State of Utah

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*Executive Director*

Division of Facilities Construction and Management
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*Director*

# ADDENDUM NO. 6

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| Date: | July 15, 2010 |
| To: | Short-Listed Contractors |
| From: | Rick James |
| Reference: | Honors Housing at Legacy Bridge – Design/Build<br>University of Utah – Salt Lake City, Utah<br>DFCM Project No. 09217750 |
| Subject: | **Addendum No. 6** |

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| Pages | Addendum Cover Sheet | 3 | pages |
| | Supplemental Report Geotechnical Study | 41 | pages |
| | Total | 44 | pages |

***Note: This Addendum shall be included as part of the Contract Documents. Items in this Addendum apply to all drawings and specification sections whether referenced or not involving the portion of the work added, deleted, modified, or otherwise addressed in the Addendum. Acknowledge receipt of this Addendum in the space provided on the Bid Form. Failure to do so may subject the Bidder to Disqualification.***

**While we contend that SB220 should only be potentially applicable to a contract issued after the effective date of said bill, this is to clarify that for purposes of this contract, regardless of the execution or effective dates of this contract, the status of Utah Law and remedies available to the State of Utah and DFCM, as it relates to any matter referred to or affected by said SB220, shall be the Utah law in effect at the time of the issuance of this Addendum.**

**6.1** **SCHEDULE CHANGES:** There are no Project Schedule changes.

**6.2** **GENERAL ITEMS:** Questions/Answers/Clarifications

6.2.1 Question: "The program identifies the campus HTHW and chilled water from the plant as the preferred mechanical option. Please provide the location where the connection is to be made. Also, what is the route of the extensions to the Honors Housing site?
Answer: Same question as Addendum No. 5, Item No. 2.

6.2.2 Question: Laundry Room 3-88, references vending machines. Typically the vendor who services and maintains the vending machines will provide the machines as part of their service contract. Please clarify if the detergent vending machine and general vending machines are in the design build contract?
Answer: They will be provided by the vendor.

6.2.3 Question: In the apartment narrative section of the program (3.68 – 3.79) under the security description, it references electronic card key access to unit and each bedroom. This is a huge expense. Please clarify if the card access system has to tie into the campus system or can the card access be stand alone similar to a hotel door key?
Answer: The card access needs to tie into Blackboard, the campus card system. A cost modification would be considered for the hallway doors to have swipe access while the interior bedroom doors are on key access.

6.2.4 Question: There is a Furniture and Fixtures section for each of the spaces in Chap. 3 of the program. It talks about Built In, Fixed, Moveable, and other. Can you clarify which ones are provided by Design Build contract and which are Owner provided. I assumed the Movable are provided by Owner and the remaining are Design Build. Please clarify?
Answer: The Moveable are provided by the owner, the remainder are part of Design Build.

6.2.5 Question: 3-117 under fixed indicates "White Board, microwave". The plan view does not show a microwave but does show a refrigerator. Please clarify which is required. Also does the Design Build provide the microwave and refrigerator?
Answer: The Fixed should read: White Board, Refrigerator, Microwave. The Design Build should provide all three items.

6.2.6 Question: We have started looking at the way the Honors Housing project will fit onto drawing sheets. So far we have found that the building wings can break up well onto 30"x42" sheets if we use the following scales:

a) 1/16" = 1'-0" for site drawings
b) 3/32" = 1'-0" for floor/ceiling plans
c) ¼" = 1'-0" for enlarged floor plans

We are aware of the fact that 3/32" = 1'-0" is not a DFCM standard scale. However, we are requesting that you consider allowing us to print drawings at the 3/32" scale because it works so well for this project. In contrast, the use of 1/8" = 1'-0" would require breaking up the building into less intuitive break points and require the use of many more drawing sheets.
Answer: The drawing scale of 3/32"=1'-0" is accepted for use for floor and ceiling plans as long as when printed at half scale all lettering is readable.

6.2.7 Question: Additional Discrepancy: 3-84 Student Workroom the Refrigerator is not listed on the fixed equipment and should be.
Answer: The Fixed should read: White Board, Refrigerator, Microwave. The Design Build should provide all three items. (See 6.2.5 above)

6.2.8 Question: In the second user group meeting, the steering committee stated that an REC housing unit has been eliminated from the program, per Addendum 2. Addendum 2, item 2.2.1.1 states: "One of the Res Ed Offices can be deleted as we are only going to staff one REC in that building." Is the intent to remove just the REC office, just the REC housing unit, or both?
Answer: The intent is to remove just one REC office only.

6.2.9 Question: The submission requirements call for 24" x 36" boards. Are we allowed to use 30" x 42" boards?
Answer: 30” x 42” boards are allowed.

6.2.10 Question: Does the outline specification required for the submission also need to include Division One specifications, or are all of the Division One requirements addressed in the DFCM/University of Utah General Conditions and contract requirements?
Answer: All requirements of DFCM/University of Utah General Conditions and contract requirements as they pertain to Design Build agreements apply to this agreement. Refer to the “DFCM and Design/Build Team Agreement” on the DFCM web site, for further clarification. See document under “Standard Documents”

6.2.11 Question: Presentation Boards required in the submittal are they for the design team presentation or for user review. If for the design team presentation, consider that the presentation will be in power point and the boards will not be used, thus a waste of effort and materials. It is better to let the design team determine their own presentation method?
Answer: Boards are also used by the selection committee for further discussions and scoring. Boards are required.

6.2.12 Clarification: The attached “Supplemental Report Geotechnical Study” dated July 12, 2010 and issued by Gordon Spilker Huber Geotechnical Consultants, Inc. is included in this addendum.

6.2.13 Clarification: The project must meet the requirements of Design Standards of the University of Utah and the Design Standards of the Division of Facilities Construction and Management.

6.2.14 Clarification: On page 183 of the program in the seismic loads table the values of S1 should be changed to 0.61, the Seismic Design Category should be changed to Category D, and the short period site coefficient Fa = 1.0 should be added.

Gordon Spilker Huber
Geotechnical Consultants, Inc.

# SUPPLEMENTAL REPORT
# GEOTECHNICAL STUDY
# PROPOSED HONORS HOUSING FACILITY
# PHASE I DEVELOPMENT
# NORTHWEST CORNER OF HEMPSTEAD ROAD
# AND WASATCH DRIVE
# UNIVERSITY OF UTAH CAMPUS
# SALT LAKE CITY, UTAH

Submitted To:

State of Utah - DFCM
State Office Building, Suite 4110
P.O. Box 141160
Salt Lake City, Utah 84114

Submitted By:

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

July 12, 2010

Job No. 0128-55A-10

GSH
Gordon Spilker Huber
Geotechnical Consultants, Inc.

July 12, 2010
Job No. 0128-55A-10

State of Utah - DFCM
State Office Building, Suite 4110
P.O. Box 141160
Salt Lake City, Utah 84114

**Attention: Mr. Rick James**

Ladies and Gentlemen:

Re: Supplemental Report
Geotechnical Study
Proposed Honors Housing Facility
Phase I Development
Northwest Corner of Hempstead Road and Wasatch Drive
University of Utah Campus
Salt Lake City, Utah

## 1. INTRODUCTION

### 1.1 GENERAL

This report presents the of our supplemental geotechnical study performed at the site of Phase I of the proposed Honors Housing facility, which is located at the northwest corner of Hempstead Road and Wasatch Drive on the University of Utah Campus in Salt Lake City, Utah.

Gordon Spilker Huber Geotechnical Consultants, Inc. (GSH) previously performed a geotechnical study of the overall site dated January 29, 2010[1] for the site. Subsequent to submittal our initial report, there were numerous planning meetings with representatives of the design team and the University of Utah. During these meetings, the concept for the initial phase (Phase 1) portion of the overall housing development was modified. Therefore, GSH performed a supplemental geotechnical study dated March 30, 2010[2] for the site. However, this design concept was modified again and this geotechnical study incorporates those design changes.

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1 "Report, Initial Phase, Geotechnical Study, Proposed Honors Housing Facility, Northwest Corner of Hempstead Road and Wasatch Drive, University of Utah Campus, Salt Lake City, Utah," GSH Job No. 0128-055-09.

2 "Supplemental Report, Geotechnical Study, Initial Phase, Proposed Honors Housing Facility, Northwest Corner of Hempstead Road and Wasatch Drive, University of Utah Campus, Salt Lake City, Utah," GSH Job No. 0128-055-09.

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The general location of the overall 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 overall and Phase 1 sites with regard to adjoining facilities on an air photograph base is presented on Figure 2, Area Map. A detailed layout of the site showing the location and layout of the proposed Phase I development with respect to existing and proposed facilities and site-specific topography is presented on Figure 3, Site Plan. In addition, the locations of the borings drilled in conjunction with this study and the January 29, 2010 study are presented on Figures 2 and 3.

During the course of this study, many of the general conclusions and recommendations summarized herein were discussed with representatives of the design team.

## 1.2 OBJECTIVES AND SCOPE

The objectives and scope of our study were planned in discussions between Mr. Rick James of The State of Utah – DFCM; Mr. Kenneth R. Pollard of Pollard Architects; and Mr. Bill Gordon of Gordon Spilker Huber Geotechnical Consultants, Inc. (GSH).

In general, the objectives of this study were to:

1. Further define and evaluate the near subsurface soil and groundwater conditions across the Phase 1 site.

2. Provide geotechnical discussions and recommendations regarding earthwork, foundation, and the geoseismic setting of the site to be utilized in the development 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 5 additional exploration borings extending from 14.5 to 16.5 feet.

