GSH
Gordon Spilker Huber
Geotechnical Consultants, Inc.

REPORT
GEOTECHNICAL STUDY
PROPOSED SPANISH FORK MEETINGHOUSE
1882 WEST 900 SOUTH
SPANISH FORK, UTAH
LDS PROPERTY NUMBER: 500-2178

Submitted To:

The Church of Jesus Christ of Latter-Day Saints
% NAI Corporate Services Group
343 East 500 South
Salt Lake City, Utah 84111

Submitted By:

Gordon Spilker Huber Geotechnical Consultants, Inc.
4426 South Century Drive, Suite 100
Salt Lake City, Utah 84123

July 3, 2008

Job No. 0153-050-08

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Gordon Spilker Huber
Geotechnical Consultants, Inc.

July 3, 2008
Job No. 0153-050-08

The Church of Jesus Christ of Latter-Day Saints
% NAI Corporate Services Group
343 East 500 South
Salt Lake City, Utah 84111

Attention: Mr. Matthew Morris

Ladies and Gentlemen:

Re: Report
Geotechnical Study
Proposed Spanish Fork Meetinghouse
1882 West 900 South
Spanish Fork, Utah
LDS Property Number: 500-2178

1. INTRODUCTION

1.1 GENERAL

This report presents the results of our geotechnical study performed at the site of the proposed church meetinghouse, which is located at 1882 West 900 South in Spanish Fork, Utah. The general location of the site with respect to major topographic features and existing facilities, as of 1998, is presented on Figure 1, Vicinity Map. A more detailed layout of the site overlaying an aerial photograph showing the proposed facilities and adjacent roadways is presented on Figure 2, Site Plan. The locations of the borings drilled in conjunction with this study are also presented on Figure 2.

1.2 OBJECTIVES AND SCOPE

The objectives and scope of our study were planned in discussions between Mr. Matthew Morris and Ms. China Bills of NAI Utah Commercial Real Estate, and Mr. Mike Huber of Gordon Spilker Huber Geotechnical Consultants, Inc. (GSH).

In general, the objectives of this study were to:

Gordon Spilker Huber Geotechnical Consultants, Inc.
4426 South Century Drive, Suite 100
Salt Lake City, Utah 84123
Tel: (801) 685-9190 Fax: (801) 685-2990
www.gshgeotech.com

1. Define and evaluate the subsurface soil and groundwater conditions across the site.
2. Provide appropriate foundation, earthwork, and pavement recommendations to be utilized in the design and construction of the proposed facilities.

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

1. A field program consisting of the drilling, logging, and sampling of 10 borings.

2. A laboratory testing program.

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

1.3 AUTHORIZATION

Authorization was provided by the client by a "Consultant Services Agreement" dated June 19, 2008.

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, 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.

2. PROPOSED CONSTRUCTION

The approximately 24,000 square foot meetinghouse is planned for the approximate 3.35-acre site. The structure will be one to one-extended levels in height. The structure will be of wood-frame construction established slab-on-grade.

Maximum real column and wall loads, as provided in the "Geo-Technical Information Guideline", will be 20 to 70 kips and 1.8 to 5.2 kips per lineal foot, respectively. Real loads are defined as the total of all dead plus frequently applied (reduced) live loads.

Extensive at-grade paved parking and roadway areas will be part of overall development. Projected traffic in the parking areas is anticipated to consist of a light volume of automobiles and light trucks and occasional medium-weight trucks. In primary roadway areas, traffic is projected to consist of a moderate volume of automobiles and light trucks, a light volume of medium-weight trucks, and occasional heavy-weight trucks.

Maximum site grading cuts are projected to be on the order of two to three feet with maximum fills on the order of seven to eight feet. Once a grading plan is completed for the site, GSH must review the plan and provide further recommendations, as required.

3. SITE INVESTIGATIONS

3.1 FIELD PROGRAM

In order to define and evaluate the subsurface soil and groundwater conditions at the site, 10 borings were explored to depths ranging from 5.0 to 51.5 feet below existing grade. The borings were drilled using a truck-mounted drill rig equipped with hollow-stem augers. Locations of the test 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 encountered were obtained for subsequent laboratory testing and examination. The soils were classified in the field based upon visual and textural examination. These classifications have been supplemented by subsequent inspection and testing in our laboratory. Detailed graphical representation of the subsurface conditions encountered is presented on Figures 3A through 3J, Log of Borings. Soils were classified in accordance with the nomenclature described on Figure 4, Unified Soil Classification System.

A 3.25-inch outside diameter, 2.42-inch inside diameter drive sampler (Dames & Moore) was utilized in the majority of the subsurface sampling at the site. Additionally, a 2.0-inch outside diameter, 1.38-inch inside diameter drive sampler (SPT) was utilized at select locations. 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, one and one-quarter-inch diameter slotted PVC pipe was installed in the five deep borings in order to provide a means of monitoring the groundwater fluctuations.

3.2 LABORATORY TESTING

3.2.1 General

In order to provide data necessary for our engineering analyses, a laboratory testing program was performed. The program included moisture, density, partial gradation, sulfate, pH, and topsoil tests. The following paragraphs describe the tests and summarize the test data.

3.2.2 Moisture and Density Tests

To aid in classifying the soils and to help 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 3J.

3.2.3 Partial Gradation Tests

To aid in classifying the granular soils, partial gradation tests were performed. Results of the tests are tabulated below:

Boring No.	Depth (feet)	Percent Passing No. 200 Sieve	Soil Classification
B-1	10.5	12.9	SM
B-1	20.5	13.9	SM
B-1	35.5	8.0	SP-SM
B-3	9.5	6.1	SP-SM
B-9	10.5	11.6	SP-SM
B-10	15.5	9.3	SP-SM

3.2.4 Chemical Tests

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

Boring No.	Depth (feet)	pH	Total Water Soluble Sulfate (mg/L)
B-4	2.0	7.7	*

* below detectable limit

3.2.5 Topsoil Tests

A series of topsoil tests were performed on a combined surface sample from three locations on the site. The results of these tests are attached to this report as Appendix A.

4. SITE CONDITIONS

4.1 SURFACE

The parcel is 3.35 acres and consists of generally undeveloped agricultural land with several older outbuildings located in the southern portion of the site. These outbuildings are one level in height of wood-frame construction and do not have floor slabs. Vegetation across the site consists of a moderate growth of weeds, grasses, and alfalfa up to waist high.

