Geotechnical Investigation
Proposed Water Reservoir
Osprey Ranch Development
Eden, Weber County, Utah

January 7 2021

Prepared by:

Christensen Geotechnical

8143 South 2475 East, South Weber, Utah

Christensen Geotechnical
8143 South 2475 East South Weber, Utah 84405
Phone: 801 814-1714

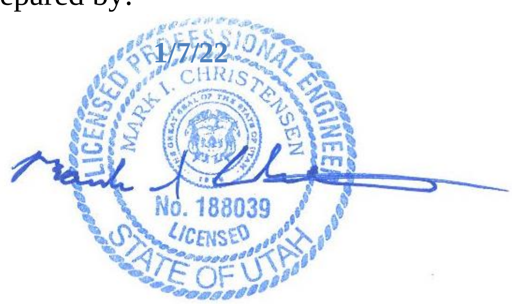
Prepared for:

Lewis Homes
Attn: John Lewis
3718 North Wolf Creek Drive
Eden, Utah 84310

Geotechnical Investigation
Proposed Water Reservoir
Osprey Ranch Development
Eden, Weber County, Utah
CG Project No.: 133-014

Prepared by:

1/7/22



Mark I. Christensen, P.E.
Principal

Christensen Geotechnical
8143 South 2475 East
South Weber, Utah 84405

January 7, 2022

TABLE OF CONTENTS

1.0 INTRODUCTION 1

1.1 PURPOSE AND SCOPE OF WORK 1
1.2 PROJECT DESCRIPTION 1

2.0 METHODS OF STUDY 2

2.1 FIELD INVESTIGATION 2
2.2 LABORATORY TESTING 2

3.0 GENERAL SITE CONDITIONS 3

3.1 SURFACE CONDITIONS 3
3.2 SUBSURFACE CONDITIONS 3
3.2.1 Soils 3
3.2.2 Groundwater 3

4.0 SEISMIC CONSIDERATIONS 4

4.1 SEISMIC DESIGN CRITERIA 4
4.2 LIQUEFACTION 4

5.0 ENGINEERING ANALYSIS AND RECOMMENDATIONS 5

5.1 GENERAL CONCLUSIONS 5
5.2 EARTHWORK 5
5.2.1 General Site Preparation and Grading 5
5.2.2 Temporary Construction Excavations 5
5.2.3 Structural Fill and Compaction 5
5.2.4 Excavatability 6
5.2.5 Permanent Cut and Fill Slopes 6
5.3 FOUNDATIONS 6
5.4 ESTIMATED SETTLEMENT 7
5.5 LATERAL EARTH PRESSURES 7
5.6 CONCRETE SLAB-ON-GRADE CONSTRUCTION 8
5.7 MOISTURE PROTECTION AND SURFACE DRAINAGE 8
5.7.1 Surface Drainage 8
5.7.2 Reservoir Under-Drainage 9
5.8 SUBSURFACE DRAINAGE 9
5.9 SLOPE STABILITY 9

6.0 LIMITATIONS 11

7.0 REFERENCES 12

ATTACHED PLATES

Plate 1..Vicinity Map
Plate 2..Exploration Location Map
Plates 3 ....Test Pit Logs
Plate 4..Key to Soil Symbols and Terms
Plate 5..Grain Size Distribution Test Results
Plates 6 to 7................................Slope Stability Analyses

1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE OF WORK

This report presents the results of a geotechnical investigation that was performed for a proposed water reservoir which is to be constructed for the Osprey Ranch development. The development is to be located in Eden, Weber County, Utah. The general location of the project is indicated on the Project Vicinity Map, Plate 1. In general, the purposes of this investigation were to evaluate the subsurface conditions and the nature and engineering properties of the subsurface soils, and to provide recommendations for general site grading and for the design and construction of concrete slabs and foundations. This investigation included subsurface exploration, representative soil sampling, field and laboratory testing, engineering analysis, and preparation of this report. Prior to the completion of our report, the Geologic Hazards Evaluation for the development by Western Geologic, dated January 3, 2022, was reviewed to assist in our assessments. The work performed for this report was authorized by Mr. John Lewis.

1.2 PROJECT DESCRIPTION

Based on conversations with our client, we understand that the proposed construction at the site is to consist of a concrete water reservoir. The proposed reservoir is to have an approximate 250,000-gallon capacity and is to be partially buried. The footing loads for the proposed reservoir are anticipated to be on the order of 3 to 6 klf for walls and up to 200 kips for columns. If the actual structural loads are different from those anticipated, Christensen Geotechnical should be notified in order to reevaluate our recommendations.

2.0 METHODS OF STUDY

2.1 FIELD INVESTIGATION

The subsurface conditions at the site were explored by excavating one test pit at the site of the water reservoir. The test pit was excavated to a depth approximately of 7½ feet below the existing site grade. The approximate test pit location is shown on the Exploration Location Map, Plate 2. The subsurface conditions as encountered in the test pit were recorded at the time of excavation and are presented on the attached Test Pit Log, Plate 3. A key to the symbols and terms used on the Test Pit Logs may be found on Plate 4.

The test pit excavation was accomplished with a tracked excavator. Disturbed samples were collected from the test pit sidewalls at the time of excavation which were placed in bags and buckets. The samples were visually classified in the field and portions of each sample were packaged and transported to our laboratory for testing. The classifications for the individual soil units are shown on the attached Test Pit Logs.

