September 30, 2025
Job No. 3409-02A-25

Mr. Preston Pruett
GO Industrial, LLC
3200 East Camelback Road
Pheonix, Arizona 85018

Mr. Pruett:

Re: Letter – Addendum No. 1
Geotechnical Study Update
7800 Logistics Industrial Development
Southwest Corner of the Intersection of 7800 South and Airport Road
West Jordan, Utah (40.6084°, -111.9989°)

Introduction

GSH Geotechnical, Inc. (GSH) completed a geotechnical study at the above-referenced site dated January 17, 2022[1]. GSH was requested by Mr. Preston Pruett of GO Industrial, LLC to review the referenced report as well as to visit the site to observe surficial conditions and provide an updated geotechnical report. This letter is to serve as an addendum to the referenced geotechnical report.

Site Visit Observations

As requested, Mr. Darin Nagy of GSH visited the above-referenced site on September 23, 2025, to observe current site conditions. No significant changes to the surface or topography were observed during the site visit. The piezometers installed at the time of the referenced geotechnical study were still in place, the table on the following page presents the groundwater measurements.

[1] "Report, Geotechnical Study, Proposed Office/Warehouses, Convenience Store, and Fuel Station – West Jordan, Southwest Corner of the Intersection of 7800 South and 4455 West, South Jordan, Utah" GSH Job No. 3409-002-21.

GSH Geotechnical, Inc.
473 West 4800 South
Salt Lake City, Utah 84123
Tel: (801) 685-9190
www.gshgeotech.com

Boring No.	Groundwater Depth (feet)
	September 23, 2025
B-5	15.1
B-9	14.1
B-10	13.6

The groundwater measurements presented are conditions at the time of the site visit and may not be representative of other times or locations. Groundwater levels may vary seasonally and with precipitation, as well as other factors including irrigation. Evaluation of these factors is beyond the scope of this study. Groundwater levels may, therefore, be at shallower or deeper depths than those measured during this study, including during construction and over the life of the structure.

The extent and nature of any dewatering required during construction will be dependent on the actual groundwater conditions prevalent at the time of construction and the effectiveness of construction drainage to prevent run-off into open excavations.

The surface conditions observed at the time of the site visit are consistent with the findings of the referenced geotechnical report, although, a large fill pile located within the south-central area of the site appeared to be on site during the original study and still exists.

Geoseismic Setting

Geoseismic parameters presented in the referenced geotechnical report were in accordance with the International Building Code (IBC) 2018. Since the time of the referenced study, Utah municipalities have adopted the IBC 2021 code. The IBC 2021 code refers to ASCE 7-16 Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE 7-16) determines the seismic hazard for a site based upon mapping of bedrock accelerations prepared by the United States Geologic Survey (USGS) and the soil site class. The USGS values are presented on maps incorporated into the IBC code and are also available based on latitude and longitude coordinates (grid points).

Ground Motions

The IBC 2021 code is based on USGS mapping, which provides values of short and long period accelerations for average bedrock values for the Western United States and must be corrected for local soil conditions. The following table summarizes the peak ground and short and long period accelerations for the MCE event and incorporates the appropriate soil amplification factor for a Site Class D – Default* Soil Profile. Based on the site latitude and longitude (40.6084 degrees north and 111.9989 degrees west, respectively) and Risk Category II, the values for this site are tabulated on the following page.

Spectral Acceleration Value, T	Bedrock Boundary [mapped values] (% g)	Site Coefficient	Site Class D - Default* [adjusted for site class effects] (% g)	Design Values** (% g)
0.2 Seconds (Short Period Acceleration)	S_S = 105.4	F_a = 1.200	S_{MS} = 126.5	S_{DS} = 84.3
1.0 Second (Long Period Acceleration)	S_1 = 37.3	F_v = 1.927	S_{M1} = 71.9	S_{D1} = 47.9

* If a measured site class in accordance with IBC 2021/ASCE 7-16 is beneficial based on the project structural engineer's review, please contact GSH for additional options for obtaining this measured site class.

**IBC 2021/ASCE 7-16 may require a site-specific study based on the project structural engineer's evaluation and recommendations. If needed, GSH can provide additional information and analysis including a complete site-specific study in accordance with chapter 21 of ASCE 7-16.

Closure

Based on our site observations and review of the referenced geotechnical report, all other recommendations presented in the referenced geotechnical report remain valid and shall continue to be followed.

GSH must verify that all topsoil/disturbed soils and any other unsuitable soils have been removed, that non-engineered fills have been removed, and that suitable soils have been encountered prior to placing site grading fills, footings, slabs, and pavements. Additionally, GSH must observe fill placement and verify in-place moisture content and density of fill materials placed at the site.

If you have any questions or would like to discuss these items further, please feel free to contact us at (801) 685-9190.

Respectfully submitted,

GSH Geotechnical, Inc.

Tristen Leberknight
Staff Engineer, E.I.T.

Reviewed by:

Alan D. Spilker, P.E.
State of Utah No. 334228
President/Senior Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER
No. 334228
ALAN D. SPILKER
STATE OF UTAH

TL/ADS:jmt

Addressee (email)

November 7, 2025
Job No. 3409-02A-25

Mr. Preston Pruett
GO Industrial, LLC
3200 East Camelback Road
Pheonix, Arizona 85018

Mr. Pruett:

Re: Letter – Addendum No. 2
Response to Review Comments
Tooele Multi-family Development
Northwest of 3100 North and 50 West
Tooele, Utah

Introduction

GSH Geotechnical, Inc. (GSH) was requested to provide responses to the review comments submitted by Terracon Consultants, Inc, dated October 22, 2025[1]. GSH completed a geotechnical study[2] and an updated geotechnical study[3] for the above-referenced site dated January 17, 2022, and July 25, 2025, respectively. This letter is to address the comments in the third-party geotechnical engineering review document provided by Mr. Preston Pruett on November 3, 2025.

Review Comment 1

"Undocumented fill (non-engineered fill): GSH should provide addition information regarding the anticipated extent of undocumented fill."

1 "Geotechnical Report Peer Review, GO West Industrial Warehouse Development, 7800 South Airport Road, West Jordan, Utah, Project No. 61255248"
2 "Report, Geotechnical Study, Proposed Office/Warehouses, Convenience Store, and Fuel Station – West Jordan, Southwest Corner of the Intersection of 7800 South and 4455 West, South Jordan, Utah" GSH Job No. 3409-002-21
3 "Letter – Addendum No,1, Geotechnical Study Update, Proposed Office/Warehouses, Convenience Store, and Fuel Station – West Jordan, Southwest Corner of the Intersection of 7800 South and 4455 West, South Jordan, Utah (40.6084°, -111.9989°)" GSH Job No. 3409-02A-25.

GSH Geotechnical, Inc.
473 West 4800 South
Salt Lake City, Utah 84123
Tel: (801) 685-9190
www.gshgeotech.com

Review Response 1

Based on the review of aerial imagery from present date to the time of the referenced geotechnical study, in 2022, it indicates the "assumed fill pile" identified on the southern perimeter of the site has been in place since 2022. Additionally, no major activity appears to have occurred at the site.

The explorations performed within the referenced geotechnical study indicate that no non-engineered fills were encountered at the time of the field explorations, however, Section 4.2 and the boring logs, Figures 3A through 3Q of the report, indicates that topsoils were encountered from 4 to 8 inches below the ground surface. Topsoil thickness is frequently erratic and thicker zones of topsoil should be anticipated.

Additionally, eighteen (18), 8-inch borings were performed at the approximate 14.34-acre site. Due to the developed nature of the surrounding area, additional non-engineered fills may exist in unexplored areas of the site. Based on our experience, non-engineered fills are frequently erratic in composition and consistency.

It must be noted that prior to the site grading process, GSH must be contacted to verify that all topsoils, organics, deleterious materials, and unsuitable soils have been removed from the surface prior to the placement of site grading or structural fill.

Review Comment 2

"Shallow Groundwater: GSH should clarify if the remaining temporary piezometers were observed (and results) or not found in 2025."

Review Response 2

As indicated within the referenced geotechnical report update, "Mr. Darin Nagy of GSH visited the above-referenced site on September 23, 2025, to observe current site conditions. No significant changes to the surface or topography were observed during the site visit. The piezometers installed at the time of the referenced geotechnical study were still in place, the table below presents the groundwater measurements."

Boring No.	Groundwater Depth (feet)
	September 23, 2025
B-5	15.1
B-9	14.1
B-10	13.6

The groundwater measurements presented are conditions at the time of the site visit and may not be representative of other times or locations. Groundwater levels may vary seasonally and with precipitation, as well as other factors including irrigation. Evaluation of these factors is beyond the scope of this study. Groundwater levels may, therefore, be at shallower or deeper depths than those measured during this study, including during construction and over the life of the structure.

The extent and nature of any dewatering required during construction will be dependent on the actual groundwater conditions prevalent at the time of construction and the effectiveness of construction drainage to prevent run-off into open excavations.

The surface conditions observed at the time of the site visit are consistent with the findings of the referenced geotechnical report, although, a large fill pile located within the south-central area of the site appeared to be on site during the original study and still exists.

Review Comment 3

"Settlement: GSH should provide the laboratory consolidation test data used for their analysis. Furthermore, GSH should address the potential for moisture-sensitive soils such as hydro-collapsible soils."

Review Response 3

Laboratory consolidation test data is included as Attachment 1, Consolidation Testing, at the end of this document.

Hydro-collapsible soils were not encountered within the 18 explorations to the maximum depths explored of 21.5 feet below the ground surface.

Review Comment 4

"Additionally, based on the current grading plan it includes significant cut/fill (up to 7.5 feet) settlement of the subgrade soils should be considered. Terracon recommends settlement based on the current proposed grading plan and structures be completed."

Review Response 4

Based on review of the current grading plan, it appears that the "cut" is on the west side of the site and the fill is on the east side of the site. Based on the review of the boring logs, specifically the blow counts of the borings performed on the western half of the site, GSH anticipates that the clay soils encountered at depths of 10 feet and greater (accounting for max cut of 7.5 feet, and minimum depth of embedment for frost protection of 2.5 feet) will exhibit similar properties to the samples tested.

GSH confirms that a design bearing capacity of 2,500 pounds per square foot may be utilized for design.

However, GSH was unaware of the final grading plans and must update the fill placement and compaction specifications. All structural fill shall be placed in lifts not exceeding 8 inches in loose thickness. Structural fills shall be compacted in accordance with the percent of the maximum dry density as determined by the AASHTO4 T180 (ASTM5 D1557) compaction criteria in accordance with the following table:

Location	Total Fill Thickness (feet)	Minimum Percentage of Maximum Dry Density
Beneath an area extending at least 5 feet beyond the perimeter of the structure	0 to 5	95
	5 to 10*	98
Site grading fills outside area defined above	0 to 5	90
	5 to 10*	98
Utility trenches within structural areas	--	96
Road base	--	96

* For structural fill sequences greater than 5 feet thick and up to 10 feet thick, the entire fill sequence must be compacted to 98 percent of the maximum dry density and compaction shall be performed at 0- to 3-percent over the optimum moisture content.

Structural fills greater than 10 feet thick are not anticipated at the site.

Review Comment 5

"Pavement: GSH should explain their basis of pavement designs, including design period, method used and materials parameters (measured or assumed)."

Review Response 5

The pavement design is based on the UDOT Pavement Design Manual 2025 which incorporates AASHTO's Mechanistic-Empirical Pavement Design Guide. The pavement design presented within the referenced report utilizes an estimated California Bearing Ratio of 5 percent of the subgrade soils and a design life of 20 years.

It must be noted that GSH has not been provided with "estimated traffic counts" from the client, thus the last paragraph of Section 5.8, Pavements, of the referenced geotechnical report still applies.

"Please note that the recommended pavement section is based on estimated post-construction traffic loading. If the pavement is to be constructed and utilized by construction traffic, the above pavement section may prove insufficient for heavy truck traffic, such as concrete trucks or tractor-trailers used for construction delivery. Unexpected distress, reduced pavement life, and/or premature failure of the pavement section could result if subjected to heavy construction traffic and the owner should be made aware of this risk. If the estimated traffic loading stated herein is not correct, GSH must review actual pavement loading conditions to determine if revisions to these recommendations are warranted."

Review Comment 6

Temporary Excavations: GSH provides recommendations that appear to contradict OSHA standards without further explanation or limitations for the excavation slopes they recommend. As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926 subpart P, "Excavations" and its appendices, and in accordance with any applicable local and/or state regulations.

Review Response 6

Temporary excavations up to 8 feet deep in fine-grained cohesive soils, or otherwise defined by OSHA as Soil Group A, above or below the water table, may be constructed with sideslopes no steeper than three-quarter horizontal to one vertical (3/4H:1 V).

For granular (cohesionless) soils, otherwise defined by OSHA as Soil Group C, construction excavations above the water table, not exceeding 4 feet, should be no steeper than one and one-half horizontal to one vertical (1.5H:1.0V). For excavations up to 8 feet, in granular soils and above the water table, the slopes should be no steeper than one and one-half horizontal to one vertical (1.5H: 1 V). Excavations encountering saturated cohesionless soils will be very difficult and will require very flat sideslopes and/or shoring, bracing, and dewatering.

All excavations must be inspected periodically by qualified personnel. If any signs of instability or excessive sloughing are noted, immediate remedial action must be initiated.

Review Comment 7

"Material Stiffness/Density: GSH should provide explanation for the reported blow counts shown on the logs. Blow counts should be corrected for the larger Dames & Moore sampler."

Review Response 7

The description for the reported blow counts shown on the logs can be found within Figure 4, Key to Boring Logs, Bullet Point 5, of the referenced report.

"Blow Count: Number of blows to advance sampler 12-inches beyond first 6-inches, using a 140-pound hammer with a 30-inch drop"

Blow counts utilized for material stiffness/density and engineering calculations have been corrected accordingly.

Review Comment 8

"GSH should explain what percolation test method was followed, including details and duration of the test."

Review Response 8

West Jordan City does not currently have a required method of percolation/infiltration testing for stormwater basins. However, GSH performs Falling - Head Percolation Tests which is a common field test often performed for stormwater applications. GSH performed the percolation test within Boring B-17 at a depth of 5 feet, located on the eastern side of the site. Based on the proposed cut and fill, as presented on the current grading plan, the test may not be representative of the soils at the base of the proposed stormwater system. GSH recommends that a percolation test be conducted once the grading has been completed, and at the design elevation of the base of the retention/detention system.

