Geotechnical Evaluation Report

Proposed Syracuse Lake View YSA Meetinghouse Addition

3300 West 6000 South

Roy, Utah

LDS Property/Project Number:
548646724020101

Prepared for:

The Church of Jesus Christ of Latter-day Saints

Utah North PM Office

435 North Wall Avenue, Suite D

Ogden, Utah 84404

GSH

Prepared by
GSH Geotechnical
February 17, 2025

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February 17, 2025
Job No. 0153-558-24

Mr. Brian Childs
The Church of Jesus Christ of Latter-day Saints
Utah North PM Office
435 North Wall Avenue, Suite D
Ogden, Utah 84404

Mr. Childs:

Re: Geotechnical Evaluation Report
Proposed Syracuse Lake View YSA Meetinghouse Addition
3300 West 6000 South
Roy, Utah
LDS Property/Project Number: 548646724020101

1. EXECUTIVE SUMMARY

This report presents the results of our geotechnical study performed at the site of the proposed Syracuse Lake View YSA Meetinghouse Addition to be located at 3300 West 6000 South in Roy, Utah.

The soils at the site were generally similar at the boring locations. The borings typically encountered 12 inches of topsoil overlying natural soils consisting of sandy clays and silty/clayey sands.

The natural clay soils were stiff to hard, slightly moist to saturated, orange, red, tan, brown, and dark 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 sand soils were medium dense to very dense, slightly moist to saturated, and yellow, orange, gray, brown, and dark brown in color. The natural sand soils are anticipated to exhibit moderately high strength and moderately low compressibility characteristics under the anticipated load range.

Groundwater was encountered as shallow as 8.6 feet beneath the existing ground surface.

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The results of the study indicate that the proposed addition structure may be supported upon conventional spread and continuous wall foundations established upon suitable natural soils or granular structural fill extending to suitable natural soils. Under no circumstance shall footings, floor slabs, or pavements be placed upon topsoil, loose/disturbed soils, or non-engineered fill (if encountered).

Prior to proceeding with construction, removal of all topsoil, non-engineered fills (if encountered), loose/disturbed soil, surface vegetation, root systems, and any deleterious materials from beneath an area extending out at least 5 feet from the perimeter of the proposed building foundations and 3 feet beyond new pavements and exterior flatwork areas will be required. All footing excavations must extend to suitable undisturbed natural soils.

2. INTRODUCTION

This report presents the results of the geotechnical study performed at the site of the proposed Syracuse Lake View YSA Meetinghouse Addition to be located at 3300 West 6000 South in Roy, Utah. The general location of the site with respect to existing roadways, as of 2025, is presented on Figure 1, Vicinity Map. A more detailed site plan showing the proposed construction is presented on Figure 2, Site Plan. The approximate locations of the borings completed in conjunction with this study are also presented on Figure 2.

3. AUTHORIZATION

Authorization was provided by the client returning a signed "Agreement Between Client and Geotechnical Consultant" in accordance with our Professional Services Agreement No. 24-1144.

4. PROJECT DESCRIPTION, PURPOSE OF EVALUATION, & SCOPE OF WORK

The objectives and scope of our study were planned in discussions among Mr. Brian Childs of The Church of Jesus Christ of Latter-day Saints, Mr. Chad Spencer of EA Architects, and Mr. Michael S. Huber of GSH Geotechnical, Inc. (GSH).

In general, the objectives of this study were to:

1. Define and evaluate the subsurface soil and groundwater conditions at the proposed site.

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

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

1. A field program consisting of the drilling, logging, and sampling of 2 borings.

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.

5. 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 6, Design Criteria, of this report. 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.

6. DESIGN CRITERIA

The site is proposed to be developed for the construction of an addition to the existing meetinghouse structure. The structure will be 1 to 1-extended level in height of wood-frame construction established slab on grade over conventional spread and continuous wall foundations.

Maximum real column and wall loads are anticipated to be 120 kips and 5 kips per lineal foot, respectively. Real loads are defined as the total of all dead plus frequently applied (reduced) live loads.