2.2 LABORATORY TESTING

Of the soils collected during the field investigation, representative samples were selected for testing in the laboratory in order to evaluate the pertinent engineering properties. The laboratory testing performed included a moisture content determination and a partial gradation analysis. A summary of our laboratory testing is presented in the table below:

Table No. 1: Laboratory Test Results

Test Hole No.	Depth (ft.)	Dry Density (pcf)	Moisture Content (%)	Atterberg Limits		Grain Size Distribution (%)			Soil Type
				LL	PI	Gravel (+#4)	Sand	Silt/Clay (- #200)	
TP-67	6		3.9			67.2	20.0	12.9	GC

The results of our laboratory tests are also presented on the Test Pit Log, Plate 3, and more detailed laboratory results are presented on the laboratory testing plate, Plate 5.

The samples will be retained in our laboratory for 30 days following the date of this report, at which time they will be disposed of unless a written request for additional holding time is received prior to the disposal date.

3.0 GENERAL SITE CONDITIONS

3.1 SURFACE CONDITIONS

At the time of our investigation, the subject site was undeveloped land located in the foothills of the mountains above Eden, Utah. The site generally sloped down to the northeast at grades of 5 to 15 percent. The vegetation at the site consisted of dense trees with common grasses and weeds.

3.2 SUBSURFACE CONDITIONS

3.2.1 Soils

Based on the test pit excavated at the site of the water reservoir, the subsurface materials consisted of approximately 1 foot of topsoil and 1 ½ feet of Clayey GRAVEL with sand (GC) overlying conglomerate bedrock. The bedrock was weathered to slightly weathered and moderately strong to strong, with the bedrock strength increasing with depth.

3.2.2 Groundwater

Groundwater was not encountered within our test pit at the time of excavation. It should be understood that groundwater is likely below its seasonal high and may fluctuate in response to seasonal changes, precipitation, and irrigation.

4.0 SEISMIC CONSIDERATIONS

4.1 SEISMIC DESIGN CRITERIA

The State of Utah and Utah municipalities have adopted the 2018 International Building Code (IBC) for seismic design. The IBC seismic design is based on seismic hazard maps which depict probabilistic ground motions and spectral response; the maps, ground motions, and spectral response having been developed by the United States Geological Survey (USGS). Seismic design values, including the design spectral response, may be calculated for a specific site using the web-based application by the Applied Technology Council (ATC), the project site's approximate latitude and longitude, and its Site Class. Based on our field exploration, it is our opinion that this location is best described as a Site Class C, which represents a "very dense soil and soft rock" profile. The spectral acceleration values obtained from the ATC's web-based application are shown below.

Table 2: IBC Seismic Response Spectrum Values

Site Location: 41.29303⁰ N -111.84996⁰ W	
Name	**Response Spectral Value**
$\mathbf{S_S}$	**1.013**
$\mathbf{S_1}$	**0.364**
$\mathbf{S_{MS}}$	**1.215**
$\mathbf{S_{M1}}$	**0.546**
$\mathbf{S_{DS}}$	**0.810**
$\mathbf{S_{D1}}$	**0.364**
PGA	**0.45**
$\mathbf{PGA_M}$	**0.54**

4.2 LIQUEFACTION

Certain areas in the intermountain west possess a potential for liquefaction. Liquefaction is a phenomenon in which soils lose their intergranular strength due to an increase of pore pressures during a dynamic event such as an earthquake. The potential for liquefaction is based on several factors, including 1) the grain-size distribution of the soil, 2) the plasticity of the fine fraction of the soil (material passing the No. 200 sieve), 3) the relative density of the soils, 4) earthquake strength (magnitude) and duration, 5) overburden pressures, and 6) the depth to groundwater. Due to the shallow bedrock at this site, we assess the liquefaction potential to be very low.

5.0 ENGINEERING ANALYSIS AND RECOMMENDATIONS

5.1 GENERAL CONCLUSIONS

Based on the results of our field and laboratory investigations, it is our opinion that the subject site is suitable for the proposed construction provided that the recommendations contained in this report are incorporated into the design and construction of the project.

5.2 EARTHWORK

5.2.1 General Site Preparation and Grading

Prior to the site grading operations, all vegetation, topsoil, undocumented fill soils, and loose or disturbed soils should be stripped (removed) from the reservoir pad and flatwork concrete areas. Following the stripping operations, the exposed soils should be proof rolled to a firm, unyielding condition. Site grading may then be conducted to bring the site to design grade. Where over-excavation is required, the excavation should extend at least 1 foot laterally for every foot of over-excavation. A Christensen Geotechnical representative should observe the site grading operations.

5.2.2 Temporary Construction Excavations

Based on OSHA requirements and the soil conditions encountered during our field investigation, we anticipate that temporary construction excavations at the site that have vertical walls that extend to depths of up to 5 feet may be occupied without shoring; however, where groundwater or fill soils are encountered, flatter slopes may be required. Excavations that extend to more than 5 feet in depth should be sloped or shored in accordance with OSHA regulations for a type A soil. The stability of construction excavations is the contractor's responsibility. If the stability of an excavation becomes questionable, the excavation should be evaluated immediately by qualified personnel.

