57	2.56	2.55	2.54
15.481	2.53	2.51	2.50	2.49	2.48	2.47	2.46
15.608	2.45	2.44	2.43	2.42	2.41	2.40	2.38
15.735	2.37	2.36	2.35	2.34	2.33	2.32	2.31

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 25-Yr

SUB-AREA:
West Pond Outlet .08234 87. .287

STREAM REACH:

15.862	2.30	2.29	2.28	2.26	2.25	2.24	2.23
15.989	2.22	2.21	2.20	2.19	2.18	2.17	2.16
16.116	2.15	2.14	2.13	2.12	2.11	2.10	2.10
16.243	2.09	2.08	2.08	2.07	2.07	2.06	2.06
16.369	2.05	2.05	2.04	2.04	2.03	2.03	2.03
16.496	2.02	2.02	2.01	2.01	2.01	2.00	2.00

EIRSWD
Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.018 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
16.623	1.99	1.99	1.99	1.98	1.98	1.97	1.97
16.750	1.97	1.96	1.96	1.96	1.95	1.95	1.94
16.877	1.94	1.94	1.93	1.93	1.93	1.92	1.92
17.004	1.91	1.91	1.91	1.90	1.90	1.89	1.89
17.131	1.89	1.88	1.88	1.88	1.87	1.87	1.86
17.258	1.86	1.86	1.85	1.85	1.84	1.84	1.84
17.385	1.83	1.83	1.83	1.82	1.82	1.81	1.81
17.511	1.81	1.80	1.80	1.79	1.79	1.79	1.78
17.638	1.78	1.77	1.77	1.77	1.76	1.76	1.76
17.765	1.75	1.75	1.74	1.74	1.74	1.73	1.73
17.892	1.72	1.72	1.72	1.71	1.71	1.70	1.70
18.019	1.70	1.69	1.69	1.68	1.68	1.68	1.67
18.146	1.67	1.66	1.66	1.66	1.65	1.65	1.64
18.273	1.64	1.64	1.63	1.63	1.63	1.62	1.62
18.400	1.61	1.61	1.61	1.60	1.60	1.59	1.59
18.526	1.59	1.58	1.58	1.57	1.57	1.57	1.56
18.653	1.56	1.55	1.55	1.55	1.54	1.54	1.53
18.780	1.53	1.53	1.52	1.52	1.51	1.51	1.51
18.907	1.50	1.50	1.49	1.49	1.49	1.48	1.48
19.034	1.47	1.47	1.47	1.46	1.46	1.45	1.45
19.161	1.45	1.44	1.44	1.43	1.43	1.42	1.42
19.288	1.42	1.41	1.41	1.40	1.40	1.40	1.39

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 25-Yr

SUB-AREA:
West Pond Outlet .08234 87. .287

STREAM REACH:

19.415	1.39	1.38	1.38	1.38	1.37	1.37	1.36
19.542	1.36	1.36	1.35	1.35	1.34	1.34	1.34
19.668	1.33	1.33	1.32	1.32	1.32	1.31	1.31
19.795	1.30	1.30	1.30	1.29	1.29	1.28	1.28
19.922	1.27	1.27	1.27	1.26	1.26	1.25	1.25
20.049	1.25	1.24	1.24	1.23	1.23	1.23	1.22
20.176	1.22	1.22	1.22	1.21	1.21	1.21	1.21
20.303	1.21	1.21	1.20	1.20	1.20	1.20	1.20
20.430	1.20	1.20	1.20	1.20	1.20	1.19	1.19
20.557	1.19	1.19	1.19	1.19	1.19	1.19	1.19
20.684	1.19	1.19	1.19	1.19	1.18	1.18	1.18
20.810	1.18	1.18	1.18	1.18	1.18	1.18	1.18
20.937	1.18	1.18	1.18	1.17	1.17	1.17	1.17
21.064	1.17	1.17	1.17	1.17	1.17	1.17	1.17
21.191	1.17	1.17	1.16	1.16	1.16	1.16	1.16
21.318	1.16	1.16	1.16	1.16	1.16	1.16	1.16
21.445	1.16	1.15	1.15	1.15	1.15	1.15	1.15
21.572	1.15	1.15	1.15	1.15	1.15	1.15	1.15
21.699	1.14	1.14	1.14	1.14	1.14	1.14	1.14
21.825	1.14	1.14	1.14	1.14	1.14	1.14	1.14
21.952	1.13	1.13	1.13	1.13	1.13	1.13	1.13
22.079	1.13	1.13	1.13	1.13	1.13	1.13	1.12
22.206	1.12	1.12	1.12	1.12	1.12	1.12	1.12
22.333	1.12	1.12	1.12	1.12	1.12	1.11	1.11
22.460	1.11	1.11	1.11	1.11	1.11	1.11	1.11
22.587	1.11	1.11	1.11	1.11	1.10	1.10	1.10
22.714	1.10	1.10	1.10	1.10	1.10	1.10	1.10
22.841	1.10	1.10	1.09	1.09	1.09	1.09	1.09
22.967	1.09	1.09	1.09	1.09	1.09	1.09	1.09