Improving the existing at-grade paved parking and roadway areas may be part of the overall site development. Projected traffic in the parking areas is anticipated to consist of a light volume of automobiles and light trucks with no medium-weight or heavyweight trucks. In primary drive areas within the church parking lot, traffic is projected to consist of a light volume of automobiles and light trucks with occasional medium-weight and heavyweight trucks (mainly garbage trucks).

Maximum site grading cuts are anticipated to be minor and less than a foot (excluding footing excavations and removal of non-engineered fills). Maximum site grading fills are anticipated to be on the order of 2 to 4 feet.

7. SITE CONDITIONS

The site is developed with landscape, flatwork, parking lot areas, and drive lanes adjacent to the existing meetinghouse structure located at 3300 West 6000 South in Roy, Utah. The site slopes downward to the south with a total relief of less than 2 feet. Vegetation at the site consists of landscaped grass areas around the structure.

The site is bounded to the north by the existing meetinghouse structure followed by 6000 South Street; to the east by existing parking lot and drive lane areas followed by vacant/undeveloped agricultural land; to the south by existing parking lot and drive lane areas as well as an outbuilding structure and landscaped grass areas followed by vacant/undeveloped agricultural land; and to the west by existing parking lot and drive lane areas followed by a commercial structure.

8. FIELD STUDY

In order to define and evaluate the subsurface soil and groundwater conditions across the site, 2 borings were extended to depths ranging from 16.5 to 40.0 feet below existing grades. These borings were completed using a truck-mounted drill rig equipped with hollow-stem augers. Auger refusal within very dense granular soils terminated Boring B-1. The approximate locations of the borings are presented on Figure 2.

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 penetrated were obtained for subsequent laboratory testing and examination. The soils were classified in the field based upon visual and textural properties. These classifications were later supplemented by subsequent inspection and testing in our laboratory. Detailed graphical representation of the subsurface conditions encountered is presented on Figures 3A and 3B, Boring Logs. Soils were classified in accordance with the nomenclature described on Figure 4, Key to Boring Log (USCS).

3.25- and 3.0-inch outside diameters, 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 drilling operations, 1.25-inch diameter slotted PVC pipe was installed in both borings to provide a means of monitoring the groundwater fluctuations. The borings were backfilled with auger cuttings.

9. SUBSURFACE CONDITIONS AND GROUNDWATER

The borings typically encountered 12 inches of topsoil overlying natural soils consisting of sandy clays and silty/clayey sands.

The natural clay soils were stiff to hard, slightly moist to saturated, orange, red, tan, brown, and dark 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 sand soils were medium dense to very dense, slightly moist to saturated, and yellow, orange, gray, brown, and dark brown in color. The natural sand soils are anticipated to exhibit moderately high strength and moderately low compressibility characteristics under the anticipated load range.

Groundwater was encountered as shallow as 8.6 feet beneath the existing ground surface.

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

10. LABORATORY TESTING

10.1 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.

10.2 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 and 3B.

10.3 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 and 3B:

Boring No.	Depth (feet)	Percent Passing No. 200 Sieve	Moisture Content Percent	Soil Classification
B-1	30.0	32.5	21.5	SM
B-2	15.0	82.6	23.9	SM*

*sample tested contained layer of clay

10.4 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 and 3B:

Boring No.	Depth (feet)	Liquid Limit (percent)	Plastic Limit (percent)	Plasticity Index (percent)	Soil Classification
B-1	30.0	30	19	11	CL

10.5 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.

10.6 Chemical Tests

A representative soil sample was collected and sent for laboratory analysis for pH and sulfate content. As of the date of this report, results are still pending and will be transmitted when available and with corresponding cement recommendations, if applicable.

11. RECOMMENDATIONS AND CONCLUSIONS

11.1 SUMMARY OF FINDINGS

The results of the study indicate that the proposed addition structure may be supported upon conventional spread and continuous wall foundations established upon suitable natural soils or granular structural fill extending to suitable natural soils. Under no circumstance shall the footings, floor slabs, or pavements be placed upon topsoil, loose/disturbed soils, or non-engineered fill (if encountered).

Prior to proceeding with construction, removal of all topsoil, loose/disturbed soils, non-engineered fills (if encountered), surface vegetation, root systems, and any deleterious materials from beneath an area extending out at least 5 feet from the perimeter of the proposed building foundations and 3 feet beyond new pavements and exterior flatwork areas will be required. All footing excavations must extend to suitable natural soils.