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 Mr. Rick James of The State of Utah – DFCM. A final contract is in development and will be received shortly.

## 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 from this study and the January 29, 2010 study, 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

## 2.1 GENERAL

Discussions regarding the Phase 1 development are divided into two sections: the north wing structure and the primary-podium structure. The overall configuration is presented on Figure 3. The concept may change slightly (number of floors, column spacing); however, the general concept is presented below.

## 2.2 NORTH WING STRUCTURE

The north wing structure is roughly rectangular in shape, with maximum plan dimensions on the order of 40 feet by 180 feet, with the long dimension running essentially northwest-southeast. The structure will be of steel-frame construction utilizing a concrete-topped steel floor system having fairly large spans. The first floor level (at-grade) of the structure will be established approximately at existing grade.

Structural loads will be transmitted down through bearing walls and columns to the supporting foundations. The maximum anticipated column loads for this building will be on the order of 450 to 550 kips. In addition, there may be some bearing wall loads possibly in the range of 6 to 8 kips per lineal foot. At-grade floor slab loads will be typical, on the order of 150 to 200 pounds per square foot.

At the far southern end of this wing will be a below-grade mechanical area, which will connect to the lower level of the primary-podium structure to the south.

In addition to the five to nine feet of structural fill beneath the footprint of the structure, some low-height berms to the east and terraced landscaped areas sloping downward to the west are proposed.

## 2.3 PRIMARY-PODIUM STRUCTURE

The primary-podium structure will be roughly rectangular in shape with maximum plan dimensions on the order of 140 feet by 260 feet. The south end of the stand-alone north wing structure will be attached to the northeast corner of the primary-podium structure. The lowest level of the podium structure will extend as much as four to five feet below existing grade. The below-grade level will be of reinforced concrete construction. The top of the parking level will be a plaza level except along the eastern limit and northwest corner where five levels of residential structure will extend above the plaza. The residential structure will also be of steel-frame construction with a concrete-topped steel-frame floor system. Loads associated with the five-level structure will be transmitted through the top slab of the parking level and to columns within the parking level. The plaza level will be loaded with landscaping features. These loads will also be transmitted through the top of the parking-plaza level, down to supporting foundations. Available data indicates that in the areas to be occupied by the five levels of housing over the parking level maximum column load will be on the order of 800 to 1,000 kips. Bearing wall loads of 8 to 10 kips per lineal foot may also be applied.

Extending out from the west side of the podium plaza area will be a café/C store, one to two levels, with the main level at approximately the plaza podium elevation. The lowest level slab will be established one foot above the parking level to the east. Cuts and fills on the order of two to three feet will be required in the café/C store footprint to obtained desired at-grade slab elevations.

Similar to the housing structure to the north, landscaping berms, and landscaping terraces sloping downward to the west will be part of site development.

# 3. SITE INVESTIGATIONS

## 3.1 FIELD PROGRAM

In order to further define and evaluate the near subsurface soil and groundwater conditions in the Phase 1 area, 5 borings have been drilled to depths ranging from 14.5 to 16.5 feet across the site. The borings were drilled utilizing a truck-mounted rig equipped with hollow-stem augers. Locations of the borings from this study and our January 29, 2010 study are shown on Figures 2 and 3.

The field portion of our investigation was under 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, relatively undisturbed and small disturbed 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 in this study are presented on Figures 4A through 4E, Log of Borings,

and the January 29, 2010 study are presented on Figures 5A through 5I, Log of Borings (Previous Study). Soils were classified in accordance with the nomenclature described on Figure 6, 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. Additionally, a 2.0-inch outside diameter, 1.38-inch inside diameter drive sampler (SPT) was utilized at select locations and depths. The blow-counts recorded on the boring logs are 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 Borings B-1A, B-2A, and B-5A in order to provide a means of monitoring the groundwater fluctuations.

## 3.2 LABORATORY TESTING

### 3.2.1 General

To provide data necessary for our engineering analyses, an additional laboratory testing program was performed. The program included moisture, density, partial gradation, and consolidation tests. Compressibility and strength parameters utilized in our analysis are based upon visual and textural examination of the soils, correlation of blow-counts, and our experience with similar materials in the area. Additionally, the laboratory testing from the January 29, 2010 report was also reviewed as part of this study.

### 3.2.2 Moisture and Density Tests

To provide data for general correlation purposes, moisture and density tests were performed on selected samples. The results of these tests are presented on the boring logs, Figures 4A through 4E.

### 3.2.3 Partial Gradation Tests

To aid in classifying the soils and to provide general index parameters, partial gradation tests were performed upon representative samples of the soils encountered in the exploration borings. At the time of this report, the gradation tests were underway. These results will be transmitted when complete. It should be noted numerous gradation tests were completed in conjunction with the January 29, 2010.

### 3.2.4 Consolidation Tests

To provide data necessary for our settlement analyses, a consolidation test was performed on each of four representative samples of the near-surface fine-grained cohesive soils. The results of the tests indicate that the soils are all slightly to moderately over-consolidated and, when

loaded below the preconsolidation pressure, will exhibit moderate to moderately high compressibility characteristics. It should be noted that the consolidation curves after saturation indicate some of the near-surface fine-grained cohesive soils are potentially collapsible. Detailed results of the tests are maintained within our files and can be transmitted to you, upon your request.

## 4. OVERALL SITE CONDITIONS

### 4.1 SURFACE

The irregular, but roughly trapezoidal-shaped, parcel is located at the northwest corner of Hempstead Road and Wasatch Drive. TRAX rails run in the center of Hempstead Road and along the western portion of Mario Capecchi Drive.

The northern approximately 60 percent of the site is occupied by an at-grade asphalt concrete paved parking lot, which has a number of northwest-to-southeast running islands. The remaining southern portion of the site is occupied by 4 two- to three-level older wood-frame structures with the lower level established slab-on-grade. Between these buildings and adjacent to northwest, north, and east sides of the parking area are landscaped areas with grasses and some deciduous trees.

Overall slope of the site is from the northeast-to-west/southwest with maximum relief from the highest northeast corner to the lowest southwest corner being on the order of 28 feet. Bounding the site further to the north are baseball and soccer fields and to the southwest by Huntsman Basketball Arena.

The Phase I site is located in the northern portion of the overall site.

### 4.2 SUBSURFACE SOIL AND GROUNDWATER

The subsurface conditions encountered in conjunction with this study and the January 29, 2010 study were relatively similar.

At Borings B-1A, B-2A, B-3A, and B-4A, an asphalt concrete pavement section, consisting of four to four and one-half inches of asphalt concrete generally over four to five and one-half inches of aggregate base, was encountered at the surface. At Borings B-1A, B-2A, and B-3A, underlying the pavement section, silty clay fills were encountered that extended to two to three feet below grade. The fills will exhibit variable and, in most cases, poor engineering characteristics.

Underlying the pavement sections and fills and from the ground surface in Boring B-5A, natural silty clays were encountered that extend to depths of four to eight and one-half feet below grade. The clays are brown, moist, medium stiff to very stiff, and will exhibit moderate to moderately high compressibility characteristics. It should be noted that the consolidation curves after

saturation indicate some of the near-surface fine-grained cohesive soils are potentially collapsible. At Boring B-5A, the upper four inches of the clays are loose and disturbed and contain major roots and have been classified as topsoil.

Underlying the fills and natural clays, silty and clayey sands and gravels were encountered that extend to the depths explored, 14.5 to 16.5 feet. The sands and gravels are brown, moist, loose to very dense, and will exhibit relatively high strength and low compressibility characteristics. In conjunction with the January 29, 2010, in zones, gravel content was lower and the soils were classified as silty and/or clayey fine to coarse sands with trace to some gravel. Interdispersed within these granular soils, occasional zones containing one- to four-inch layers of silty clays was encountered. In conjunction with the USTAR project, deeper thicker random deposits of highly preconsolidated clays were encountered. These deposits were not found in these borings.

Also, in conjunction with the January 29, 2010 study, refusal was encountered at depths ranging from 23.5 to 33.5 feet in the majority of the exploration borings. The refusal materials are projected to be very dense mixtures of sands and gravels with occasional cobbles, which could be partially cemented.

In general, the subsurface sequence consists of two to three feet of pavement sections and fills. The pavement sections and fills are underlain by silty clays that extend four to eight and one-half feet. In turn, the clays were underlain by silty sands and gravels that extend to the depths explored.

Groundwater was not encountered to the depths penetrated during drilling or subsequent to drilling during this study and the January 29, 2010 study. Following completion of the drilling operations, one and one-quarter-inch diameter slotted PVC pipe was installed in Borings B-1A, B-2A, and B-5A. In addition, all borings were subsequently backfilled and patched if in asphalt concrete parking areas.

## 5. DISCUSSIONS AND RECOMMENDATIONS

### 5.1 SUMMARY OF FINDINGS

This study shows that the surface/near-surface clays are only slightly to moderately over-consolidated (and, in some cases, potentially collapsible) and even when loaded below the preconsolidation pressure, will exhibit moderate to moderately high compressibility characteristics. These clays should be removed from beneath footings. Conventional spread and continuous wall footings can be established upon deeper underlying sands and gravel and/or upon granular structural fill existing to suitable granular soil. As an option Geopiers® or stone columns can be installed to the natural granular soil. These clays, however, are suitable to support at-grade floor slabs and pavements and can be utilized as general structural site grading fills beneath outside flatwork, floor slabs, and pavements.

In the following sections, detailed discussions and recommendations pertaining to earthwork, foundation, and geoseismic discussions and recommendations are presented. Many of these recommendations were previously presented in our January 29, 2010 and March 30, 2010 reports.

