REPORT
GEOTECHNICAL STUDY
PROPOSED ALLRED PIECE DEVELOPMENT
BETWEEN REDWOOD ROAD
AND THE JORDAN RIVER
NORTH OF COMMERCE DRIVE
SARATOGA SPRINGS, UTAH

Submitted To:

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Submitted By:

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Mr. Dave Martin
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Draper, Utah 84020

Mr. Martin:

Re: Report
Geotechnical Study
Proposed Allred Piece Development
Between Redwood Road and The Jordan River
North of Commerce Drive
Saratoga Springs, Utah

1. INTRODUCTION

1.1 GENERAL

This report presents the results of our geotechnical study performed at the site of the proposed Allred Piece Development located between Redwood Road and The Jordan River, north of Commerce Drive in Saratoga Springs, Utah. The general location of the site with respect to existing roadways, as of 2016, is presented on Figure 1, Vicinity Map. A more detailed layout of the current site, nearby features, potential development, and streets is presented on Figure 2, Site Plan. The locations of the borings drilled and test pits excavated 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. Dave Martin of DR Horton Homes and Mr. Alan Spilker of GSH Geotechnical, Inc. (GSH).

In general, the objectives of this study were to:

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

2. Provide general foundation, earthwork and pavement recommendations, and geoseismic information to be utilized in the design and construction of the proposed development.

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

1. A field program consisting of the drilling, logging, and sampling of 12 borings and 24 test pits.

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 returning a signed copy of our Professional Services Agreement No. 16-0126rev1 dated January 18, 2016.

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 and test pits, 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 site consists of about 292 total acres to be developed for multiple structure types, including retail office/shops along Redwood Road and at the southwest and northwest perimeters of the property. Additional construction will consist of multi-unit-level and single-family residential housing. The proposed structures will likely be 1 to 4 levels above grade with possible basements if conditions allow, constructed of concrete spread foundations with wood-or light steel-frame construction above.

Anticipated maximum column and wall loads will be on the order of 200 kips and 1 to 8 kips per lineal foot, respectively. Average uniform floor slab loads are anticipated to be on the order of 100 to 150 pounds per square foot.

Associated commercial and residential pavements are anticipated to be constructed primarily with asphalt concrete with some rigid (Portland cement concrete) pavements. Projected traffic in retail/office parking areas will likely consist of a light volume of automobiles and light trucks and occasional medium-weight trucks. In primary on-site roadway areas, projected traffic is anticipated to consist of a moderate volume of automobiles and light trucks and occasional to light volume of medium-weight truck traffic with occasional heavy-weight trucks.

It is anticipated that the residential streets will be constructed of asphalt pavement with relatively light projected traffic that includes primarily passenger vehicles, daily delivery trucks, daily school buses, and an occasional garbage truck/single-trailer semis.

Maximum site grading cuts and fills to achieve design grades are anticipated to be up to as much as about 6 feet. Larger cuts and fills may be required in isolated areas up to about 10 feet.

3. SITE INVESTIGATIONS

3.1 FIELD PROGRAM

In order to define and evaluate the subsurface soil and groundwater conditions at the proposed site, 12 borings were drilled to depths of 11.0 to 46.5 feet below existing grade using a truck-mounted drill rig equipped with hollow-stem augers. Further, 24 test pits were excavated to depths of 10 to 14 feet below existing grades. Locations of the borings are presented on Figure 2.

The field portion of our study was performed under the direct control and continual supervision of experienced members of our geotechnical staff. During the course of the drilling/excavation 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 observation and laboratory testing. Detailed graphical representation of the subsurface conditions encountered is presented on Figures 3A through 3L, Boring Logs and Figures 4A through 4X, Test Pit Logs. Soils were classified in accordance with the nomenclature described on Figure 5, Key to Boring Log (USCS) and Figure 6, Key to Test Pit Log (USCS).

A 3.25-inch outside diameter, 2.42-inch inside diameter drive sampler (Dames & Moore) and a 2.0-inch outside diameter, 1.38-inch inside diameter drive sampler (SPT) were 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. Additionally, a 2.42-inch inside diameter thin-wall hand sampler was utilized in the subsurface sampling within test pits at the site.

Following completion of drilling and excavation operations, 1.25-inch diameter slotted PVC pipe was installed in Borings B-1, B-2, B-3, B-4, B-5, and B-8 and in Test Pits TP-4, TP-13, and TP-23 in order to provide a means of monitoring the groundwater fluctuations.

The borings were backfilled with auger cuttings. Following completion of the test pit excavations each test pit was backfilled. Although an effort was made to compact the backfill with the backhoe bucket, backfill was not placed in uniform lifts and compacted to a specific density. Consequently, settlement of the backfill with time is likely to occur.