The site is bounded by 900 South Street to the north; to the east by single-family residential homes; to the south by undeveloped land; and to the west by similarly agricultural land and the single-family residential home associated with the property with 1400 West beyond. The site slopes moderately to the south with total estimated relief of two to three feet from 900 South Street to approximately 150 feet south of 900 South Street. The site grade then changes more abruptly with a total estimated relief of 10 to 12 feet over a distance of approximately 40 to 50 feet. At this point, the site then tapers to a gradual slope with a total estimated relief of two to three feet to the south edge of the property. A series of irrigation canals are also located on the site with the primary canals along the north and south boundaries.

4.2 SUBSURFACE SOIL

Subsurface conditions are described in detail on the attached boring logs. The soil conditions encountered in each of the borings, to the depths penetrated, 5.0 to 51.5 feet, are natural granular soils comprised of fine to coarse sands and gravels with varying silt and clay content. The soils were generally light brown to brown, loose to medium dense, moist to saturated and will exhibit moderately high to high strength and low compressibility characteristics within the anticipated loading range. The upper four to six inches of the soils are loose with one to three inches of topsoil at the boring locations.

4.3 GROUNDWATER

Groundwater was measured individually during drilling and six days after. Groundwater measurements are tabulated on the following page.

Boring No.	Groundwater Depth (feet)	
	June 26, 2008	July 2, 2008
B-1	20.0*	17.6
B-2	None encountered to 14.5	None encountered to 14.5
B-3	None encountered to 17.0	None encountered to 17.0
B-4	None encountered to 5.0	No pipe installed
B-5	None encountered to 5.0	No pipe installed
B-6	None encountered to 5.0	No pipe installed
B-7	None encountered to 5.0	No pipe installed
B-8	None encountered to 5.0	No pipe installed
B-9	15.0*	11.8
B-10	10.0*	10.2

* During drilling, not stabilized.

It should be noted that Borings B-1 through B-5 were drilled within the northern portion of the property, which is roughly 10 to 12 feet higher than the southern portion where Borings B-6 through B-10 are located.

Seasonal and longer-term groundwater fluctuations on the order of one to one and one-half feet are projected with the highest seasonal levels generally occurring during the late spring and early summer months. Irrigation on this and surrounding fields may also create additional groundwater fluctuations.

5. DISCUSSIONS AND RECOMMENDATIONS

5.1 SUMMARY OF FINDINGS

Our analysis indicates that the proposed structure may be supported upon conventional spread and continuous wall foundations supported upon natural suitable soils and/or granular structural fill extending to suitable soils.

As previously mentioned, moderate to significant site grading is anticipated at the site to construct the proposed facility. Once a site grading plan is prepared, GSH must be contacted to review this plan and provide further recommendations, as required.

Non-engineered fills associated with the demolition of the existing facilities must be completely removed in building, pavement, and exterior flatwork areas.

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

5.2 EARTHWORK

5.2.1 Site Preparation

Initial site preparation will consist of the demolition and removal of the existing small wood outbuildings and all associated non-engineered fills and debris, surface vegetation, topsoil, root bulbs, sod, and any other deleterious materials. Approximately four to six inches of stripping is anticipated to remove the majority of topsoil and loose/disturbed surficial soils. Vegetation and other deleterious materials should be removed from the site. Stripped topsoil will be unsuitable for structural fill but may be stockpiled for subsequent landscaping purposes.

Subsequent to the above operations and prior to the placement of footings, structural site grading fill, or floor slabs, the exposed natural subgrade must be proofrolled by passing moderate-weight rubber tire-mounted construction equipment over the surface at least twice. If any loose, soft, or disturbed zones are encountered, they must be completely removed in footing and floor slab areas and replaced with granular structural fill. In pavement areas, unsuitable soils encountered during recompaction and proofrolling must be removed to a maximum depth of two feet and replaced with compacted granular structural fill.

5.2.2 Temporary Excavations

Temporary construction excavations in the site soils not exceeding four feet in depth may be constructed with near vertical sideslopes. Temporary excavations up to 10 feet deep in the site soils and not encountering groundwater may be constructed with sideslopes no steeper than one horizontal to one vertical. Excavations deeper than 10 feet are not anticipated. If excessive sloughing occurs, if groundwater is encountered, or where extensive layers of clean granular soils are encountered, the sideslopes should be appropriately flattened and/or shoring/bracing/dewatering utilized. Excavations below the groundwater in granular soils will be extremely difficult since these soils will tend to flow into the excavation.

All excavations must be inspected periodically by qualified personnel. If any signs of instability 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 possibly as replacement fill below footings. All structural fill must be free of sod, rubbish, topsoil, frozen soil, and other deleterious materials. Structural site grading fill is defined as fill placed over relatively large open areas to raise the overall grade. For structural site grading fill, the maximum particle size shall not exceed four inches or half the thickness of the fill; although, occasional larger particles, not exceeding eight 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 two inches.

The on-site soils may be re-utilized as structural site grading fill if they meet the requirements of such.

Non-structural site grading fill is defined as all fill material not designated as structural fill and may consist of any cohesive or granular soils not containing excessive amounts of degradable material.

5.2.4 Fill Placement and Compaction

All structural fill shall be placed in lifts not exceeding eight inches in loose thickness. Structural fills beneath an area extending at least 3 feet beyond the perimeter of the structure must be compacted to at least 95 percent of the maximum dry density as determined by the AASHTO[1] T-180 (ASTM[2] D-1557) compaction criteria. Structural fills 5 to 10 feet thick must be compacted to 95 percent of the above criteria. Structural fills less than 5 feet thick, which are not beneath an area extending out at least 3 feet from the perimeter of the structure, shall be compacted to at least 90 percent of the above-defined criteria. 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.

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

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

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 proofrolled and/or properly compacted prior to the construction of any exterior flatwork over a backfilled trench. Proofrolling may 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 proofrolling, they shall be removed to a maximum depth of two feet below design finish grade and replaced with compacted 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 D-1557) method of compaction. We recommend that as the major utilities continue onto the site that these compaction specifications are followed.

5.3 SPREAD AND CONTINUOUS WALL FOUNDATIONS

5.3.1 Design Data

The proposed 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:

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 Pressure for Real Load Conditions	- 3,000 pounds per square foot
Bearing Pressure Increase for Seismic Loading	- 50 percent

The term "net bearing pressure" refers to the 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.