5.2.3 Structural Fill and Compaction

All fill that is placed for the support of reservoir and concrete flatwork should consist of structural fill. The structural fill may consist of the native gravel soil and the native conglomerate bedrock if it is crushed to a maximum particle size of 4 inches. Imported structural fill, if required, should consist of a relatively well-graded granular soil with a maximum particle size of 4 inches, with a maximum of 50 percent passing the No. 4 sieve and with a maximum of 30 percent passing the No. 200 sieve. The liquid limit of the fines (material passing the No. 200 sieve) should not exceed 35 and the plasticity index should be less than 15. Additionally, all structural fill, whether native soils or imported material, should be free of topsoil, vegetation, frozen material, particles larger than 4 inches in diameter, and any other deleterious materials. Any imported materials should be approved by the geotechnical engineer prior to importing.

The structural fill should be placed in loose lifts that are a maximum of 8 inches thick. The moisture content should be within 3 percent of optimum and the fill should be compacted to at least 95 percent of the maximum density as determined by ASTM D 1557. Where the fill heights exceed 5 feet, the level of compaction should be increased to 98 percent.

5.2.4 Excavatability

As indicated earlier, conglomerate bedrock was encountered within our test pit at a depth of 2 ½ feet below existing site grade. This bedrock was generally in a moderately strong to strong condition, with strength increasing with depth. We anticipate that the minimum equipment required for excavations within the bedrock will be the use of a heavy excavator with a ripper tooth or a hoe-ram. Prior to bidding, the contractor should be provided with this report in order to be made aware of the subsurface conditions so that they can assess the type of equipment that will be best suited for these conditions.

5.2.5 Permanent Cut and Fill Slopes

The existing slopes on the property should not be over-steepened by cutting or filling. We recommend that all non-retained cut and fill slopes be graded no steeper than a 3 to 1 (horizontal to vertical) grade. If steeper grades are required, additional slope stability assessments may be required.

5.3 FOUNDATIONS

The foundations for the planned reservoir may consist of conventional continuous and/or spread footings established either on undisturbed bedrock or on properly placed and compacted structural fill which extends down to undisturbed bedrock. The footings for the proposed structure should be a minimum of 20 inches and 30 inches wide for continuous and spot footings, respectively. The exterior footings should be established at a minimum of 30 inches below the lowest adjacent grade to provide frost protection and confinement. Interior footings that are not subject to frost should be embedded a minimum of 18 inches for confinement.

Continuous and spread footings that are established on undisturbed bedrock or structural fill may be proportioned for a maximum net allowable bearing capacity of 3,000 psf. A one-third increase may be used for transient wind or seismic loads. All footing excavations should be observed by the geotechnical engineer prior to the construction of footings.

5.4 ESTIMATED SETTLEMENT

If the foundations are designed and constructed in accordance with the recommendations presented in this report, there is a low risk that total settlement will exceed 1 inch and a low risk that differential settlement will exceed ½ inch for a 30-foot span.

5.5 LATERAL EARTH PRESSURES

Buried structures, such as basement walls, should be designed to resist the lateral loads imposed by the soils retained. The lateral earth pressures on the below-grade walls and the distribution of those pressures will depend upon the type of structure, hydrostatic pressures, in-situ soils, backfill, and tolerable movements. Basement and retaining walls are usually designed with triangular stress distributions, which are based on an equivalent fluid pressure and calculated from lateral earth pressure coefficients. If soils similar to the native soils are used to backfill the basement walls, then the walls may be designed using the following ultimate values:

Table No. 3: Lateral Earth Pressures

Condition	Lateral Pressure Coefficient	Equivalent Fluid Density (pcf)
Active Static	0.29	37
Active Seismic	0.19	24
At-Rest	0.46	57
Passive Static	3.39	424
Passive Seismic	-0.44	-55

We recommend that walls which are allowed little or no wall movement be designed using "at rest" conditions. Walls that are allowed to rotate at least 0.4 percent of the wall height may be designed with "active" pressures. The coefficients and densities that are presented above assume a level backfill with no buildup of hydrostatic pressures. If anticipated, hydrostatic pressures and any surcharge loads should be added to the presented values. If sloping backfill is present, we recommend that the geotechnical engineer be consulted to provide more appropriate lateral pressure parameters once the design geometry is established.

The seismic active and passive earth pressure coefficients provided in the table above are based on the Mononobe-Okabe method and only account for the dynamic horizontal force produced by a seismic event. The resulting dynamic pressure should therefore be added to the static pressure to determine the total pressure on the wall. The dynamic pressure distribution can be represented as an inverted triangle, with stress decreasing with depth, and the resultant force acting approximately 0.6 times the height of the retaining wall, measured upward from the bottom of the wall.

Lateral building loads will be resisted by frictional resistance between the footings and the foundation soils and by passive pressure developed by backfill against the wall. For footings on native bedrock, we recommend that an ultimate coefficient of friction of 0.40 be used. If passive resistance is used in conjunction with frictional resistance, the passive resistance should be reduced by ½. The passive earth pressure from soils subject to frost or heave should usually be neglected in design.

The coefficients and equivalent fluid densities presented above are ultimate values and should be used with an appropriate factor of safety against overturning and sliding. A value of 1.5 is typically used.