3.2 LABORATORY TESTING

3.2.1 General

In order to provide data necessary for our engineering analyses, a laboratory testing program was completed. The program included moisture, density, partial gradation, Atterberg limits, consolidation, and chemical 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 Figures 3A through 3L, Boring Logs, and Figures 4A through 4X, Test Pit Logs.

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/Test Pit No.	Depth (feet)	Percent Passing No. 200 Sieve	Moisture Content Percent	Soil Classification
B-1	25.5	14.2	27.2	SM
B-1	30.5	14.4	26.2	SM
B-1	40.5	10.3	12.6	GP-GM
B-5	9.5	21.5	10.9	GC
TP-6	10.0	24.6	7.0	GM
TP-14	8.0	5.1	18.3	SP-SM
TP-15	10.0	12.7	29.8	SM
TP-18	8.0	8.4	25.6	SP-SM

3.2.4 Atterberg Limits Tests

To aid in classifying the soils, an Atterberg limits test was performed on samples of the fine-grained cohesive soils. Results of the test are tabulated on the following page.

Boring No.	Depth (feet)	Liquid Limit (percent)	Plastic Limit (percent)	Plasticity Index (percent)	Soil Classification
B-2	25.5	47	17	30	CL
B-2	40.5	22	18	4	CL/ML
B-4	15.0	28	17	11	CL
B-7	5.0	38	17	21	CL

3.2.5 Consolidation Tests

To provide data necessary for our settlement analysis, a consolidation test was performed on each of 7 representative samples of the natural clay soils within the upper 15 feet. The results of the tests indicate that the samples tested were moderately over-consolidated and will exhibit moderate strength and compressibility characteristics under the anticipated loading range. Detailed results of the tests are maintained within our files and can be transmitted to you, upon your request.

3.2.6 Chemical Tests

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

Boring No.	Depth (feet)	Soil Classification	pH	Total Water Soluble Sulfate (mg/kg-dry)
B-2	2.5	CL	8.15	458
B-7	5.0	CL	7.9	169

4. SITE CONDITIONS

4.1 SURFACE

The site consists of roughly 292 acres of primarily agricultural land utilized for crop growing and pasture. A pond and residential home are located along the south-central portion of the property. Visible fill piles have been placed within the southwest quarter of the property. The land is subdivided by fences, ditches, and paved/unpaved roadways. A paved road (3600 West/400 East) bisects the property from north to south near the middle. Overall, the site slopes gently to the east with a total projected relief of about 106 feet. Localized grades may be steeper. The site is bordered by Redwood Road along the west. The Jordon River borders the property along the east and a portion of the south. Similar vacant agricultural property borders the site along the north, including some commercial buildings along the northwest corner. A residential development borders the site along the south.

4.2 SUBSURFACE SOIL

Subsurface soils were fairly consistent across the site. Some surficial non-engineered fill soils were encountered at Boring B-3 and Test Pits TP-2 and TP-13, ranging in thickness from 1.5 feet to as much as 11.0 feet at Test Pit TP-2. Below the fills and from the surface at the remaining borings/test pits, natural soils consisted primarily of silty and fine sandy clay soils with occasional intermittent sand and gravel layers starting at about 10 feet.

The upper 10 to 12 inches of soil are loose/disturbed from past agricultural activities with the top about 2 to 4 inches containing major roots/topsoil.

The natural clay soils were generally stiff/medium stiff grading soft in some areas below about 25 feet and were moist grading saturated, brown grading gray, and moderately over-consolidated within the upper 15 to 20 feet.

The sand and gravel layers encountered ranged from a couple of feet up to about 9 feet thick, were loose to dense, moist to saturated, and will exhibit relatively high strength and low compressibility characteristics under anticipated static loading.

For a more detailed description of subsurface conditions, please refer to Figures 3A through 3L, Boring Logs, and Figures 4A through 4X, Test Pit Logs. The lines designating the interface between soil types on the boring logs generally represent approximate boundaries. In-situ, the transition between soil types may be gradual.