Review Comment 9

"Re-evaluate the potential for total settlement and differential settlement based on the current grading plan."

Review Response 9

GSH has re-evaulated the potential for total settlement and differential settlement based on the current grading plan, where the western side of the site will be cut, removing clay soils overlying granular soils. The western side of the site will be subject to properly placed and compacted structural fill as indicated within Review Response 4, above, extending to suitable natural soils. Please refer to Review Response 4 for additional information.

The amount of differential settlement is difficult to predict because the subsurface and foundation loading conditions can vary considerably across the site. However, we anticipate differential settlement between adjacent foundations could vary from 0.5 to 0.75 inch. The final deflected shape of the structure will be dependent on actual foundation locations and loading.

Review Comment 10

"For potential retaining walls provide shear strength parameters and any other necessary geotechnical recommendation the developer and contractor should be aware of."

Review Response 10

The scope of the Professional Services Agreement No. 21-0818 dated August 11, 2021, does not include a retaining wall design, recommendations, or parameters to be used in the design of a retaining wall. If a retaining wall is proposed for the site and a retaining wall design and/or slope stability analysis is required, please contact GSH.

Closure

If you have any questions or would like to discuss these items further, please feel free to contact us at (801) 685-9190.

Respectfully submitted,

GSH Geotechnical, Inc.

Tristen Leberknight
Staff Engineer, E.I.T.

Reviewed by:

Alan D. Spilker, P.E.
State of Utah No. 334228
President/Senior Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER
No. 334228
ALAN D. SPILKER
STATE OF UTAH

TL/ADS:jmt

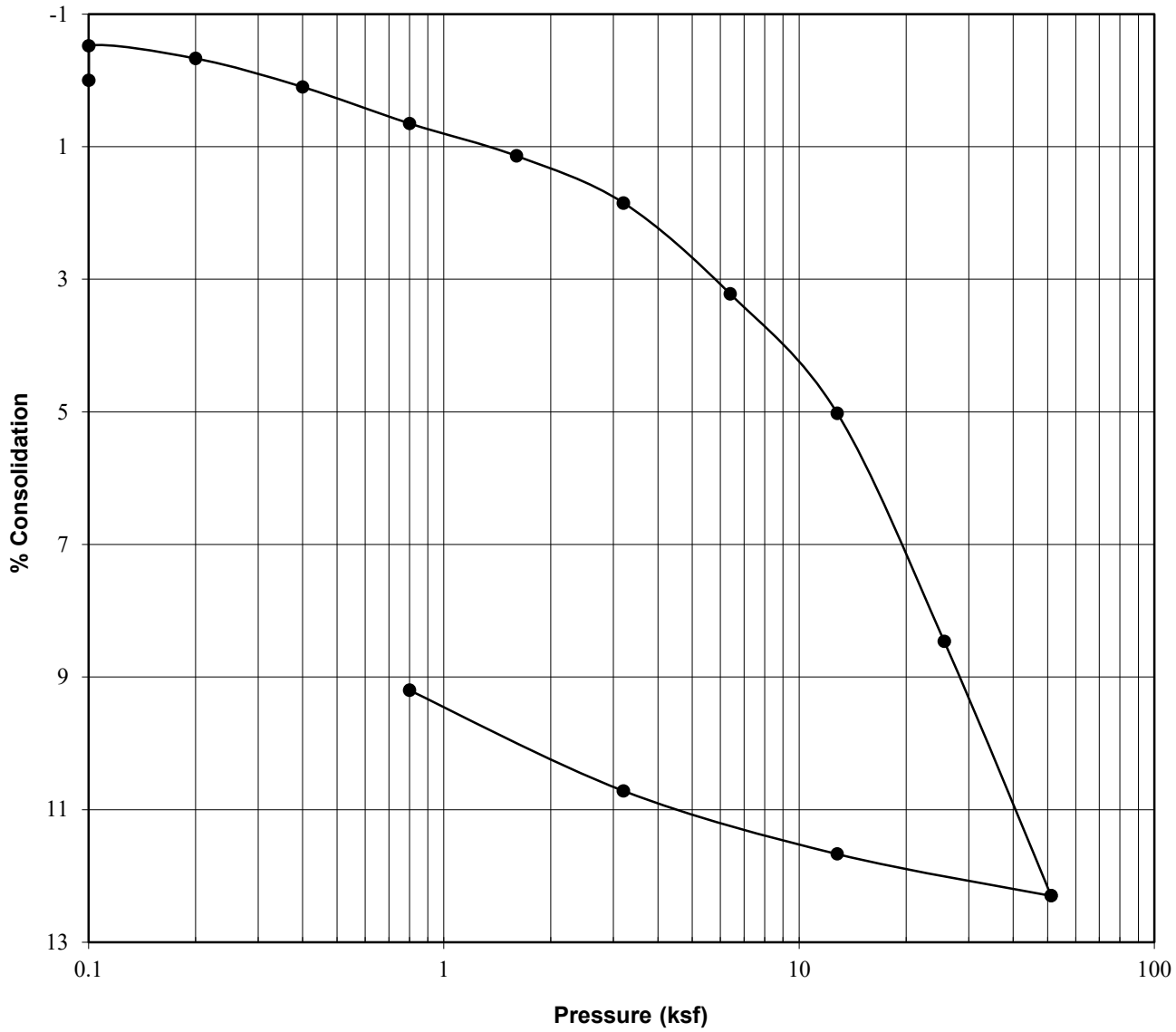
Addressee (email)

Encl. Attachment 1, Consolidation Testing

Attachment 1

Consolidation Testing

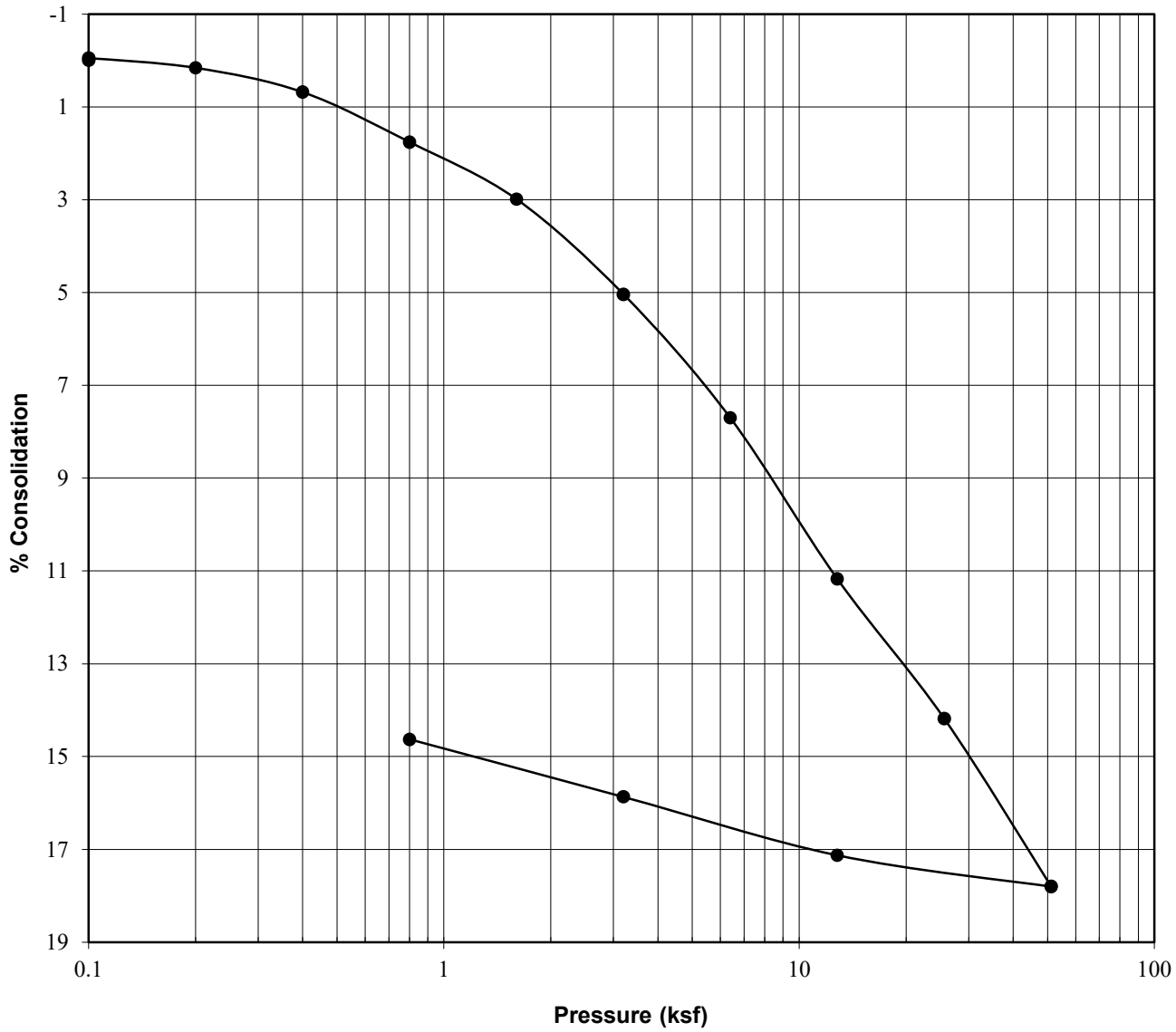
CONSOLIDATION - SWELL TEST



Project:	office/wh/gas west jordan		
Location:	B1		
Sample Depth:	5	**Natural Moisture, %:**	23
Description:	Rings	**Dry Density, pcf:**	91
Water Added at:	0.1 ksf	**Liquid Limit:**	N/A
Percent Swell:	0.5	**Plasticity Index:**	N/A
Soil Type:	Silty Clay (CL)		

PROJECT NO.:	3409-002-21	GSH	**FIGURE NO.:**

CONSOLIDATION - SWELL TEST



Project:	3409-002-22		
Location:	B10		
Sample Depth:	10	**Natural Moisture, %:**	24
Description:	Rings	**Dry Density, pcf:**	85
Water Added at:	0.1 ksf	**Liquid Limit:**	N/A
Percent Swell:	0.1	**Plasticity Index:**	N/A
Soil Type:	Silty Clay (CL)		

PROJECT NO.:	3409-002-21	GSH	**FIGURE NO.:**

November 26, 2025
Job No. 3409-02A-25

Mr. Preston Pruett
GO Industrial, LLC
3200 East Camelback Road
Pheonix, Arizona 85018

Mr. Pruett:

Re: Letter – Addendum No. 3
Updated Pavement Recommendations
7800 Logistics Industrial Development
Southwest of 7800 South and Airport Road
West Jordan, Utah (40.6084°, -111.9989°)

Introduction

GSH Geotechnical, Inc. (GSH) was requested to provide an updated pavement section design for the parking area and light-duty drive lanes at the above-referenced site. GSH completed a geotechnical study[1], an updated geotechnical study[2], and an addendum[3] dated January 17, 2022, July 25, 2025, and November 7, 2025, respectively.

Recommendations

Under no circumstances shall pavements be established over unprepared non-engineered fills, loose or disturbed soils, topsoil, surface vegetation, root systems, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water. With the subgrade soils determined from the referenced studies and estimated traffic conditions, the following light-duty pavement sections are recommended:

---

1 "Report, Geotechnical Study, Proposed Office/Warehouses, Convenience Store, and Fuel Station – West Jordan, Southwest Corner of the Intersection of 7800 South and 4455 West, South Jordan, Utah" GSH Job No. 3409-002-21

2 "Letter – Addendum No. 1, Geotechnical Study Update, Proposed Office/Warehouses, Convenience Store, and Fuel Station – West Jordan, Southwest Corner of the Intersection of 7800 South and 4455 West, South Jordan, Utah (40.6084°, -111.9989°)" GSH Job No. 3409-02A-25.

3 "Letter – Addendum No. 2, Response to Review Comments, Proposed Office/Warehouses, Convenience Store, and Fuel Station – West Jordan, Southwest Corner of the Intersection of 7800 South and 4455 West, South Jordan, Utah (40.6084°, -111.9989°)" GSH Job No. 3409-02A-25.

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Salt Lake City, Utah 84123
Tel: (801) 685-9190
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Parking Areas and Light-Duty Drive Lanes

(Light to moderate Volume of Automobiles and Light Trucks,
Occasional to Light Volume of Medium-Weight Trucks,
No Heavyweight Trucks)
[9 equivalent 18-kip axle loads per day]

Flexible:

3.0 inches	Asphalt concrete
8.0 inches	Aggregate base
Over	Properly prepared fills, natural subgrade soils, and/or structural site grading fill extending to properly prepared fills and/or natural subgrade soils

Rigid:

5.5 inches	Portland cement concrete (non-reinforced)
5.0 inches	Aggregate base
Over	Properly prepared natural subgrade soils and/or structural site grading fill extending to properly prepared natural subgrade soils

Please note that the recommended pavement section is based on estimated post-construction traffic loading. If the estimated traffic loading stated herein is not correct, GSH must review actual pavement loading conditions to determine if revisions to these recommendations are warranted.

Closure

All other recommendations presented in the referenced geotechnical report remain valid and shall continue to be followed.

If you have any questions or would like to discuss these items further, please feel free to contact us at (801) 685-9190.

Respectfully submitted,

GSH Geotechnical, Inc.

Nathan Wenger
Staff Engineer, E.I.T.

Reviewed by:

Robert A. Gifford, P.G.
State of Utah No. 11567245
Licensed Professional Geologist

LICENSED PROFESSIONAL GEOLOGIST
Robert Alexander Gifford
11567245-2250
STATE OF UTAH

NW/RAG:ab

February 9, 2026
Job No. 3409-02A-25

Mr. Preston Pruett
GO Industrial, LLC
3200 East Camelback Road
Pheonix, Arizona 85018

Mr. Pruett:

Re: Letter – Addendum No. 4
Response to Review Comments No. 2
7800 Logistics Industrial Development
Southwest of 7800 South and Airport Road
West Jordan, Utah (40.6084°, -111.9989°)

Introduction

GSH Geotechnical, Inc. (GSH) was requested to provide responses to the review comments provided by Mr. Preston Pruett. GSH completed a geotechnical study[1] and an updated geotechnical study[2], a response to review comments[3], and an updated pavement recommendation addendum[4] for the above-referenced site dated January 17, 2022, and July 25, 2025, November 7, 2025, and November 26, 2025, respectively. This letter serves as an additional addendum and is to address the comments in the third-party geotechnical engineering review document provided by Mr. Preston Pruett.