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 (if encountered) must be removed below all footings, floor slabs, and pavements.

Groundwater was measured as shallow as 8.6 feet below the ground surface. GSH recommends placing floor slabs no closer than 4 feet from the highest groundwater elevation.

Proof rolling of the natural clay subgrade must not be completed if cuts extend to within 1 foot of the groundwater surface. In areas where cuts are to extend to within 1 foot of the groundwater surface, stabilization must be anticipated.

To reduce disturbance of the natural soils during excavation, it is recommended that low-impact, track-mounted equipment with smooth edge buckets/blades be utilized.

In the following sections, detailed discussions pertaining to earthwork, foundations, lateral resistance, floor slabs, pavements, and the geoseismic setting of the site are provided.

11.2 EARTHWORK

11.2.1 Site Preparation

Initial site preparation will consist of the removal of all topsoil, loose/disturbed soils, surface vegetation, root systems, non-engineered fill, debris, and any deleterious materials from beneath an area extending out at least 5 feet from the perimeter of the proposed building foundations and 3 feet beyond new pavements and exterior flatwork areas.

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.

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

Due to the relatively high groundwater, site grading cuts should be kept to a minimum. Cuts extending to within 1 foot of the groundwater elevation will likely disturb the natural clay soils

and proof rolling must not be completed. Stabilization must be anticipated in areas where cuts are to extend to within 1 foot of the groundwater surface.

To reduce disturbance of the natural soils during excavation, it is recommended that low-impact, track-mounted equipment with smooth edge buckets/blades be utilized.

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.

11.2.2 Temporary Excavations

Temporary excavations up to 8 feet deep in fine-grained cohesive soils, above or below the water table (not anticipated at the site), 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, 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, 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.

To reduce disturbance of the natural soils during excavation, it is recommended that low-impact, track-mounted equipment with smooth edge buckets/blades be utilized.

The static groundwater table was encountered as shallow as 8.6 feet below the existing surface and may be shallower with seasonal fluctuations. Consideration for dewatering of utility trenches, excavations for the removal of non-engineered fill, and other excavations below this level should be incorporated into the design and bidding process.

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

11.2.3 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) shall 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.

11.2.4 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 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
Site grading fills outside area defined above	0 to 5	90
Utility trenches within structural areas	--	96
Road base	--	96

Structural fills greater than 5 feet thick are not anticipated at the site.

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

Subsequent to stripping and prior to the placement of structural site grading fill, the subgrade shall be prepared as discussed in Section 11.2.1, Site Preparation, of this report.

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.

Coarse gravel and cobble mixtures (stabilizing fill), 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 fill may be compacted by passing moderately heavy construction equipment or large self-propelled compaction equipment 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.

11.2.5 Utility Trenches

All utility trench backfill material below structurally loaded facilities (flatwork, floor slabs, roads, 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.

Most utility companies and City-County governments are now requiring that Type A-1a or A-1b (AASHTO Designation – basically 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 T-180 (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 clays and silts, are not recommended for utility trench backfill.

The static groundwater table was encountered as shallow as 8.6 feet below the existing surface and may be shallower with seasonal fluctuations. Dewatering of utility trenches and other excavations below this level should be anticipated.

To reduce disturbance of the natural soils during excavation, it is recommended that low-impact, track-mounted equipment with smooth edge buckets/blades be utilized.

11.3 SPREAD AND CONTINUOUS WALL FOUNDATIONS

11.3.1 Design Data

The results of our analysis indicate that the proposed addition structure may be supported upon conventional spread and continuous wall foundations established upon suitable natural soils and/or structural fill extending to suitable natural soils. For design, the following parameters are provided with respect to the projected loading discussed in Section 6, Design Criteria, of this report:

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.

11.3.2 Installation

Under no circumstances shall the footings be established upon loose or disturbed soil, surface vegetation, root systems, topsoil, rubbish, construction debris, non-engineered fill, frozen soil, or other deleterious materials. If unsuitable soils are encountered, they must be completely removed and replaced with compacted structural fill.