4.3 GROUNDWATER

Groundwater was measured at the time of the drilling and excavation and subsequent measurement within installed monitoring pipes on February 23, 2016. Surface ponding from recent snowmelt was observed in many locations on February 23, 2016 and has likely influenced static readings in some cases. It is recommended that further measurements be taken at a later date. Groundwater measurements are tabulated below:

Boring No.	Groundwater Depth (feet)	
	At Time of Drilling *	February 23, 2016**
B-1	11.0	12.0
B-2	6.5	6.5
B-3	5.5	2.1**
B-4	14.0	0.1**
B-5	Not measured	3.5**

Boring No.	Groundwater Depth (feet)	
	At Time of Drilling *	February 23, 2016**
B-6	No groundwater encountered to Full depth, 11.0 feet	No pipe installed
B-7	No groundwater encountered to Full depth, 11.0 feet	No pipe installed
B-8	No groundwater encountered to Full depth, 21.0 feet	No groundwater encountered to piped depth, 20.0 feet
B-9	No groundwater encountered to Full depth, 11.0 feet	No pipe installed
B-10	No groundwater encountered to Full depth, 11.0 feet	No pipe installed
B-11	No groundwater encountered to Full depth, 11.0 feet	No pipe installed
B-12	No groundwater encountered to Full depth, 11.0 feet	No pipe installed

* During drilling; not stabilized.
** Surface ponding from snowmelt in area of the pipe noted during monitoring period.

Test Pit No.	Groundwater Depth (feet)	
	At Time of Excavation *	February 23, 2016**
TP-1	No groundwater encountered to Full depth, 10.0 feet	No pipe installed
TP-2	No groundwater encountered to Full depth, 12.0 feet	No pipe installed
TP-3	No groundwater encountered to Full depth, 10.0 feet	No pipe installed
TP-4	14.0	3.9**
TP-5	No groundwater encountered to Full depth, 10.5 feet	No pipe installed
TP-6	No groundwater encountered to Full depth, 10.5 feet	No pipe installed
TP-7	No groundwater encountered to Full depth, 12.5 feet	No pipe installed
TP-8	No groundwater encountered to Full depth, 12.5 feet	No pipe installed
TP-9	No groundwater encountered to Full depth, 10.0 feet	No pipe installed
TP-10	No groundwater encountered to Full depth, 10.5 feet	No pipe installed

Test Pit No.	Groundwater Depth (feet)	
	At Time of Excavation *	February 23, 2016**
TP-11	No groundwater encountered to Full depth, 10.5 feet	No pipe installed
TP-12	No groundwater encountered to Full depth, 11.0 feet	No pipe installed
TP-13	8.0	7.7
TP-14	7.0	No pipe installed
TP-15	7.0	No pipe installed
TP-16	9.0	No pipe installed
TP-17	7.5	No pipe installed
TP-18	7.5	No pipe installed
TP-19	4.5	No pipe installed
TP-20	No groundwater encountered to Full depth, 10.0 feet	No pipe installed
TP-21	No groundwater encountered to Full depth, 10.0 feet	No pipe installed
TP-22	No groundwater encountered to Full depth, 10.0 feet	No pipe installed
TP-23	4.5	0.6**
TP-24	4.0	No pipe installed

* During drilling; not stabilized.
** Surface ponding from snowmelt in area of the pipe noted during monitoring period.

Seasonal and longer-term groundwater fluctuations on the order of 1 to 2.5 feet are projected, with the highest seasonal levels generally occurring during the late spring and early summer months.

Further, seasonal irrigation is likely to affect the water level in localized areas.

5. DISCUSSIONS AND RECOMMENDATIONS

5.1 SUMMARY OF FINDINGS

The results of our study show that the proposed structures may be supported upon conventional spread and continuous wall foundations placed on suitable natural soils or structural fill extending to suitable natural soils. More heavily loaded footings will require some granular structural replacement fill to control settlement.

The most significant geotechnical aspects of the site are:

1. The existing, non-engineered fills, which extended to depths of about 1.5 to 11.0 feet below the surface at some of the boring and test pit locations, as well as loose fill piles across the site;
2. The upper about 10 to 12 inches of loose/disturbed soils across the site from agricultural activities;
3. The relatively high groundwater levels measured in some areas along the north perimeter and particularly at about the east one-third of the site; and
4. Two layers of loose, saturated sand soils encountered in Boring B-1 at depths of about 29 feet and 44 feet could liquefy during the design seismic event.

All non-engineered fills, loose/disturbed soils must be removed below all buildings and rigid pavements. The in-situ, non-engineered fills may remain below flexible pavements if free of any deleterious materials, of limited thickness, and if properly prepared, as discussed later in this report. Loose fill piles across the surface must be completely removed.

On February 23, 2016, groundwater was measured within installed pipes up to just below the surface. At many of these locations, surface water ponding from recent snowmelt was present, which likely influenced these readings. However, shallow groundwater was visibly encountered within test pits at depths of 4.0 to 8.0 feet below the surface which were located within the eastern third of the property where the surface elevation is the lowest, as well as being near the Jordan River. The shallow groundwater encountered at the site will likely affect the installation of some utilities and possible sublevel construction if considered.

It is recommended that the top of the lowest habitable slabs be kept a minimum of 3.5 feet above the measured groundwater level. If a land drain is constructed within the development, the top of slabs within the lowest habitable level are recommended to be 1.5 feet above the level controlled by subdrains tied into land drains within the development.