5.3.2 Installation

Under no circumstances shall the footings be established upon non-engineered fill, loose or disturbed soils, sod, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water. If unsuitable soils are encountered, they must be completely removed and replaced with compacted structural fill. If granular soils become loose or disturbed, they must be recompacted to the requirements for structural fill.

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.

5.3.3 Settlements

Settlements of foundations designed and installed in accordance with above recommendations and supporting maximum projected structural loads are anticipated to be approximately one-half to five-eighths of an inch. Settlements are expected to occur rapidly, with approximately 60 to 70 percent of the settlements occurring during construction.

5.4 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 0.40 should 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.

5.5 LATERAL PRESSURES

The lateral pressure parameters, as presented within this section, are for backfills which will consist of drained granular 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), granular backfill may be considered equivalent to a fluid with a density of 35 pounds per cubic foot in computing lateral pressures. For more rigid walls, generally not exceeding 8 feet in height, granular backfill may be considered equivalent to a fluid with a density of 45 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 three feet of the wall will be compacted with hand-operated compacting equipment.
For seismic loading and below-grade walls up to 4 feet tall, a uniform pressure of 30 and 60 pounds per square foot should be added for active and more rigid walls, respectively.

5.6 FLOOR SLABS

Floor slabs shall be established upon suitable natural soils and/or upon structural fill extending to suitable natural soils. Under no circumstances shall floor slabs be established over non-engineered fills, loose or disturbed soils, sod, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water. Settlement of lightly loaded (up to 200 pounds per square foot) floor slabs is anticipated to be less than one-quarter inch.

5.7 PAVEMENTS

The existing natural soils are granular and will exhibit moderate engineering characteristics when saturated or near-saturated. Considering these soils as the design subgrade soils and the projected traffic conditions, the following pavement sections are recommended.

Parking Lot Areas

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

Flexible:

2.5 inches	Asphalt concrete
7.0 inches	Aggregate base course
Over	Properly prepared natural soils, or structural site grading fill extending to suitable natural soils

Rigid:

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

Primary Roadway Areas

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

Flexible:

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

Rigid:

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

For dumpster pads, we recommend a pavement section consisting of six and one-half inches of Portland cement concrete, four inches of aggregate base course, over properly prepared natural subgrade or site grading structural fills extending to suitable natural soils.

These 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 with 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.

5.8 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.

5.9 GEOSEISMIC SETTING

5.9.1 General

Utah municipalities adopted the International Building Code (IBC) 2006 on January 1, 2007. The IBC 2006 code determines the seismic hazard for a site based upon 2002 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).

The structure must be designed in accordance with the procedure presented in Section 1613, Earthquake Loads, of the IBC 2006 edition.

5.9.2 Faulting

Based upon our review of available literature, no active faults are known to pass through or immediately adjacent to the site. The nearest active fault is the Wasatch fault approximately four

miles southeast of the site. The Wasatch fault zone is considered capable of generating earthquakes as large as magnitude 7.4.

5.9.3 Soil Class

Our analysis of the soils in the upper 30 feet in the borings shows that some of the deeper saturated soils could liquefy during the design seismic event (see Section 5.9.5, Liquefaction). According to the IBC 2006 Table 1613.5.2, "Soils vulnerable to potential failure or collapse under seismic loading such as liquefiable soils..." are designated under site Class F. However, the potential settlements due to liquefaction are anticipated to be up to approximately one to one and one-quarter inch. This magnitude of settlement can typically be tolerated by an adequately designed structure to protect life safety. Additionally, surface rupture and lateral spreading are not anticipated to occur. Therefore, we recommend the site be designated under Site Class D - Stiff Soil Profile for design.

5.9.4 Ground Motions

The IBC 2006 code is based on 2002 USGS (United States Geologic Survey) mapping, which provides values of short and long period accelerations for the Site Class B-C boundary for the Maximum Considered Earthquake (MCE). This Site Class B-C boundary represents a hypothetical bedrock surface and must be corrected for local soil conditions. The following table summarizes the peak ground and short and long period accelerations for a MCE event and incorporates a soil amplification factor for a Site Class D soil profile in the second column. Based on the site latitude and longitude (40.09788 degrees north and 111.686399 degrees west, respectively), the values for this site are tabulated on the following page.

Spectral Acceleration Value, T Seconds	Site Class B-C Boundary [mapped values] (% g)	Site Class D [adjusted for site class effects] (% g)
Peak Ground Acceleration	52.0	52.0
0.2 Seconds, (Short Period Acceleration)	$S_S = 130.0$	$S_{MS} = 130.0$
1.0 Seconds (Long Period Acceleration)	$S_1 = 54.5$	$S_{M1} = 81.7$

The IBC 2006 code design accelerations (S_{DS} and S_{D1}) are based on multiplying the above accelerations (adjusted for site class effects) for the MCE event by two-thirds (⅔).

5.9.5 Liquefaction

The site is located in an area that has been identified by the Earthquake Preparedness Information Center, Utah Division of Comprehensive Emergency Management for Utah County as having a "high" liquefaction potential. Liquefaction is defined as the condition when saturated, loose, finer-grained sand-type soils lose their support capabilities because of excessive pore water pressure which develops during a seismic event.

Saturated granular soils were encountered in Borings B-1, B-9, and B-10. Our analysis indicates that in Borings B-1 and B-9, isolated layers of the deeper saturated sand layers encountered could liquefy under the design seismic event. The other layers, as well as the saturated sands encountered in Boring B-10, will not likely liquefy during the design seismic event. If these isolated layers were to completely liquefy, settlements on the order of one to one and one-quarter inch could occur. Due to the depth of the potentially liquefiable layers and the thickness of overlying non-liquefiable soils, ground rupture is not anticipated during the design seismic event. Due to the depth of the potentially liquefiable layers, the lack of a free face, as well as the lack of a contiguous potentially liquefiable layer, lateral spread is not anticipated to occur at the site during the design seismic event. It should be noted that our liquefaction analysis was performed on the soils encountered in the upper 30 feet as is typically performed for single-level slab-on-grade facilities. If these deeper soils were analyzed, additional settlements could be predicted.

Calculations were performed using the procedures described in NCEER-97-0022 entitled, "Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils," and only apply to the saturated cohesionless deposits.

GSH
Gordon Spilker Huber
Geotechnical Consultants, Inc.

We appreciate the opportunity of providing this service for you. If you have any questions or require additional information, please do not hesitate to contact us.

Respectfully submitted,

GSH Geotechnical Consultants, Inc.