Review Comment 1

"GEOR, please provide the allowable bearing pressure at property line."

---

1 "Report, Geotechnical Study, Proposed Office/Warehouses, Convenience Store, and Fuel Station – West Jordan, Southwest Corner of the Intersection of 7800 South and 4455 West, South Jordan, Utah" GSH Job No. 3409-002-21

2 "Letter – Addendum No,1, Geotechnical Study Update, Proposed Office/Warehouses, Convenience Store, and Fuel Station – West Jordan, Southwest Corner of the Intersection of 7800 South and 4455 West, South Jordan, Utah (40.6084°, -111.9989°)" GSH Job No. 3409-02A-25.

3 "Letter – Addendum No,1, Geotechnical Study Update, Proposed Office/Warehouses, Convenience Store, and Fuel Station – West Jordan, Southwest Corner of the Intersection of 7800 South and 4455 West, South Jordan, Utah (40.6084°, -111.9989°)" GSH Job No. 3409-02A-25.

4 "Letter – Addendum No,1, Geotechnical Study Update, Proposed Office/Warehouses, Convenience Store, and Fuel Station – West Jordan, Southwest Corner of the Intersection of 7800 South and 4455 West, South Jordan, Utah (40.6084°, -111.9989°)" GSH Job No. 3409-02A-25.

GSH Geotechnical, Inc.
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Salt Lake City, Utah 84123
Tel: (801) 685-9190
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Review Response 1

GSH does not recommend placing a structure at or within 5 feet of the property line. Based on our experience, structures developed near the property line may contribute to areal settlement beyond the property line and cause distress of nearby structures.

If the structure is proposed to be placed within 5 feet of the property line, GSH must be contacted and be presented with the exact loading conditions in order to perform additional analysis to verify if the associated loading will not produce or will produce associated settlement beyond the property line.

Review Comment 2

"GEOR, please provide the exact amount of diffrential settlement between the adjacent foundation for spans 56 feet & 60 feet."

Review Response 2

The amount of differential settlement is difficult to predict because the subsurface and foundation loading conditions can vary considerably across the site. However, we anticipate differential settlement between adjacent foundations over 56-foot and 60-foot intervals to be less than 0.5-inches, as GSH limits overall settlement across the site to less than 1.0-inch. The final deflected shape of the structure will be dependent on actual foundation locations and loading.

Review Comment 3 & 4

"AS per (ACI 318, Table 4.3.1) , HSA will proceed with S0, Please Confirm."

"GEOR : please provide the category per ACI 318-19.3.1.1"

Review Response 3 & 4

To determine if the site soils will react detrimentally with subgrade improvements, chemical tests were performed on a representative sample of the near-surface native soil encountered at the site. The results of the chemical tests are tabulated below:

Test Pit No.	Depth (feet)	Soil Classification	pH	Total Water-Soluble Sulfate (mg/kg-dry)	Total Water-Soluble Chloride (mg/kg-dry)
TP-1	0.5	CL	8.0	Not Detected	Not Detected

The laboratory tests indicate that the natural soils tested contain a negligible amount of water-soluble sulfates and water-soluble chlorides. Based on our test results, concrete in contact with the

on-site soil will have a low potential for sulfate reaction (ACI 318, Table 4.3.1). Therefore, all concrete which will be in contact with the site soils may be prepared using Type I or IA cement.

Based on our test results steel in contact with the on-site soils will have a low potential for chloride reaction (ASM 13, Figure 11).

The results of the chemical analysis are included at the end of this letter within Attachment 1, Chemical Testing.

Review Comment 4

"GEOR : please Provide recommended Minimum Slab on grade Thikness and Reinforcement"

Review Response 4

The structural engineer is responsible for determining the slab on grade thickness and reinforcement, however, GSH recommends that a minimum thickness of 4-inches is utilized. Additionally, reinforcement is not required, however, it can provide reinforcement within the slab to minimize displacement of cracks if they were to occur.

Review Comment 5

"GEOR: Please provide the size of vapor barrier in offices / Warehouse if needed."

Review Response 5

GSH typically only requires a vapor barrier to mitigate environmental risk. If a vapor barrier is elected to NOT be used, GSH recommends that a minimum separation of 4-feet from the stabilized groundwater elevation and the bottom of the floor slab is achieved.

If a vapor barrier is elected to be used, we recommend a minimum vapor barrier Stego 15-mil or equivalent. However, to eliminate potential slab curl, GSH recommends that the required 4-inches of free draining gravel beneath the floor slab be placed on top of the vapor barrier. GSH recommends that the architect of record for the project be responsible for determining the vapor barrier specifications.

Review Comment 6

"GEOR: Please provide Modulus of subgrade reaction"

Review Response 6

Based on soil conditions encountered within the borings, clay soils were encountered from the surface to approximately 10-feet in depth below the current grade. GSH anticipates footings and

pavements to be established over suitable natural clay soils. Based on this condition, a modulus of subgrade reaction "k" of 100 pounds per cubic inch is recommended for the natural clay soils. This value must be appropriately factored with respect to the structural engineer's design methods.

Closure

If you have any questions or would like to discuss these items further, please feel free to contact us at (801) 685-9190.

Respectfully submitted,

GSH Geotechnical, Inc.

Tristen Leberknight
Staff Engineer, E.I.T.

Reviewed by:

Alan D. Spilker, P.E.
State of Utah No. 334228
President/Senior Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER
No. 334228
ALAN D. SPILKER
STATE OF UTAH

TL/ADS:jmt

Addressee (email)

Encl. Attachment 1, Chemical Testing

Attachment 1

Chemical Testing

2/6/2026

Work Order: 26B0194
Project: [none]

GSH Geotechnical
Attn: Ben Zuckerman
473 West 4800 South
Murray, UT 84123

Client Service Contact: 801.262.7299

The analyses presented on this report were performed in accordance with the National Environmental Laboratory Accreditation Program (NELAP) unless noted in the comments, flags, or case narrative. If the report is to be used for regulatory compliance, it should be presented in its entirety, and not be altered.

Approved By:

Aimee Rust, Project Manager

Chemtech-Ford Laboratories

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Certificate of Analysis

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Murray, UT 84123

PO#:
Receipt: **2/3/26 13:30 @ 1.7** °C
Date Reported: 2/6/2026
Project Name: **[none]**

Sample ID: **B5 #2 @ 2.5 / 2049-015-26**

Matrix: **Solid**

Lab ID: **26B0194-01**

Date Sampled: **1/27/26 12:00**

Sampled By: **Morgan Stewart**

	Result	Units	Minimum Reporting Limit	Method	Preparation Date/Time	Analysis Date/Time	Flag(s)
Inorganic							
pH	8.2	pH Units	0.1	EPA 9045D	2/3/26 15:54	2/3/26 17:07	SPH
Sulfate, Soluble (IC)	41	mg/kg dry	15	EPA 300.0	2/4/26	2/4/26	
Total Solids	65.1	%	0.1	CTF8000	2/5/26	2/5/26	

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Ben Zuckerman
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Murray, UT 84123

PO#:
Receipt: **2/3/26 13:30 @ 1.7** °C
Date Reported: 2/6/2026
Project Name: **[none]**

Sample ID: **TP2 #2 @ 2.5 / 2093-15A-26**

Matrix: **Solid**

Lab ID: **26B0194-02**

Date Sampled: **1/27/26 13:00**

Sampled By: **Morgan Stewart**

	Result	Units	Minimum Reporting Limit	Method	Preparation Date/Time	Analysis Date/Time	Flag(s)
Inorganic							
pH	8.5	pH Units	0.1	EPA 9045D	2/3/26 15:54	2/3/26 17:09	SPH
Sulfate, Soluble (IC)	19	mg/kg dry	11	EPA 300.0	2/4/26	2/4/26	
Total Solids	94.5	%	0.1	CTF8000	2/5/26	2/5/26	

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PO#:
Receipt: **2/3/26 13:30 @ 1.7** °C
Date Reported: 2/6/2026
Project Name: **[none]**

Sample ID: **B1 #2 @ 2.5 / 0762-049-26**

Matrix: **Solid**

Lab ID: **26B0194-03**

Date Sampled: **1/27/26 14:45**

Sampled By: **Morgan Stewart**

	Result	Units	Minimum Reporting Limit	Method	Preparation Date/Time	Analysis Date/Time	Flag(s)
Inorganic							
pH	8.4	pH Units	0.1	EPA 9045D	2/3/26 15:54	2/3/26 17:11	SPH
Sulfate, Soluble (IC)	64	mg/kg dry	12	EPA 300.0	2/4/26	2/4/26	
Total Solids	85.7	%	0.1	CTF8000	2/5/26	2/5/26	

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PO#:
Receipt: **2/3/26 13:30 @ 1.7** °C
Date Reported: 2/6/2026
Project Name: **[none]**

Sample ID: **B1 #1 @ 2.5 / 3820-009-25**

Matrix: **Solid**
Lab ID: **26B0194-04**
Date Sampled: **1/29/26 10:00**
Sampled By: **Morgan Stewart**

	Result	Units	Minimum Reporting Limit	Method	Preparation Date/Time	Analysis Date/Time	Flag(s)
Inorganic							
pH	8.3	pH Units	0.1	EPA 9045D	2/3/26 15:54	2/3/26 17:12	SPH
Sulfate, Soluble (IC)	ND	mg/kg dry	11	EPA 300.0	2/4/26	2/4/26	
Total Solids	90.4	%	0.1	CTF8000	2/5/26	2/5/26	

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PO#:
Receipt: **2/3/26 13:30 @ 1.7** °C
Date Reported: 2/6/2026
Project Name: **[none]**

Sample ID: **B30 #1 @ 2.5 / 3820-009-25**

Matrix: **Solid**
Lab ID: **26B0194-05**
Date Sampled: **1/29/26 10:30**
Sampled By: **Morgan Stewart**

	Result	Units	Minimum Reporting Limit	Method	Preparation Date/Time	Analysis Date/Time	Flag(s)
Inorganic							
pH	7.8	pH Units	0.1	EPA 9045D	2/3/26 15:54	2/3/26 17:20	SPH
Sulfate, Soluble (IC)	ND	mg/kg dry	11	EPA 300.0	2/4/26	2/4/26	
Total Solids	89.4	%	0.1	CTF8000	2/5/26	2/5/26	

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PO#:
Receipt: **2/3/26 13:30 @ 1.7** °C
Date Reported: 2/6/2026
Project Name: **[none]**

Sample ID: **B3 #1 @ 2.5 / 0990-119-26**

Matrix: **Solid**
Lab ID: **26B0194-06**
Date Sampled: **1/29/26 14:00**
Sampled By: **Morgan Stewart**

	Result	Units	Minimum Reporting Limit	Method	Preparation Date/Time	Analysis Date/Time	Flag(s)
Inorganic							
pH	8.2	pH Units	0.1	EPA 9045D	2/3/26 15:54	2/3/26 17:21	SPH
Sulfate, Soluble (IC)	37	mg/kg dry	11	EPA 300.0	2/4/26	2/4/26	
Total Solids	94.5	%	0.1	CTF8000	2/5/26	2/5/26	

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PO#:
Receipt: **2/3/26 13:30 @ 1.7** °C
Date Reported: 2/6/2026
Project Name: **[none]**

Sample ID: **B3 #2 @ 2.5 / 3523-021-26**

Matrix: **Solid**

Lab ID: **26B0194-07**

Date Sampled: **1/30/26 15:00**

Sampled By: **Morgan Stewart**

	Result	Units	Minimum Reporting Limit	Method	Preparation Date/Time	Analysis Date/Time	Flag(s)
Inorganic							
pH	9.1	pH Units	0.1	EPA 9045D	2/3/26 15:54	2/3/26 17:24	SPH
Sulfate, Soluble (IC)	16	mg/kg dry	10	EPA 300.0	2/4/26	2/4/26	
Total Solids	97.4	%	0.1	CTF8000	2/5/26	2/5/26	

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PO#:
Receipt: **2/3/26 13:30 @ 1.7** °C
Date Reported: 2/6/2026
Project Name: **[none]**

Sample ID: **TP1 #1 @ 0.5 / 3409-02a-25**

Matrix: **Solid**

Lab ID: **26B0194-08**

Date Sampled: **2/2/26 16:00**

Sampled By: **Morgan Stewart**

	Result	Units	Minimum Reporting Limit	Method	Preparation Date/Time	Analysis Date/Time	Flag(s)
Inorganic							
Chloride, Soluble (IC)	ND	mg/kg dry	11	EPA 300.0	2/4/26	2/4/26	
pH	8.0	pH Units	0.1	EPA 9045D	2/3/26 15:54	2/3/26 17:27	
Sulfate, Soluble (IC)	ND	mg/kg dry	11	EPA 300.0	2/4/26	2/4/26	
Total Solids	89.4	%	0.1	CTF8000	2/5/26	2/5/26	

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PO#:
Receipt: **2/3/26 13:30 @ 1.7** °C
Date Reported: 2/6/2026
Project Name: **[none]**

Sample ID: **B1 #2 @ 2.5 / 3605-01c**

Matrix: **Solid**
Lab ID: **26B0194-09**
Date Sampled: **2/3/26 10:00**
Sampled By: **Morgan Stewart**

	Result	Units	Minimum Reporting Limit	Method	Preparation Date/Time	Analysis Date/Time	Flag(s)
Inorganic							
pH	8.3	pH Units	0.1	EPA 9045D	2/3/26 15:54	2/3/26 17:30	
Sulfate, Soluble (IC)	33	mg/kg dry	11	EPA 300.0	2/4/26	2/4/26	
Total Solids	94.6	%	0.1	CTF8000	2/5/26	2/5/26	

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Murray, UT 84123

PO#:
Receipt: **2/3/26 13:30 @ 1.7** °C
Date Reported: 2/6/2026
Project Name: **[none]**

Sample ID: **B3 #1 @ 2.5 / 4233-001**

Matrix: **Solid**

Lab ID: **26B0194-10**

Date Sampled: **2/3/26 9:00**

Sampled By: **Morgan Stewart**

	Result	Units	Minimum Reporting Limit	Method	Preparation Date/Time	Analysis Date/Time	Flag(s)
Inorganic							
pH	9.0	pH Units	0.1	EPA 9045D	2/3/26 15:54	2/3/26 17:32	
Sulfate, Soluble (IC)	29	mg/kg dry	12	EPA 300.0	2/4/26	2/4/26	
Total Solids	82.7	%	0.1	CTF8000	2/5/26	2/5/26	

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Murray, UT 84123

PO#:
Receipt: **2/3/26 13:30 @ 1.7** °C
Date Reported: 2/6/2026
Project Name: **[none]**

Sample ID: **TP4 #2 @ 4 / 2928-016**

Matrix: **Solid**

Lab ID: **26B0194-11**

Date Sampled: **2/3/26 9:00**

Sampled By: **Morgan Stewart**

	Result	Units	Minimum Reporting Limit	Method	Preparation Date/Time	Analysis Date/Time	Flag(s)
Inorganic							
pH	8.0	pH Units	0.1	EPA 9045D	2/3/26 15:54	2/3/26 17:35	
Sulfate, Soluble (IC)	ND	mg/kg dry	11	EPA 300.0	2/4/26	2/4/26	
Total Solids	88.3	%	0.1	CTF8000	2/5/26	2/5/26	

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473 West 4800 South
Murray, UT 84123

PO#:
Receipt: **2/3/26 13:30 @ 1.7** °C
Date Reported: 2/6/2026
Project Name: **[none]**

Report Footnotes

Abbreviations

ND = Not detected at the corresponding Minimum Reporting Limit (MRL).
1 mg/L = one milligram per liter or 1 mg/kg = one milligram per kilogram = 1 part per million.
1 ug/L = one microgram per liter or 1 ug/kg = one microgram per kilogram = 1 part per billion.
1 ng/L = one nanogram per liter or 1 ng/kg = one nanogram per kilogram = 1 part per trillion.
On calculated parameters, there may be a slight difference between summing the rounded values shown on the report vs the unrounded values used in the calculation.