EIRSWD
Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.018 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 25-Yr

SUB-AREA:
West Pond Outlet .08234 87. .287

STREAM REACH:

23.094	1.09	1.08	1.08	1.08	1.08	1.08	1.08
23.221	1.08	1.08	1.08	1.08	1.08	1.08	1.08
23.348	1.07	1.07	1.07	1.07	1.07	1.07	1.07
23.475	1.07	1.07	1.07	1.07	1.07	1.07	1.06
23.602	1.06	1.06	1.06	1.06	1.06	1.06	1.06
23.729	1.06	1.06	1.06	1.06	1.06	1.05	1.05
23.856	1.05	1.05	1.05	1.05	1.05	1.05	1.05
23.983	1.05	1.05	1.04	1.03	1.02	0.99	0.96
24.109	0.90	0.84	0.77	0.69	0.61	0.53	0.46
24.236	0.39	0.33	0.28	0.24	0.20	0.17	0.14
24.363	0.12	0.10	0.09	0.07	0.06	0.05	

STORM 100-Yr

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
West Pond	0.082		1.566		12.06	97.04	1178.52

Line Start Time (hr)	Flow Values @ time increment of 0.018 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
7.814	0.05	0.06	0.06	0.07	0.07	0.07	0.08
7.941	0.08	0.09	0.09	0.10	0.10	0.11	0.11
8.068	0.12	0.12	0.13	0.13	0.14	0.14	0.15
8.195	0.15	0.16	0.16	0.17	0.17	0.18	0.19
8.322	0.19	0.20	0.21	0.21	0.22	0.23	0.23
8.449	0.24	0.25	0.25	0.26	0.27	0.28	0.28
8.576	0.29	0.30	0.31	0.32	0.32	0.33	0.34
8.703	0.35	0.36	0.37	0.38	0.39	0.39	0.40
8.829	0.41	0.42	0.43	0.44	0.45	0.46	0.47
8.956	0.48	0.49	0.50	0.51	0.52	0.54	0.55
9.083	0.56	0.57	0.58	0.59	0.60	0.61	0.62
9.210	0.63	0.64	0.65	0.66	0.67	0.67	0.68
9.337	0.69	0.70	0.71	0.72	0.73	0.73	0.74

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 100-Yr

SUB-AREA:
West Pond Outlet .08234 87. .287

STREAM REACH:

9.464	0.75	0.76	0.77	0.78	0.78	0.79	0.80
9.591	0.81	0.82	0.83	0.84	0.85	0.86	0.87
9.718	0.88	0.89	0.91	0.92	0.94	0.95	0.97
9.845	0.98	1.00	1.01	1.03	1.05	1.06	1.08
9.971	1.10	1.12	1.14	1.15	1.17	1.19	1.21
10.098	1.23	1.25	1.27	1.29	1.32	1.34	1.36
10.225	1.38	1.41	1.43	1.46	1.48	1.51	1.54
10.352	1.57	1.59	1.62	1.65	1.68	1.71	1.74
10.479	1.77	1.80	1.83	1.86	1.89	1.92	1.96
10.606	1.99	2.03	2.06	2.10	2.14	2.18	2.22
10.733	2.26	2.31	2.35	2.40	2.44	2.49	2.54
10.860	2.59	2.64	2.70	2.75	2.80	2.86	2.91
10.986	2.97	3.02	3.08	3.14	3.20	3.26	3.33
11.113	3.40	3.47	3.55	3.63	3.71	3.80	3.90