Two layers of loose, saturated sand soils were encountered at about 29.0 and 44.0 feet at Boring B-1. Our analysis shows that layers of these saturated sand soils could liquefy during the design seismic event (see Section 5.10.5, Liquefaction). The cumulative potential settlement due to liquefaction is anticipated to be about 1.5 inches. This magnitude of settlement can typically be tolerated by an adequately designed structure to protect life safety. With the relatively thick layer of clay above the potentially liquefiable soils, associated settlements at shallow foundation level are anticipated to be significantly less. Additionally, surface rupture and lateral spreading are not anticipated to occur.

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

5.2 DESIGN GROUNDWATER

Shallow static groundwater was measured following drilling/excavation along the north perimeter, as well as within the eastern portion of the site property. As a result, further measures may be required to control groundwater levels within the development, such as the construction of a land drain system in these areas if sublevels/basements are planned. Floor slabs must be maintained a minimum 1.5 feet above the water level controlled by a land drain and perimeter foundation drains installed. Recommendations for perimeter foundation drains may be provided, upon request.

If a land drain is not constructed within the development, then habitable sublevel/basement floor slabs embedment should be kept a minimum of 4.0 feet above measured static groundwater levels indicated above in Section 4.3, Groundwater. Further if sublevels are planned, particularly within the eastern portion of the site and along the north-central portion of the site, it is recommended that further monitoring of the groundwater level be completed to determine floor slab elevation with respect to groundwater.

5.3 EARTHWORK

5.3.1 Site Preparation

Initial site preparation will consist of the removal of surface vegetation, topsoil, loose surficial fill piles, loose disturbed soils, and any other deleterious materials from beneath an area extending out at least 4 feet from the perimeter of the proposed buildings and 2 feet beyond pavements and exterior flatwork areas. Vegetation and other deleterious materials should be removed from the site. Topsoil, although unsuitable for utilization as structural fill, may be stockpiled for subsequent landscaping purposes.

All non-engineered fills must be removed below buildings extending out 4 feet and below rigid pavements extending out 2 feet. In-situ, non-engineered fills may remain below flexible pavements if free of debris and deleterious materials, less than 3 feet in thickness, and if properly prepared. Proper preparation below pavements will consist of the scarification of the upper 12 inches followed by moisture preparation and re-compaction to the requirements of structural fill.

It must be noted that from a handling and compaction standpoint, on-site soils containing high amounts of fines (silts and clays) are inherently more difficult to rework and are very sensitive to changes in moisture content, requiring very close moisture control during placement and compaction. This will be very difficult, if not impossible, during wet and cold periods of the year. Additionally, the on-site soils are likely above optimum moisture content for compacting at present and would require some drying prior to recompacting. As an alternative, the fills may be removed and replaced with imported granular structural fill over unfrozen, proof rolled subgrade.

Subgrade preparation as described must be completed prior to placing overlying structural site grading fills. Even with proper preparation, pavements/slabs established overlying non-engineered fills may encounter some long-term movements unless the non-engineered fills are completely removed. Installing reinforcement in slabs over fills may help reduce potential displacement cracking.

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

A representative of GSH must verify that suitable natural soils and/or proper preparation of existing fills have been encountered/met prior to placing site grading fills, footings, slabs, and pavements.

5.3.2 Temporary Excavations

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

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

To reduce disturbance of the natural soils during excavation, it is recommended that smooth edge buckets/blades be utilized.

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

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

On-site soils may be re-utilized as structural site grading fill if they do not contain deleterious material and meet the requirements of structural fill. However, utilizing the native clay soils as structural site grading fill will require significant care and preparation to assure appropriate moisture levels during placement and compaction. This may be extremely difficult, especially during periods of precipitation or during colder periods of the year.

Only granular soils are recommended in confined areas, such as utility trenches, below footings, etc. Generally, we recommend that all imported granular structural fill consist of a well graded mixture of sands and gravels with no more than 20 percent fines (material passing the No. 200 sieve) and no more than 30 percent retained on the three-quarter-inch sieve.

To stabilize soft subgrade conditions (if encountered) or where structural fill is required to be placed closer than 1.0 foot above the water table at the time of construction, a mixture of coarse angular gravels and cobbles and/or 1.5- to 2.0-inch gravel (stabilizing fill) should be utilized. It may also help to utilize a stabilization fabric, such as Mirafi 600X or equivalent, placed on the native ground if 1.5- to 2.0-inch gravel is used as stabilizing fill.

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.