Flag Descriptions

SPH = Sample submitted past method specified holding time.

CHAIN OF CUSTODY - SAMPLE SUBMITTAL FORM

COMPANY: GSH Geotechnical Inc.
ADDRESS: 473 West 4800 South
CITY/STATE/ZIP: Murray, Utah 84107
PHONE #: (801) 685-9190
CONTACT: Ben Zuckerman
EMAIL: Bzuckerman@gshgeotech.com
PROJECT:
PO Number:
INVOICE EMAIL ADDRESS: Jo@gshgeotech.com

26B0194 (1 of 2)

RUSH Due Date*:
3 Days

*Expedited turnaround subject to additional charge

QC Level
1 (2) 3 4

QC levels definition: QC1: none QC2: Batch QC, random sample
QC3: 25% surcharge. Narrative plus Batch QC, your sample selected
QC4: 40% surcharge. Add raw data

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Sandy, UT 84070
Phone: 801-262-7299
www.chemtechford.com

Sample condition			
	Custody Seal	✓	Correct Containers
✓	Container Intact	✓	Sufficient Sample Volume
✓	COC/Labels Agree		Headspace Present (VOC)
✓	Received on Ice	✓	Temperature Blank
		✓	Received within Holding Time

Delivery Method			
	UPS		USPS
	FedEx	✓	Chemtech-Ford Courier
	Walk-in		Customer Courier

TESTS REQUESTED

RUSH Due 2/6/26 DL1744

Lab Use Only	CLIENT SAMPLE INFORMATION: LOCATION / IDENTIFICATION	DATE	TIME	MATRIX	Ph	Sulfates	Chlorides										E. Coli/Coliform (Absent/Present)	E. Coli/Coliform (Enumerated)	HPC
-1	1. BS #2@2.5/2049-015-26	1.27	12	Soil	X	X													
-2	2. TP2 #2@2.5/2093-015A-26	1.27	1 pm	Soil	X	X													
-3	3. B1 #2 @2.5/0762-049-26	1.27	2:45 pm	Soil	X	X													
-4	4. B1 #1@2.5/3820-009-25	1.29	10 am	Soil	X	X													
-5	5. B30 #1@2.5/3820-009-25	1.29	10:30	Soil	X	X													
-6	6. B3 #1@2.5/0990-119-26	1.29	2:00 pm	Soil	X	X													
-7	7. B3#2@2.5/3523-021-26	1.30	3 pm	Soil	X	X													
-8	8. TP1 #2@2.5/3409-02a-25	2.2	4 PM	Soil	X	X	X												
-9	9. B1 #2 @2.5/3605-016	2.3	10 am	Soil	X	X													
-10	10. B3 #1@2.5/4233-001	2.3	9 am	Soil	X	X													
				Bottle type				#1-1											
				Lot #				G4-1522											

Sampled by: [print] Morgan Stewart
Sampled by: [signature]

ON ICE NOT ON ICE Temp (C°): 1.7

Samples received outside the EPA recommended temperature range of 0-6 C° may be rejected.

Special Instructions:

Relinquished by: [signature]	Date/Time	Received by: [signature]	Date/Time
[signature]	2/3 1:15	[signature]	2/3/26 1:15
[signature] 2/3/26	1330	Denise Brown	2/3/26 1330

Payment Terms are net 30 days OAC. 1.5% interest charge per month (18% per annum). Client agress to pay collection costs and attorney's fees.

CHAIN OF CUSTODY - SAMPLE SUBMITTAL FORM

COMPANY: GSH Geotechnical Inc.
ADDRESS: 473 West 4800 South
CITY/STATE/ZIP: Murray, Utah 84107
PHONE #: (801) 685-9190
CONTACT: Ben Zuckerman
EMAIL: Bzuckerman@gshgeotech.co
PROJECT: m
PO Number:
INVOICE EMAIL ADDRESS: Jo@gshgeotech.com

26B0194 (2 of 2)

RUSH Due Date*:
3 Days

** Expedited turnaround subject to additional charge*

QC Level
1 (2) 3 4

QC levels definition: QC1: none QC2: Batch QC, random sample
QC3: 25% surcharge. Narrative plus Batch QC, your sample selected
QC4: 40% surcharge. Add raw data

CHEMTECH-FORD LABORATORIES

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Sandy, UT 84070
Phone: 801-262-7299
www.chemtechford.com

Sample condition			
	Custody Seal	✓	Correct Containers
✓	Container Intact	✓	Sufficient Sample Volume
✓	COC/Labels Agree		Headspace Present (VOC)
✓	Received on Ice	✓	Temperature Blank
		✓	Received within Holding Time

Delivery Method			
	UPS		USPS
	FedEx	✓	Chemtech-Ford Courier
	Walk-in		Customer Courier

TESTS REQUESTED

Lab Use Only	CLIENT SAMPLE INFORMATION: LOCATION / IDENTIFICATION	DATE	TIME	MATRIX	Ph	Sulfates											E. Coli/Coliform (Absent/Present)	E. Coli/Coliform (Enumerated)	HPC
-11	1. TP4 #2@4/2928-016	2/3	~~10~~ 9am	Soil	X	X													
	2.																		
	3.																		
	4.																		
	5.																		
	6.																		
	7.																		
	8.																		
	9.																		
	10.																		
				Bottle type															
				Lot #															

Sampled by: [print]
Sampled by: [signature]

ON ICE NOT ON ICE Temp (C°): 1.7

Samples received outside the EPA recommended temperature range of 0-6 C° may be rejected.

Special Instructions:

Relinquished by: [signature]	Date/Time	Received by: [signature]	Date/Time
Austin Lum	2/3 1:15	[signature] 2-3-26	13 15
[signature] 2-3-26	13 30	Denise Brown	2/3/26 1330

Payment Terms are net 30 days OAC. 1.5% interest charge per month (18% per annum). Client agress to pay collection costs and attorney's fees.

QC Report for Work Order (WO) - 26B0194

Analyte	% Rec	RPD	Limits	RPD Max	Result	Source Conc	Spk Value	MRL	DF
Duplicate - EPA 300.0 - Chloride, Soluble (IC)									
QC Sample ID: BAB0077-DUP1	Batch: BAB0077		QC Source Sample: XXXXXXX-XX						
Date Prepared: 02/04/2026	Date Analyzed: 02/04/2026					Units:	mg/kg dry		
Chloride, Soluble (IC)		9.64		20	4	4		10	10.00
QC Sample ID: BAB0077-DUP2	Batch: BAB0077		QC Source Sample: XXXXXXX-XX						
Date Prepared: 02/04/2026	Date Analyzed: 02/04/2026					Units:	mg/kg dry		
Chloride, Soluble (IC)		9.62		20	36	40		11	10.00

QC Report for Work Order (WO) - 26B0194

Analyte	% Rec	RPD	Limits	RPD Max	Result	Source Conc	Spk Value	MRL	DF
Duplicate - EPA 9045D - pH 9045D									
QC Sample ID: BAB0108-DUP1	Batch: BAB0108		QC Source Sample: 26B0194-05						
Date Prepared: 02/03/2026	Date Analyzed: 02/03/2026					Units:	pH Units		
pH		0.765		3	7.9	7.8		0.1	1.00
QC Sample ID: BAB0108-DUP2	Batch: BAB0108		QC Source Sample: 26B0194-11						
Date Prepared: 02/03/2026	Date Analyzed: 02/03/2026					Units:	pH Units		
pH		0.873		3	8.0	8.0		0.1	1.00

QC Report for Work Order (WO) - 26B0194

Analyte	% Rec	RPD	Limits	RPD Max	Result	Source Conc	Spk Value	MRL	DF
Duplicate - EPA 300.0 - Sulfate, Soluble (IC)									
QC Sample ID: BAB0077-DUP1	Batch: BAB0077		QC Source Sample: XXXXXXX-XX						
Date Prepared: 02/04/2026	Date Analyzed: 02/04/2026					Units:	mg/kg dry		
Sulfate, Soluble (IC)		6.90		20	10	11		10	10.00
QC Sample ID: BAB0077-DUP2	Batch: BAB0077		QC Source Sample: XXXXXXX-XX						
Date Prepared: 02/04/2026	Date Analyzed: 02/04/2026					Units:	mg/kg dry		
Sulfate, Soluble (IC)				20	ND	ND		11	10.00

REPORT
GEOTECHNICAL STUDY
PROPOSED OFFICE/WAREHOUSES, CONVENIENCE STORE, AND FUEL STATION – WEST JORDAN
SOUTHWEST CORNER OF THE INTERSECTION OF 7800 SOUTH AND 4455 WEST
WEST JORDAN, UTAH

Submitted To:

Holiday Oil Corporate Office
3115 West 2100 South
West Valley City, Utah 84119

Submitted By:

GSH Geotechnical, Inc.
473 West 4800 South
Salt Lake City, Utah 84123

January 17, 2022

Job No. 3409-002-21

January 17, 2022
Job No. 3409-002-21

Mr. Brent Neel
Holiday Oil Corporate Office
3115 West 2100 South
West Valley City, Utah 84119

Mr. Neel:

Re: Report
Geotechnical Study
Proposed Office/Warehouses, Convenience Store, and Fuel Station – West Jordan
Southwest Corner of the Intersection of 7800 South and 4455 West
West Jordan, Utah

1. INTRODUCTION

1.1 GENERAL

This report presents the results of our geotechnical study performed at the site of the proposed office/warehouses, convenience store, and fuel station to be located at the southwest corner of 7800 South and 4455 West in West Jordan, Utah. The general location of the site with respect to existing roadways, as of 2021, is presented on Figure 1, Vicinity Map. A more detailed layout of the site showing proposed facilities, existing roadways, and the borings drilled in conjunction with this study is presented on Figure 2, Site Plan.

1.2 OBJECTIVES AND SCOPE

The objectives and scope of the study were planned in discussions between Mr. Brent Neel of Holiday Oil Corporate Office and Mr. Robert Gifford of GSH Geotechnical, Inc. (GSH).

In general, the objectives of this study were to:

1. Define and evaluate the subsurface soil and groundwater conditions across the site.

2. Provide appropriate foundation, earthwork, pavement, stormwater percolation, and geoseismic recommendations to be utilized in the design and construction of the proposed facilities.

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473 West 4800 South
Salt Lake City, Utah 84123
Tel: 801.685.9190 Fax: 801.685.2990
www.gshgeo.com

In accomplishing these objectives, our scope has included the following:

1. A field program consisting of the exploration, logging, and sampling of 17 borings, as well as performing a stormwater percolation test.

2. A laboratory testing program.

3. An office program consisting of the correlation of available data, engineering analysis, and the preparation of this summary report.

1.3 AUTHORIZATION

Authorization was provided by returning a signed copy of the Professional Services Agreement No. 21-0818 dated August 11, 2021.

1.4 PROFESSIONAL STATEMENTS

Supporting data upon which our recommendations are based are presented in subsequent sections of this report. Recommendations presented herein are governed by the physical properties of the soils encountered in the exploration borings, projected groundwater conditions, and the layout and design data discussed in Section 2, Proposed Construction. If subsurface conditions other than those described in this report are encountered and/or if design and layout changes are implemented, GSH must be informed so that our recommendations can be reviewed and amended, if necessary.

Our professional services have been performed, our findings developed, and our recommendations prepared in accordance with generally accepted engineering principles and practices in this area at this time.

2. PROPOSED CONSTRUCTION

The project is to consist of the construction of a 1- to 2-level, slab-on-grade convenience store, 3 office/warehouse structures (with footprints up to 103,000 square feet) adjoining pavements and fueling station with below grade fuel tanks. The store structure is anticipated to be constructed with wood- or light-steel framing. The office/warehouse structures are anticipated to be constructed with concrete tilt-up walls or masonry block construction. All of the structures are anticipated to be supported upon conventional spread and continuous wall foundations.

Maximum real column and wall loads are anticipated to be on the order of up to 220 kips and 5 to 6 kips per lineal foot, respectively. Real loads are defined as the total of all dead plus frequently applied (reduced) live loads.

Paved parking areas, light- and heavy-duty drive lanes, and loading/unloading areas are planned around the structures. Projected traffic in the parking areas is anticipated to consist of a light volume of automobiles and light trucks, occasional medium-weight trucks, and no heavy-weight

trucks. Proposed traffic in the light-duty drive lanes is anticipated to consist of a moderate volume of automobiles and light trucks, a light volume of medium-weight trucks, and occasional heavy-weight trucks. Projected traffic in the heavy-duty drive lanes and loading/unloading areas is anticipated to consist of a moderate volume of automobiles, light trucks, and medium-weight trucks with a light volume of heavy-weight trucks.