EIRSWD
Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.018 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.240	4.00	4.11	4.21	4.33	4.44	4.56	4.69
11.367	4.81	4.94	5.07	5.21	5.35	5.49	5.63
11.494	5.77	5.93	6.12	6.37	6.67	7.07	7.58
11.621	8.23	9.06	10.07	11.27	12.69	14.39	16.37
11.748	18.63	21.15	23.94	27.03	30.54	34.55	39.06
11.875	44.13	49.87	56.28	63.13	70.10	76.87	83.08
12.002	88.47	92.67	95.54	97.04	97.04	95.31	91.88
12.128	87.14	81.49	75.34	69.14	63.02	57.24	51.84
12.255	46.90	42.54	38.88	35.78	33.10	30.74	28.68
12.382	26.84	25.20	23.75	22.44	21.26	20.19	19.21
12.509	18.31	17.46	16.69	15.96	15.30	14.68	14.10
12.636	13.56	13.06	12.60	12.18	11.80	11.45	11.14
12.763	10.86	10.60	10.37	10.16	9.96	9.79	9.62
12.890	9.47	9.33	9.20	9.07	8.94	8.82	8.70

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 100-Yr

SUB-AREA:
West Pond Outlet .08234 87. .287

STREAM REACH:

13.017	8.58	8.46	8.35	8.23	8.13	8.02	7.92
13.144	7.82	7.72	7.63	7.54	7.46	7.38	7.30
13.270	7.22	7.15	7.08	7.01	6.95	6.88	6.82
13.397	6.76	6.69	6.63	6.57	6.51	6.45	6.39
13.524	6.33	6.27	6.21	6.15	6.09	6.04	5.98
13.651	5.92	5.87	5.82	5.77	5.72	5.67	5.62
13.778	5.57	5.53	5.48	5.44	5.39	5.35	5.30
13.905	5.26	5.21	5.17	5.13	5.08	5.04	5.00
14.032	4.96	4.91	4.87	4.83	4.79	4.76	4.72
14.159	4.68	4.65	4.62	4.59	4.57	4.54	4.51
14.285	4.49	4.47	4.45	4.43	4.41	4.40	4.38
14.412	4.36	4.34	4.33	4.31	4.30	4.28	4.26
14.539	4.25	4.23	4.22	4.20	4.19	4.17	4.16
14.666	4.14	4.13	4.11	4.10	4.09	4.07	4.06
14.793	4.04	4.03	4.01	4.00	3.98	3.97	3.95
14.920	3.94	3.92	3.91	3.89	3.88	3.86	3.85
15.047	3.83	3.82	3.80	3.79	3.77	3.76	3.75
15.174	3.73	3.72	3.70	3.69	3.67	3.66	3.64
15.301	3.63	3.61	3.60	3.58	3.57	3.55	3.54
15.427	3.52	3.51	3.49	3.47	3.46	3.45	3.43
15.554	3.41	3.40	3.39	3.37	3.35	3.34	3.32
15.681	3.31	3.29	3.28	3.26	3.25	3.23	3.22
15.808	3.20	3.19	3.17	3.16	3.14	3.13	3.11
15.935	3.10	3.08	3.07	3.05	3.04	3.02	3.00
16.062	2.99	2.98	2.96	2.95	2.93	2.92	2.91
16.189	2.90	2.89	2.88	2.87	2.86	2.85	2.84
16.316	2.84	2.83	2.82	2.82	2.81	2.80	2.80
16.442	2.79	2.79	2.78	2.77	2.77	2.76	2.76
16.569	2.75	2.75	2.74	2.74	2.73	2.72	2.72
16.696	2.71	2.71	2.70	2.70	2.69	2.69	2.68
16.823	2.68	2.67	2.67	2.66	2.66	2.65	2.64
16.950	2.64	2.63	2.63	2.62	2.62	2.61	2.61
17.077	2.60	2.60	2.59	2.59	2.58	2.58	2.57
17.204	2.56	2.56	2.55	2.55	2.54	2.54	2.53
17.331	2.53	2.52	2.52	2.51	2.51	2.50	2.49
17.458	2.49	2.48	2.48	2.47	2.47	2.46	2.46
17.584	2.45	2.45	2.44	2.43	2.43	2.42	2.42

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing
STORM 100-Yr
SUB-AREA:
West Pond Outlet .08234 87. .287

STREAM REACH:

EIRSWD
Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.018 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
17.711	2.41	2.41	2.40	2.40	2.39	2.39	2.38
17.838	2.37	2.37	2.36	2.36	2.35	2.35	2.34
17.965	2.34	2.33	2.33	2.32	2.31	2.31	2.30
18.092	2.30	2.29	2.29	2.28	2.28	2.27	2.27
18.219	2.26	2.25	2.25	2.24	2.24	2.23	2.23
18.346	2.22	2.22	2.21	2.21	2.20	2.19	2.19
18.473	2.18	2.18	2.17	2.17	2.16	2.16	2.15
18.600	2.14	2.14	2.13	2.13	2.12	2.12	2.11
18.726	2.11	2.10	2.09	2.09	2.08	2.08	2.07
18.853	2.07	2.06	2.06	2.05	2.05	2.04	2.03
18.980	2.03	2.02	2.02	2.01	2.01	2.00	1.99
19.107	1.99	1.98	1.98	1.97	1.97	1.96	1.96
19.234	1.95	1.95	1.94	1.93	1.93	1.92	1.92
19.361	1.91	1.91	1.90	1.90	1.89	1.88	1.88
19.488	1.87	1.87	1.86	1.86	1.85	1.84	1.84
19.615	1.83	1.83	1.82	1.82	1.81	1.81	1.80
19.741	1.79	1.79	1.78	1.78	1.77	1.77	1.76
19.868	1.75	1.75	1.74	1.74	1.73	1.73	1.72
19.995	1.72	1.71	1.70	1.70	1.69	1.69	1.68
20.122	1.68	1.67	1.67	1.67	1.66	1.66	1.66
20.249	1.65	1.65	1.65	1.65	1.64	1.64	1.64
20.376	1.64	1.64	1.64	1.63	1.63	1.63	1.63
20.503	1.63	1.63	1.63	1.63	1.62	1.62	1.62
20.630	1.62	1.62	1.62	1.62	1.62	1.62	1.61
20.757	1.61	1.61	1.61	1.61	1.61	1.61	1.61
20.883	1.61	1.60	1.60	1.60	1.60	1.60	1.60
21.010	1.60	1.60	1.60	1.60	1.59	1.59	1.59
21.137	1.59	1.59	1.59	1.59	1.59	1.59	1.59
21.264	1.58	1.58	1.58	1.58	1.58	1.58	1.58

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 100-Yr

SUB-AREA:
West Pond Outlet .08234 87. .287

STREAM REACH:

21.391	1.58	1.58	1.57	1.57	1.57	1.57	1.57
21.518	1.57	1.57	1.57	1.57	1.57	1.56	1.56
21.645	1.56	1.56	1.56	1.56	1.56	1.56	1.56
21.772	1.55	1.55	1.55	1.55	1.55	1.55	1.55
21.899	1.55	1.55	1.54	1.54	1.54	1.54	1.54
22.025	1.54	1.54	1.54	1.54	1.53	1.53	1.53
22.152	1.53	1.53	1.53	1.53	1.53	1.53	1.53
22.279	1.52	1.52	1.52	1.52	1.52	1.52	1.52
22.406	1.52	1.52	1.51	1.51	1.51	1.51	1.51
22.533	1.51	1.51	1.51	1.51	1.51	1.50	1.50
22.660	1.50	1.50	1.50	1.50	1.50	1.50	1.50
22.787	1.49	1.49	1.49	1.49	1.49	1.49	1.49
22.914	1.49	1.49	1.48	1.48	1.48	1.48	1.48
23.040	1.48	1.48	1.48	1.48	1.47	1.47	1.47
23.167	1.47	1.47	1.47	1.47	1.47	1.47	1.46
23.294	1.46	1.46	1.46	1.46	1.46	1.46	1.46
23.421	1.46	1.46	1.45	1.45	1.45	1.45	1.45
23.548	1.45	1.45	1.45	1.45	1.44	1.44	1.44
23.675	1.44	1.44	1.44	1.44	1.44	1.44	1.43
23.802	1.43	1.43	1.43	1.43	1.43	1.43	1.43
23.929	1.43	1.42	1.42	1.42	1.42	1.42	1.40
24.056	1.38	1.35	1.30	1.22	1.14	1.04	0.93

EIRSWD
Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.018 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
24.182	0.82	0.72	0.62	0.53	0.45	0.38	0.32
24.309	0.27	0.23	0.20	0.17	0.14	0.12	0.10
24.436	0.09	0.07	0.06	0.05			