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

11.3.3 Settlements

Based on column loadings, soil bearing capacities, and the foundation recommendations as discussed above, settlements are anticipated 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 one-half to three-quarter inch. The final deflected shape of the structure will be dependent on actual foundation locations and loading.

11.4 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 for footing interface with the natural clay soils, and a coefficient of friction of 0.40 for footing interface with the natural granular soils or granular structural fill may be utilized. 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.

11.5 FLOOR SLABS

Floor slabs may be established upon suitable stabilized natural soils and/or upon structural fill extending to suitable stabilized natural soils. Under no circumstances shall floor slabs be established over topsoil, loose/disturbed soils, non-engineered fills (if encountered), surface vegetation, root systems, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water.

Additionally, GSH recommends that floor slabs be constructed a minimum of 4.0 feet from the stabilized groundwater elevation.

In order 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.

In accordance with the Geotechnical Evaluation Report Template, floor slabs are to be constructed without control or construction joints, reinforced with No. 4 bars at 18 inches on-center each way, and shall include a 15-mil vapor retarder placed directly under the concrete with at least 4 inches of "free-draining" fill, described previously, placed below the vapor retarder.

11.6 PAVEMENTS

The natural clay soils will exhibit poor pavement support characteristics when saturated. All pavement areas must be prepared as previously discussed (see Section 11.2.1, Site Preparation). Under no circumstances shall pavements be established over topsoil, loose or disturbed soils, non-engineered fills (if encountered), surface vegetation, root systems, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water. With the subgrade soils and the projected traffic (40-year design life) as discussed in Section 6, Design Criteria, the following pavement sections are recommended:

Parking Areas

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

Flexible:

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

Rigid:

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

Parking Lot Drive Lanes and Access Driveways

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

Flexible:

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

Rigid:

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

For trash enclosure and associated approach slabs (one 40,000-pound axel load per week), we recommend a pavement section consisting of 8.0 inches of Portland cement concrete, 12.0 inches of aggregate base, over properly prepared and stabilized natural subgrade or site grading structural fills extending to suitable stabilized natural soils.

The 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 shall have a minimum 28-day unconfined compressive strength of 4,500 pounds per square inch, contain 6 percent ±1 percent air-entrainment, and meet the requirements given below in Section 11.7, Cement Types, of this report. In accordance with the Geotechnical Evaluation Report Template, 25 percent fly ash is required in all concrete exposed to freeze-thaw cycles and deicers.

The crushed stone shall conform to applicable sections of the current Utah Department of Transportation (UDOT) Standard Specifications. All asphalt material and paving operations shall 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. UDOT spec gradation requirements are presented below:

Gradation Limits	
Sieve Size	**Job Mix Gradation Target Blend**
1 1/2 inch	100
1 inch	90-100
3/4 inch	70-85
1/2 inch	65-80
3/8 inch	55-75
No. 4	40-65
No. 16	25-40
No. 200	7-11

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.

11.7 CEMENT TYPES

A representative soil sample was collected and sent for laboratory analysis for pH and sulfate content. As of the date of this report, results are still pending and will be transmitted when available and with corresponding cement recommendations, if applicable.

11.8 DOWNSPOUTS

It is recommended that all surface water be directed away from the building with positive drainage measures, including downspouts.

11.9 GEOSEISMIC SETTING

11.9.1 General

Utah municipalities have adopted the International Building Code (IBC) 2021. 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).

11.9.2 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 Weber Section of the Wasatch Fault, located about 6.6 miles to the northeast of the site.

11.9.3 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 2021) 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.

11.9.4 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 (41.1535 degrees north and 112.0602 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 = 113.5	F_a = 1.200	S_{MS} = 136.2	S_{DS} = 90.8
1.0 Second (Long Period Acceleration)	S_1 = 40.2	F_v = 1.898	S_{M1} = 76.3	S_{D1} = 50.9

* 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.

11.9.5 Liquefaction

The site is located in an area that has been identified by the Utah Geological Survey (UGS) as being a "high" 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 and density of the granular soils, liquefaction is not anticipated to occur within the soils encountered at this site.

11.10 SITE VISITS

Prior to placement of foundations and site grading fills, GSH must verify that suitable natural soils have been encountered below floor slabs, footings, structural fill, and pavements.