5.6 CONCRETE SLAB-ON-GRADE CONSTRUCTION

Concrete slabs-on-grade should be constructed over at least 12 inches of compacted gravel to help distribute floor loads, break the rise of capillary water, and to aid in the curing process. The gravel should consist of free-draining gravel compacted to a firm, unyielding condition. To help control normal shrinkage and stress cracking, the floor slab should have adequate reinforcement for the anticipated floor loads, with the reinforcement continuous through the interior joints. In addition, we recommend adequate crack control joints to control crack propagation.

5.7 MOISTURE PROTECTION AND SURFACE DRAINAGE

5.7.1 Surface Drainage

Any wetting of the foundation soils will likely cause some degree of volume change within the soils and should be prevented both during and after construction. We recommend that grading be performed to prevent ponding and the infiltration of surface water near the proposed reservoir. If necessary, diversion berms or ditches should be placed uphill of the reservoir to redirect runoff. In addition, we recommend adequate compaction of backfill around the reservoir walls. At a minimum, we recommend that the backfill around the tank’s walls be compacted to at least 90 percent of the maximum density as determined by ASTM D 1557.

5.7.2 Reservoir Under-Drainage

Consideration should be given to constructing a drainage system below the reservoir. The drainage system should consist of an impermeable membrane, such as an HDPE liner, over which at least 6 inches of free-draining gravel should be placed. Perforated collection pipes should be installed within the free-draining gravel, and the perforated pipe and the impermeable membrane should be graded to facilitate drainage to a low point in order to assist in leak detection and to allow the discharge of collected water.

5.8 SUBSURFACE DRAINAGE

Due to the high alpine setting of the subject site, we recommend that all subgrade walls incorporate a foundation drain. The foundation drain should consist of a 4-inch-diameter slotted pipe placed at or below the bottom of footings and encased in at least 12 inches of free-draining gravel. The gravel should extend up the foundation wall to within 2 feet of the final ground surface, and a filter fabric, such as Mirafi 140N, should separate the gravel from the native soils. The pipe should be graded to drain to a free-gravity outfall. The gravel which extends up the wall may be replaced by a fabricated drain panel such as Mirafi G200N or equivalent.

5.9 SLOPE STABILITY

As recommended in the Geologic Hazards Evaluation by Western Geologic, the stability of the slope at the site was assessed using the Slide computer program and the modified Bishop's method of slices. The location of the profile is shown on Plate 2 and is based on the cross section presented in the Western Geologic report. For our analyses, we assumed that the top 5 feet of the bedrock was highly weathered. The strength of the subsurface materials there was used in our analyses was based on our experience and laboratory testing performed for the Osprey Ranch development.

The profile was assessed under static and pseudo static conditions. The pseudo static condition is used to assess the slope during a seismic event. As indicated in Section 4.1, the peak ground acceleration at this site is estimated to be 0.54g. As is common practice, half of this value was used in our pseudo static assessments. Minimum factors of safety of 1.5 and 1.0 for static and seismic conditions, respectively, were considered acceptable. Our analyses indicate that the slope in the area of the proposed water reservoir has safety factors greater than 1.5 and 1.0 for the static and pseudo static conditions. It is therefore our opinion that the proposed site is suitable for construction of the reservoir. The results of our slope stability assessments may be found on Plates 6 and 7.

The slope stability analysis presented above is based on the assumption that no significant cuts or fills will occur during the development of the site. Significant changes to the site grade, such as the steepening of slopes with cuts or fills, may adversely affect the stability of the slopes and increase the risk of slope failures. If cuts or fills over 15 feet are planned, additional slope stability assessments may be necessary and Christensen Geotechnical should be contacted to provide the additional assessments.

6.0 LIMITATIONS

The recommendations contained in this report are based on limited field exploration, laboratory testing, and our understanding of the proposed construction. The subsurface data used in this report was obtained from the explorations that were made specifically for this investigation. It is possible that variations in the soil and groundwater conditions could exist between and beyond the points explored. The nature and extent of variations may not be evident until construction occurs. If any conditions are encountered at this site that are different from those described in this report, Christensen Geotechnical should be immediately notified so that we may make any necessary revisions to the recommendations contained in this report. In addition, if the scope of the proposed construction changes from that described in this report, Christensen Geotechnical should be notified.

This report was prepared in accordance with the generally accepted standard of practice at the time the report was written. No other warranty, expressed or implied, is made.

It is the client's responsibility to see that all parties to the project, including the designer, contractor, subcontractors, etc., are made aware of this report in its entirety. The use of information contained in this report for bidding purposes should be done at the contractor's option and risk.

The recommendations presented within this report are based on the assumption that an adequate program of tests and observations will be followed during construction to verify compliance with our recommendations. We also assume that we will review the project plans and specifications to verify that our conclusions and recommendations are incorporated and remain appropriate (based on the actual design).