Site development will require some earthwork in the form of minor cutting and filling. At this time, we anticipate that maximum site grading cuts and fills, excluding utilities, will be on the order of 5 to 7 feet.

3. SITE INVESTIGATIONS

3.1 GENERAL

Subsurface conditions in unexplored locations or at other times may vary from those encountered at specific boring locations. If such variations are noted during construction or if project development plans are changed, GSH must review the changes and amend our recommendations, if necessary.

Boring locations were established by estimating distances and angles from site landmarks. If increased accuracy is desired by the client, we recommend that the boring locations and elevations be surveyed.

3.2 FIELD PROGRAM

To define and evaluate the subsurface soil and groundwater conditions across the site, 17 borings were completed within the accessible areas. These borings were completed to depths ranging from 5.0 to 21.5. feet with a truck-mounted drill rig equipped with hollow-stem augers. Auger refusal within very dense granular soils terminated Borings B-1 and B-3. The approximate locations of the borings are presented on Figure 2. Additionally, a stormwater percolation test to determine the percolation rate was performed in Boring B-17 at a depth of 5 feet.

The field portion of our study was under the direct control and continual supervision of an experienced member of our geotechnical staff. During the course of the drilling operations, a continuous log of the subsurface conditions encountered was maintained. In addition, samples of the typical soils encountered were obtained for subsequent laboratory testing and examination. The soils were classified in the field based upon visual and textural examination. These classifications were supplemented by subsequent inspection and testing in our laboratory. Graphical representation of the subsurface conditions encountered is presented on Figures 3A through 3Q, Boring Logs. Soils were classified in accordance with the nomenclature described on Figure 4, Key to Boring Log (USCS).

A 3.25-inch outside diameter, 2.42-inch inside diameter (Dames & Moore) and a 2.0-inch outside diameter, 1.38-inch inside diameter drive sampler (SPT) were utilized at select locations and

depths. The blow counts recorded on the boring logs were those required to drive the sampler 12 inches with a 140-pound hammer dropping 30 inches.

Following completion of exploration operations, 1.25-inch diameter slotted PVC pipe was installed in Borings B-4 through B-6, B-9, B-10, B-12, and B-14 through B-16 to provide a means of monitoring the groundwater fluctuations. The borings were backfilled with auger cuttings.

3.3 LABORATORY TESTING

3.3.1 General

To provide data necessary for our engineering analysis, a laboratory testing program was performed. This program included moisture, density, partial gradation, Atterberg limits, consolidation, and chemical tests. The following paragraphs describe the tests and summarize the test data.

3.3.2 Moisture and Density Tests

To provide index parameters and to correlate other test data, moisture and density tests were performed on selected samples. The results of these tests are presented on the boring logs, Figures 3A through 3Q.

3.3.3 Partial Gradation Tests

To aid in classifying the granular soils, partial gradation tests were performed. Results of the tests are tabulated below and presented on the boring logs, Figures 3A through 3Q:

Boring No.	Depth (feet)	Percent Passing No. 200 Sieve	Moisture Content Percent	Soil Classification
B-6	15.0	11.1	16.0	GP/GC
B-9	10.0	1.7	7.3	SP
B-16	10.0	94.6	19.6	CL

3.3.4 Atterberg Limits Test

To aid in classifying the soils, an Atterberg limits test was performed on a sample of the fine-grained cohesive soils. Results of the test are tabulated below and presented on the boring logs, Figures 3A through 3Q:

Boring No.	Depth (feet)	Liquid Limit (percent)	Plastic Limit (percent)	Plasticity Index (percent)	Soil Classification
B-5	10.0	45	24	21	CL

3.3.5 Consolidation Tests

To provide data necessary for our settlement analysis, consolidation testing was performed on 2 representative samples of the natural fine-grained clay soils encountered at the site. The results of these tests indicate that the samples tested were moderately over-consolidated and will exhibit moderate strength and compressibility characteristics under the anticipated loading. Detailed results of the tests are maintained within our files and can be transmitted to you, upon your request.

3.3.6 Chemical Tests

To determine if the site soils will react detrimentally with concrete, chemical tests were performed on a representative sample of the near-surface soil encountered at the site. The results of the chemical tests are tabulated below:

Boring No.	Depth (feet)	Soil Classification	pH	Total Water Soluble Sulfate (mg/kg-dry)
B-1	2.5	CL	8.12	127

4. SITE CONDITIONS

4.1 SURFACE

The site is located at the southwest corner of 7800 South and 4455 West in West Jordan, Utah. The site is currently vacant/undeveloped brush/grass land with an abandoned canal running along the southern border of the site form east to west as well as a commercial railroad track running along the western border of the site from north to south. The topography of the site is relatively flat, grading down to the east with a total relief of approximately 20 to 24 feet. Site vegetation consists of various weeds and brush/grass.

The site is bounded to the north by 7800 South Street followed by similar vacant/undeveloped land along with commercial structures; to the east by Airport Road followed by commercial structures along with similar vacant/undeveloped land; to the south by commercial structures along with similar vacant/undeveloped land followed by New Bingham Highway; and to the west by single-family residential structures.

4.2 SUBSURFACE SOIL

The following paragraphs provide generalized descriptions of the subsurface profiles and soil conditions encountered within the borings conducted during this study. As previously noted, soil conditions may vary in unexplored locations.

The borings were completed to depths ranging from 5.0 to 21.5 feet. The soil conditions encountered in each of the borings, to the depths completed, were generally similar across the boring locations.

- Approximately 4 to 8 inches of topsoil was encountered in each boring. Topsoil thickness is frequently erratic and thicker zones of topsoil should be anticipated.

- Natural soils were encountered below the ground surface in each boring. The natural soils consisted primarily of surficial clay with varying silt, sand, and gravel content overlying silty sands and gravels with varying clay content encountered at depths of approximately 9+ feet with extended to the maximum depths explored.

- Materials causing auger/excavation refusal were encountered within the dense natural soils in Borings B-1 and B-3 at depths of approximately 11 feet below the existing ground surface.

The natural clay soils were medium stiff to hard, dry to moist, white, light brown, and brown in color, and moderately over-consolidated. The natural clay soils are anticipated to exhibit moderate strength and compressibility characteristics under the anticipated loading.

The natural granular soils were loose to very dense, dry to moist, and white, orangish-brown, light brown, and brown in color. The natural granular soils are anticipated to exhibit moderately high strength and moderately low compressibility characteristics under the anticipated load range.

For a more descriptive interpretation of subsurface conditions, please refer to Figures 3A through 3Q, Boring Logs. The lines designating the interface between soil types on the boring logs generally represent approximate boundaries. In situ, the transition between soil types may be gradual.

4.3 GROUNDWATER

Groundwater was not encountered to the depths explored in the borings completed at the site and is not anticipated to effect mass grading or construction operations.

Groundwater levels vary with changes in season and rainfall, construction activity, irrigation, snow melt, surface water run-off, and other site-specific factors.

5. DISCUSSIONS AND RECOMMENDATIONS

5.1 SUMMARY OF FINDINGS

The proposed structures may be supported upon conventional spread and continuous wall foundations supported upon suitable natural soils and/or structural fill extending to suitable natural soils.

The most significant geotechnical aspects at the site are:

1. The existing vegetation blanketing the site.

2. The potential to encounter non-engineered fill at the site.

3. The materials causing excavation/auger refusal in Borings B-1 and B-3 at depths of approximately 11 feet.

Prior to proceeding with construction, removal of any existing debris, surface vegetation, root systems, topsoil, non-engineered fill (if encountered), and any deleterious materials from beneath an area extending out at least 5 feet from the perimeter of the proposed structure footprints and 3 feet beyond pavements and exterior flatwork areas will be required. All existing utility locations should be reviewed to assess their impact on the proposed construction and abandoned and/or relocated as appropriate.

Due to the developed nature of this site and the surrounding area, non-engineered fills may exist in unexplored areas of the site. Based on our experience, non-engineered fills are frequently erratic in composition and consistency. All surficial loose/disturbed soils and non-engineered fills must be removed below all footings, floor slabs, and pavements.

The dense natural soils encountered at the refusal depths may require significant effort to excavate and should be considered in the design and bidding process. However, larger excavation equipment may be utilized to reach required design depths. These soils are only expected to be encountered in deeper excavations such as those for the underground storage tanks and utilities.

Detailed discussions pertaining to earthwork, foundations, pavements, and the geoseismic setting of the site are presented in the following sections.

5.2 EARTHWORK

5.2.1 Site Preparation

Initial site preparation will consist of the removal of any existing debris, non-engineered fills (if encountered), surface vegetation, root systems, topsoil, and any deleterious materials from beneath an area extending out at least 5 feet from the perimeter of the proposed structure footprint and 3 feet beyond pavements and exterior flatwork areas. All existing utility locations should be reviewed to assess their impact on the proposed construction and abandoned and/or relocated as appropriate.

It must be noted that from a handling and compaction standpoint, soils containing high amounts of fines (silts and clays) are inherently more difficult to rework and are very sensitive to changes in moisture content, requiring very close moisture control during placement and compaction. This will be very difficult, if not impossible, during wet and cold periods of the year. Additionally, the

on-site soils are likely above optimum moisture content for compacting at present and would require some drying prior to re-compacting.

Subsequent to stripping and prior to the placement of floor slabs, foundations, structural site grading fills, exterior flatwork, and pavements, the exposed subgrade must be proof rolled by passing moderate-weight rubber tire-mounted construction equipment over the surface at least twice. If excessively soft or otherwise unsuitable soils are encountered beneath footings, they must be completely removed. If removal depth required is greater than 2 feet below footings, GSH must be notified to provide further recommendations. In pavement, floor slab, and outside flatwork areas, unsuitable natural soils should be removed to a maximum depth of 2 feet and replaced with compacted granular structural fill.

Subgrade preparation as described must be completed prior to placing overlying structural site grading fills.

GSH must be notified prior to the placement of structural site grading fills, floor slabs, footings, and pavements to verify that all loose/disturbed soils and non-engineered fills (if encountered) have been completely removed.

5.2.2 Temporary Excavations

Temporary excavations up to 8 feet deep in fine-grained cohesive soils, above or below the water table, may be constructed with sideslopes no steeper than one-half horizontal to one vertical (0.5H:1.0V). Excavations deeper than 8 feet are not anticipated at the site.

For granular (cohesionless) soils, construction excavations above the water table, not exceeding 4 feet, should be no steeper than one-half horizontal to one vertical (0.5H:1.0V). For excavations up to 8 feet, in granular soils and above the water table, the slopes should be no steeper than one horizontal to one vertical (1H:1V). Excavations encountering saturated cohesionless soils will be very difficult and will require very flat sideslopes and/or shoring, bracing, and dewatering.

Due to the relatively shallow refusal depths, difficult excavation should be anticipated within deeper excavations such as those for construction of utilities. However, larger excavation equipment may be utilized to reach required design depths. These soils are only expected to be encountered in deeper excavations such as those for the underground storage tanks and utilities.

All excavations must be inspected periodically by qualified personnel. If any signs of instability or excessive sloughing are noted, immediate remedial action must be initiated.

5.2.3 Structural Fill

Structural fill is defined as all fill which will ultimately be subjected to structural loadings, such as imposed by footings, floor slabs, pavements, etc. Structural fill will be required as backfill over foundations and utilities, as site grading fill, and as replacement fill below footings. All structural

fill must be free of surface vegetation, root systems, rubbish, topsoil, frozen soil, and other deleterious materials.

Structural site grading fill is defined as structural fill placed over relatively large open areas to raise the overall grade. For structural site grading fill, the maximum particle size shall not exceed 4 inches; although, occasional larger particles, not exceeding 8 inches in diameter, may be incorporated if placed randomly in a manner such that "honeycombing" does not occur and the desired degree of compaction can be achieved. The maximum particle size within structural fill placed within confined areas shall be restricted to 2 inches.

On-site soils may be re-utilized as structural site grading fill if they do not contain construction debris or deleterious material and meet the requirements of structural fill. Fine-grained soils will require very close moisture control and may be very difficult, if not impossible, to properly place and compact during wet and cold periods of the year.

Imported structural fill below foundations and floor slabs shall consist of a well graded sand and gravel mixture with less than 30 percent retained on the three-quarter-inch sieve and less than 20 percent passing the No. 200 Sieve (clays and silts).

To stabilize soft subgrade conditions (if encountered) or where structural fill is required to be placed closer than 2.0 feet above the water table at the time of construction, a mixture of coarse angular gravels and cobbles and/or 1.5- to 2.0-inch gravel (stabilizing fill) should be utilized. It may also help to utilize a stabilization fabric, such as Mirafi 600X or equivalent, placed on the natural ground if 1.5- to 2.0-inch gravel is used as stabilizing fill.

5.2.4 Fill Placement and Compaction

All structural fill shall be placed in lifts not exceeding 8 inches in loose thickness. Structural fills shall be compacted in accordance with the percent of the maximum dry density as determined by the AASHTO[1] T180 (ASTM[2] D1557) compaction criteria in accordance with the table on the following page.

[1] American Association of State Highway and Transportation Officials
[2] American Society for Testing and Materials

Location	Total Fill Thickness (feet)	Minimum Percentage of Maximum Dry Density
Beneath an area extending at least 5 feet beyond the perimeter of the structure	0 to 10	95
Site grading fills outside area defined above	0 to 5	90
Site grading fills outside area defined above	5 to 10	95
Utility trenches within structural areas	--	96
Road base	--	96

Structural fills greater than 10 feet thick are not anticipated at the site.

Subsequent to stripping and prior to the placement of structural site grading fill, the subgrade shall be prepared as discussed in Section 5.2.1, Site Preparation, of this report. In confined areas, subgrade preparation should consist of the removal of all loose or disturbed soils.