Area or Reach	Drainage Area	Rain Gage ID or	Runoff Amount	Peak Flow Elevation	Time	Rate	Rate

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 100-Yr

SUB-AREA:
West Pond Outlet .08234 87. .287

STREAM REACH:

Identifier	(sq mi)	Location	(in)	(ft)	(hr)	(cfs)	(csm)
OUTLET	0.082		1.566		12.06	97.04	1178.52

Line Start Time (hr)	Flow Values @ time increment of 0.018 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
7.814	0.05	0.06	0.06	0.07	0.07	0.07	0.08
7.941	0.08	0.09	0.09	0.10	0.10	0.11	0.11
8.068	0.12	0.12	0.13	0.13	0.14	0.14	0.15
8.195	0.15	0.16	0.16	0.17	0.17	0.18	0.19
8.322	0.19	0.20	0.21	0.21	0.22	0.23	0.23
8.449	0.24	0.25	0.25	0.26	0.27	0.28	0.28
8.576	0.29	0.30	0.31	0.32	0.32	0.33	0.34
8.703	0.35	0.36	0.37	0.38	0.39	0.39	0.40
8.829	0.41	0.42	0.43	0.44	0.45	0.46	0.47
8.956	0.48	0.49	0.50	0.51	0.52	0.54	0.55
9.083	0.56	0.57	0.58	0.59	0.60	0.61	0.62
9.210	0.63	0.64	0.65	0.66	0.67	0.67	0.68
9.337	0.69	0.70	0.71	0.72	0.73	0.73	0.74
9.464	0.75	0.76	0.77	0.78	0.78	0.79	0.80
9.591	0.81	0.82	0.83	0.84	0.85	0.86	0.87
9.718	0.88	0.89	0.91	0.92	0.94	0.95	0.97
9.845	0.98	1.00	1.01	1.03	1.05	1.06	1.08
9.971	1.10	1.12	1.14	1.15	1.17	1.19	1.21
10.098	1.23	1.25	1.27	1.29	1.32	1.34	1.36
10.225	1.38	1.41	1.43	1.46	1.48	1.51	1.54
10.352	1.57	1.59	1.62	1.65	1.68	1.71	1.74
10.479	1.77	1.80	1.83	1.86	1.89	1.92	1.96
10.606	1.99	2.03	2.06	2.10	2.14	2.18	2.22
10.733	2.26	2.31	2.35	2.40	2.44	2.49	2.54
10.860	2.59	2.64	2.70	2.75	2.80	2.86	2.91
10.986	2.97	3.02	3.08	3.14	3.20	3.26	3.33
11.113	3.40	3.47	3.55	3.63	3.71	3.80	3.90
11.240	4.00	4.11	4.21	4.33	4.44	4.56	4.69
11.367	4.81	4.94	5.07	5.21	5.35	5.49	5.63
11.494	5.77	5.93	6.12	6.37	6.67	7.07	7.58

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing
STORM 100-Yr
SUB-AREA:
West Pond Outlet .08234 87. .287

STREAM REACH:

11.621	8.23	9.06	10.07	11.27	12.69	14.39	16.37
11.748	18.63	21.15	23.94	27.03	30.54	34.55	39.06
11.875	44.13	49.87	56.28	63.13	70.10	76.87	83.08
12.002	88.47	92.67	95.54	97.04	97.04	95.31	91.88
12.128	87.14	81.49	75.34	69.14	63.02	57.24	51.84
12.255	46.90	42.54	38.88	35.78	33.10	30.74	28.68
12.382	26.84	25.20	23.75	22.44	21.26	20.19	19.21