Bryan N. Roberts, State of Utah No. 276476
Professional Engineer

And:

Michael S. Huber, State of Utah No. 343650
Professional Engineer

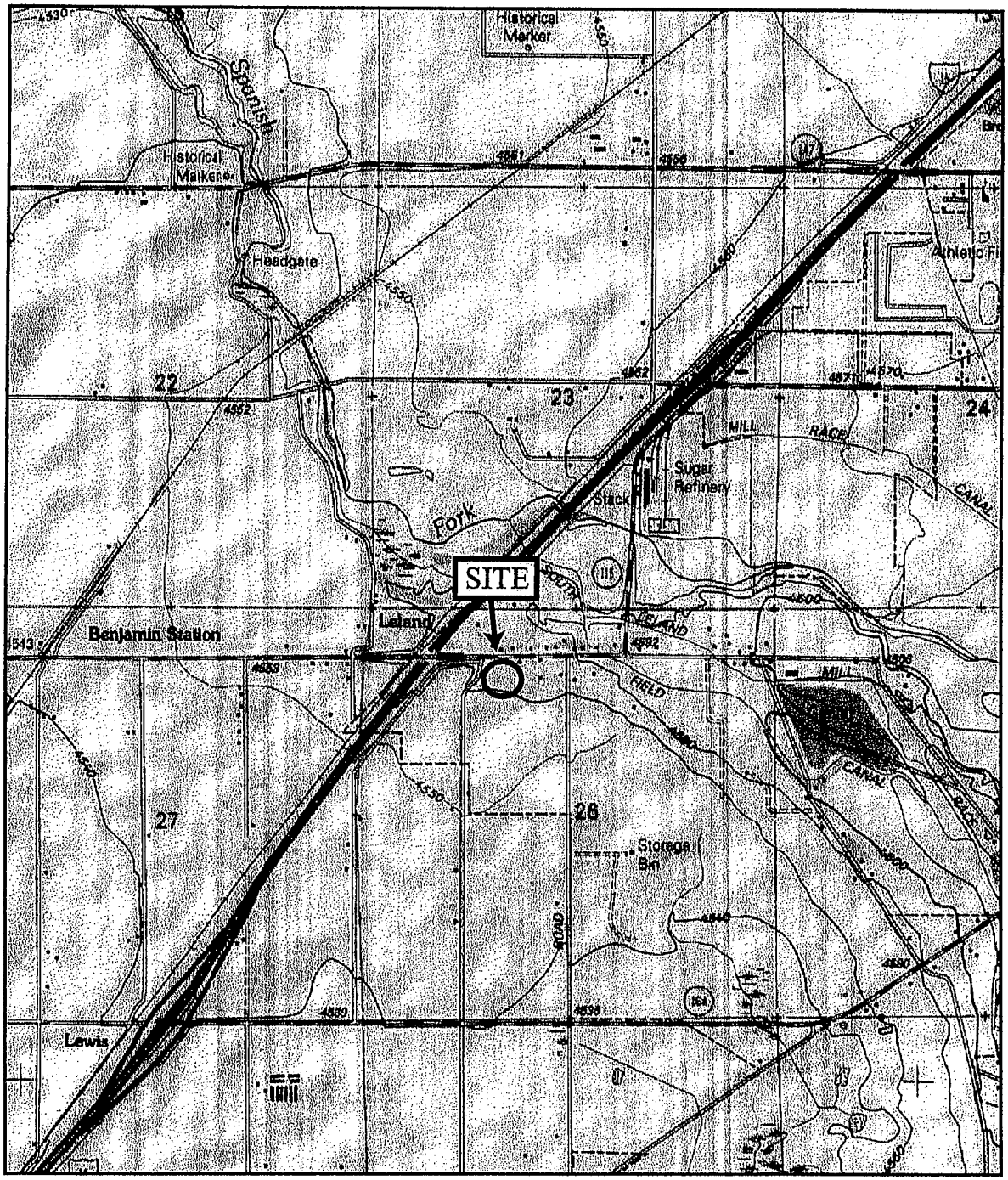
BNR/MSH:jlh

Encl. Figure 1, Vicinity Map
Figure 2, Site Plan
Figures 3A through 3J, Log of Borings
Figure 4, Unified Soil Classification System
Appendix A, Topsoil Testing Report

Addressee (3 + email)
c: Ms. China Bills (1 + email)
NAI Utah Commercial Real Estate
343 East 500 South
Salt Lake City, Utah 84111

Mr. Mark Davis (1)
The Church of Jesus Christ of Latter-Day Saints
50 East North Temple, RM 467 W
Salt Lake City, Utah 84150-6915