## 5.2 EARTHWORK

### 5.2.1 Site Preparation

Preparation of the site will include the demolition of existing structures, within or immediately adjacent to the footprint of the proposed structures, followed by stripping the existing pavements, outside flatwork, topsoil, and non-engineered fills from an area extending out at least three feet from the perimeter of the proposed structure. Prior to these activities, all utilities entering this site must be located, abandoned, and/or relocated.

Beneath an area extending out 3 feet from the proposed structures and proposed pavement areas, footings, curbs and gutters, existing pavements, and floor slabs may remain if at least 12 inches below the base of the ultimate pavement section.

Vegetation, construction debris, and other deleterious material should be removed from the site. If cleaner granular soils are encountered in conjunction with these operations, they should be stockpiled on site for subsequent re-utilization as structural fill.

### 5.2.2 Excavations

For the present design concept for Phase 1, the maximum mass excavation cuts will be on the order of four to five feet. It is anticipated that either stiff silty clays or mixtures of sands and gravels with varying amounts of silt and clay will be encountered. Groundwater is projected to be at much deeper depth and should not impact the proposed excavations. Excavations not exceeding four feet in depth sideslopes can be constructed near-vertical. Deeper excavations up to eight feet in these soils can be constructed with sideslopes no steeper than one-half horizontal to one vertical.

If “perched” groundwater conditions are encountered through granular soils, sideslopes may need to be somewhat flattened.

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 Fills

Structural fill is defined as fill which will ultimately be subjected to structural loadings, such as imposed by footings, floor slabs, pavements, etc. All structural fills must be free of sod, rubbish, construction debris, frozen soils, and other deleterious materials. For structural site grading fill,

the maximum particle size should generally not exceed four inches; although, occasional particles up to six to eight inches may be incorporated provided that they do not result in "honeycombing" or preclude the obtainment of the desired degree of compaction. Structural site grading fill is defined as fill placed over fairly large open areas to raise the overall site grade. In confined areas, the maximum particle size should not exceed two and one-half inches.

It is recommended that all structural fill beneath the footprint of the building; that is, beneath the proposed footings and/or at-grade slabs, consist of granular soils. To facilitate placement, compaction, and to obtain the engineering characteristics upon which our engineering analysis are based, it is imperative that these granular fills consist of well-graded mixtures of sands and gravels containing no more than 22 percent fines; that is, material passing the No. 200 sieve. In addition, no more than 25 percent of the mixture should be retained on the three-quarter-inch sieve. This will allow for the utilization of standard nuclear gauge testing during placement and compaction operations.

In order to control lateral pressures imposed by the backfills on subgrade walls, it is imperative that the structural backfill extending out at least five feet from the perimeter of the primary subgrade walls contain no more than 20 percent fines. Further out from the subgrade walls, the sand and gravel with as much as 35 percent fines may be utilized.

As discussed previously, available data indicates that the soils to depths of as much as approximately eight and one-half feet will be silty clays, which will not be suitable as the select granular structural fill. The clays can be used as structural fills beneath pavements and floor slabs but will be difficult to compact. If granular soils are not present, cost estimates should then be based upon importing the select granular materials.

### 5.2.4 Fill Placement and Compaction

All structural fill should be placed in lifts not exceeding eight inches in loose thickness. Granular structural fills placed beneath an area extending out at least 3 feet from the perimeter of the proposed structures, no more than 5 feet thick and supporting the proposed footings, must be compacted to at least 97 percent of the maximum dry density as determined by the AASHTO[3] T-180 (ASTM[4] D-1557) compaction criteria. If the thickness of these fills is greater than 5 feet, the degree of compaction should be increased to 98 percent. In proposed floor slab areas where the fills are no more than 5 feet thick, 92 percent compaction is recommended. Fills greater than 5 feet thick under floor slabs should be compacted to at least 95 percent again in accordance the above-defined compaction criteria.

The structural site grading fill placed beneath proposed pavements, at-grade slabs, etc., and generally not exceeding 5 feet in thickness must be compacted to 90 percent of the above-defined criteria. For greater thicknesses, up to 10 feet, the compaction should be increased to 92 percent.

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[3] American Association of State Highway and Transportation Officials
[4] American Society for Testing and Materials

Under all circumstances, the fills extending out at least 10 feet from the perimeter of the deep subgrade walls must be granular. These fills in landscaped areas should be compacted to at least 85 percent of the above-defined criteria. If under stairways, entranceways, patios, and at-grade slabs, the degree of compaction should be increased to 95 percent.

Even with proper compaction of suitable materials, there will be moderate settlement of the fill wedges between the subgrade walls and the interface with the natural soils. We strongly recommend that all at-grade slabs, stairways, and entranceways over this zone be reinforced and designed to bridge the fill wedge. One end of the at-grade slabs can be structurally supported by the subgrade walls of the structure and the other on natural soils, extending at least five feet from the interface of the fill wedge and the natural soils.

### 5.2.5 Areal Settlements

Areal settlements resulting from site grading fills (including berms) as much as eight to nine feet should be less than one inch. However, the pressures imposed by these site grading fills and berms could be approaching the preconsolidation pressures of the clays. If these preconsolidation pressures are exceeded, two to three inches of settlement could occur. These settlements are in addition to settlements induced by foundation and floor slab loads. To reduce the total settlement that the structure will realize, site grading fill (including berms) must be placed as far in advance of other construction as possible. The majority of this settlement will occur during placement.

## 5.3 SPREAD AND CONTINUOUS WALL FOUNDATIONS

### 5.3.1 Design Data

The structures may be supported upon conventional spread and continuous wall foundations. In order to allow for the utilization of high bearing pressures, the design of the footings and in order to control total and differential settlements, it is essential that these footings be underlain by natural granular soils and/or granular structural fill extending to natural granular soils. For this subsurface sequence, 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

| | |
|---|---|
| Footings having minimum recommended footing width | - 3,000 pounds per square foot* |
| Footings having minimum footing width of four feet or greater | - 6,500 pounds per square foot* |
| Bearing Pressure Increase for Seismic Loading | - 50 percent |

* For intermediate-sized footings, the appropriate bearing pressure may be interpolated on a straightline basis from these values.

It has previously been our experience that conventional spread and continuous wall foundations established natural granular soils or granular structural fill extending to suitable natural granular soils was the most cost effective way to support the proposed structure. However, in the current economic climate, this may not be the case. On recent projects, Geopiers®, stone columns, and other equivalent systems have been as cost effective as conventional foundations. These systems if properly designed could be a cost effective, suitable alternative.

Lightly loaded auxiliary footings could be established on varying amounts of replacement fill extending to near-surface silty clays in some cases. Please contact GSH if this information is required.

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 should the footings, as discussed above, be established directly upon natural silty clay soils, loose or disturbed soils, sod, rubbish, construction debris, frozen soil, or other deleterious materials. At the USTAR – Sorenson Molecular Biotech Building site, a significant and unexpected amount of fine-grained soils were encountered in the predominantly dense granular sequence. Where the clays were encountered at footing elevation, they were over-excavated and replaced with granular structural fill. This condition appears to be more surficial at this site. It would prudent to excavate a series of test pits to verify at least four feet of suitable natural sands and gravels are presented at footing elevation. These test pits could then be backfilled with crushed gravels.

If the unsuitable soils are encountered, they must be removed and replaced with compacted granular fill. If the granular soils become loose or disturbed, they must be appropriately recompacted.

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

If natural silty sands are encountered at footing elevation for footings utilizing a bearing pressure of 6,500 pounds per square foot, these soils will need to be removed and replaced with select sand and gravel granular fill to a depth of 4 feet below grade.

### 5.3.3 Settlements

Settlements of foundations designed and installed in accordance with the above recommendations and supporting the projected maximum loads should not exceed approximately five-eighths of an inch. Settlements will occur rapidly with approximately 50 to 60 percent of the quoted 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 0.45 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, assume that the backfill extending out at least five feet from the subgrade wall will consist of a 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 subgrade walls, granular backfill may be considered equivalent to a fluid with a density of 45 pounds per cubic foot. Backfill within four feet of the wall should be compacted with hand-operated equipment.

For seismic loading, an average uniform pressure of 90 pounds per square foot should be used for 5 foot high subgrade walls.

From a purely cost standpoint, it is desired to utilize as much of the excavated soil as possibly as the backfill. It is strongly recommended that during the course of the excavation operations that as much of the granular soils encountered in the deeper part of the excavations be saved and utilized as the primary backfill material. However, the clays, in many cases, will be required to be utilized. They should be excavated and, if above optimum moisture, allowed to dry.

In landscaping areas or in playfield areas, the amount of compaction applied to the backfill will be minimal, generally in the range of 85 percent of the maximum dry density as determined by the Modified Proctor. In structural areas, such as under roadways, sidewalks, or other critical facilities, it is our recommendation that the compaction be increased to 95 percent of the Modified Proctor and that the selective stockpiled more granular soils be utilized. These criteria are provided in order to minimize short- and long-term settlements.

## 5.6 AT-GRADE SLABS

In conjunction with this study and the January 29, 2010 study, groundwater was not encountered to at least 34 feet; therefore, an under-slab dewatering system is not required. We do, however, recommend that as a leveling course and as a capillary break, a minimum four inches of three-quarter- to one-inch minus clean gap-graded crushed gravel be placed beneath the slab. As an alternate, an aggregate base material may be utilized; however, the aggregate base must be underlain by an appropriate impermeable vapor barrier.

Settlements of the at-grade slabs supporting average uniform loads of about 200 pounds per square foot should be negligible.