5.3.4 Fill Placement and Compaction

All structural fill shall be placed in lifts not exceeding 8 inches in loose thickness. Structural fills shall be compacted in accordance with the percent of the maximum dry density as determined by the ASTM[1] D-1557(AASHTO[2] T-180) compaction criteria in accordance with the table on the following page.

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

Location	Total Fill Thickness (feet)	Minimum Percentage of Maximum Dry Density
Beneath an area extending at least 4 feet beyond the perimeter of the structure	0 to 8	95
Site grading fills outside area defined above	0 to 5	90
Site grading fills outside area defined above	5 to 8	95
Utility trenches within structural areas	--	96
Road base	-	96

Structural fills greater than 8 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 5.3.1, Site Preparation, of this report. In confined areas, subgrade preparation should consist of the removal of all loose or disturbed soils.

Coarse angular gravel and cobble mixtures (stabilizing fill), if utilized, shall be end-dumped, spread to a maximum loose lift thickness of 15 inches, and compacted by dropping a backhoe bucket onto the surface continuously at least twice. As an alternative, the stabilizing fill may be compacted by passing moderately heavy construction equipment or large self-propelled compaction equipment at least twice. Subsequent fill material placed over the coarse gravels and cobbles shall be adequately compacted so that the "fines" are "worked into" the voids in the underlying coarser gravels and cobbles.

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.

5.3.5 Utility Trenches

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

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 (ASTMD-1557) method of compaction. GSH recommends that as the major utilities continue onto the site that these compaction specifications are followed.

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

Dewatering of utility trenches may be required, depending on location and depths.

5.4 SPREAD AND CONTINUOUS WALL FOUNDATIONS

5.4.1 Design Data

The proposed structures may be supported upon conventional spread and continuous wall foundations established upon suitable natural soils and/or structural fill extending to suitable natural soils. In order to control total and differential settlements, heavily loaded footings must be underlain by some thickness of granular structural fill. For minimum thickness of replacement fill below footings, please see Section 5.4.3, Settlements below. For design, with respect to the proposed construction and anticipated loading given in Section 2.0, Proposed Construction, the following parameters are recommended:

Minimum Depth of Embedment for Frost Protection	- 30 inches
Minimum Depth of Embedment for Non-frost Conditions	- 15 inches
Minimum Width for Continuous Wall Footings	- 18 inches
Minimum Width for Isolated Spread Footings	- 24 inches
Recommended Net Bearing Pressure for Real Load Conditions For footings on suitable natural clay soils	- 2,500 pounds* per square foot
Bearing Pressure Increase for Seismic Loading	- 50 percent

* More heavily loaded footing must be underlain with some granular replacement structural fill to control settlements. See Section 5.4.3, Settlements below for specifics.

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.

5.4.2 Installation

Under no circumstances shall the footings be established upon non-engineered fills, loose/disturbed soils, topsoil, 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.

The width of structural fill, where placed below footings, should extend laterally at least 6 inches beyond the edges of the footings in all directions for each foot of fill thickness beneath the footings. For example, if the width of the footing is 2 feet and the thickness of the structural fill beneath the footing is 2 feet, the width of the structural fill at the base of the footing excavation would be a total of 4 feet, centered below the footing.

To minimize soils disturbance, a flat-blade excavator is recommended for footing excavations.

5.4.3 Settlements

Settlements of foundations designed and installed in accordance with the above criteria and recommendations supporting the loads, as discussed in Section 2, Proposed Construction, can be controlled to within one inch or less if heavily loaded footings are underlain by some thickness of granular structural fill per the table below.

Approximately 40 percent of the quoted settlement should occur during construction.

Foundations	Loading	Minimum Thickness of Replacement Granular Structural Fill (feet)
Spread	Up to 150 kip	0.0
Spread	150+ to 200 kips	1.0
Wall	Up to 8 kips per lineal foot	0.0

5.5 LATERAL RESISTANCE

Lateral loads imposed upon foundations due to wind or seismic forces may be resisted by the development of passive earth pressures and friction between the base of the footings and the supporting soils. In determining frictional resistance, a coefficient of 0.30 should be utilized for natural soils and 0.40 for granular structural fill. Passive resistance provided by properly placed

and compacted granular structural fill above the water table may be considered equivalent to a fluid with a density of 300 pounds per cubic foot.

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

5.6 LATERAL PRESSURES

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

The lateral pressures imposed upon subgrade facilities will, therefore, be basically dependent upon the relative rigidity and movement of the backfilled structure. For active walls, such as retaining walls which can move outward (away from the backfill), soil backfill may be considered equivalent to a fluid with a density of 45 pounds per cubic foot in computing lateral pressures. For more rigid basement walls that are not more than 10 inches thick, clean backfill may be considered equivalent to a fluid with a density of 55 pounds per cubic foot. For very rigid non-yielding walls, backfill should be considered equivalent to a fluid with a density with at least 65 pounds per cubic foot. The above values assume that the surface of the soils slope behind the wall is horizontal and that the backfill within 3 feet of the wall will be compacted with hand-operated compacting equipment.