THE CHURCH OF JESUS CHRIST OF LATTER-DAY SAINTS
JOB NO. 0153-050-08



SCALE IN FEET
1000 0 1000 2000

FIGURE 1
VICINITY MAP

REFERENCE:
USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE MAP
TITLED "SPANISH FORK, UTAH" DATED 1998

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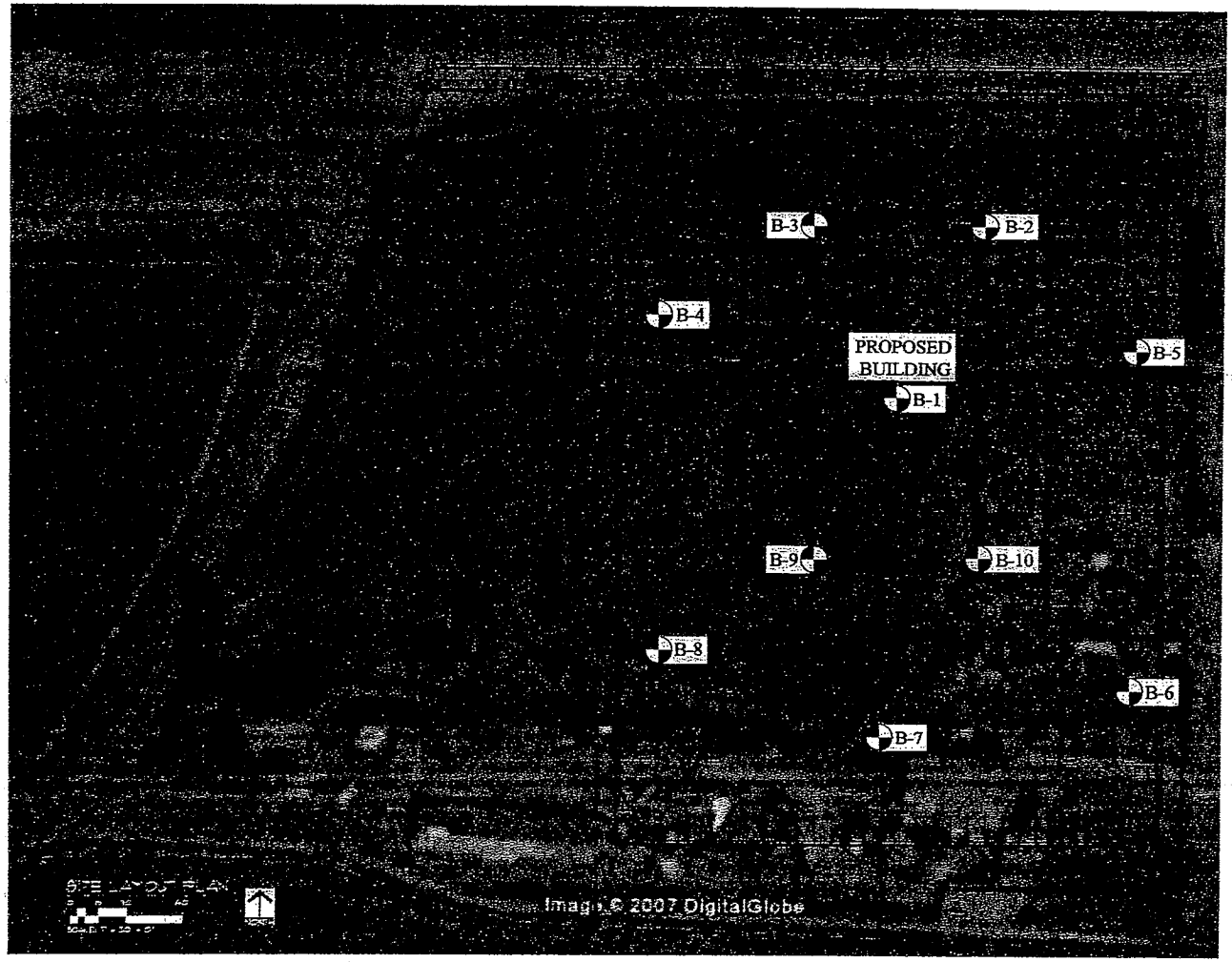
JOB NO. 0153-050-08



REFERENCE:
ADAPTED FROM DRAWING ENTITLED
"SITE LAYOUT PLAN" PROVIDED BY CLIENT, NOT DATED

SCALE IN FEET
30 0 30 60

FIGURE 2
SITE PLAN

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Gordon Spilker Huber
Geotechnical Consultants, Inc.

Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

BOREHOLE B-1

Project Name: Proposed Spanish Fork Meetinghouse
Project No.: 0153-050-08
Location: 1882 West 900 South, Spanish Fork, Utah
Client: The Church of Jesus Christ of Latter-Day Saints
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 06-26-08
Elevation: Overall Site Approximately 4575' +/-
Water Level: 20.0' (06-26-08) 17.6' (07-02-08)
Remarks:

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface	0								
		SILTY SAND AND GRAVEL with occasional cobbles; major roots (topsoil) to 2"-3"; fine to coarse sand; fine and coarse gravel; light brown (SM/GM)									loose to 4"-6" slightly moist
				89							dense
		GRAVELLY SAND/SANDY GRAVEL with trace to some silt; fine sand; fine and coarse gravel; light brown (SP/SM/GP/GM)	5	28							moist medium dense
		SILTY SAND fine to medium sand; light brown (SM)	10	16							moist
				10							medium dense
			15	20							loose
			20	9							saturated
			25								medium dense

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 3A

Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

BOREHOLE B-1

Project Name: Proposed Spanish Fork Meetinghouse
Project No.: 0153-050-08
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Water Level: 20.0' (06-26-08) 17.6' (07-02-08)
Remarks:

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
				10							
		SAND with some silt; fine to medium sand; light brown (SP/SM)	30	8							loose
		grades with oxidation	35	12							medium dense
			40	11							
		SILTY SAND fine sand; light brown (SM)	45	13							saturated medium dense
			50								loose

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 3A
(con't)

Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

BOREHOLE B-1

Project Name: Proposed Spanish Fork Meetinghouse
Project No.: 0153-050-08
Location: 1882 West 900 South, Spanish Fork, Utah
Client: The Church of Jesus Christ of Latter-Day Saints
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 06-26-08
Elevation: Overall Site Approximately 4575' +/-
Water Level: 20.0' (06-26-08) 17.6' (07-02-08)
Remarks:

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
				6							
		Stopped drilling at 50.0'. Stopped sampling at 51.5'. Intalled 1-1/4" diameter slotted PVC pipe to 51.5'.	55 60 65 70 75								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 3A
(con't)

Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

BOREHOLE B-2

Project Name: Proposed Spanish Fork Meetinghouse
Project No.: 0153-050-08
Location: 1882 West 900 South, Spanish Fork, Utah
Client: The Church of Jesus Christ of Latter-Day Saints
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 06-26-08
Elevation: Overall Site Approximately 4575' +/-
Water Level: No groundwater encountered (06-26-08 & 07-02-08)
Remarks:

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface	0								
		CLAYEY SAND with some fine and coarse gravel; major roots (topsoil) to 2"-3"; fine to coarse sand; brown (SC)									loose to 4"-6" moist
				23		10.7		120.2			loose
		SILTY GRAVEL with some sand; fine and coarse gravel; light brown (GM)	5	65							medium dense
		SANDY GRAVEL with trace silt; fine to coarse sand; fine and coarse gravel; brown (GP)									moist loose
				20							
			10								
		SAND with trace to some silt; fine sand; light brown (SP/SM)									moist loose
				17							
		Stopped drilling at 15.0'.	15								
		Stopped sampling at 14.5'.									
		Installed 1-1/4" diameter slotted PVC pipe to 14.5'.									
		No groundwater encountered at time of drilling.	20								
			25								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 3B

Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

BOREHOLE B-3

Project Name: Proposed Spanish Fork Meetinghouse
Project No.: 0153-050-08
Location: 1882 West 900 South, Spanish Fork, Utah
Client: The Church of Jesus Christ of Latter-Day Saints
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 06-26-08
Elevation: Overall Site Approximately 4575' +/-
Water Level: No groundwater encountered (06-26-08 & 07-02-08)
Remarks:

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface	0								
		SILTY SAND AND GRAVEL major roots (topsoil) to 2"-3"; fine to coarse sand; fine and coarse gravel; oxidation mottling; light brown (SM/GM)									loose to 4"-6" moist dense
				79							
			5								
				73							
		FINE SAND with trace to some silt; fine sand; light brown (SP/SM)									moist medium dense
				39		6.9	6.1				
			10								
		SAND with trace silt; fine to medium sand; brown (SP)		18							moist loose medium dense
			15	11							
		Stopped drilling at 15.0'.									
		Stopped sampling at 17.0'.									
		Installed 1-1/4" diameter slotted PVC pipe to 17.0'.	20								
		No groundwater encountered at time of drilling.									
			25								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 3C

Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

BOREHOLE B-4

Project Name: Proposed Spanish Fork Meetinghouse
Project No.: 0153-050-08
Location: 1882 West 900 South, Spanish Fork, Utah
Client: The Church of Jesus Christ of Latter-Day Saints
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 06-26-08
Elevation: Overall Site Approximately 4575' +/-
Water Level: No groundwater encountered (06-26-08)
Remarks:

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface	0								
		SILTY SAND AND GRAVEL major roots (topsoil) to 2"-3"; fine to coarse sand; fine gravel; light brown (SM/GM)									loose to 4"-6" moist medium dense
			5								
		Stopped drilling at 5.0'. Stopped sampling at 5.0'. No groundwater encountered at time of drilling.	10								
			15								
			20								
			25								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 3D

Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

BOREHOLE B-5

Project Name: Proposed Spanish Fork Meetinghouse
Project No.: 0153-050-08
Location: 1882 West 900 South, Spanish Fork, Utah
Client: The Church of Jesus Christ of Latter-Day Saints
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 06-26-08
Elevation: Overall Site Approximately 4575' +/-
Water Level: No groundwater encountered (06-26-08)
Remarks:

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface	0								
		SILTY SAND AND GRAVEL major roots (topsoil) to 1"-2"; fine to coarse sand; fine and coarse gravel; light brown (SM/GM)									loose to 4"-6" moist "medium dense"
			5								
		Stopped drilling at 5.0'. Stopped sampling at 5.0'. No groundwater encountered at time of drilling.	10								
			15								
			20								
			25								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 3E

Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

BOREHOLE B-6

Project Name: Proposed Spanish Fork Meetinghouse
Project No.: 0153-050-08
Location: 1882 West 900 South, Spanish Fork, Utah
Client: The Church of Jesus Christ of Latter-Day Saints
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 06-26-08
Elevation: Overall Site Approximately 4575' +/-
Water Level: No groundwater encountered (06-26-08)
Remarks:

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface	0								
		CLAYEY SAND/SANDY CLAY major roots (topsoil) to 2"-3"; fine sand; brown (CL/SC)									loose to 4"-6" moist "medium dense"
			5								
		Stopped drilling at 5.0'. Stopped sampling at 5.0'. No groundwater encountered at time of drilling.	10								
			15								
			20								
			25								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 3F

Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

BOREHOLE B-7

Project Name: Proposed Spanish Fork Meetinghouse
Project No.: 0153-050-08
Location: 1882 West 900 South, Spanish Fork, Utah
Client: The Church of Jesus Christ of Latter-Day Saints
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 06-26-08
Elevation: Overall Site Approximately 4575' +/-
Water Level: No groundwater encountered (06-26-08)
Remarks:

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface	0								
		SILTY GRAVEL with some fine to coarse sand; major roots (topsoil) to 2"-3"; fine and coarse gravel; brown (GM)									loose to 4"-6" moist "medium dense"
			5								
		Stopped drilling at 5.0'.									
		Stopped sampling at 5.0'.									
		No groundwater encountered at time of drilling.									
			10								
			15								
			20								
			25								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 3G

Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

BOREHOLE B-8

Project Name: Proposed Spanish Fork Meetinghouse
Project No.: 0153-050-08
Location: 1882 West 900 South, Spanish Fork, Utah
Client: The Church of Jesus Christ of Latter-Day Saints
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 06-26-08
Elevation: Overall Site Approximately 4575' +/-
Water Level: No groundwater encountered (06-26-08)
Remarks:

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface	0								
		SILTY GRAVEL with some fine to coarse sand; fine and coarse gravel; brown (GM)									moist "medium dense"
			5								
		Stopped drilling at 5.0'.									
		Stopped sampling at 5.0'.									
		No groundwater encountered at time of drilling.									
			10								
			15								
			20								
			25								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 3H

Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

BOREHOLE B-9

Project Name: Proposed Spanish Fork Meetinghouse
Project No.: 0153-050-08
Location: 1882 West 900 South, Spanish Fork, Utah
Client: The Church of Jesus Christ of Latter-Day Saints
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 06-26-08
Elevation: Overall Site Approximately 4575' +/-
Water Level: 15.0' (06-26-08) 11.8' (07-02-08)
Remarks:

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface	0								
		CLAYEY SAND with some gravel; major roots (topsoil) to 2"-3"; fine sand; brown (SC)									loose to 4"-6" moist loose
				18							
		grades less gravel	5	16		13.2	103				
		SAND with some silt; fine to medium sand; light brown (SM/SP)	10	7		10.8	11.6				
			15	9							saturated
		Stopped drilling at 15.0'. Stopped sampling at 16.5'. Installed 1-1/4" diameter slotted PVC pipe to 16.5'.	20								
			25								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 3I

Gordon Spilker Huber Geotechnical Consultants, Inc.
Salt Lake City, Utah 84123

BOREHOLE B-10

Project Name: Proposed Spanish Fork Meetinghouse
Project No.: 0153-050-08
Location: 1882 West 900 South, Spanish Fork, Utah
Client: The Church of Jesus Christ of Latter-Day Saints
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 06-26-08
Elevation: Overall Site Approximately 4575' +/-
Water Level: 10.0' (06-26-08) 10.2' (07-02-08)
Remarks:

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface	0								
		CLAYEY SAND with occasinal fine and coarse gravel; major roots (topsoil) to 2"-3"; fine sand; light brown (SC)									loose to 4"-6" moist loose
				20							
		grades silty/clayey sand	5	15							
		SILTY SAND AND GRAVEL fine to coarse sand; fine and coarse gravel; brown (SP/SM/GP/GM)									medium dense
			10	27							saturated
		SAND with some silt; fine to medium sand; brown (SP/SM)									saturated medium dense
			15	15		25.7	9.3				
		Stopped drilling at 15.0'. Stopped sampling at 16.5'. Installed 1-1/4" diameter slotted PVC pipe to 16.5'.	20								
			25								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 3J