## 5.7 SUBDRAINS

Portions of the University of Utah campus are notorious for seasonal laterally and horizontally variable “perched” groundwater conditions. Although groundwater was not in the borings drilled in conjunction with this study, we strongly recommend that a perimeter/foundation chimney subdrain be installed against all below-grade walls. This may only be required in some areas of the structure. The perimeter footing subdrain can consist of a four-inch diameter slotted or perforated PVC or other durable material established at least 18 inches below the top of the lowest adjacent slab. The subdrain should slope at a minimum of 0.25 percent to a suitable exterior or interior sump. The pipe should be encased in a one-half- to three-quarter-inch clean gap-graded gravel extending two inches below laterally and at least six inches above the top of the lowest adjacent slab. The gravel must be separated from other backfill materials or natural soils with a geotextile fabric, such as Mirafi 140N or equivalent. Extending upon from the top of the perimeter subdrain to within two feet of final grade should be a chimney subdrain consisting of a minimum of six-inch-width of continuous “free-draining” granular materials and/or

synthetic drain board. The gravel chimney must be separated from other backfill soils with the same geotextile fabric.

There are some synthetic drain board systems which now include a base section which will satisfy the requirement for the four-inch perforated or slotted PVC pipe. It is, however, essential that the invert of this section be established 18 inches below the top of the lowest adjacent slab.

Prior to the placement of this chimney subdrain, the subgrade walls as a minimum must be dampproofed. In critical areas, a waterproofing system is recommended.

## 5.8 GEOSEISMIC SETTING

### 5.8.1 General

Most of the Utah municipalities will adopt the International Building Code (IBC) 2009 on July 1, 2010.

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.

### 5.8.2 Soil Class

For dynamic structural analysis, the Site Class D - Stiff Soil Profile as defined in Table 1613.5.2, Site Class Definitions, of the IBC 2006 can be utilized.

### 5.8.3 Liquefaction

The site is located in an area that has been identified by Salt Lake County as having a “very low” 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.

Data available to date indicates that the water table is in excess of 34 feet below grade. The soils above the water table are not susceptible to liquefaction, even during major seismic event. All indications are that the potential for liquefaction at the site will be minimal.

### 5.8.4 Faulting

Review of available literature indicates that the site is not underlain by active faulting.

### 5.8.5 Ground Motions

The IBC 2006 code is based on 2002 USGS 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 (40.7630 degrees north and 111.8371 degrees west, respectively), the values for this site are tabulated below:

| **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 | 0.622 | 0.622 |
| 0.2 Seconds, (Short Period Acceleration) | $S_S = 1.555$ | $S_{MS} = 1.555$ |
| 1.0 Seconds (Long Period Acceleration) | $S_1 = 0.613$ | $S_{M1} = 0.920$ |

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).

oOo

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.**

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State of Utah No. 6252902
Project Geotechnical Engineer

Reviewed by:

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State of Utah No. 146417
President/Senior Geotechnical Engineer

JMW/WJG:sn

Encl. Figure 1, Vicinity Map
Figure 2, Area Map
Figure 3, Site Plan
Figures 4A through 4E, Log of Borings
Figures 5A through 5I, Log of Borings (Previous Study)
Figure 6, Unified Soil Classification System

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Pollard Architects
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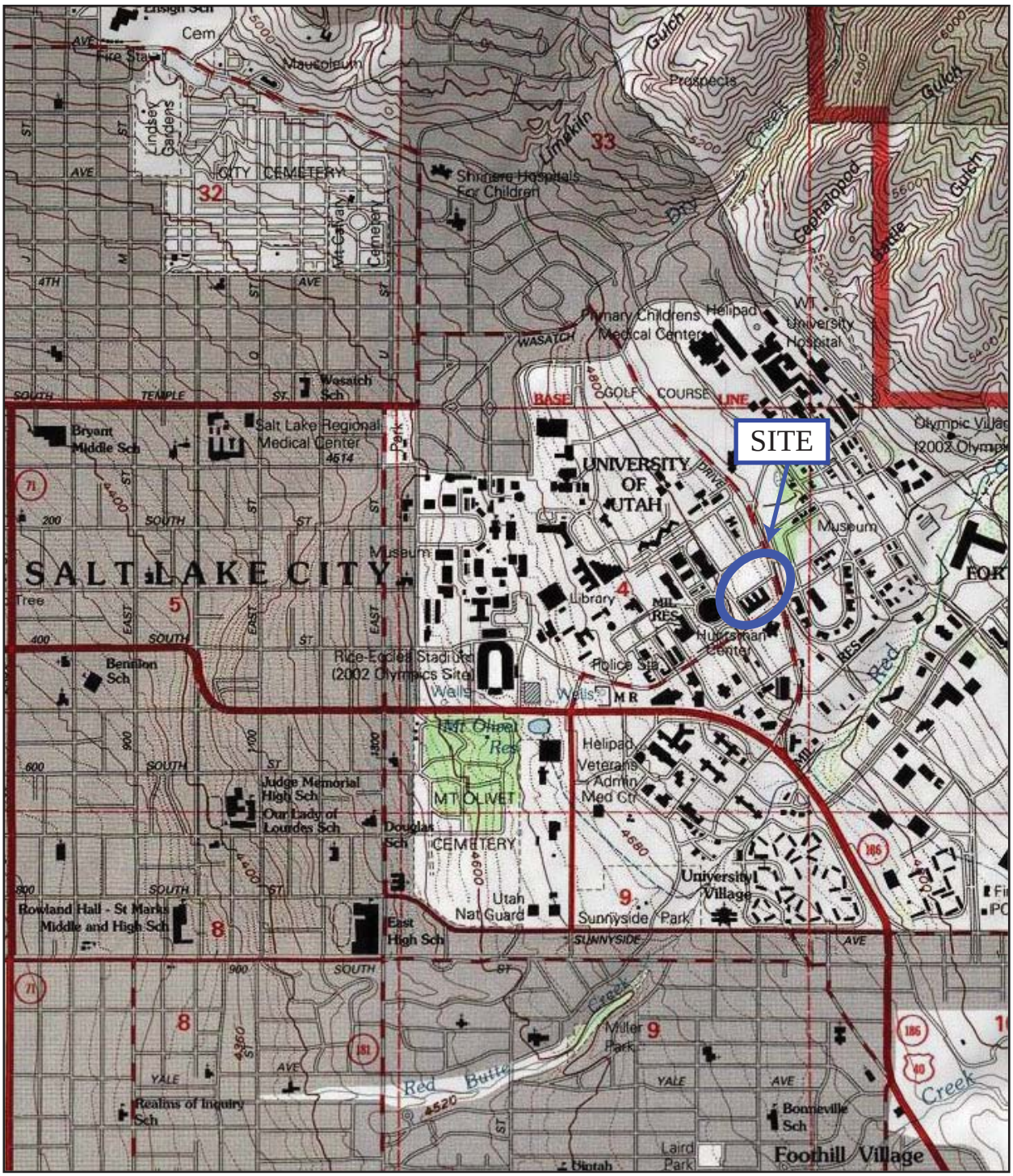
Salt Lake City, Utah 84111

STATE OF UTAH - DFCM
JOB NO. 0128-55A-10




SCALE IN FEET

1000 0 1000 2000

# FIGURE 1
# VICINITY MAP

REFERENCE:
USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE MAPS
TITLED "FORT DOUGLAS, UTAH" AND "SUGAR HOUSE, UTAH"
BOTH DATED 1998

GSH
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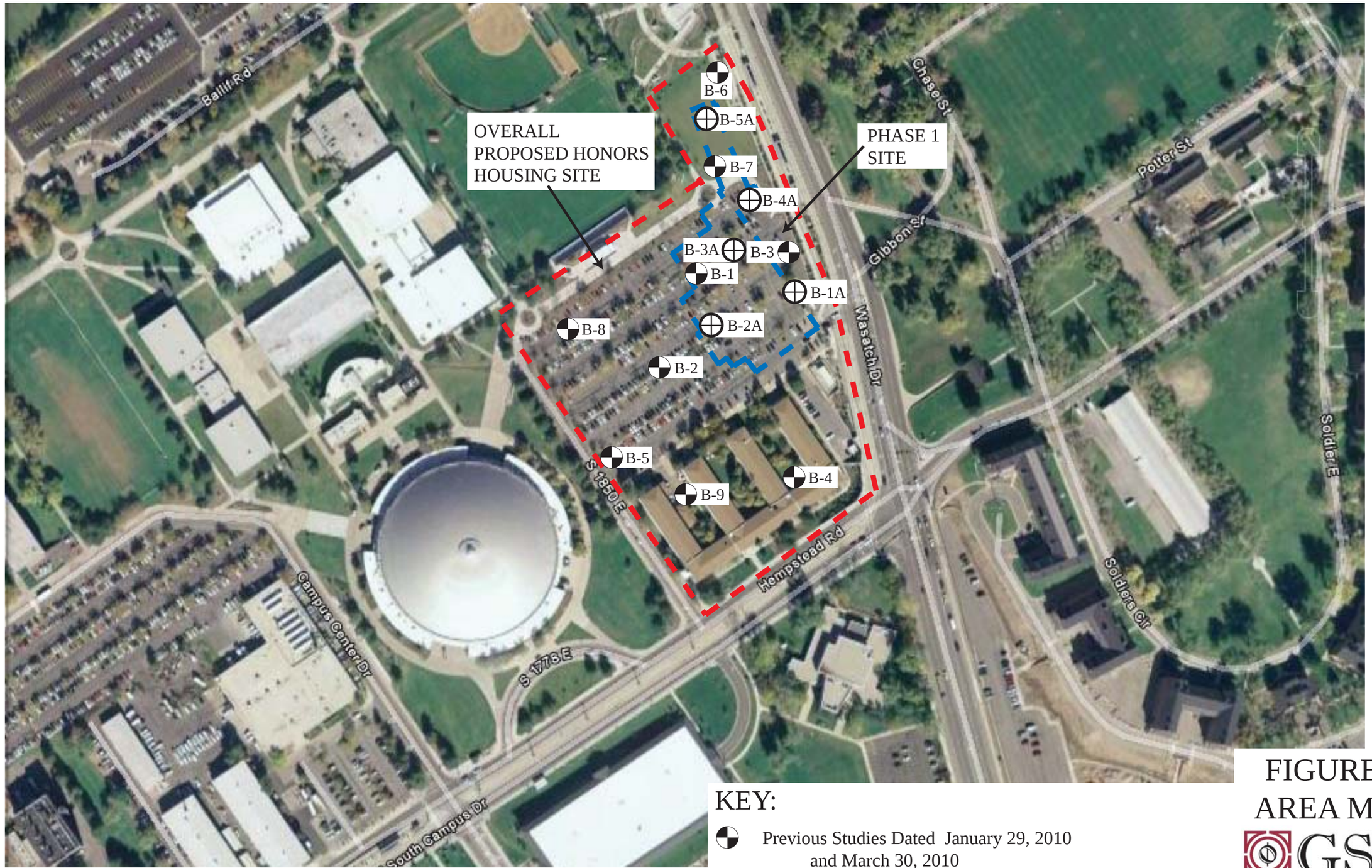
Geotechnical Consultants, Inc.