EIRSWD
Pond Sizing

Line Start Time (hr)	Flow Values @ time increment of 0.018 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
12.509	18.31	17.46	16.69	15.96	15.30	14.68	14.10
12.636	13.56	13.06	12.60	12.18	11.80	11.45	11.14
12.763	10.86	10.60	10.37	10.16	9.96	9.79	9.62
12.890	9.47	9.33	9.20	9.07	8.94	8.82	8.70
13.017	8.58	8.46	8.35	8.23	8.13	8.02	7.92
13.144	7.82	7.72	7.63	7.54	7.46	7.38	7.30
13.270	7.22	7.15	7.08	7.01	6.95	6.88	6.82
13.397	6.76	6.69	6.63	6.57	6.51	6.45	6.39
13.524	6.33	6.27	6.21	6.15	6.09	6.04	5.98
13.651	5.92	5.87	5.82	5.77	5.72	5.67	5.62
13.778	5.57	5.53	5.48	5.44	5.39	5.35	5.30
13.905	5.26	5.21	5.17	5.13	5.08	5.04	5.00
14.032	4.96	4.91	4.87	4.83	4.79	4.76	4.72
14.159	4.68	4.65	4.62	4.59	4.57	4.54	4.51
14.285	4.49	4.47	4.45	4.43	4.41	4.40	4.38
14.412	4.36	4.34	4.33	4.31	4.30	4.28	4.26
14.539	4.25	4.23	4.22	4.20	4.19	4.17	4.16
14.666	4.14	4.13	4.11	4.10	4.09	4.07	4.06
14.793	4.04	4.03	4.01	4.00	3.98	3.97	3.95
14.920	3.94	3.92	3.91	3.89	3.88	3.86	3.85
15.047	3.83	3.82	3.80	3.79	3.77	3.76	3.75

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 100-Yr

SUB-AREA:
West Pond Outlet .08234 87. .287

STREAM REACH:

15.174	3.73	3.72	3.70	3.69	3.67	3.66	3.64
15.301	3.63	3.61	3.60	3.58	3.57	3.55	3.54
15.427	3.52	3.51	3.49	3.47	3.46	3.45	3.43
15.554	3.41	3.40	3.39	3.37	3.35	3.34	3.32
15.681	3.31	3.29	3.28	3.26	3.25	3.23	3.22
15.808	3.20	3.19	3.17	3.16	3.14	3.13	3.11
15.935	3.10	3.08	3.07	3.05	3.04	3.02	3.00
16.062	2.99	2.98	2.96	2.95	2.93	2.92	2.91
16.189	2.90	2.89	2.88	2.87	2.86	2.85	2.84
16.316	2.84	2.83	2.82	2.82	2.81	2.80	2.80
16.442	2.79	2.79	2.78	2.77	2.77	2.76	2.76
16.569	2.75	2.75	2.74	2.74	2.73	2.72	2.72
16.696	2.71	2.71	2.70	2.70	2.69	2.69	2.68
16.823	2.68	2.67	2.67	2.66	2.66	2.65	2.64
16.950	2.64	2.63	2.63	2.62	2.62	2.61	2.61
17.077	2.60	2.60	2.59	2.59	2.58	2.58	2.57
17.204	2.56	2.56	2.55	2.55	2.54	2.54	2.53
17.331	2.53	2.52	2.52	2.51	2.51	2.50	2.49
17.458	2.49	2.48	2.48	2.47	2.47	2.46	2.46
17.584	2.45	2.45	2.44	2.43	2.43	2.42	2.42
17.711	2.41	2.41	2.40	2.40	2.39	2.39	2.38
17.838	2.37	2.37	2.36	2.36	2.35	2.35	2.34
17.965	2.34	2.33	2.33	2.32	2.31	2.31	2.30
18.092	2.30	2.29	2.29	2.28	2.28	2.27	2.27
18.219	2.26	2.25	2.25	2.24	2.24	2.23	2.23
18.346	2.22	2.22	2.21	2.21	2.20	2.19	2.19
18.473	2.18	2.18	2.17	2.17	2.16	2.16	2.15
18.600	2.14	2.14	2.13	2.13	2.12	2.12	2.11
18.726	2.11	2.10	2.09	2.09	2.08	2.08	2.07
18.853	2.07	2.06	2.06	2.05	2.05	2.04	2.03

EIRSWD
Pond Sizing

Line
Start Time ---------- Flow Values @ time increment of 0.018 hr ----------

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 100-Yr

SUB-AREA:
West Pond Outlet .08234 87. .287

STREAM REACH:

(hr)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
18.980	2.03	2.02	2.02	2.01	2.01	2.00	1.99
19.107	1.99	1.98	1.98	1.97	1.97	1.96	1.96
19.234	1.95	1.95	1.94	1.93	1.93	1.92	1.92
19.361	1.91	1.91	1.90	1.90	1.89	1.88	1.88
19.488	1.87	1.87	1.86	1.86	1.85	1.84	1.84
19.615	1.83	1.83	1.82	1.82	1.81	1.81	1.80
19.741	1.79	1.79	1.78	1.78	1.77	1.77	1.76
19.868	1.75	1.75	1.74	1.74	1.73	1.73	1.72
19.995	1.72	1.71	1.70	1.70	1.69	1.69	1.68
20.122	1.68	1.67	1.67	1.67	1.66	1.66	1.66
20.249	1.65	1.65	1.65	1.65	1.64	1.64	1.64
20.376	1.64	1.64	1.64	1.63	1.63	1.63	1.63
20.503	1.63	1.63	1.63	1.63	1.62	1.62	1.62
20.630	1.62	1.62	1.62	1.62	1.62	1.62	1.61
20.757	1.61	1.61	1.61	1.61	1.61	1.61	1.61
20.883	1.61	1.60	1.60	1.60	1.60	1.60	1.60
21.010	1.60	1.60	1.60	1.60	1.59	1.59	1.59
21.137	1.59	1.59	1.59	1.59	1.59	1.59	1.59
21.264	1.58	1.58	1.58	1.58	1.58	1.58	1.58
21.391	1.58	1.58	1.57	1.57	1.57	1.57	1.57
21.518	1.57	1.57	1.57	1.57	1.57	1.56	1.56
21.645	1.56	1.56	1.56	1.56	1.56	1.56	1.56
21.772	1.55	1.55	1.55	1.55	1.55	1.55	1.55
21.899	1.55	1.55	1.54	1.54	1.54	1.54	1.54
22.025	1.54	1.54	1.54	1.54	1.53	1.53	1.53
22.152	1.53	1.53	1.53	1.53	1.53	1.53	1.53
22.279	1.52	1.52	1.52	1.52	1.52	1.52	1.52
22.406	1.52	1.52	1.51	1.51	1.51	1.51	1.51
22.533	1.51	1.51	1.51	1.51	1.51	1.50	1.50
22.660	1.50	1.50	1.50	1.50	1.50	1.50	1.50
22.787	1.49	1.49	1.49	1.49	1.49	1.49	1.49
22.914	1.49	1.49	1.48	1.48	1.48	1.48	1.48
23.040	1.48	1.48	1.48	1.48	1.47	1.47	1.47
23.167	1.47	1.47	1.47	1.47	1.47	1.47	1.46
23.294	1.46	1.46	1.46	1.46	1.46	1.46	1.46
23.421	1.46	1.46	1.45	1.45	1.45	1.45	1.45

WinTR-20: Version 1.10 0 0 0.05
D (continued)
Pond Sizing

STORM 100-Yr

SUB-AREA:
West Pond Outlet .08234 87. .287

STREAM REACH:

23.548	1.45	1.45	1.45	1.45	1.44	1.44	1.44
23.675	1.44	1.44	1.44	1.44	1.44	1.44	1.43
23.802	1.43	1.43	1.43	1.43	1.43	1.43	1.43
23.929	1.43	1.42	1.42	1.42	1.42	1.42	1.40
24.056	1.38	1.35	1.30	1.22	1.14	1.04	0.93
24.182	0.82	0.72	0.62	0.53	0.45	0.38	0.32
24.309	0.27	0.23	0.20	0.17	0.14	0.12	0.10
24.436	0.09	0.07	0.06	0.05			

EIRSWD
Pond Sizing

Area or Reach Identifier	Drainage Area (sq mi)	Alternate	Peak Flow by Storm 25-Yr (cfs)	100-Yr (cfs)	(cfs)	(cfs)	(cfs)
West Pond	0.082		66.04	97.04			
OUTLET	0.082		66.04	97.04			

```
WinTR-20: Version 1.10                  0         0         0.05
D                                                                                    (continued)
Pond Sizing
                                           STORM 100-Yr
SUB-AREA:
          West Pond Outlet              .08234    87.       .287

STREAM REACH:
```

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WinTR-20: Version 1.10                  0         0         0.05
D                                                                                    (continued)
Pond Sizing
                                           STORM 100-Yr
SUB-AREA:
          West Pond Outlet              .08234    87.       .287