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.

Michael S. Huber, P.E.
State of Utah No. 343650
Vice President/Senior Geotechnical Engineer

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

Addressee (email)

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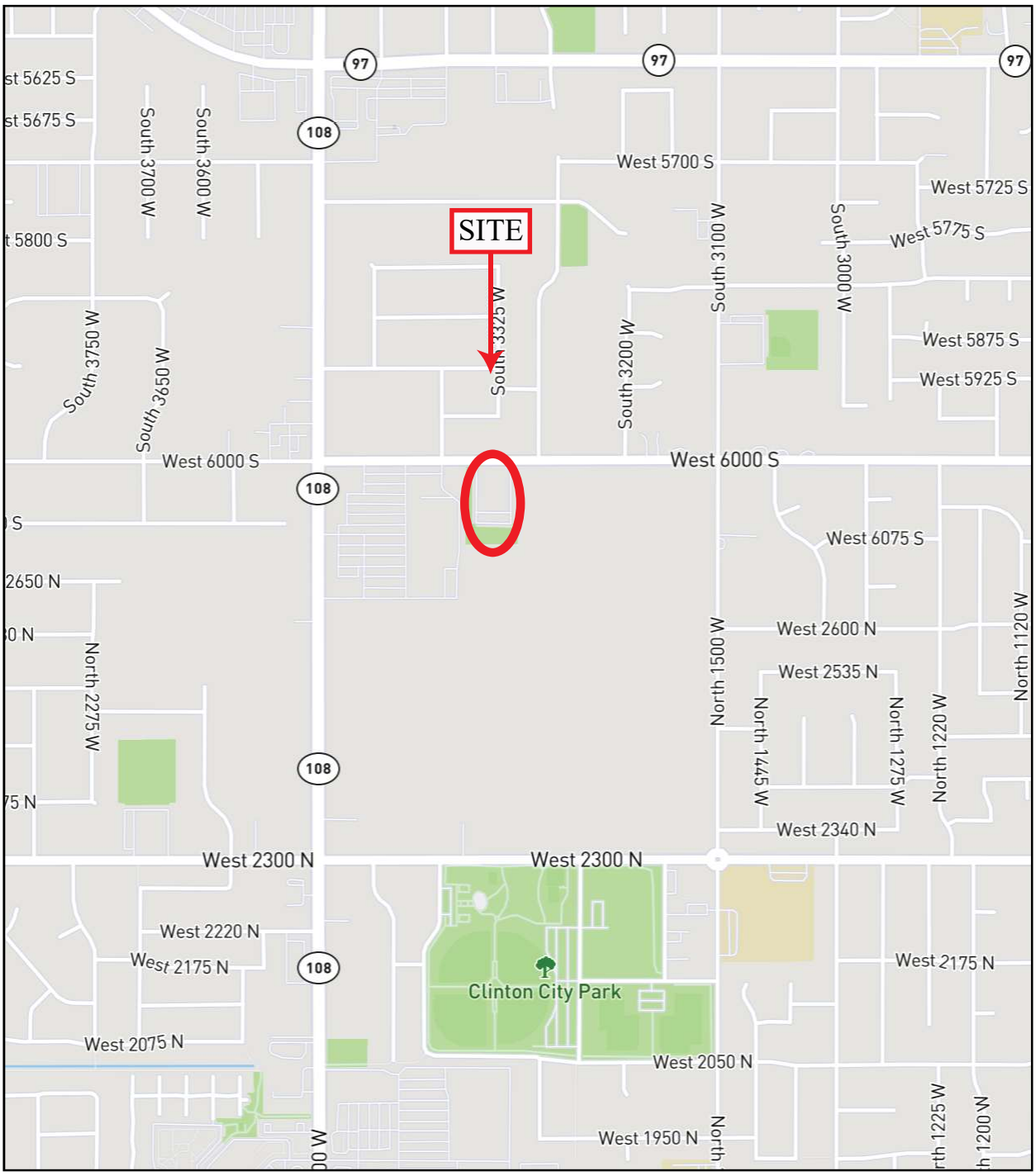
EA Architecture