STATE OF UTAH - DFCM
JOB NO. 0128-55A-10




KEY:

Previous Studies Dated January 29, 2010 and March 30, 2010

This Study

REFERENCE:
ADAPTED FROM AERIAL PHOTOGRAPH
DOWNLOADED FROM 2009 GOOGLE EARTH

APPROXIMATE SCALE: 1" = 190'

FIGURE 2
AREA MAP

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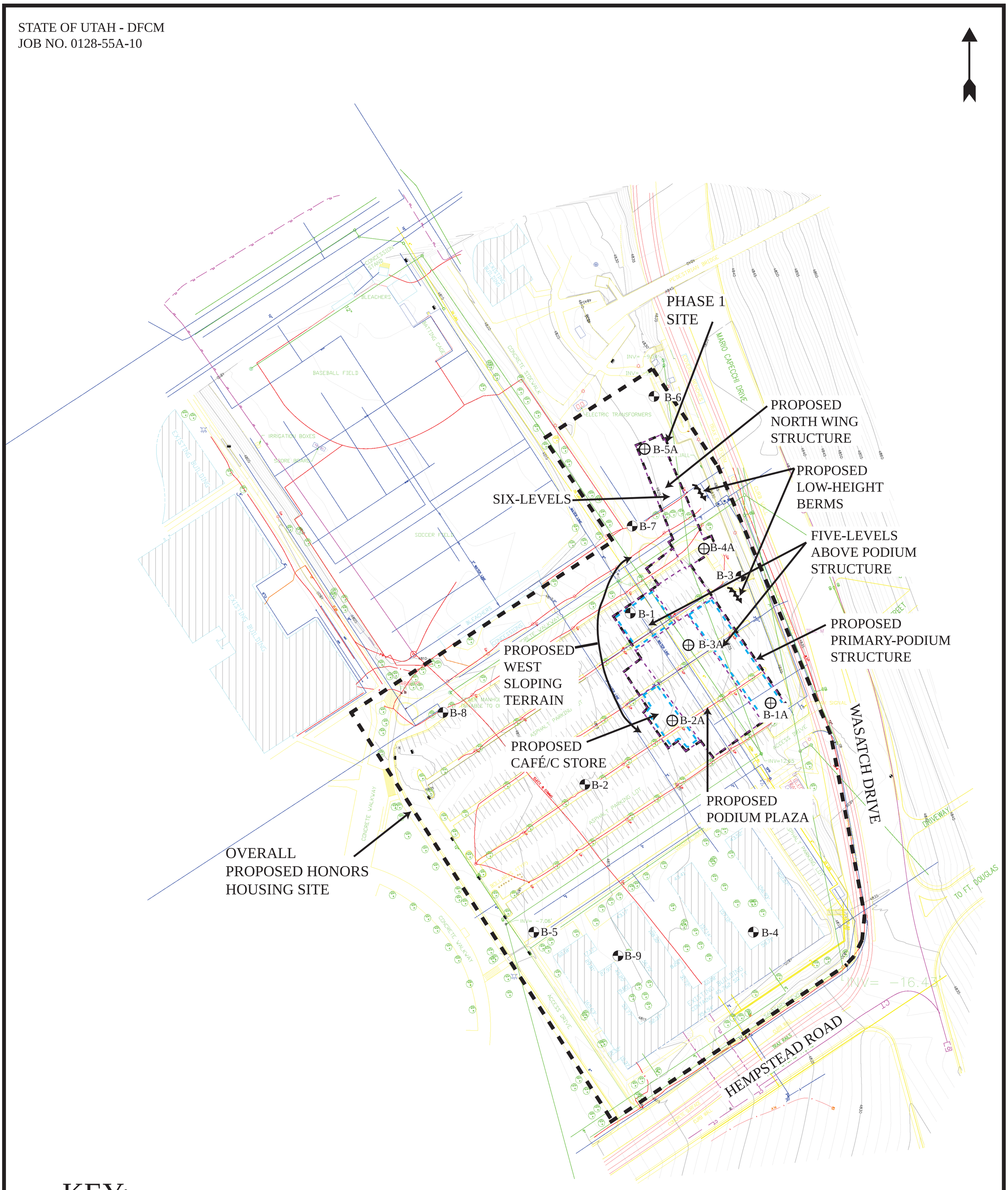
STATE OF UTAH - DFCM
JOB NO. 0128-55A-10




KEY:

Previous Studies Dated January 29, 2010 and March 30, 2010

This Study

APPROXIMATE SCALE: 1" = 68'

FIGURE 3
SITE PLAN

REFERENCE:
ADAPTED FROM DRAWING ENTITLED
"TOPOGRAPHIC SURVEY
BY BUSH & GUDGELL, INC., DATED DECEMBER 17, 2009

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Salt Lake City, Utah 84123

Project Name: Proposed Honors Housing Facility
Project No.: 0128-55A-10
Location: NW Cnr Hempstead Rd/ Wasatch Dr, SLC, UT
Client: State of Utah - DFCM
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 06-24-10
GSH Field Rep.: RJG
Elevation: ---
Water Level: No groundwater encountered (06-24-10 & 07-06-10)
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 | | | | | | | | |
| | | **4" ASPHALT CONCRETE** | | | | | | | | | |
| | | **4" ROADBASE** silty fine to coarse sand and fine gravel; brown (SM/GM-FILL) | | | | | | | | | moist medium stiff/stiff |
| | | **SILTY CLAY, FILL** with some fine to coarse sand and fine and coarse gravel; dark brown (CL-FILL) | | 11 | | | | | | | moist |
| | | **SILTY CLAY** with some fine sand and occasional fine and coarse gravel; brown with light brown mottling (CL) | 5 | 14 | | 14.1 | | 113 | | | stiff |
| | | **SILTY FINE TO COARSE SAND AND FINE AND COARSE GRAVEL** brown (SM/GM) | | | | | | | | | moist |
| | | | 10 | 67 | | | | | | | medium dense |
| | | | 15 | 82 | | | | | | | dense |
| | | Stopped drilling at 15.0'. Stopped sampling at 16.5'. Installed 1-1/4" diameter slotted pipe to 16.5'. No groundwater encountered. | 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 4A

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

Project Name: Proposed Honors Housing Facility
Project No.: 0128-55A-10
Location: NW Cnr Hempstead Rd/Wasatch Dr, SLC, UT
Client: State of Utah - DFCM
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 06-24-10
GSH Field Rep.: RJG
Elevation: ---
Water Level: No groundwater encountered (06-24-10 & 07-06-10)
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 | | | | | | | | |
| | | **4.5" ASPHALT CONCRETE** | | | | | | | | | |
| | | **5.5" ROADBASE** silty fine to coarse sand and fine gravel; brown (SM/GM-FILL) | | | | | | | | | moist "medium stiff" |
| | | **SILTY CLAY, FILL** with some fine to coarse sand and fine and coarse gravel; brown (CL-FILL) | | 60 | | | | | | | moist medium dense |
| | | **SILTY FINE TO COARSE SAND AND FINE AND COARSE GRAVEL** brown (SM/GM) | | | | | | | | | |
| | | grades with occasional cobbles | 5 | 122 | | | | | | | very dense |
| | | grades with occasional clayey fine to coarse sand and fine and coarse gravel layers up to 1" thick; reddish-brown | 10 | 73 | | | | | | | dense |
| | | | 15 | 69 | | | | | | | medium dense |
| | | Stopped drilling at 15.0'. | | | | | | | | | |
| | | Stopped sampling at 16.5'. | | | | | | | | | |
| | | Installed 1-1/4" diameter slotted pipe to 16.5'. | | | | | | | | | |
| | | No groundwater encountered. | 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 4B