UNIFIED SOIL CLASSIFICATION SYSTEM

FIELD IDENTIFICATION PROCEDURES				GRAPH SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS More than half of material is larger than No. 200 sieve size. [b] (The No. 200 sieve size is about the smallest particle visible to the naked eye)	GRAVELS More than half of coarse fraction is larger than No. 4 sieve size. (For visual classifications, the 1/4" size may be used as equivalent to the No. 4 sieve size.)	CLEAN GRAVELS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes.		GW	Well graded gravels, gravel-sand mixtures, little or no fines.
			Predominantly one size or a range of sizes with some intermediate sizes missing.		GP	Poorly graded gravels, gravel-sand mixtures, little or no fines.
		GRAVELS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below).		GM	Silty gravels, poorly graded gravel-sand-silt mixtures.
			Plastic fines (for identification procedures see CL below).		GC	Clayey gravels, poorly graded gravel-sand-clay mixtures.
	SANDS More than half of coarse fraction is smaller than No. 4 sieve size. (For visual classifications, the 1/4" size may be used as equivalent to the No. 4 sieve size.)	CLEAN SANDS (Little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate particle sizes.		SW	Well graded sands, gravelly sands, little or no fines.
			Predominantly one size or a range of sizes with some intermediate sizes missing.		SP	Poorly graded sands, gravelly sands, little or no fines.
		SANDS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below).		SM	Silty sands, poorly graded sand-silt mixtures.
			Plastic fines (for identification procedures see CL below).		SC	Clayey sands, poorly graded sand-clay mixtures.
FINE GRAINED SOILS More than half of material is smaller than No. 200 sieve size. (The No. 200 sieve size is about the smallest particle visible to the naked eye)	IDENTIFICATION PROCEDURES ON FRACTION SMALLER THAN No. 40 SIEVE SIZE					
		DRY STRENGTH (CRUSHING CHARACTERISTICS)	DILATANCY (REACTION TO SHAKING)	TOUGHNESS (CONSISTENCY NEAR PLASTIC LIMIT)		
	SILTS AND CLAYS Liquid limit less than 50	None to slight	Quick to slow	None	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sand with slight plasticity.
		Medium to high	None to very slow	Medium	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		Slight to medium	Slow	Slight	OL	Organic silts and organic silt-clays of low plasticity.
	SILTS AND CLAYS Liquid limit greater than 50	Slight to medium	Slow to none	Slight to medium	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
		High to very high	None	High	CH	Inorganic clays of high plasticity, fat clays.
		Medium to high	None to very slow	Slight to medium	OH	Organic clays of medium to high plasticity.
HIGHLY ORGANIC SOILS		Readily identified by color, odor, spongy feel and frequently by fibrous texture.			Pt	Peat and other highly organic soils.

[a] Boundary classifications: Soils possessing characteristics of two groups are designated by combinations of group symbols. For example GW-GC, well graded gravel-sand mixture with clay binder.
[b] All sieve sizes on this chart are U.S. standard.

GENERAL NOTES

1. In general, Unified Soil Classification Designations presented on the logs were evaluated by visual methods only. There fore, actual designations (based on laboratory testing) may differ.
2. Lines seperating strata on the logs represent approximate boundaries only Actual transitions may be gradual.
3. Logs represent general soil conditions observed at teh point of exploration onthe date indicated.
4. No warranty is provided as to the continuity of soil conditions between individual sample locations.

FINE - GRAINED SOIL

CONSISTENCY	SPT (blows/ft)	UNDRAINED SHEAR STRENGTH (tsf)	TORVANE / POCKET PENETROMETER UNCONFINED COMPRESSIVE STRENGTH (tsf)	FIELD TEST
Very Soft	<2	<0.125	<0.25	Easily penetrated several inches by Thumb. Squeezes through fingers.
Soft	2 - 4	0.125 - 0.25	0.25 - 0.5	Easily penetrated 1 " by Thumb . Molded by light finger pressure.
Medium Stiff	4 - 8	0.25 - 0.5	0.5 - 1.0	Penetrated over 1/2 " by Thumb with moerate effort. Molded by strong finger pressure.
Stiff	8 - 15	0.5 - 1.0	1.0 - 2.0	Indented about 1/2 " by Thumb but penetrated only with great effort
Very Stiff	15 - 30	1.0 - 2.0	2.0 - 4.0	Readily indented by Thumbnail
Hard	>30	>2.0	>4.0	Indented with difficulty by Thumbnail

LOG KEY SYMBOLS

- Bulk / Bag Sample
- Standard Penetration Split Spoon Sampler
- Rock Core
- Water Level
- Thin Wall
- No Recovery
- 3-3/4" ID D&M Sampler
- 3" ID D&M Sampler
- California Sampler

COARSE -GRAINDE SOIL

APPERENT DENSITY	SPT (blows/ft)	RELATIVE DENSITY (%)	FIELD TEST
Very Loose	<4	0 - 15	Easily penetrated with 1/2 " reinforcing rod pushed by hand
Loose	4 - 10	15 - 35	Difficult to penetrated with 1/2 " reinforcing rod pushed by hand
Medium Dense	10 - 30	35 - 65	Easily penetrated a foot with 1/2 " reinforcing rod driven with 5-lb hammer
Dense	30 - 50	65 - 85	Difficult to penetrated a foot with 1/2 " reinforcing rod driven with 5-lb hammer
Very Dense	>50	85 - 100	Penetrated only a few inches with 1/2 " reinforcing rod driven with 5-lb hammer

STRATIFICATION

DESCRIPTION	THICKNESS
SEAM	1/16 - 1/2 "
LAYER	1/2 - 12 "

DESCRIPTION	THICKNESS
Occasional	One or less per foot of thickness
Frequent	More than on per foot of thickness

CEMENTATION

DESCRIPTION	DESCRIPTION
Weakely	Crumbles or breaks with handling of slight finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumbles or breaks with finger pressure

MODIFIERS

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

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible water, usually soil below Water Table

FIGURE 4

GSH
Gordon Spilker Huber
Geotechnical Consultants, Inc.

APPENDIX A

Topsoil Testing Report

Topsoil Testing Report

Spanish Fork 0153-090-08

DTA Area Office

Ward/Branch

City Spanish Fork State UT

Stake/Mission

Site Street Address

This form should be given to the person or lab doing the testing each time a soils test is requested.