7.0 REFERENCES

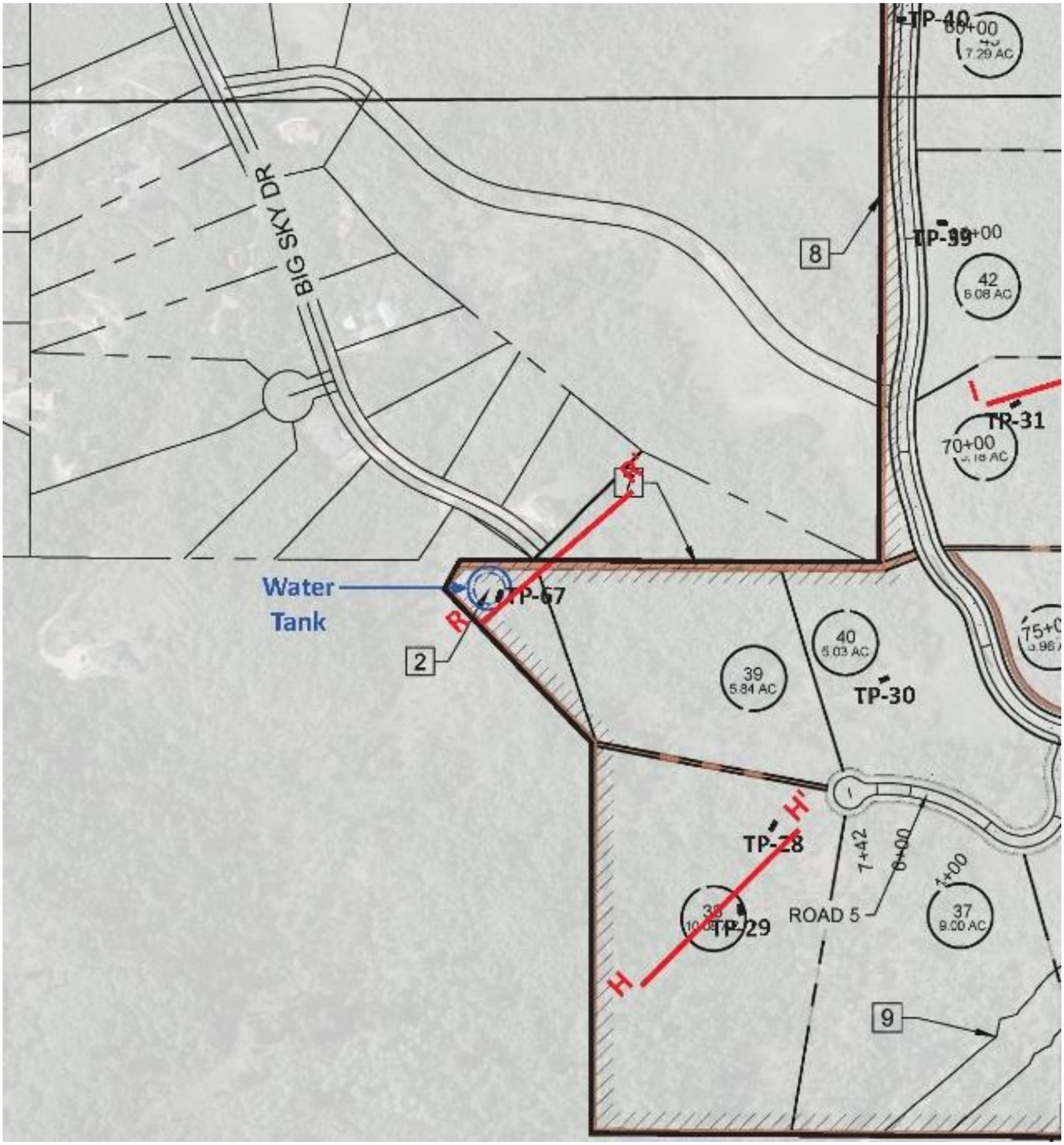
Black, Bill, January 3, 2022, “Geologic Hazards Evaluation, Proposed Osprey Ranch Development, 2050 Highway 150, Eden, Weber County, Utah,” Western Geologic, consultant’s unpublished report.

Base Photo: Utah AGRC

Drawing Not to Scale

N

Christensen Geotechnical	Lewis Homes Osprey Ranch Water Reservoir Eden, Utah Project No. 133-014 **Vicinity Map**	Plate 1



Base Photo: Utah AGRC

Approximate Test Pit Location

Slope Stability Profile

Drawing Not to Scale

Base Site Plan: Gardner Engineering

N

Christensen Geotechnical	Lewis Homes Osprey Ranch Water Reservoir Eden, Utah Project No. 133-014 **Exploration Location Map**	Plate 2

Date			TEST PIT LOG		Test Pit No.
	Started:	11/22/2021		Logged By: M Christensen	TP-67
	Completed:	11/22/2021		Equipment: Trackhoe	
	Backfilled:	---		Location: See Plate 2	.

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Clayey GRAVEL with sand - slightly moist, dark brown					
	☒			GC	Clayey GRAVEL with sand - medium dense, moist, brown					
5	☒				Conglomerate Bedrock - moderately strong to strong, weathered to slightly weathered, brown		3.9	12.9		
10					Refusal at 7½ feet on bedrock					
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample
Stablllized Groundwater
Groundwater At Time of Excavation

Christensen Geotechnical

Lewis Homes
Osprey Ranch Water Reservoir
Eden, Utah
Project No.: 133-014

Plate

3

RELATIVE DENSITY – COURSE GRAINED SOILS

Relative Density	SPT (blows/ft.)	3 In OD California Sampler (blows/ft.)	Relative Density (%)	Field Test
Very Loose	<4	<5	0 – 15	Easily penetrated with a ½ inch steel rod pushed by hand
Loose	4 – 10	5 – 15	15 – 35	Difficult to penetrate with a ½ inch steel rod pushed by hand
Medium Dense	10 – 30	15 – 40	35 – 65	Easily penetrated 1-foot with a steel rod driven by a 5 pound hammer
Dense	30 – 50	40 – 70	65 – 85	Difficult to penetrate 1-foot with a steel rod driven by a 5 pound hammer
Very Dese	>50	>70	85 - 100	Penetrate only a few inches with a steel rod driven by a 5 pound hammer