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



Project Name: Proposed Honors Housing Facility
Project No.: 0128-55A-10
Location: NW Cnr Hempstead Rd/Wasatch Dr, SLC, UT
Client: State of Utah - DFCM
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 06-24-10
GSH Field Rep.: RJG
Elevation: ---
Water Level: No groundwater encountered (06-24-10)
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 | | | | | | | | |
| | | **4.5" ASPHALT CONCRETE** | | | | | | | | | |
| | | **5.0" ROADBASE, FILL** silty fine to coarse sand and fine gravel; brown (SM/GM-FILL) | | | | | | | | | moist very stiff |
| | | **SILTY CLAY, FILL** with some fine sand and occasional fine and coarse gravel; brown (CL-FILL) | | 29 | | | | | | | |
| | | **SILTY CLAY** with some fine to coarse sand and fine gravel; brown with light brown mottling (CL) | | | | | | | | | moist very stiff |
| | | | 5 | 24 | | 19.3 | | 104 | | | |
| | | **SILTY FINE TO COARSE SAND AND FINE AND COARSE GRAVEL** with occasional cobbles; brown (SM/GM) | | 107+ | | | | | | | moist very dense |
| | | | 10 | | | | | | | | |
| | | | | 110 | | | | | | | |
| | | | 15 | | | | | | | | |
| | | Stopped drilling at 13.0'. | | | | | | | | | |
| | | Stopped sampling at 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 4C

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



Project Name: Proposed Honors Housing
Project No.: 0128-55A-10
Location: NW Cnr Hempstead Rd/Wasatch Dr, SLT, UT
Client: State of Utah - DFCM
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 06-24-10
GSH Field Rep.: RJG
Elevation: ---
Water Level: No groundwater encountered (06-24-10)
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 | | | | | | | | |
| | | **4.5" ASPHALT CONCRETE** | | | | | | | | | |
| | | **5.0" ROADBASE** silty fine to coarse sand and fine gravel; brown (SM/GM-FILL) | | | | | | | | | moist "medium stiff" |
| | | **SILTY CLAY** with some fine to coarse sand and fine and coarse gravel; dark brown (CL) | | | | | | | | | medium stiff |
| | | | | 10 | | 18.2 | | 108 | | | |
| | | | 5 | | | | | | | | |
| | | **CLAYEY FINE TO COARSE SAND AND FINE AND COARSE GRAVEL** brown (SC/GC) | | 19 | | | | | | | moist loose |
| | | **SILTY FINE TO COARSE SAND AND FINE AND COARSE GRAVEL** reddish-brown (SM/GM) | | | | | | | | | moist very dense |
| | | | 10 | 106 | | | | | | | medium stiff |
| | | **CLAYEY FINE TO COARSE SAND AND FINE AND COARSE GRAVEL** with numerous layers up to 2" thick of fine and coarse gravel; gray (SC/GC) | | | | | | | | | moist medium dense |
| | | | 15 | 16 | | | | | | | |
| | | Stopped drilling at 14.0'. | | | | | | | | | |
| | | Stopped sampling at 15.5'. | | | | | | | | | |
| | | 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 4D

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

Project Name: Proposed Honors Housing Facility
Project No.: 0128-55A-10
Location: NW Cnr Hempstead Rd/Wasatch Dr, SLC, UT
Client: State of Utah - DFCM
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 06-24-10
GSH Field Rep.: RJG
Elevation: ---
Water Level: No groundwater encountered (06-24-10 & 07-06-10)
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 CLAY** with some fine to coarse sand and occasional fine and coarse gravel; major roots (topsoil) to 4"; brown (CL) | | | | | | | | | loose to 4" moist medium stiff |
| | | | | 7 | | 18.3 | | 107 | | | |
| | | **SILTY FINE TO COARSE SAND AND FINE AND COARSE GRAVEL** brown (GM/SM) | 5 | | | | | | | | moist medium dense |
| | | | | 43 | | | | | | | |
| | | grades with occasional layers up to 2" thick of clayey fine to coarse sand and fine and coarse gravel and cobbles | 10 | 86 | | | | | | | dense |
| | | | 15 | 50 | | | | | | | very dense |
| | | Stopped drilling at 15.0'. Stopped sampling at 16.5'. Installed 1-1/4" diameter slotted pipe to 16.5'. No groundwater encountered. | 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 4E

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



Project Name: Proposed Honors Housing Facility
Project No.: 0128-055-09
Location: NW Cnr Hempstead Rd/Wasatch Dr, SLC, UT
Client: State of Utah - DFCM
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 12-22-09
GSH Field Rep.: RJG
Elevation: 4817.0' +/-
Water Level: No groundwater encountered (12-22-09)
Remarks: Datum: See Figure 3, Site Plan

| 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 | | | | | | | | |
| | | **3" ASPHALT CONCRETE** | | | | | | | | | |
| | | **5" AGGREGATE BASE** brown | | | | | | | | | slightly moist very dense |
| | | **SILTY FINE TO COARSE SAND** with some fine and coarse gravel; brown (SM) | | 130+ | | | | | | | |
| | | grades with occasional layers up to 1/2" thick of silty fine sand; light brown | 5 | 75+ | | | | | | | |
| | | **SILTY/CLAYEY FINE AND COARSE GRAVEL** with some fine to coarse sand; reddish-brown (GM/GC) | | | | | | | | | slightly moist dense |
| | | | | | | | 12.5 | | | | |
| | | grades with occasional cobbles | 10 | 75 | | | | | | | |
| | | **CLAYEY FINE TO COARSE SAND AND FINE AND COARSE GRAVEL** reddish-brown (SC/GC) | | | | | | | | | slightly moist very dense |
| | | | 15 | 120 | | 4.5 | 11.9 | 122 | | | |
| | | drilling indicates occasional layers up to 6" thick of less dense material | | | | | | | | | |
| | | grades with occasional layers up to 1" thick of clayey fine to coarse sand | 20 | 28 | | | | | | | dense |
| | | | 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 5A

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



Project Name: Proposed Honors Housing Facility
Project No.: 0128-055-09
Location: NW Cnr Hempstead Rd/Wasatch Dr, SLC, UT
Client: State of Utah - DFCM
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 12-22-09
GSH Field Rep.: RJG
Elevation: 4817.0' +/-
Water Level: No groundwater encountered (12-22-09)
Remarks: Datum: See Figure 3, Site Plan

| Graphical Log | Water Level | DESCRIPTION | DEPTH FT. | BLOWS/FT | SAMPLE SYMBOL | MOISTURE (%) | % PASSING 200 | DRY DENSITY (PCF) | Liquid Limit (%) | Plastic Limit (%) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 88 | | | | | | | |
| | | very stiff near refusal drilling (smooth); possible clay layers 27.5 to 29.0' or cemented sand | | | | | | | | | |
| | | **SILTY/CLAYEY FINE TO COARSE SAND AND FINE AND COARSE GRAVEL** reddish-brown (SC/GM) | 30 | 90 | | 4.6 | 13.5 | 132 | | | slightly moist dense |
| | | **REFUSAL** | | 100+ | | | | | | | |
| | | Stopped drilling at 32.0' - refusal. | 35 | | | | | | | | |
| | | Stopped sampling at 33.5'. | | | | | | | | | |
| | | Installed 1-1/4" diameter slotted PVC pipe to 33.5'. | | | | | | | | | |
| | | No groundwater encountered at time of drilling. | 40 | | | | | | | | |
| | | | 45 | | | | | | | | |
| | | | 50 | | | | | | | | |

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 5A
(con't)

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

Project Name: Proposed Honors Housing Facility
Project No.: 0128-055-09
Location: NW Cnr Hempstead Rd/Wasatch Dr, SLC, UT
Client: State of Utah - DFCM
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 12-22-09
GSH Field Rep.: RJG
Elevation: 4813.5' +/-
Water Level: No groundwater encountered (12-22-09)
Remarks: Datum: See Figure 3, Site Plan

| 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 | | | | | | | | |
| | | **3" ASPHALT CONCRETE** | | | | | | | | | |
| | | **6" AGGREGATE BASE, FILL** | | | | | | | | | |
| | | **SILTY FINE TO COARSE SAND AND FINE AND COARSE GRAVEL** light brown (SM/GM) | | | | | | | | | slightly moist very dense |
| | | | | 136+ | | | | | | | |
| | | grades with occasional layers up to 4" of silty clay with some fine sand | | | | | | | | | |
| | | | 5 | | | | | | | | dense |
| | | | | 50+ | | | | | | | |
| | | softer drilling 8.0 to 9.5' | | | | | | | | | |
| | | **SILTY FINE AND COARSE GRAVEL** with some fine to coarse sand; reddish-brown (GM) | 10 | | | | | | | | slightly moist medium dense |
| | | | | 47 | | | | | | | |
| | | **SILTY/CLAYEY FINE TO COARSE SAND AND FINE AND COARSE GRAVEL** reddish-brown (SM/GC) | 15 | | | | | | | | slgithly moist medium dense |
| | | | | 45 | | 5.6 | 15.5 | 119 | | | |
| | | | 20 | | | | | | | | very dense |
| | | Stopped drilling at 23.0 - refusal. | | 100+ | | | | | | | |
| | | Stopped samling at 24.5'. | | | | | | | | | |
| | | Groundwater not encountered at time of drilling. | | | | | | | | | |
| | | **REFUSAL** | | 119+ | | | 23.6 | | | | |
| | | | 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 5B