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

Uniform Lateral Pressures			
Wall Height (Feet)	**Active Pressure Case (psf)**	**Moderately Yielding Case (psf)**	**At Rest/Non-Yielding Case (psf)**
4	25	50	75
6	35	75	110
8	45	100	150

5.7 FLOOR SLABS

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

In order to facilitate curing of the concrete, it is recommended that floor slabs be directly underlain by at least 4 inches of “free-draining” fill, such as “pea” gravel or three-quarters to one-inch minus clean gap-graded gravel.

GSH recommends that habitable floor slabs must be maintained a minimum 4.0 feet above measured groundwater and 1.5 feet above groundwater controlled by land drains.

5.8 PAVEMENTS

The existing fine-grained soils across the site will exhibit relatively poor pavement support characteristics when saturated or nearly saturated. All pavement areas must be prepared as previously discussed (see Section 5.3.1, Site Preparation). With the subgrade soils and the projected traffic, as discussed in Section 2, Proposed Construction, the pavement sections below are recommended. In commercial areas with tight maneuvering heavy vehicles, rigid pavements are recommended. For design with respect to the predominately silty and fine sandy clay soils, an estimated California Bearing Ratio (CBR) of 4 percent was utilized.

Retail/Commercial Parking Areas

(Light to moderate Volume of Automobiles and Light Trucks,
Occasional to Light Volume of Medium-Weight Trucks,
No Heavy-Weight Trucks)
[1-3 equivalent 18-kip axle loads per day]

Flexible:

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

Rigid:

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

Retail/Commercial Primary Drive Lanes/Delivery Areas
(Moderate Volume of Automobiles and Light Trucks,
Occasional to Light Volume of Medium-Weight Trucks,
and Occasional Heavy-Weight Trucks)
[up to 12 equivalent 18-kip axle loads per day]

Flexible:

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

Rigid:

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

Minor Streets/Cul-de-Sac Traffic
(Light to Moderate Volume of Automobiles and Light Trucks,
Light Volume of Medium-Weight Trucks,
and occasional Heavy-Weight Trucks)
[6-10 equivalent 18-kip axle loads per day]

Flexible Pavement:

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

Or

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

* Aggregate subbase shall consist of a granular soil with a minimum CBR of 30 percent.

For dumpster pads, we recommend a pavement section consisting of 6.5 inches of Portland cement concrete, 4.0 inches of aggregate base, over properly prepared suitable natural subgrade or site grading structural fills extending to suitable natural soils. Dumpster pads shall not be constructed overlying non-engineered fills unless heavily reinforced.

These above rigid pavement sections are for non-reinforced Portland cement concrete. Concrete should be designed in accordance with the American Concrete Institute (ACI) and joint details should conform to the Portland Cement Association (PCA) guidelines. The concrete should have a minimum 28-day unconfined compressive strength of 4,000 pounds per square inch and contain 6 percent ±1 percent air-entrainment.

Road base shall meet UDOT requirements.

5.9 CEMENT TYPES

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

5.10 GEOSEISMIC SETTING

5.10.1 General

Utah municipalities have adopted the International Building Code (IBC) 2012. The IBC 2012 code determines the seismic hazard for a site based upon 2008 mapping of bedrock accelerations prepared by the United States Geologic Survey (USGS) and the soil site class. The USGS values are presented on maps incorporated into the IBC code and are also available based on latitude and longitude coordinates (grid points).

5.10.2 Faulting

Based upon our review of available literature, no active faults are known to pass through the site. The site is located about 2.8 miles north of the Mapped West Utah Lake fault trace.

5.10.3 Soil Class

Two layers of loose, saturated sand soils were encountered at about 29.0 and 44.0 feet at Boring B-1. Our analysis shows that layers of these saturated sand soils could liquefy during the design seismic event (see Section 5.10.5, Liquefaction). According to the IBC 2012, which references ASCE-7-10, Chapter 20, "Soils vulnerable to potential failure or collapse under seismic loading such as liquefiable soils..." are designated under site Class F. The potential settlements due to liquefaction are anticipated to be about 1.5 inches combined. This magnitude of settlement can typically be tolerated by an adequately designed structure to protect life safety. With the relatively thick layer of clay above the potentially liquefiable soils, associated settlements at shallow foundation level are anticipated to be significantly less. Additionally, surface rupture and lateral spreading are not anticipated to occur. Therefore, we recommend for dynamic structural analysis, the Site Class D – Stiff Soil Profile, as defined in Chapter 20 of ASCE 7 (per Section 1613.3.2, Site Class Definitions, of IBC 2012) can be utilized.