THE CHURCH OF JESUS CHRIST OF LATTER-DAY SAINTS
JOB NO. 0153-558-24



0.10 0 0 0 0 0.1 0.2 0.3 MI 0.4

200 0 0 200 400 M 600

FIGURE 1
VICINITY MAP

REFERENCE:
ALL TRAILS - NATIONAL GEOGRAPHIC TERRAIN
DATED 2025

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THE CHURCH OF JESUS CHRIST OF LATTER-DAY SAINTS
JOB NO. 0153-558-24

FIGURE 2
SITE PLAN

REFERENCE:
ADAPTED FROM AERIAL PHOTOGRAPH
DOWNLOADED FROM GOOGLE EARTH
IMAGERY - NOT DATED

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BORING LOG

Page: 1 of 2

BORING: B-1

CLIENT: The Church of Jesus Christ of Latter-day Saints | PROJECT NUMBER: 0153-558-24

PROJECT: Proposed Syracuse Lake View YSA Meetinghouse Addition | DATE STARTED: 1/30/25 | DATE FINISHED: 1/30/25

LOCATION: 3300 West 6000 South, Roy, Utah | GSH FIELD REP.: JA

DRILLING METHOD/EQUIPMENT: 4-1/4" ID Hollow-Stem Auger | HAMMER: Automatic | WEIGHT: 140 lbs | DROP: 30"

GROUNDWATER DEPTH: 8.6' (1/31/25) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL	FINE SANDY CLAY with major roots (topsoil) to 12"; dark brown									slightly moist hard
		grades silty clay with some fine sand		31							
			5	20							very stiff
		grades tan									
▼											saturated
		grades tan/red	10	11							stiff
			15	36							hard
		grades with layers of fine to medium sand up to 1" thick; orange/brown	20	22							very stiff
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3A

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BORING LOG

Page: 2 of 2

BORING: B-1

CLIENT: The Church of Jesus Christ of Latter-day Saints PROJECT NUMBER: 0153-558-24

PROJECT: Proposed Syracuse Lake View YSA Meetinghouse Addition DATE STARTED: 1/30/25 DATE FINISHED: 1/30/25

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
			25								
		grades with layers of fine to medium sand up to 4" thick		10							
	SM	SILTY FINE TO MEDIUM SAND orange/brown									saturated medium dense
			30	29		21.2		32.5			
	SM	SILTY FINE TO MEDIUM SAND brown/yellow/gray	35	50/4"							saturated very dense
		Refusal at 40.0' on very dense granular soils. Installed 1.25" diameter slotted PVC pipe to 40.0'.	40								
			45								
			50								

See Subsurface Conditions section in the report for additional information.

FIGURE 3A
(continued)

BORING LOG

Page: 1 of 1

BORING: B-2

CLIENT: The Church of Jesus Christ of Latter-day Saints | PROJECT NUMBER: 0153-558-24

PROJECT: Proposed Syracuse Lake View YSA Meetinghouse Addition | DATE STARTED: 1/30/25 | DATE FINISHED: 1/30/25

LOCATION: 3300 West 6000 South, Roy, Utah | GSH FIELD REP.: JA

DRILLING METHOD/EQUIPMENT: 4-1/4" ID Hollow-Stem Auger | HAMMER: Automatic | WEIGHT: 140 lbs | DROP: 30"

GROUNDWATER DEPTH: 9.1' (1/31/25) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	SM/SC	SILTY/CLAYEY FINE TO MEDIUM SAND with major roots (topsoil) to 12"; brown/yellow/gray									slightly moist medium dense
		grades dark brown		46		18.3	101				
	CL	SILTY CLAY with some fine to medium sand; tan/dark brown	5								moist very stiff
				28							
▼											saturated
		grades with trace fine gravel; tan	10	21							stiff
		grades with layers of fine to medium sand up to 6" thick; red/brown/orange	15	22		33.9	98	82.6			very stiff
		End of Exploration at 16.5'. Installed 1.25" diameter slotted PVC pipe to 16.5'.	20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3B

CLIENT: The Church of Jesus Christ of Latter-day Saints
PROJECT: Proposed Syracuse Lake View YSA Meetinghouse Addition
PROJECT NUMBER: 0153-558-24

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

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