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



Project Name: Proposed Honors Housing Facility
Project No.: 0128-055-09
Location: NW Cnr Hempstead Rd/Wasatch Dr, SLC, UT
Client: State of Utah - DFCM
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 12-22-09
GSH Field Rep.: RJG
Elevation: 4826.0' +/-
Water Level: No groundwater encountered (12-22-09)
Remarks: Datum: See Figure 3, Site Plan

| 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 | | | | | | | | |
| | | **3" ASPHALT CONCRETE** | | | | | | | | | |
| | | **5" AGREGATE BASE, FILL** | | | | | | | | | |
| | | **SILTY CLAY** with some fine sand and trace fine and coarse gravel; brown (CL) | | | | | | | | | slightly moist stiff |
| | | | | 17 | | | | | | | |
| | | | 5 | 11 | | | | | | | |
| | | **SILTY/CLAYEY FINE TO COARSE SAND AND FINE AND COARSE GRAVEL** reddish-brown and light brown (SM/GC) | | | | | | | | | slightly moist medium dense |
| | | | 10 | 53 | | | 21.2 | | | | |
| | | grades with occasional layers up to 2" thick of clayey fine to coarse sand with fine and coarse gravel | | | | | | | | | |
| | | **SILTY FINE TO COARSE SAND AND FINE AND COARSE GRAVEL** reddish-brown (SM/GM) | 15 | 108 | | | | | | | slightly moist dense |
| | | grades with occasional cobbles up to 6" thick | 20 | 94 | | | | | | | |
| | | | 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 5C

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

Project Name: Proposed Honors Housing Facility
Project No.: 0128-055-09
Location: NW Cnr Hempstead Rd/Wasatch Dr, SLC, UT
Client: State of Utah - DFCM
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 12-22-09
GSH Field Rep.: RJG
Elevation: 4826.0' +/-
Water Level: No groundwater encountered (12-22-09)
Remarks: Datum: See Figure 3, Site Plan

| Graphical Log | Water Level | DESCRIPTION | DEPTH FT. | BLOWS/FT | SAMPLE SYMBOL | MOISTURE (%) | % PASSING 200 | DRY DENSITY (PCF) | Liquid Limit (%) | Plastic Limit (%) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 126 | | 6.4 | 14.7 | 128 | | | |
| | | grades with some clay | | | | | | | | | |
| | | **REFUSAL** | 30 | 88 | | | | | | | |
| | | Auger refusal at 29.0'. | | | | | | | | | |
| | | Stopped sampling at 30.5'. | | | | | | | | | |
| | | No groundwater encountered at time of drilling. | | | | | | | | | |
| | | | 35 | | | | | | | | |
| | | | 40 | | | | | | | | |
| | | | 45 | | | | | | | | |
| | | | 50 | | | | | | | | |

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 5C
(con't)

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



Project Name: Proposed Honors Housing Facility
Project No.: 0128-055-09
Location: NW Cnr Hempstead Rd/Wasatch Dr, SLC, UT
Client: State of Utah - DFCM
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 12-23-09
GSH Field Rep.: RJG
Elevation: 4820.0' +/-
Water Level: No groundwater encountered (12-23-09)
Remarks: Datum: See Figure 3, Site Plan

| 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 CLAY, FILL** with some fine sand ; major roots (topsoil) to 3"; brown (CL-FILL) | | | | | | | | | |
| | | **SILTY FINE TO COARSE SAND** with some fine and coarse gravel; reddish-brown (SM) | | | | | | | | | slightly moist medium dense |
| | | | | 41 | | | | | | | |
| | | | 5 | | | | | | | | dense |
| | | | | 98 | | | | | | | |
| | | **SILTY/CLAYEY FINE TO COARSE SAND AND AND COARSE GRAVEL** reddish-brown (SC/GM) | | | | | | | | | slightly moist dense |
| | | | 10 | 45 | | | 23.9 | | | | |
| | | grades with occasional layers to 1/2" thick of clayey fine to coarse sand with fine and coarse gravel; reddish-brown | 15 | 104 | | | | | | | |
| | | more gravel drilling | 20 | 50+ | | | | | | | |
| | | | 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 5D

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



Project Name: Proposed Honors Housing Facility
Project No.: 0128-055-09
Location: NW Cnr Hempstead Rd/Wasatch Dr, SLC, UT
Client: State of Utah - DFCM
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 12-23-09
GSH Field Rep.: RJG
Elevation: 4820.0' +/-
Water Level: No groundwater encountered (12-23-09)
Remarks: Datum: See Figure 3, Site Plan

| Graphical Log | Water Level | DESCRIPTION | DEPTH FT. | BLOWS/FT | SAMPLE SYMBOL | MOISTURE (%) | % PASSING 200 | DRY DENSITY (PCF) | Liquid Limit (%) | Plastic Limit (%) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **SILTY/CLAYEY FINE TO COARSE SAND AND FINE AND COARSE GRAVEL** reddish-brown (SC/GM) | | 72 | | | | | | | slightly moist very dense |
| | | | | | | | | | | | dense |
| | | **REFUSAL** | | 48 | | | 20.1 | | | | |
| | | | 30 | | | | | | | | |
| | | Auger refusal at 28.5'. | | | | | | | | | |
| | | Stopped sampling at 30.0'. | | | | | | | | | |
| | | Installed 1-1/4" diameter slotted PVC pipe to 30.0'. | | | | | | | | | |
| | | No groundwater encountered at time of drilling. | | | | | | | | | |
| | | | 35 | | | | | | | | |
| | | | 40 | | | | | | | | |
| | | | 45 | | | | | | | | |
| | | | 50 | | | | | | | | |

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 5D (con't)

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

Project Name: Proposed Honors Housing Facility
Project No.: 0128-055-09
Location: NW Cnr Hempstead Rd/Wasatch Dr, SLC, UT
Client: State of Utah - DFCM
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 12-23-09
GSH Field Rep.: RJG
Elevation: 4809.5' +/-
Water Level: No groundwater encountered (12-23-09)
Remarks: Datum: See Figure 3, Site Plan

| 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 | | | | | | | | |
| | | **5" ASPHALT CONCRETE** | | | | | | | | | |
| | | **8" AGGREGATE BASE** brown | | | | | | | | | moist very dense |
| | | **CLAYEY FIEN ADN COARSE GRAVEL** with some fine to coarse sand; brown (GC) | | 100+ | | | | | | | |
| | | grades with occasional layers up to 4" thick of silty clay with some fine sand; light brown with mottling | | | | | | | | | |
| | | **SILTY FINE AND COARSE GRAVEL** with some fine to coarse sand; reddish-brown (GM) | 5 | 97 | | | | | | | slightly moist dense |
| | | **CLAYEY FINE AND COARSE GRAVEL** with some fine to coarse sand; reddish-brown (GC) | 10 | 68 | | | | | | | slightly moist very dense |
| | | grades with occasional silty layers up to 1/2" thick; light brown | | | | | | | | | |
| | | drilling indicates layering of silty and clayey gravels up to 1' thick | | | | | | | | | |
| | | **SILTY FINE AND COARSE GRAVEL** with some fine to coarse sand; reddish-brown (GM) | 15 | 93 | | 4.4 | 12.0 | 133 | | | slightly moist dense |
| | | smooth drilling 17 to 18', sand or clay layer? | | | | | | | | | |
| | | Auger refusal at 22.0'. | 20 | 100+ | | | | | | | very dense |
| | | Sampler refusal at 23.5'. | | | | | | | | | |
| | | No groundwater encountered at time of drilling. | | 100+ | | | | | | | |
| | | **REFUSAL** | | | | | | | | | |
| | | | 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 5E

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



Project Name: Honors Housing Facility
Project No.: 0128-055-09
Location: NW Cnr Hempstead Rd/Wasatch Dr, SLC, UT
Client: State of Utah - DFCM
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 12-22-09
GSH Field Rep.: RJG
Elevation: 4826.0' +/-
Water Level: No groundwater encountered (12-22-09)
Remarks: Datum: See Figure 3, Site Plan

| 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 FINE AND COARSE GRAVEL, FILL** with some fine to coarse sand; major roots (topsoil) to 3"; brown (GM-FILL) | | | | | | | | | moist "loose" "medium dense" |
| | | **SILTY CLAY** with some fine gravel and trace fine sand; brown (CL) | | 17 | | | | | | | slightly moist stiff |
| | | | | | | | | | | | medium stiff |
| | | | 5 | 12 | | | | | | | slightly moist dense |
| | | **SILTY FINE GRAVEL** with some fine to coarse sand; brown (GM) | | | | | | | | | |
| | | **SILTY FINE AND COARSE GRAVEL** with some fine to coarse sand and occasional cobbles; brown (GM) | | | | | | | | | slgihtly moist very dense |
| | | | 10 | 100 5" | | | | | | | |
| | | grades with occasional layers up to 2" of silty clay with some fine to coarse sand and no cobbles | 15 | 81 | | 8.3 | 20.5 | 115 | | | dense |
| | | | 20 | 165 | | | | | | | very dense |
| | | | 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 5F

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

Project Name: Honors Housing Facility
Project No.: 0128-055-09
Location: NW Cnr Hempstead Rd/Wasatch Dr, SLC, UT
Client: State of Utah - DFCM
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 12-22-09
GSH Field Rep.: RJG
Elevation: 4826.0' +/-
Water Level: No groundwater encountered (12-22-09)
Remarks: Datum: See Figure 3, Site Plan

| Graphical Log | Water Level | DESCRIPTION | DEPTH FT. | BLOWS/FT | SAMPLE SYMBOL | MOISTURE (%) | % PASSING 200 | DRY DENSITY (PCF) | Liquid Limit (%) | Plastic Limit (%) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 100 5" | | | | | | | |
| | | | | 50 3" | | | | | | | |
| | | **REFUSAL** | | | | | | | | | |
| | | Auger refusal at 27.0'. | | | | | | | | | |
| | | Stopped sampling at 28.5'. | 30 | | | | | | | | |
| | | Installed 1-1/4" diameter slotted PVC pipe to 28.0'. | | | | | | | | | |
| | | No groundwater encountered at time of drilling. | | | | | | | | | |
| | | | 35 | | | | | | | | |
| | | | 40 | | | | | | | | |
| | | | 45 | | | | | | | | |
| | | | 50 | | | | | | | | |