5.10.4 Ground Motions

The IBC 2012 code is based on 2008 USGS mapping, which provides values of short and long period accelerations for the Site Class B boundary for the Maximum Considered Earthquake (MCE). This Site Class B boundary represents average bedrock values for the Western United States and must be corrected for local soil conditions. The following table summarizes the peak ground and short and long period accelerations for the MCE event and incorporates the appropriate soil amplification factor for a Site Class D soil profile. Based on the site latitude and longitude (40.39667 degrees north and 111.90682 degrees west, respectively), the values for this site are tabulated below:

Spectral Acceleration Value, T	Site Class B Boundary [mapped values] (% g)	Site Coefficient	Site Class D [adjusted for site class effects] (% g)	Design Values (% g)
Peak Ground Acceleration	41.1	F_a = 1.089	44.8	29.9
0.2 Seconds (Short Period Acceleration)	S_S = 102.8	F_a = 1.089	S_{MS} = 111.9	S_{DS} = 74.6
1.0 Second (Long Period Acceleration)	S_1 = 34.7	F_v = 1.706	S_{M1} = 59.2	S_{D1} = 39.5

5.10.5 Liquefaction

Based on mapping provided by the Utah Earthquake Preparedness Information Center Utah Division of Comprehensive Emergency Management for Utah County, the site property lies within a portion of a "low to moderate" liquefaction zone at the west end of the property and within a "high" liquefaction zone within the east portion. Liquefaction is defined as the condition when saturated, loose, granular soils lose their support capabilities because of excessive pore water pressure, which develops during a seismic event. Clayey soils, even if saturated, will generally not liquefy during a major seismic event.

Five borings were completed across the site (Boring B-1 through B-5) to depths of 41.0 to 46.5 feet below the ground surface in order to help define the liquefaction potential. Calculations were performed using the procedures described in the 2008 Soil Liquefaction During Earthquakes Monograph by Idriss and Boulanger[3] and the 2014 Soil Liquefaction During Earthquakes Monograph by Idriss and Boulanger Boulanger[4]. Our calculations indicate that the loose, saturated sand soils encountered between about 29.0 and 33.0 feet and 44.0 to 46.0 feet at Boring B-1 could liquefy during the design seismic event. Combined calculated settlement associated with these liquefiable zones was on the order of about 1.5 inches. This magnitude of settlement should be tolerable to design for life safety. Calculated settlements are measured at the top of these layers (about 29 feet and 44 feet below the ground surface). We anticipated that associated settlements near the surface would be smaller due to bridging of the upper clay soil sequence. Additionally, lateral spread and ground rupture are unlikely to occur.

5.11 SITE VISITS

GSH must verify that all topsoil/disturbed soil, non-engineered fills, and any other unsuitable soils have been removed, that non-engineered fills have been removed and/or properly prepared, and that suitable soils have been encountered prior to placing site grading fills, footings, slabs, and pavements.

[3] Idriss, I. M., and Boulanger, R. W. (2008), Soil liquefaction during earthquakes: Monograph MNO-12, Earthquake Engineering Research Institute, Oakland, CA, 261 pp.

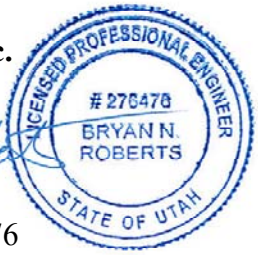
[4] Boulanger, R. W. and Idriss, I. M. (2014), "CPT and SPT Based Liquefaction Triggering Procedures." Report No. UCD/CGM-14/01, Center for Geotechnical Modeling, Department of Civil and Environmental Engineering, University of California, Davis, CA, 134 p.

5.12 CLOSURE

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

Respectfully submitted,

GSH Geotechnical, Inc.



Bryan N. Roberts, P.E.
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President/Senior Geotechnical Engineer

BNR/ADS:jlh

Encl. Figure 1, Vicinity Map
Figure 2, Site Plan
Figures 3A through 3L, Boring Log
Figures 4A through 4X, Test Pit Logs
Figure 5, Key to Boring Log (USCS)
Figure 6, Key to Test Pit Log (USCS)

Addressee (email)