CONSISTENCY – FINE GRAINED SOILS

Consistency	SPT (blows/ft)	Torvane Undrained Shear Strength (tsf)	Pocket Penetrometer Undrained Shear Strength (tsf)	Field Test
Very Soft	<2	<0.125	<0.25	Easily penetrated several inches with thumb
Soft	2 – 14	0.125 – 0.25	0.25 – 0.5	Easily penetrated one inch with thumb
Medium Stiff	4 – 8	0.25 – 0.5	0.5 – 1.0	Penetrated over ½ inch by thumb with moderate effort. Molded by strong finger pressure
Stiff	8 – 15	0.5 – 1.0	1.0 – 2.0	Indented ½ inch by thumb with great effort
Very Stiff	15 – 30	1.0 – 2.0	2.0 – 4.0	Readily indented with thumbnail
Hard	>30	>2.0	>4.0	Indented with difficulty with thumbnail

CEMENTATION

Weakly	Crumbles or breaks with handling or little finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumble or break with finger pressure

MOISTURE

Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible water, usually below water table

GRAIN SIZE

Description		Sieve Size	Grain Size (in)	Approximate Size
Boulders		>12″	>12″	Larger than basketball
Cobbles		3″ – 12″	3″ – 12″	Fist to basketball
Gravel	Coarse	3/4″ - 3″	3/4″ - 3″	Thumb to fist
	Fine	#4 – 3″	0.19 – 0.75	Pea to thumb
Sand	Coarse	#10 - #4	0.079 – 0.19	Rock salt to pea
	Medium	#40 - #10	0.017 – 0.079	Sugar to rock salt
	Fine	#200 - #40	0.0029 – 0.017	Flour to sugar
Silt/Clay		<#200	<0.0029	Flour sized or smaller

STRATAFICATION

Occasional	One or less per foot of thickness
Frequent	More than one per foot of thickness

MODIFIERS

Trace	<5%
Some	5-12%
With	>12%

STRATIFICATION

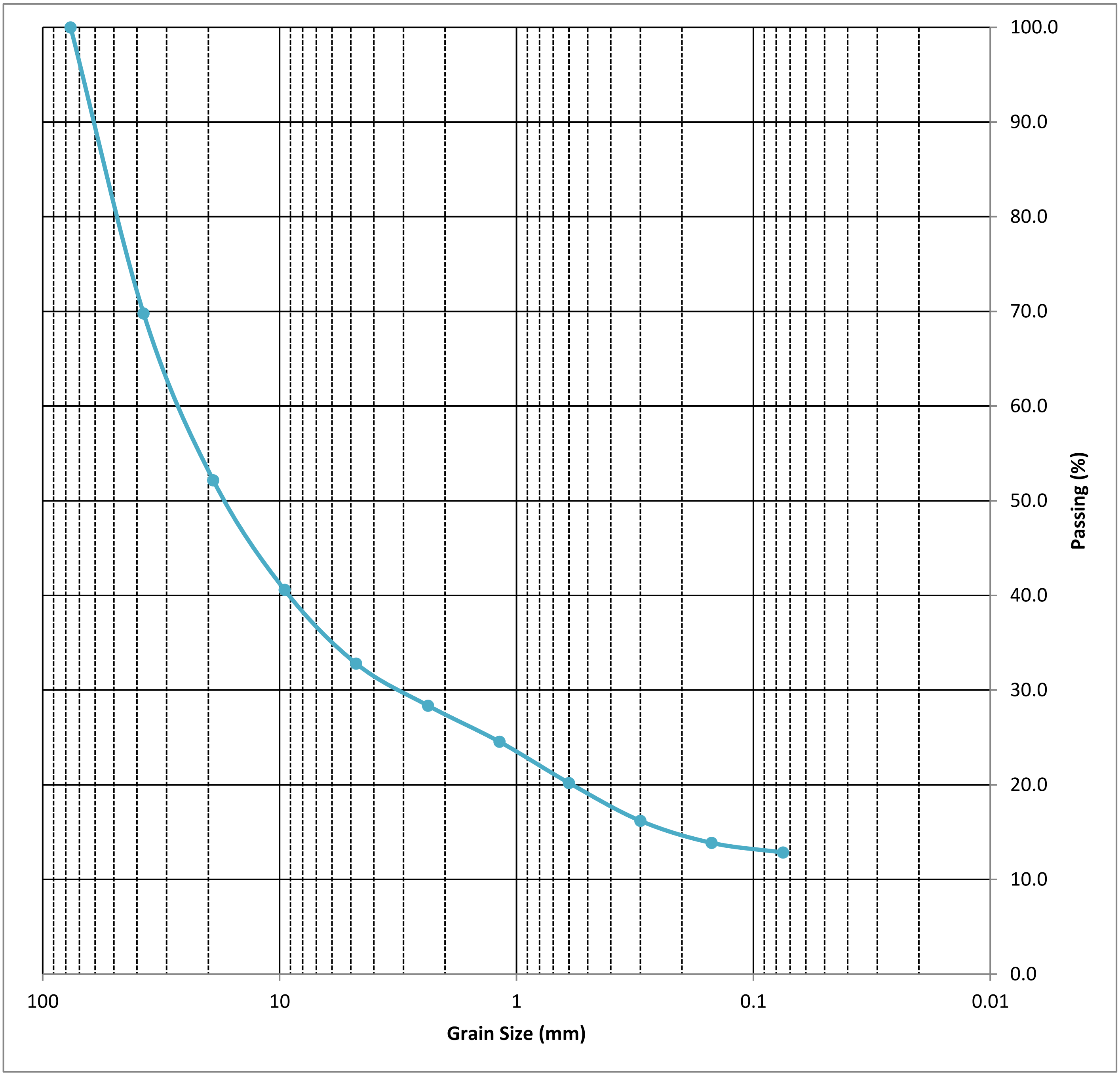
Seam	1/16 to 1/2 inch
Layer	1/2 to 12 inch