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 5F
(con't)

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

Project Name: Proposed Honors Housing Facility
Project No.: 0128-055-09
Location: NW Cnr Hempstead Rd/Wasatch Dr, SLC, UT
Client: State of Utah - DFCM
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 12-22-09
GSH Field Rep.: RJG
Elevation: 4823.5' +/-
Water Level: No groundwater encountered (12-22-09)
Remarks: Datum: See Figure 3, Site Plan

| Graphical Log | Water Level | DESCRIPTION | DEPTH FT. | BLOWS/FT | SAMPLE SYMBOL | MOISTURE (%) | % PASSING 200 | DRY DENSITY (PCF) | Liquid Limit (%) | Plastic Limit (%) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Ground Surface | | | | | | | | | |
| | | **SILTY CLAY** with some fine to coarse sand; fine gravel; major roots (topsoil) to 3"; brown (CL) | 0 | | | | | | | | frozen to 3" moist stiff |
| | | | | 16 | | | | | | | |
| | | | 5 | | | | | | | | |
| | | **SILTY/CLAYEY FINE TO COARSE SAND, AND AND COARSE GRAVEL** brown/reddish-brown (SM/GC) | | 100 | | | | | | | slightly moist dense |
| | | | 10 | 181 | | 6.0 | 16.4 | 120 | | | very dense |
| | | | 15 | 86 | | | | | | | |
| | | | 20 | 50 3" | | | | | | | |
| | | clay or sand layer 21' to 23' | | | | | | | | | |
| | | | 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 5G

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

Project Name: Proposed Honors Housing Facility
Project No.: 0128-055-09
Location: NW Cnr Hempstead Rd/Wasatch Dr, SLC, UT
Client: State of Utah - DFCM
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 12-22-09
GSH Field Rep.: RJG
Elevation: 4823.5' +/-
Water Level: No groundwater encountered (12-22-09)
Remarks: Datum: See Figure 3, Site Plan

| Graphical Log | Water Level | DESCRIPTION | DEPTH FT. | BLOWS/FT | SAMPLE SYMBOL | MOISTURE (%) | % PASSING 200 | DRY DENSITY (PCF) | Liquid Limit (%) | Plastic Limit (%) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 79 | | | 21.3 | | | | |
| | | grades moderately cemented. | | | | | | | | | |
| | | | 30 | 50<br>0" | | | | | | | |
| | | **REFUSAL** | | | | | | | | | |
| | | Auger refusal at 29.5'. | | | | | | | | | |
| | | Stopped sampling at 31.0'. | | | | | | | | | |
| | | No groundwater encountered at time of drilling. | | | | | | | | | |
| | | | 35 | | | | | | | | |
| | | | 40 | | | | | | | | |
| | | | 45 | | | | | | | | |
| | | | 50 | | | | | | | | |

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 5G
(con't)

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



Project Name: Proposed Honors Housing Facility
Project No.: 0128-055-09
Location: NW Cnr Hempstead Rd/Wasatch Dr, SLC, UT
Client: State of Utah - DFCM
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 12-23-09
GSH Field Rep.: RJG
Elevation: 4808.0' +/-
Water Level: No groundwater encountered (12-23-09)
Remarks: Datum: See Figure 3, Site Plan

| 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 | | | | | | | | |
| | | **6" ASPHALT CONCRETE** | | | | | | | | | |
| | | **6" AGGREGATE BASE, FILL** brown (FILL) | | | | | | | | | |
| | | **SILTY FINE TO COARSE SAND** with some fine and coarse gravel with occasional layers up to 1" of silty clay with some fine to coarse sand; brown (SM) | | 31 | | | | | | | moist medium dense |
| | | | 5 | 46 | | | | | | | sligthly moist |
| | | | 10 | 50 2" | | | | | | | very dense |
| | | **SILTY/CLAYEY FINE TO COARSE GRAVEL** with some fine and coarse gravel; brown (SM/SC) | 15 | 100 5.5" | | | | | | | slightly moist very dense |
| | | **SILTY/CLAYEY FINE AND COARSE GRAVEL** with some fine to coarse sand and occasional layers up to 1" of silty clay; reddish-brown (GM/GC) | 20 | 31 | | 11.4 | 24.7 | 110 | | | sligthly moist medium dense |
| | | | 25 | | | | | | | | very 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 5H

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



Project Name: Proposed Honors Housing Facility
Project No.: 0128-055-09
Location: NW Cnr Hempstead Rd/Wasatch Dr, SLC, UT
Client: State of Utah - DFCM
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 12-23-09
GSH Field Rep.: RJG
Elevation: 4808.0' +/-
Water Level: No groundwater encountered (12-23-09)
Remarks: Datum: See Figure 3, Site Plan

| Graphical Log | Water Level | DESCRIPTION | DEPTH FT. | BLOWS/FT | SAMPLE SYMBOL | MOISTURE (%) | % PASSING 200 | DRY DENSITY (PCF) | Liquid Limit (%) | Plastic Limit (%) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **REFUSAL** | | 50 5" | | | | | | | |
| | | Auger refusal at 25.5'. | | | | | | | | | |
| | | Stopped sampling at 26.0'. | | | | | | | | | |
| | | Installed 1-1/4" diameter slotted PVC pipe to 25.5'. | | | | | | | | | |
| | | No groundwater encountered at time of drilling. | 30 | | | | | | | | |
| | | | 35 | | | | | | | | |
| | | | 40 | | | | | | | | |
| | | | 45 | | | | | | | | |
| | | | 50 | | | | | | | | |

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 5H
(con't)

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



Project Name: Proposed Honors Housing Facility
Project No.: 0128-055-09
Location: NW Cnr Hempstead Rd/Wasatch Dr, SLC, UT
Client: State of Utah - DFCM
Drilling Method: 3-3/4" ID Hollow-Stem Auger
Date Drilled: 12-23-09
GSH Field Rep.: RJG
Elevation: 4814.5' +/-
Water Level: No groundwater encountered (12-23-09)
Remarks: Datum: See Figure 3, Site Plan

| Graphical Log | Water Level | DESCRIPTION | DEPTH FT. | BLOWS/FT | SAMPLE SYMBOL | MOISTURE (%) | % PASSING 200 | DRY DENSITY (PCF) | Liquid Limit (%) | Plastic Limit (%) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Ground Surface | | | | | | | | | |
| | | **4" ASPHALT CONCRETE** | 0 | | | | | | | | |
| | | **SILTY FINE AND COARSE GRAVEL, FILL?** with some fine sand; brown (GM-FILL?) | | | | | | | | | slightly moist very dense |
| | | | | 100 5" | | | | | | | |
| | | **SILTY CLAY** with some fine sand; brown (CL) | 5 | 108 | | | | | | | moist dense |
| | | **SILTY FINE AND COARSE GRAVEL** with some fine to coarse sand; reddish-brown (GM) | | | | | | | | | sligthly moist very dense |
| | | | 10 | 100 5" | | | | | | | |
| | | | 15 | 100 5" | | | | | | | |
| | | **SILTY/CLAYEY FINE TO COARSE SAND AND FINE AND COARSE GRAVEL** with layers up to 1/2" thick of silty clay; reddish-brown (SC/GM) | | | | | | | | | slightly moist dense |
| | | | 20 | 71 | | | 20.7 | | | | |
| | | **REFUSAL** | | | | | | | | | |
| | | Auger refusal at 22.5'. | | | | | | | | | |
| | | 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 5I

# UNIFIED SOIL CLASSIFICATION SYSTEM

| FIELD IDENTIFICATION PROCEDURES | | | | GRAPH SYMBOL | LETTER SYMBOL [1] | TYPICAL DESCRIPTIONS |
|---|---|---|---|---|---|---|
| COARSE GRAINED SOILS<br>More than half of material is larger than No. 200 sieve size. [2]<br>(The No. 200 sieve size is about the smallest particle visible to the naked eye) | GRAVELS<br>More than half of coarse fraction is larger than No. 4 sieve size.<br>(For visual classifications, the 1/4" size may be used as equivalent to the No. 4 sieve size.) | CLEAN GRAVELS<br>(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<br>(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<br>More than half of coarse fraction is smaller than No. 4 sieve size.<br>(For visual classifications, the 1/4" size may be used as equivalent to the No. 4 sieve size.) | CLEAN SANDS<br>(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<br>(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. |

| IDENTIFICATION PROCEDURES ON FRACTION SMALLER THAN No. 40 SIEVE SIZE | | DRY STRENGTH (CRUSHING CHARACTERISTICS) | DILATANCY (REACTION TO SHAKING) | TOUGHNESS (CONSISTENCY NEAR PLASTIC LIMIT) | GRAPH SYMBOL | LETTER SYMBOL [1] | TYPICAL DESCRIPTIONS |
|---|---|---|---|---|---|---|---|
| FINE GRAINED SOILS<br>More than half of material is smaller than No. 200 sieve size.<br>(The No. 200 sieve size is about the smallest particle visible to the naked eye) | SILTS AND CLAYS<br>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<br>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. |

[1] 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.
[2] 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 rore, 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) | TORVANE UNDRAINED SHEAR STRENGTH (tsf) | 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
- Thin Wall
- Standard Penetration Split Spoon Sampler
- No Recovery
- Rock Core
- 3-3/4" ID D&M Sampler
- 3" ID D&M Sampler
- Water Level
- 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 thichness |

## 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 6

GSH
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