Date Requested: 24 June 08

By Whom: GSH

Contact Phone # 8016859190

Fax # 2990

Property Number

Instructions to Architect

1. The architect is to determine, by investigation, the quality and quantity of topsoil on a site before the Owner's review. All information on this form must be provided.
2. A horticultural topsoil test is recommended at each site.
3. The costs for the testing and report will be paid by the Owner.
4. Copies of the report shall be made available to the landscape architect and the DTA Area Office.
5. Report location where soil is from and a history of its use on the back of this form.

Instructions to the Soil Testing Laboratory Firm

1. At least two test samples shall be made of the topsoil on the project site and each anticipated topsoil source. If the site soil profile or borrow pit are not uniform, additional samples shall be taken. Uniform composite samples may also be used if properly acquired and documented.
2. The soil report must provide interpretation and recommendations for soil amendments, fertilizers, and soil conditioners for use by the architect and the landscape architect.

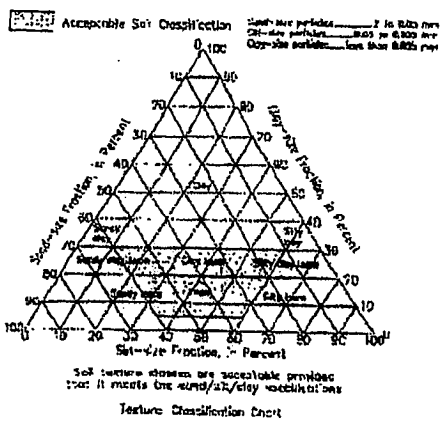
Test Report on Existing Conditions ("Acceptable Levels" refers to the allowable soil specifications prior to being amended)

Soil Test Data

Sample No.	pH(1)	EC[1] Mmhos/cm	SAR[1]	% Sand	% Silt	% Clay	Text[2] Class	%[3] OM	NO3-N[4] ppm	P[5] ppm	K[5] ppm	Fe[5] Ppm
SF	7.7	1.8	0.8	52	27	21	Sandy Clay Loam	5.7	38	3	178	14
Acceptable Level(s)	5.5-8.0	<3.0	<6.0	15-60	10-60	5-30	(2)	>1.0	>20	>11	>130	>10

IMPORTED TOPSOIL – DEFINED (Specification Section 32-9113 – Finish Grading and Soil Preparation)

- Fertile, loose, friable soil, capable of sustaining vigorous plant growth.
- Clean and free from toxic minerals & chemicals, noxious weeds, weed seeds and rock (coarse fragments) or other objectionable/construction materials. Remove any such objects. No more than 2% by volume of soil measuring over 2.0mm.



Texture Classification Chart

ACCEPTABLE COMPOSITION

	Composition in Percent		
	Sand	Silt	Clay
Acceptable %	15-60	10-60	5-30

Spanish Fork

Soil Sample No.	Description of location where sample was taken	History of Use of the soil
SF		

Documented infiltration rate of test sample(s) based on texture at 90% relative density *To the nearest 1/10 of an inch.

(1) saturated soil paste 1:1 soil:water method (please indicate)
(2) hydrometer method (Acceptable soil- sand:15-60%, silt:10-60%, clay-5-30%)
(3) potassium dichromate method (Walkey-Black) or loss of ignition
(4) chromotropic acid method
(5) AB-DTPA method
–If other methods are used for NO3-N, P, K, and Fe, then note. Changes in acceptable levels shall also be made by the testing laboratory.

Sample No. SF ____ - 7.2 inches/hour*
Sample No. ____ ____ - ____ inches/hour*
Sample No. ____ ____ - ____ inches/hour*
Sample No. ____ ____ - ____ inches/hour*

Name of Soil Lab performing the analysis

QA CONSULTING AND TESTING
VON ISAMAN
PO BOX 627
Phone # SALEM, UT 84653
(801) 423-1116
Fax # FAX (801) 423-1813

Interpretation Summary of Test Results: SF does not meet Acceptable Levels for P. SF has 0.4 % by volume of soil measuring over 2 mm. SF has no coarse fragments over 1.5" in diameter

Soil Amendments, Fertilizer and Soil Conditioner – Recommendations: No amendments are necessary. Apply 3 cu yd/1000 sq ft of organic material for every 3 inches of soil depth (incorporate well). Apply a 30-10-0 fertilizer at 3 lbs/1000 sq ft. Be sure organic material meets Compost Quality Guidelines for Landscaping (attached). Scarify the subsoil to 6" depth before applying topsoil. Fertilize 4 times/yr.

Long Term (5 Year) Fertilizer and Soil Conditioner – Recommendations: Continue with above fertilizer schedule for 2 yrs, then use a 20-0-0 ammonium sulfate fertilizer at 6 lbs/1000 sq ft. Continue with above conditioner (organic material) recommendations where possible. Core aerate turfgrass areas and top dress with 1/8 - 1/4" of organic material yearly at minimum

QA CONSULTING AND TESTING, LLC

Von Isaman
PO Box 627 Salem, UT 84653
(801) 423-1116 fax (801) 423-1813
www.qaconsultingandtesting.com
vonisaman@comcast.net

COMPOST QUALITY GUIDELINES FOR LANDSCAPING*

Category	pH**	Soluble Salts** dS/m or mmho/cm	Sodium Adsorption Ratio** (SAR)	Carbon:Nitrogen Ratio*** (C:N)	% Moisture****	≥98% Coarse Material Passing (dry wt basis)
Ideal	6 to 8	≤5	<10	≤20:1	25 to 35	3/8" (9.5 mm)
Acceptable	5-6, 8-9	≤10	<20	21:1 to 30:1	<25, >35	3/4" (19 mm)
Suspect	<5, >9	>10	>20	<10:1, >30:1	<20, >50	<98% 3/4"

for composts with biosolid feedstocks, biosolids must meet EPA 503 Class A standards

*Von Isaman MS, President of QA Consulting and Testing LLC, Dr. Rich Koenig, USU Cooperative Extension Soils Specialist, and Dr. Teresa Cerny, USU Cooperative Extension Horticulturalist, 3 March 2003.

** 1:5 Compost:Water Slurry on Coarse material passing 3/8" (9.5 mm)
*** on Coarse Material passing 3/8" (9.5 mm)
**** on total sample

Acceptable level Soluble Salts and/or SAR composts then do not exceed 3 cu yds/1000 sq ft for every 3 inches of soil depth.

CompostGuidelines06.126