Coarse angular gravel and cobble mixtures (stabilizing fill), if utilized, shall be end dumped, spread to a maximum loose lift thickness of 15 inches, and compacted by dropping a backhoe bucket onto the surface continuously at least twice. As an alternative, the stabilizing fill may be compacted by passing moderately heavy construction equipment or large self-propelled compaction equipment over the surface at least twice. Subsequent fill material placed over the coarse gravels and cobbles shall be adequately compacted so that the "fines" are "worked into" the voids in the underlying coarser gravels and cobbles. Where soil fill materials are to be placed directly over more than about 18 inches of clean gravel, a separation geofabric, such as Mirafi 140N or equivalent, is recommended to be placed between the gravel and subsequent soil fills.

Non-structural fill may be placed in lifts not exceeding 12 inches in loose thickness and compacted by passing construction, spreading, or hauling equipment over the surface at least twice.

5.2.5 Utility Trenches

All utility trench backfill material below structurally loaded facilities (footings, floor slabs, flatwork, pavements, etc.) shall be placed at the same density requirements established for structural fill. If the surface of the backfill becomes disturbed during the course of construction, the backfill shall be proof rolled and/or properly compacted prior to the construction of any exterior flatwork over a backfilled trench. Proof rolling shall be performed by passing moderately loaded rubber tire-mounted construction equipment uniformly over the surface at least twice. If excessively loose or soft areas are encountered during proof rolling, they shall be removed to a maximum depth of 2 feet below design finish grade and replaced with structural fill.

Many utility companies and City-County governments are now requiring that Type A-1a or A-1b (AASHTO Designation – granular soils with limited fines) soils be used as backfill over utilities. These organizations are also requiring that in public roadways, the backfill over major utilities be compacted over the full depth of fill to at least 96 percent of the maximum dry density as determined by the AASHTO T180 (ASTM D1557) method of compaction. GSH recommends that as the major utilities continue onto the site that these compaction specifications are followed.

Fine-grained soils, such as silts and clays, are not recommended for utility trench backfill in structural areas.

Due to the relatively shallow refusal depths, difficult excavation should be anticipated within deeper excavations such as those for construction of utilities. However, larger excavation equipment may be utilized to reach required design depths. These soils are only expected to be encountered in deeper excavations such as those for the underground storage tanks and utilities.

5.3 GROUNDWATER

Groundwater was not encountered to the depths explored in the borings completed at the site and is not anticipated to effect mass grading or construction operations.

The groundwater measurements presented are conditions at the time of the field exploration and may not be representative of other times or locations. Groundwater levels may vary seasonally and with precipitation, as well as other factors including irrigation. Evaluation of these factors is beyond the scope of this study. Groundwater levels may, therefore, be at shallower or deeper depths than those measured during this study, including during construction and over the life of the structure.

The extent and nature of any dewatering required during construction will be dependent on the actual groundwater conditions prevalent at the time of construction and the effectiveness of construction drainage to prevent run-off into open excavations.

5.3.1 Stormwater Percolation Test

A stormwater percolation test was performed at a depth of approximately 5 feet in the representative natural clay soils at Boring B-17. The field percolation rate was 160 minutes per inch. This design percolation rate should be considered typical for the soils at the site.

5.4 SPREAD AND CONTINUOUS WALL FOUNDATIONS

5.4.1 Design Data

The results of our analysis indicate that the proposed structures may be supported upon conventional spread and continuous wall foundations established upon suitable natural soils and/or structural fill extending to suitable natural soils. Under no circumstances shall foundations be

established over non-engineered fills, loose or disturbed soils, topsoil, surface vegetation, root systems, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water. More heavily loaded footings will require a certain amount of granular structural replacement fill as specified in Section 5.4.3, Settlements, of this report. For design, the following parameters are provided:

Minimum Recommended Depth of Embedment for Frost Protection	- 30 inches
Minimum Recommended Depth of Embedment for Non-frost Conditions	- 15 inches
Recommended Minimum Width for Continuous Wall Footings	- 18 inches
Minimum Recommended Width for Isolated Spread Footings	- 24 inches
Recommended Net Bearing Capacity for Real Load Conditions	- 2,500 pounds per square foot
Bearing Capacity Increase for Seismic Loading	- 50 percent

The term "net bearing capacity" refers to the allowable pressure imposed by the portion of the structure located above lowest adjacent final grade. Therefore, the weight of the footing and backfill to lowest adjacent final grade need not be considered. Real loads are defined as the total of all dead plus frequently applied live loads. Total load includes all dead and live loads, including seismic and wind.

5.4.2 Installation

Under no circumstances shall the footings be installed upon non-engineered fills, loose or disturbed soils, topsoil, surface vegetation, root systems, rubbish, construction debris, or other deleterious materials. If unsuitable soils are encountered, they must be removed and replaced with compacted granular fill. If granular soils become loose or disturbed, they must be recompacted prior to pouring the concrete.

The width of structural replacement fill below footings should be equal to the width of the footing plus one foot for each foot of fill thickness.

5.4.3 Settlements

Granular structural replacement fill will be required under more heavily loaded footings. For the required amount, refer to the table below:

Foundations	Loading	Minimum Thickness of Replacement Structural Granular Fill (feet)
Wall	Up to 6 kips per lineal foot	0
Spread	Up to 180 kips	0
	180 kips to 220 kips	1.0

Based on column loadings, soil bearing capacities, and the foundation recommendations as discussed above, we expect primary total settlement beneath individual foundations to be less than one inch.

The amount of differential settlement is difficult to predict because the subsurface and foundation loading conditions can vary considerably across the site. However, we anticipate differential settlement between adjacent foundations could vary from 0.5 to 0.75 inch. The final deflected shape of the structure will be dependent on actual foundation locations and loading.

5.5 LATERAL RESISTANCE

Lateral loads imposed upon foundations due to wind or seismic forces may be resisted by the development of passive earth pressures and friction between the base of the footings and the supporting soils. In determining frictional resistance, a coefficient of friction of 0.35 may be utilized for the footing interface with in situ natural clay soils and 0.40 for footing interface with natural granular soils or granular structural fill. Passive resistance provided by properly placed and compacted granular structural fill above the water table may be considered equivalent to a fluid with a density of 300 pounds per cubic foot. Below the water table, this granular soil should be considered equivalent to a fluid with a density of 150 pounds per cubic foot.

A combination of passive earth resistance and friction may be utilized provided that the friction component of the total is divided by 1.5.

5.6 LATERAL PRESSURES

Parameters, as presented within this section, are for backfills which will consist of drained soil placed and compacted in accordance with the recommendations presented herein.

The lateral pressures imposed upon subgrade facilities will, therefore, be basically dependent upon the relative rigidity and movement of the backfilled structure. For active walls, such as retaining

walls which can move outward (away from the backfill), drained backfill may be considered equivalent to a fluid with a density of 40 pounds per cubic foot in computing lateral pressures. For more rigid subgrade walls that are not more than 10 inches thick, granular backfill may be considered equivalent to a fluid with a density of 50 pounds per cubic foot. For very rigid non-yielding walls, granular backfill should be considered equivalent to a fluid with a density of at least 60 pounds per cubic foot. The above values assume that the surface of the soils slope behind the wall is horizontal and that the granular fill within 3 feet of the wall will be compacted with hand-operated compacting equipment.

For seismic loading of below-grade walls, the uniform lateral pressures below, in pounds per square foot (psf), should be added based on wall depth and wall case:

Uniform Lateral Pressures			
Wall Height (Feet)	**Active Pressure Case (psf)**	**Moderately Yielding Case (psf)**	**At Rest/Non-Yielding Case (psf)**
4	26	53	81
6	39	80	121
8	52	107	162
10	64	133	202
12	77	160	243

5.7 FLOOR SLABS

Floor slabs may be established upon suitable natural subgrade soils or structural fill extending to suitable natural soils. Under no circumstances shall floor slabs be established directly over non-engineered fills, loose or disturbed soils, sod, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water.

To facilitate curing of the concrete and to provide a capillary moisture break, it is recommended that floor slabs be directly underlain by at least 4 inches of "free-draining" fill, such as "pea" gravel or three-quarters to one inch minus clean gap-graded gravel.

Settlement of lightly loaded floor slabs designed according to previous recommendations (average uniform pressure of 200 pounds per square foot or less) is anticipated to be less than one-quarter of an inch.

5.8 PAVEMENTS

The natural clay soils will exhibit poor pavement support characteristics when saturated. All pavement areas must be prepared as previously discussed (see Section 5.2.1, Site Preparation). Under no circumstances shall pavements be established over non-engineered fills (if encountered),

loose or disturbed soils, topsoil, surface vegetation, root systems, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water. With the subgrade soils and the projected traffic as discussed in Section 2, Proposed Construction, the following pavement sections are recommended:

Parking Areas

(Light Volume of Automobiles and Light Trucks,
Occasional Medium-Weight Trucks,
and No Heavyweight Trucks)
[3 equivalent 18-kip axle loads per day]

Flexible Pavements:
(Asphalt Concrete)

3.0 inches	Asphalt concrete
8.0 inches	Aggregate base
Over	Properly prepared natural subgrade soils and/or structural site grading fill extending to properly prepared natural subgrade soils

Rigid Pavements:
(Non-reinforced Concrete)

5.0 inches	Portland cement concrete (non-reinforced)
5.0 inches	Aggregate base
Over	Properly prepared natural subgrade soils, and/or structural site grading fill extending to properly prepared natural subgrade soils

Light-Duty Drive Lanes

(Moderate Volume of Automobiles and Light Trucks,
Light Volume of Medium-Weight Trucks,
and Occasional Heavyweight Trucks)
[6 equivalent 18-kip axle loads per day]

Flexible Pavements:
(Asphalt Concrete)

3.0 inches	Asphalt concrete
9.0 inches	Aggregate base
Over	Properly prepared natural subgrade soils and/or structural site grading fill extending to properly prepared natural subgrade soils

Rigid Pavements:
(Non-reinforced Concrete)

6.0 inches	Portland cement concrete (non-reinforced)
5.0 inches	Aggregate base
Over	Properly prepared natural subgrade soils, and/or structural site grading fill extending to properly prepared natural subgrade soils

Heavy-Duty Drive Lanes

(Moderate Volume of Automobiles, Light Trucks,
and Medium-Weight Trucks,
with a Light Volume of Heavyweight Trucks)
[50 equivalent 18-kip axle loads per day]

Flexible Pavements:
(Asphalt Concrete)

4.0 inches	Asphalt concrete
8.0 inches	Aggregate base
8.0 inches*	Aggregate subbase
Over	Properly prepared natural subgrade soils and/or structural site grading fill extending to properly prepared natural subgrade soils

* Subbase may consist of granular site grading fills with a minimum California Bearing Ratio (CBR) of 30 percent.

Rigid Pavements:
(Non-reinforced Concrete)

7.0 inches	Portland cement concrete (non-reinforced)
6.0 inches	Aggregate base
Over	Properly prepared natural subgrade soils, and/or structural site grading fill extending to properly prepared natural subgrade soils

For dumpster pads, we recommend a pavement section consisting of 8.0 inches of Portland cement concrete, 12.0 inches of aggregate base, over properly prepared natural subgrade or site grading structural fills. Dumpster pads should not be constructed overlying non-engineered fills under any circumstances.

These above rigid pavement sections are for non-reinforced Portland cement concrete. Concrete should be designed in accordance with the American Concrete Institute (ACI) and joint details should conform to the Portland Cement Association (PCA) guidelines. The concrete should have

a minimum 28-day unconfined compressive strength of 4,000 pounds per square inch and contain 6 percent ±1 percent air-entrainment.

The crushed stone should conform to applicable sections of the current Utah Department of Transportation (UDOT) Standard Specifications. All asphalt material and paving operations should meet applicable specifications of the Asphalt Institute and UDOT. A GSH technician shall observe placement and perform density testing of the base course material and asphalt.

Please note that the recommended pavement section is based on estimated post-construction traffic loading. If the pavement is to be constructed and utilized by construction traffic, the above pavement section may prove insufficient for heavy truck traffic, such as concrete trucks or tractor-trailers used for construction delivery. Unexpected distress, reduced pavement life, and/or premature failure of the pavement section could result if subjected to heavy construction traffic and the owner should be made aware of this risk. If the estimated traffic loading stated herein is not correct, GSH must review actual pavement loading conditions to determine if revisions to these recommendations are warranted.

5.9 CEMENT TYPES

The laboratory tests indicate that the natural soils tested contain a negligible amount of water soluble sulfates. Based on our test results, concrete in contact with the on-site soil will have a low potential for sulfate reaction (ACI 318, Table 4.3.1). Therefore, all concrete which will be in contact with the site soils may be prepared using Type I or IA cement.

5.10 GEOSEISMIC SETTING

5.10.1 General

Utah municipalities have adopted the International Building Code (IBC) 2018. The IBC 2018 code refers to ASCE 7-16 Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE 7-16) determines the seismic hazard for a site based upon mapping of bedrock accelerations prepared by the United States Geologic Survey (USGS) and the soil site class. The USGS values are presented on maps incorporated into the IBC code and are also available based on latitude and longitude coordinates (grid points).

5.10.2 Faulting

Based on our review of available literature, no active faults pass through or immediately adjacent to the site. The nearest active mapped fault consists of the Granger Fault of the West Valley Fault Zone, located about 4.1 miles to the northeast of the site.

5.10.3 Site Class

For dynamic structural analysis, the Site Class D – Default Soil Profile as defined in Chapter 20 of ASCE 7-16 (per Section 1613.3.2, Site Class Definitions, of IBC 2018) can be utilized. If a measured site class is desired based on the project structural engineer's evaluation and recommendations, additional testing and analysis can be completed by GSH to determine the measured site class. Please contact GSH for additional information.

5.10.4 Ground Motions

The IBC 2018 code is based on USGS mapping, which provides values of short and long period accelerations for average bedrock values for the Western United States and must be corrected for local soil conditions. The following table summarizes the peak ground and short and long period accelerations for the MCE event and incorporates the appropriate soil amplification factor for a Site Class D – Default* Soil Profile. Based on the site latitude and longitude (40.6085 degrees north and 111.9991 degrees west, respectively) and Risk Category I, the values for this site are tabulated below:

Spectral Acceleration Value, T	Bedrock Boundary [mapped values] (% g)	Site Coefficient	Site Class D - Default* [adjusted for site class effects] (% g)	Design Values** (% g)
0.2 Seconds (Short Period Acceleration)	S_S = 105.4	F_a = 1.200	S_{MS} = 126.5	S_{DS} = 84.3
1.0 Second (Long Period Acceleration)	S_1 = 37.3	F_v = 1.927	S_{M1} = 71.9	S_{D1} = 47.9

* If a measured site class in accordance with IBC 2018/ ASCE 7-16 is beneficial based on the project structural engineers review, please contact GSH for additional options for obtaining this measured site class.