NOTES

1. The logs are subject to the limitations and conclusions presented in the report.
2. Lines separating strata represent approximate boundaries only. Actual transitions may be gradual.
3. Logs represent the soil conditions at the points explored at the time of our investigation.
4. Soils classifications shown on logs are based on visual methods . Actual designations (based on laboratory testing)may vary.

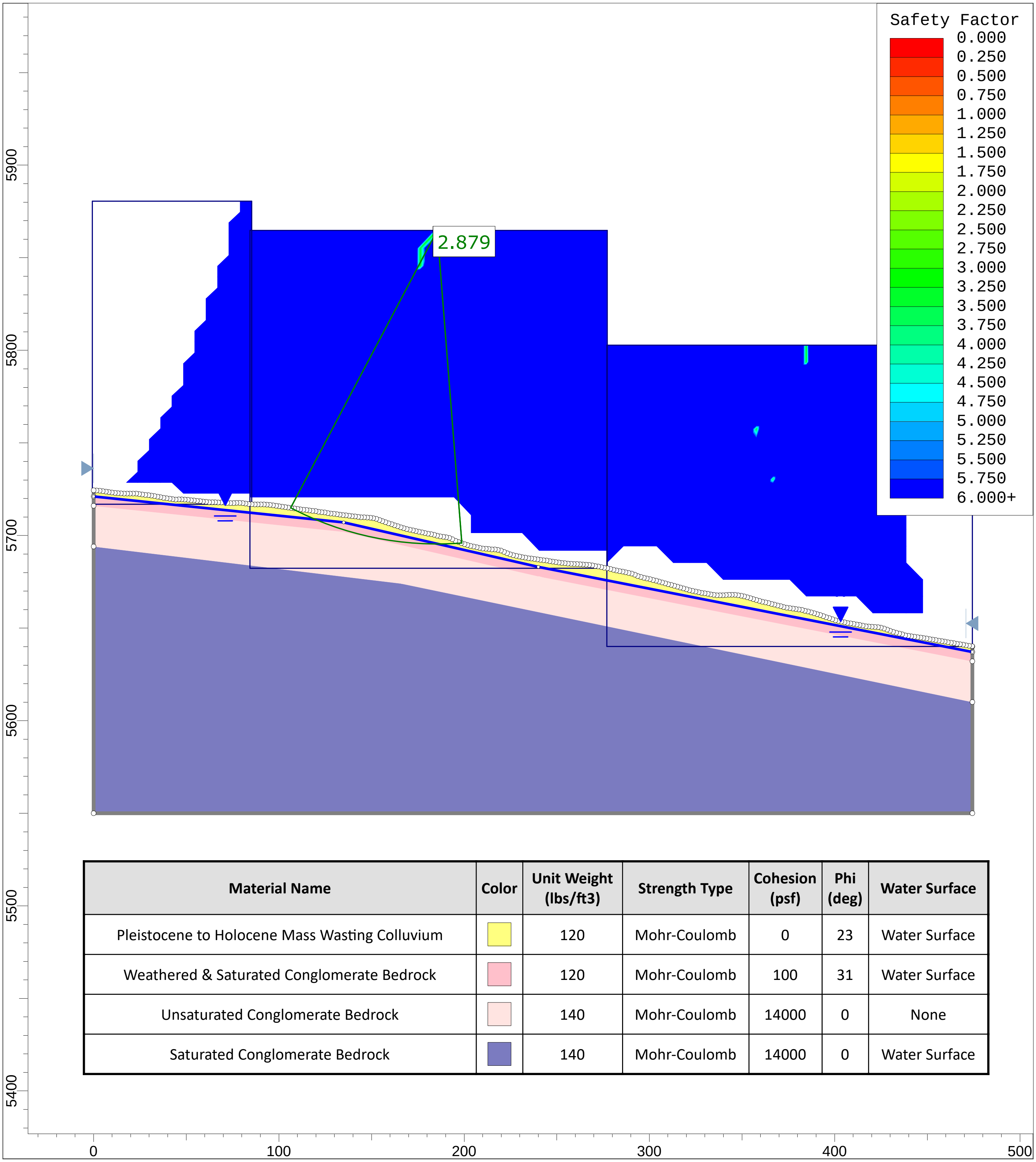
Christensen Geotechnical	**Soil Terms Key**	Plate 4