STREAM REACH:
```

WinTR-55 Current Data Description

--- Identification Data ---

User: AMR
Project: EIRSWD
SubTitle: Pond Sizing
State: Idaho
County: Madison
Filename: Y:\Shared\Boise Projects\4-20133-E Idaho SW District Landfill Design And Engineering Support\Pr

Date: 7/3/2023
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
West Pond	Pond2	Outlet	52.7	87	.287

Total area: 52.70 (ac)

--- Storm Data --

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
1.2	1.6	1.8	2.2	2.5	2.8	1.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type II
Dimensionless Unit Hydrograph: <standard>

AMR

EIRSWD
Pond Sizing
Madison County, Idaho

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
1.2	1.6	1.8	2.2	2.5	2.8	1.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type II
Dimensionless Unit Hydrograph: <standard>

AMR

EIRSWD
Pond Sizing
Madison County, Idaho

Watershed Peak Table

Sub-Area or Reach Identifier	Peak Flow by Rainfall Return Period 25-Yr (cfs)	100-Yr (cfs)
SUBAREAS		
West Pond	66.04	97.04
REACHES		
OUTLET	66.04	97.04

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Pond Sizing
Madison County, Idaho

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 25-Yr (cfs)	(hr)	100-Yr (cfs)	(hr)
SUBAREAS				
West Pond	66.04	12.07	97.04	12.06
REACHES				
OUTLET	66.04		97.04	

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EIRSWD
Pond Sizing
Madison County, Idaho

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
West Pond	52.70	0.287	87	Outlet	Pond2

Total Area: 52.70 (ac)

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
West Pond							
SHEET	100	0.0500	0.150				0.185
SHALLOW	185	0.0500	0.050				0.014
CHANNEL	1400	0.0600	0.023	8.00	8.90	14.957	0.026
CHANNEL	2900	0.0350	0.023	12.50	11.18	12.993	0.062
						Time of Concentration	.287

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
West Pond	Open space; grass cover < 50%	(poor)	C	42.1	86
	Gravel (w/ right-of-way)		C	10.6	89
	Total Area / Weighted Curve Number			52.7	87
				====	==

Attachment 3

FlowMaster Output Files

Worksheet for Culvert Road Crossings

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.015
Channel Slope	0.060 ft/ft
Diameter	24.0 in
Discharge	48.52 cfs

Results	
Normal Depth	19.9 in
Flow Area	2.8 ft²
Wetted Perimeter	4.6 ft
Hydraulic Radius	7.3 in
Top Width	1.50 ft
Critical Depth	23.7 in
Percent Full	82.9 %
Critical Slope	0.056 ft/ft
Velocity	17.42 ft/s
Velocity Head	4.72 ft
Specific Energy	6.37 ft
Froude Number	2.257
Maximum Discharge	51.66 cfs
Discharge Full	48.02 cfs
Slope Full	0.061 ft/ft
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	82.9 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	19.9 in
Critical Depth	23.7 in
Channel Slope	0.060 ft/ft
Critical Slope	0.056 ft/ft

Worksheet for Perimeter Ditch-shallow slope

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.040
Channel Slope	0.013 ft/ft
Left Side Slope	2.000 H:V
Right Side Slope	2.000 H:V
Discharge	48.52 cfs

Results	
Normal Depth	28.4 in
Flow Area	11.2 ft²
Wetted Perimeter	10.6 ft
Hydraulic Radius	12.7 in
Top Width	9.48 ft
Critical Depth	24.7 in
Critical Slope	0.027 ft/ft
Velocity	4.32 ft/s
Velocity Head	0.29 ft
Specific Energy	2.66 ft
Froude Number	0.699
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	28.4 in
Critical Depth	24.7 in
Channel Slope	0.013 ft/ft
Critical Slope	0.027 ft/ft

Worksheet for Perimeter Ditch-steep slope

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.069
Channel Slope	0.050 ft/ft
Left Side Slope	2.000 H:V
Right Side Slope	2.000 H:V
Discharge	48.52 cfs

Results	
Normal Depth	26.9 in
Flow Area	10.1 ft²
Wetted Perimeter	10.0 ft
Hydraulic Radius	12.0 in
Top Width	8.97 ft
Critical Depth	24.7 in
Critical Slope	0.080 ft/ft
Velocity	4.82 ft/s
Velocity Head	0.36 ft
Specific Energy	2.60 ft
Froude Number	0.803
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	26.9 in
Critical Depth	24.7 in
Channel Slope	0.050 ft/ft
Critical Slope	0.080 ft/ft