**IBC 2018/ASCE 7-16 may require a site-specific study based on the project structural engineer's evaluation and recommendations. If needed, GSH can provide additional information and analysis including a complete site-specific study in accordance with chapter 21 of ASCE 7-16.

5.10.5 Liquefaction

The site is located in an area that has been identified by the Utah Geological Survey (UGS) as being a "very low" liquefaction potential zone. Liquefaction is defined as the condition when saturated, loose, granular soils lose their support capabilities because of excessive pore water pressure, which develops during a seismic event. Clayey soils, even if saturated, will generally not liquefy during a major seismic event.

Due to the clayey nature of the soils, liquefaction is not anticipated to occur within the soils encountered at this site.

5.11 SITE VISITS

GSH must verify that all topsoil/disturbed soils and any other unsuitable soils have been removed, that non-engineered fills (if encountered) have been removed, and that suitable soils have been encountered prior to placing site grading fills, footings, slabs, and pavements. Additionally, GSH must observe fill placement and verify in-place moisture content and density of fill materials placed at the site.

6. CLOSURE

If you have any questions or would like to discuss these items further, please feel free to contact us at (801) 685-9190.

Respectfully submitted,

GSH Geotechnical, Inc.

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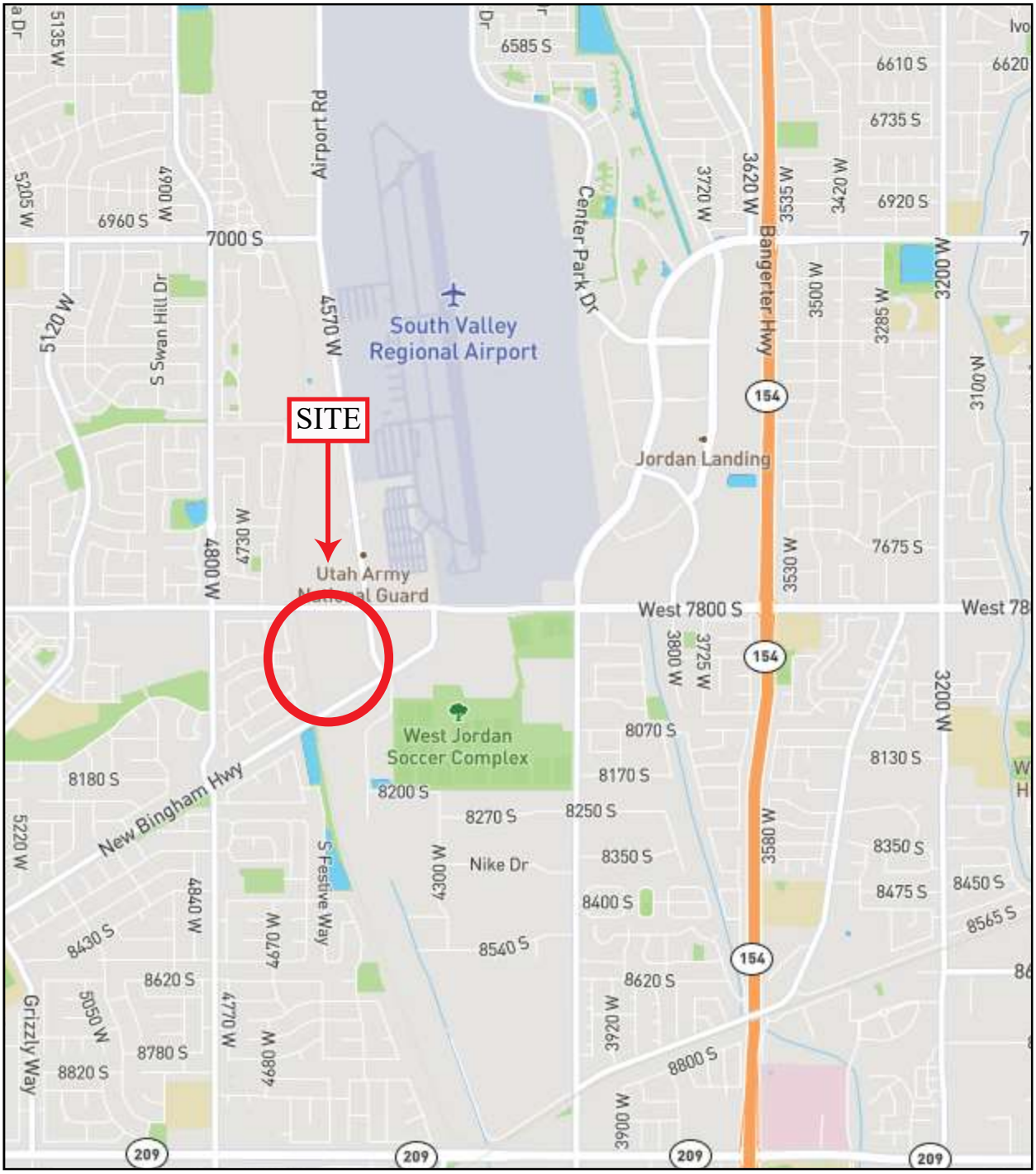
ADS:ea

Encl.	Figure	1,	Vicinity Map
	Figure	2,	Site Plan
	Figures	3A	through 3Q, Boring Logs
	Figure	4,	Key to Boring Log (USCS)

Addressee (email)

HOLIDAY OIL CORPORATE OFFICE
JOB NO. 3409-002-21



0.5 0 0.5 1 KM 1.5

0.2 0 0.2 0.4 0.6 0.8 1 MI 1.2

FIGURE 1
VICINITY MAP

REFERENCE:
ALL TRAILS - NATIONAL GEOGRAPHIC TERRAIN
DATED 2021

GSH

HOLIDAY OIL CORPORATE OFFICE
JOB NO. 3409-002-21

FIGURE 2
SITE PLAN

REFERENCE:
ADAPTED FROM DRAWING ENTITLED
"AIRPORT ROAD FLEX"
BY AEURBIA, DATED 3/21/2020

APPROXIMATE SCALE IN FEET
50 0 50 100

GSH

BORING LOG

BORING: B-1

CLIENT: Holiday Oil Corporate Office | PROJECT NUMBER: 3409-002-21

PROJECT: Proposed Office/Warehouses, Convenience Store, and Fuel Station - West Jordan | DATE STARTED: 11/29/21 | DATE FINISHED: 11/29/21

LOCATION: Southwest Corner of the Intersection of 7800 South and 4455 West, West Jordan, UT | GSH FIELD REP.: AL

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger | HAMMER: Automatic | WEIGHT: 140 lbs | DROP: 30"

GROUNDWATER DEPTH: Not Encountered (11/29/21) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface									
	CL	SILTY CLAY with some fine sand; major roots (topsoil) to 4"; brown	0								dry very stiff
				28							
			5	15							stiff
	GM	SILTY FINE AND COARSE GRAVEL with fine to coarse sand; brown	10	50+							dry very dense
		Refusal at 11.0' on very dense gravel. No groundwater encountered at time of drilling.	15								
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3A

BORING LOG

BORING: B-2

CLIENT: Holiday Oil Corporate Office | PROJECT NUMBER: 3409-002-21

PROJECT: Proposed Office/Warehouses, Convenience Store, and Fuel Station - West Jordan | DATE STARTED: 11/29/21 | DATE FINISHED: 11/29/21

LOCATION: Southwest Corner of the Intersection of 7800 South and 4455 West, West Jordan, UT | GSH FIELD REP.: AL

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger | HAMMER: Automatic | WEIGHT: 140 lbs | DROP: 30"

GROUNDWATER DEPTH: Not Encountered (11/29/21) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface									
	CL	SILTY CLAY with some fine sand; major roots (topsoil) to 4"; brown	0								dry stiff
			5								
		End of Exploration at 5.0'. No groundwater encountered at time of drilling.									
			10								
			15								
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3B

BORING LOG

Page: 1 of 1

BORING: B-3

CLIENT: Holiday Oil Corporate Office | PROJECT NUMBER: 3409-002-21

PROJECT: Proposed Office/Warehouses, Convenience Store, and Fuel Station - West Jordan | DATE STARTED: 11/29/21 | DATE FINISHED: 11/29/21

LOCATION: Southwest Corner of the Intersection of 7800 South and 4455 West, West Jordan, UT | GSH FIELD REP.: AL

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger | HAMMER: Automatic | WEIGHT: 140 lbs | DROP: 30"

GROUNDWATER DEPTH: Not Encountered (11/29/21) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface									
	CL	SILTY CLAY with some fine sand and some fine roots/holes; major roots (topsoil) to 6"; brown/white	0								dry stiff
				21							
			5								
		fine roots/holes grade out		24		17.8	86				very stiff
		grades with layers of fine and coarse gravel up to 3" thick; gray	10	50							slightly moist
		Refusal at 11.5' on very dense gravel. No groundwater encountered at time of drilling.	15								
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3C

BORING LOG

Page: 1 of 1

BORING: B-4

CLIENT: Holiday Oil Corporate Office | PROJECT NUMBER: 3409-002-21

PROJECT: Proposed Office/Warehouses, Convenience Store, and Fuel Station - West Jordan | DATE STARTED: 11/29/21 | DATE FINISHED: 11/29/21

LOCATION: Southwest Corner of the Intersection of 7800 South and 4455 West, West Jordan, UT | GSH FIELD REP.: AL

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger | HAMMER: Automatic | WEIGHT: 140 lbs | DROP: 30"

GROUNDWATER DEPTH: Not Encountered (11/29/21) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface									
	CL	SILTY CLAY with trace fine sand and occational fine roots; major roots (topsoil) to 8"; brown grades with layers of fine to coarse sandy fine and coarse gravel up to 2" thick	0								dry very stiff
				41							
		grades with some fine sand	5	40							slightly moist
		grades gray	10	26		20.4	95				
	GM/ GC	SILTY FINE AND COARSE GRAVEL with fine to medium sand and some clay; brown	15	85							slightly moist dense
		End of Exploration at 16.5'. No groundwater encountered at time of drilling. Installed 1.25" diameter slotted PVC pipe to 16.5'.	20 25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3D

BORING LOG

Page: 1 of 1

BORING: B-5

CLIENT: Holiday Oil Corporate Office | PROJECT NUMBER: 3409-002-21

PROJECT: Proposed Office/Warehouses, Convenience Store, and Fuel Station - West Jordan | DATE STARTED: 11/29/21 | DATE FINISHED: 11/29/21

LOCATION: Southwest Corner of the Intersection of 7800 South and 4455 West, West Jordan, UT | GSH FIELD REP.: AL

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger | HAMMER: Automatic | WEIGHT: 140 lbs | DROP: 30"

GROUNDWATER DEPTH: Not Encountered (11/29/21) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface									
	CL	SILTY CLAY with trace fine sand; major roots (topsoil) to 4"; brown	0								dry very stiff
				30		11					
			5								
				59		24.9	89				slightly moist
			10								
				25					45	21	
		grades fine to coarse sandy clay									
	GP	FINE TO COARSE SANDY FINE GRAVEL brown	15	33							moist medium dense
		End of Exploration at 16.5'. No groundwater encountered at time of drilling. Installed 1.25" diameter slotted PVC pipe to 16.5'.	20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3E

BORING LOG

BORING: B-6

CLIENT: Holiday Oil Corporate Office | PROJECT NUMBER: 3409-002-21

PROJECT: Proposed Office/Warehouses, Convenience Store, and Fuel Station - West Jordan | DATE STARTED: 11/29/21 | DATE FINISHED: 11/29/21

LOCATION: Southwest Corner of the Intersection of 7800 South and 4455 West, West Jordan, UT | GSH FIELD REP.: AL

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger | HAMMER: Automatic | WEIGHT: 140 lbs | DROP: 30"

GROUNDWATER DEPTH: Not Encountered (11/29/21) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface									
	CL	SILTY CLAY with trace fine sand; major roots (topsoil) to 4"; brown	0								dry very stiff
				43							
			5								
				38							slightly moist
			10	22		27.2	93				moist
	GP/GC	FINE TO COARSE SANDY FINE AND COARSE GRAVEL with some clay; orangish-brown	15	60		16		11.1			moist medium dense
		End of Exploration at 16.5'. No groundwater encountered at time of drilling. Installed 1.25" diameter slotted PVC pipe to 16.5'.	20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3F

BORING LOG

BORING: B-7

CLIENT: Holiday Oil Corporate Office | PROJECT NUMBER: 3409-002-21

PROJECT: Proposed Office/Warehouses, Convenience Store, and Fuel Station - West Jordan | DATE STARTED: 11/29/21 | DATE FINISHED: 11/29/21

LOCATION: Southwest Corner of the Intersection of 7800 South and 4455 West, West Jordan, UT | GSH FIELD REP.: AL

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger | HAMMER: Automatic | WEIGHT: 140 lbs | DROP: 30"

GROUNDWATER DEPTH: Not Encountered (11/29/21) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface									
	CL	SILTY CLAY with trace fine sand; major roots (topsoil) to 6"; brown	0								slightly moist stiff
					◢						
		End of Exploration at 5.0'. No groundwater encountered at time of drilling.	5								
			10								
			15								
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3G

BORING LOG

BORING: B-8

CLIENT: Holiday Oil Corporate Office | PROJECT NUMBER: 3409-002-21

PROJECT: Proposed Office/Warehouses, Convenience Store, and Fuel Station - West Jordan | DATE STARTED: 11/29/21 | DATE FINISHED: 11/29/21

LOCATION: Southwest Corner of the Intersection of 7800 South and 4455 West, West Jordan, UT | GSH FIELD REP.: AL

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger | HAMMER: Automatic | WEIGHT: 140 lbs | DROP: 30"

GROUNDWATER DEPTH: Not Encountered (11/29/21) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface									
	CL	SILTY CLAY with trace fine sand; major roots (topsoil) to 6"; brown	0								dry stiff
			5								
		End of Exploration at 5.0'. No groundwater encountered at time of drilling.									
			10								
			15								
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3H