Grain Size Distribution



Location	Depth		Classification	% Gravel	% Sand	% Silt and Clay
TP-67	6	●	Bedrock (Clayey GRAVEL with sand)	67.2	20.0	12.9

Christensen Geotechnical	Lewis Homes Osprey Ranch Water Reservoir Eden, Utah Project No.: 133-014	Plate 5



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface
Pleistocene to Holocene Mass Wasting Colluvium		120	Mohr-Coulomb	0	23	Water Surface
Weathered & Saturated Conglomerate Bedrock		120	Mohr-Coulomb	100	31	Water Surface
Unsaturated Conglomerate Bedrock		140	Mohr-Coulomb	14000	0	None
Saturated Conglomerate Bedrock		140	Mohr-Coulomb	14000	0	Water Surface

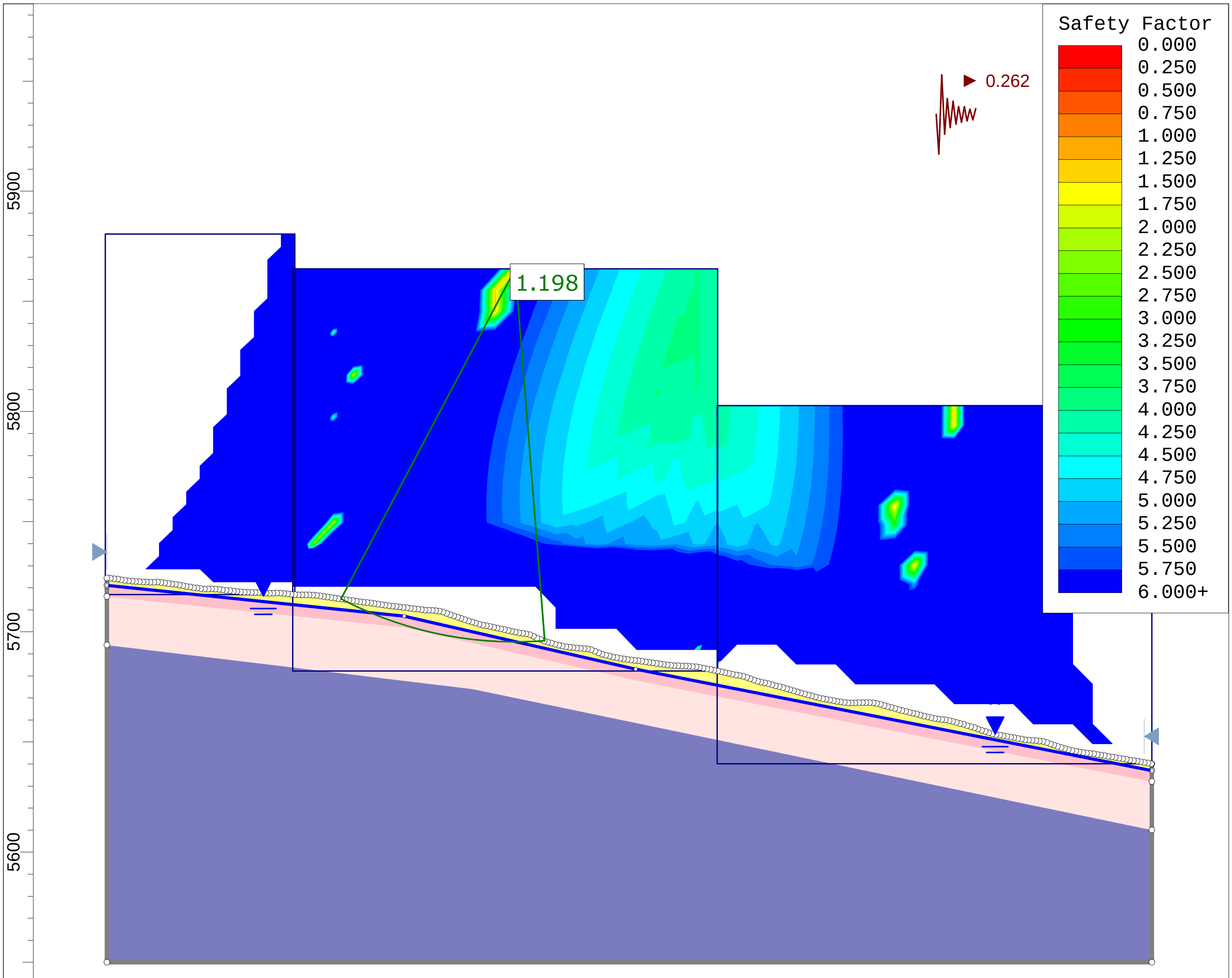
Profile R - Static

Christensen Geotechnical

Lewis Homes
Osprey Ranch Water Reservoir
Eden, Utah
133-014

Plate

6



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface
Pleistocene to Holocene Mass Wasting Colluvium		120	Mohr-Coulomb	0	23	Water Surface
Weathered & Saturated Conglomerate Bedrock		120	Mohr-Coulomb	100	31	Water Surface
Unsaturated Conglomerate Bedrock		140	Mohr-Coulomb	14000	0	None
Saturated Conglomerate Bedrock		140	Mohr-Coulomb	14000	0	Water Surface

Profile R - Pseudo Static

Christensen Geotechnical

Lewis Homes
Osprey Ranch Water Reservoir
Eden, Utah
133-014

Plate

7