BORING LOG

Page: 1 of 1

BORING: B-9

CLIENT: Holiday Oil Corporate Office | PROJECT NUMBER: 3409-002-21

PROJECT: Proposed Office/Warehouses, Convenience Store, and Fuel Station - West Jordan | DATE STARTED: 11/29/21 | DATE FINISHED: 11/29/21

LOCATION: Southwest Corner of the Intersection of 7800 South and 4455 West, West Jordan, UT | GSH FIELD REP.: AL

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger | HAMMER: Automatic | WEIGHT: 140 lbs | DROP: 30"

GROUNDWATER DEPTH: Not Encountered (11/29/21) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface									
	CL	SILTY CLAY with trace fine sand; major roots (topsoil) to 8"; brown	0								dry stiff
				16							
			5								
				31							slightly moist very stiff
		grades with some fine to coarse sand and trace fine gravel									
	SP	FINE GRAVELLY FINE TO COARSE SAND with trace silt; brown	10								slightly moist loose
				23		7.3		1.7			
		grades with layers of silty clay up to 1" thick									
	GM/ GC	SILTY/CLAYEY FINE GRAVEL with some fine to coarse sand; brown									moist medium dense
			15	61							
		End of Exploration at 16.5'. No groundwater encountered at time of drilling. Installed 1.25" diameter slotted PVC pipe to 16.5'.	20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3I

BORING LOG

Page: 1 of 1

BORING: B-10

CLIENT: Holiday Oil Corporate Office | PROJECT NUMBER: 3409-002-21

PROJECT: Proposed Office/Warehouses, Convenience Store, and Fuel Station - West Jordan | DATE STARTED: 11/30/21 | DATE FINISHED: 11/30/21

LOCATION: Southwest Corner of the Intersection of 7800 South and 4455 West, West Jordan, UT | GSH FIELD REP.: MB

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger | HAMMER: Automatic | WEIGHT: 140 lbs | DROP: 30"

GROUNDWATER DEPTH: Not Encountered (11/30/21) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface									
	CL	SILTY CLAY with fine sand and trace fine gravel; major roots (topsoil) to 6"; brown	0								dry very stiff
				53							
		gravel grades out	5	35							
		grades with trace fine sand	10	14							slightly moist stiff
	GM/ GC	SILTY/CLAYEY FINE GRAVEL with fine to coarse sand; brown									slightly moist very dense
			15	50+							
		End of Exploration at 16.0'. No groundwater encountered at time of drilling. Installed 1.25" diameter slotted PVC pipe to 16.0'.	20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3J

BORING LOG

Page: 1 of 1

BORING: B-11

CLIENT: Holiday Oil Corporate Office | PROJECT NUMBER: 3409-002-21

PROJECT: Proposed Office/Warehouses, Convenience Store, and Fuel Station - West Jordan | DATE STARTED: 11/30/21 | DATE FINISHED: 11/30/21

LOCATION: Southwest Corner of the Intersection of 7800 South and 4455 West, West Jordan, UT | GSH FIELD REP.: MB

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger | HAMMER: Automatic | WEIGHT: 140 lbs | DROP: 30"

GROUNDWATER DEPTH: Not Encountered (11/30/21) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface									
	CL	SILTY CLAY with fine sand; major roots (topsoil) to 4"; brown	0								dry stiff
			5								
		End of Exploration at 5.0'. No groundwater encountered at time of drilling.									
			10								
			15								
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3K

BORING LOG

BORING: B-12

CLIENT: Holiday Oil Corporate Office | PROJECT NUMBER: 3409-002-21

PROJECT: Proposed Office/Warehouses, Convenience Store, and Fuel Station - West Jordan | DATE STARTED: 11/30/21 | DATE FINISHED: 11/30/21

LOCATION: Southwest Corner of the Intersection of 7800 South and 4455 West, West Jordan, UT | GSH FIELD REP.: MB

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger | HAMMER: Automatic | WEIGHT: 140 lbs | DROP: 30"

GROUNDWATER DEPTH: Not Encountered (11/30/21) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface									
	CL	SILTY CLAY with trace fine sand; major roots (topsoil) to 6"; brown	0								dry hard
				50+							
			5								
				18		22.1	96				stiff
		grades light brown	10	36							very stiff
	GM/ GC	SILTY FINE GRAVEL with fine to coarse sand and some clay; light brown	15	50+							slightly moist very dense
		End of Exploration at 16.0'. No groundwater encountered at time of drilling. Installed 1.25" diameter slotted PVC pipe to 16.0'.	20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3L

BORING LOG

Page: 1 of 1

BORING: B-13

CLIENT: Holiday Oil Corporate Office | PROJECT NUMBER: 3409-002-21

PROJECT: Proposed Office/Warehouses, Convenience Store, and Fuel Station - West Jordan | DATE STARTED: 11/30/21 | DATE FINISHED: 11/30/21

LOCATION: Southwest Corner of the Intersection of 7800 South and 4455 West, West Jordan, UT | GSH FIELD REP.: MB

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger | HAMMER: Automatic | WEIGHT: 140 lbs | DROP: 30"

GROUNDWATER DEPTH: Not Encountered (11/30/21) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface									
	CL	SILTY CLAY with major roots (topsoil) to 6"; brown	0								dry medium stiff
			5								
		End of Exploration at 5.0'. No groundwater encountered at time of drilling.									
			10								
			15								
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3M

BORING LOG

Page: 1 of 1

BORING: B-14

CLIENT: Holiday Oil Corporate Office | PROJECT NUMBER: 3409-002-21

PROJECT: Proposed Office/Warehouses, Convenience Store, and Fuel Station - West Jordan | DATE STARTED: 11/30/21 | DATE FINISHED: 11/30/21

LOCATION: Southwest Corner of the Intersection of 7800 South and 4455 West, West Jordan, UT | GSH FIELD REP.: MB

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger | HAMMER: Automatic | WEIGHT: 140 lbs | DROP: 30"

GROUNDWATER DEPTH: Not Encountered (11/30/21) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface									
	CL	SILTY CLAY with some fine sand; major roots (topsoil) to 6"; brown	0								dry very stiff
				42							
			5								
				34							
		grades with trace fine sand	10	17							stiff
	GM/ GC	SILTY/CLAYEY FINE AND COARSE GRAVEL with fine to coarse sand; light brown	15	50+							dry very dense
		End of Exploration at 16.0'. No groundwater encountered at time of drilling. Installed 1.25" diameter slotted PVC pipe to 16.0'.	20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3N

BORING LOG

BORING: B-15

CLIENT: Holiday Oil Corporate Office | PROJECT NUMBER: 3409-002-21

PROJECT: Proposed Office/Warehouses, Convenience Store, and Fuel Station - West Jordan | DATE STARTED: 11/30/21 | DATE FINISHED: 11/30/21

LOCATION: Southwest Corner of the Intersection of 7800 South and 4455 West, West Jordan, UT | GSH FIELD REP.: MB

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger | HAMMER: Automatic | WEIGHT: 140 lbs | DROP: 30"

GROUNDWATER DEPTH: Not Encountered (11/30/21) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface									
	CL	SILTY CLAY with fine sand; major roots (topsoil) to 4"; brown	0								dry very stiff
				27							
			5								
		grades with some fine sand									stiff
				19							
		grades fine sandy clay with silt; light brown	10	57							very stiff
	GM/ GC	SILTY/CLAYEY FINE AND COARSE GRAVEL with fine to coarse sand; brown	15	83							dry dense
		End of Exploration at 16.5'. No groundwater encountered at time of drilling. Installed 1.25" diameter slotted PVC pipe to 16.5'.	20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3O

BORING LOG

Page: 1 of 1

BORING: B-16

CLIENT: Holiday Oil Corporate Office | PROJECT NUMBER: 3409-002-21

PROJECT: Proposed Office/Warehouses, Convenience Store, and Fuel Station - West Jordan | DATE STARTED: 11/30/21 | DATE FINISHED: 11/30/21

LOCATION: Southwest Corner of the Intersection of 7800 South and 4455 West, West Jordan, UT | GSH FIELD REP.: MB

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger | HAMMER: Automatic | WEIGHT: 140 lbs | DROP: 30"

GROUNDWATER DEPTH: Not Encountered (11/30/21) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface									
	CL	SILTY CLAY with some fine sand; major roots (topsoil) to 4"; brown	0								dry very stiff
				25		16.9					
			5								
		grades with trace fine to coarse sand and trace fine and medium gravel		32							
		grades fine to coarse sandy clay; light brown									moist hard
			10	68		19.6		94.6			
	GP/GM	FINE AND COARSE GRAVEL with fine to coarse sand and some silt; white									slightly moist very dense
			15	50+							
		grades light brown	20	85+							
		End of Exploration at 21.5'. No groundwater encountered at time of drilling. Installed 1.25" diameter slotted PVC pipe to 21.5'.									
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3P

BORING LOG

BORING: B-17

CLIENT: Holiday Oil Corporate Office | PROJECT NUMBER: 3409-002-21

PROJECT: Proposed Office/Warehouses, Convenience Store, and Fuel Station - West Jordan | DATE STARTED: 11/29/21 | DATE FINISHED: 11/29/21

LOCATION: Southwest Corner of the Intersection of 7800 South and 4455 West, West Jordan, UT | GSH FIELD REP.: AL

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger | HAMMER: Automatic | WEIGHT: 140 lbs | DROP: 30"

GROUNDWATER DEPTH: Not Encountered (11/29/21) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface									
	CL	SILTY CLAY with trace fine sand;major roots (topsoil) to 4"; brown	0								dry stiff
					◢						
		End of Exploration at 5.0'. No groundwater encountered at time of drilling.	5								
			10								
			15								
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3Q

CLIENT: Holiday Oil Corporate Office
PROJECT: Proposed Office/Warehouses, Convenience Store, and Fuel Station - West
PROJECT NUMBER: 3409-002-21

KEY TO BORING LOG

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫

COLUMN DESCRIPTIONS

① **Water Level:** Depth to measured groundwater table. See symbol below.

② **USCS:** (Unified Soil Classification System) Description of soils encountered; typical symbols are explained below.

③ **Description:** Description of material encountered; may include color, moisture, grain size, density/consistency,

④ **Depth (ft.):** Depth in feet below the ground surface.

⑤ **Blow Count:** Number of blows to advance sampler 12" beyond first 6", using a 140-lb hammer with 30" drop.

⑥ **Sample Symbol:** Type of soil sample collected at depth interval shown; sampler symbols are explained below.

⑦ **Moisture (%):** Water content of soil sample measured in laboratory; expressed as percentage of dryweight of

⑧ **Dry Density (pcf):** The density of a soil measured in laboratory; expressed in pounds per cubic foot.

⑨ **% Passing 200:** Fines content of soils sample passing a No. 200 sieve; expressed as a percentage.

⑩ **Liquid Limit (%):** Water content at which a soil changes from plastic to liquid behavior.

⑪ **Plasticity Index (%):** Range of water content at which a soil exhibits plastic properties.

⑫ **Remarks:** Comments and observations regarding drilling or sampling made by driller or field personnel. May include other field and laboratory test results using the following abbreviations:

CEMENTATION:

Weakly: Crumbles or breaks with handling or slight finger pressure.

Moderately: Crumbles or breaks with considerable finger pressure.

Strongly: Will not crumble or break with finger pressure.

MODIFIERS:

Trace <5%

Some 5-12%

With > 12%

MOISTURE CONTENT (FIELD TEST):

Dry: Absence of moisture, dusty, dry to the touch.

Moist: Damp but no visible water.

Saturated: Visible water, usually soil below water table.

Descriptions and stratum lines are interpretive; field descriptions may have been modified to reflect lab test results. Descriptions on the logs apply only at the specific boring locations and at the time the borings were advanced; they are not warranted to be representative of subsurface conditions at other locations or times.

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

MAJOR DIVISIONS			USCS SYMBOLS	TYPICAL DESCRIPTIONS
COARSE-GRAINED SOILS More than 50% of material is larger than No. 200 sieve size.	GRAVELS More than 50% of coarse fraction retained on No. 4 sieve.	CLEAN GRAVELS (little or no fines)	GW	Well-Graded Gravels, Gravel-Sand Mixtures, Little or No Fines
			GP	Poorly-Graded Gravels, Gravel-Sand Mixtures, Little or No Fines
		GRAVELS WITH FINES (appreciable amount of fines)	GM	Silty Gravels, Gravel-Sand-Silt Mixtures
			GC	Clayey Gravels, Gravel-Sand-Clay Mixtures
	SANDS More than 50% of coarse fraction passing through No. 4 sieve.	CLEAN SANDS (little or no fines)	SW	Well-Graded Sands, Gravelly Sands, Little or No Fines
			SP	Poorly-Graded Sands, Gravelly Sands, Little or No Fines
		SANDS WITH FINES (appreciable amount of fines)	SM	Silty Sands, Sand-Silt Mixtures
			SC	Clayey Sands, Sand-Clay Mixtures
FINE-GRAINED SOILS More than 50% of material is smaller than No. 200 sieve size.	SILTS AND CLAYS Liquid Limit less than 50%		ML	Inorganic Silts and Very Fine Sands, Rock Flour, Silty or Clayey Fine Sands or Clayey Silts with Slight Plasticity
			CL	Inorganic Clays of Low to Medium Plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean Clays
			OL	Organic Silts and Organic Silty Clays o f Low Plasticity
	SILTS AND CLAYS Liquid Limit greater than 50%		MH	Inorganic Silts, Micacious or Diatomacious Fine Sand or Silty Soils
			CH	Inorganic Clays of High Plasticity, Fat Clays
			OH	Organic Silts and Organic Clays of Medium to High Plasticity
HIGHLY ORGANIC SOILS			PT	Peat, Humus, Swamp Soils with High Organic Contents

Note: Dual Symbols are used to indicate borderline soil classifications.

STRATIFICATION:

DESCRIPTION	THICKNESS
Seam	up to 1/8"
Layer	1/8" to 12"

Occasional: One or less per 6" of thickness

Numerous; More than one per 6" of thickness

TYPICAL SAMPLER GRAPHIC SYMBOLS

- Bulk/Bag Sample
- Standard Penetration Split Spoon Sampler
- Rock Core
- No Recovery
- 3.25" OD, 2.42" ID D&M Sampler
- 3.0" OD, 2.42" ID D&M Sampler
- California Sampler
- Thin Wall

WATER SYMBOL

- Water Level

FIGURE 4

GSH