DR HORTON HOMES
JOB NO. 0997-002-16

2 0 2 4 6 8 KM 10

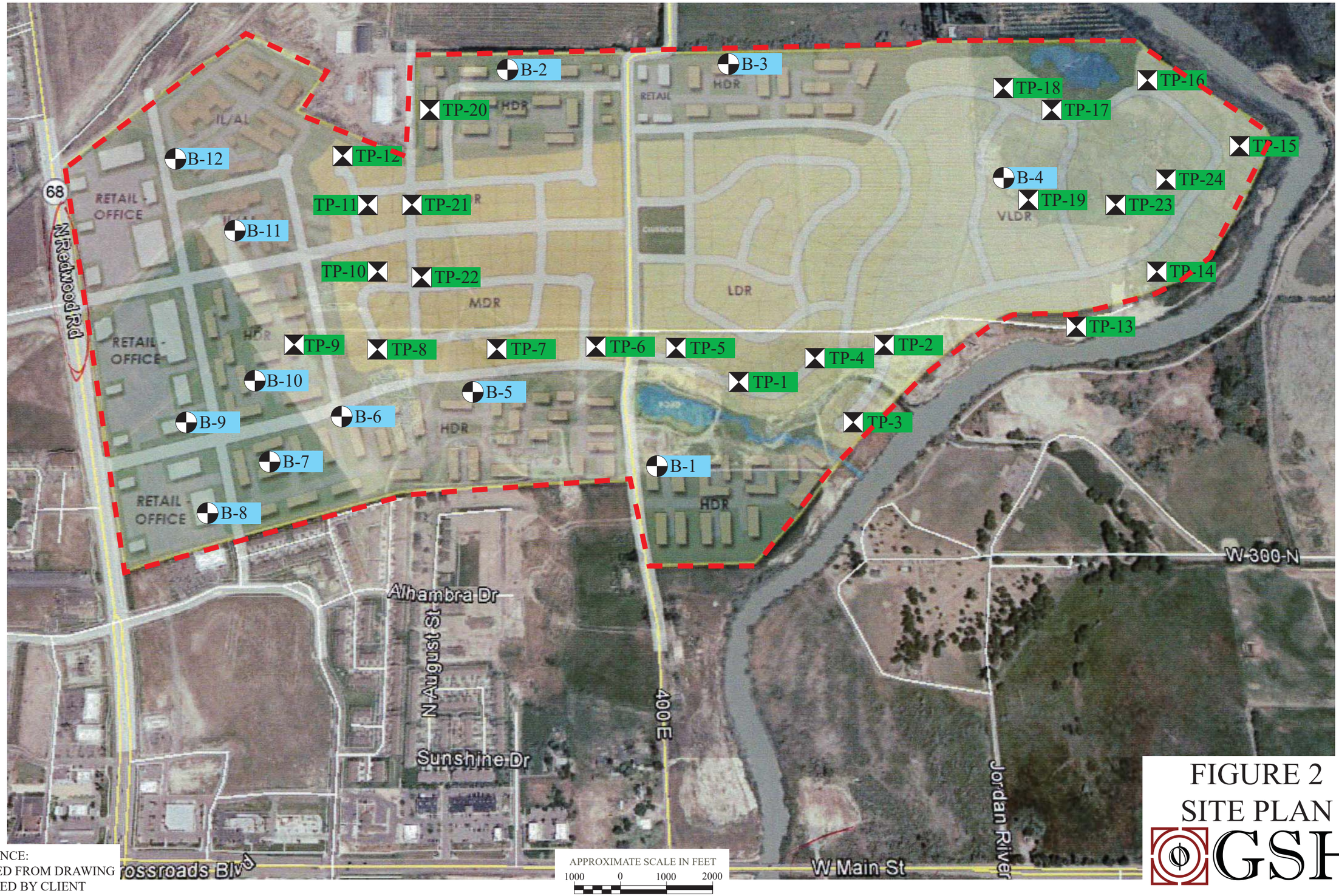
2 0 2 MI 4

FIGURE 1
VICINITY MAP

REFERENCE:
ALL TRAILS - NATIONAL GEOGRAPHIC TERRAIN
DATED 2016

GSH

DR HORTON HOMES
JOB NO. 0997-002-16



APPROXIMATE SCALE IN FEET
1000 0 1000 2000

REFERENCE:
ADAPTED FROM DRAWING
PROVIDED BY CLIENT

FIGURE 2
SITE PLAN

GSH

BORING LOG

Page: 1 of 2

BORING: B-1

CLIENT: DR Horton Homes - Salt Lake City Division | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/1/16 | DATE FINISHED: 2/1/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: RG

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

GROUNDWATER DEPTH: 12' (2/23/16) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL	SILTY CLAY with some fine sand; major roots (topsoil) to 2"; blocky structure; brown with mottling									moist loose
				52		12.0	100				hard
			5								
				34		13.6	104				very stiff
		grades with oxidation mottling	10	35		20.3	98				very moist very stiff saturated
▼											
			15	21		27.5	89				
			20	86							
		grades with occasional layers up to 1" thick of silty fine sand									
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3A

BORING LOG

Page: 2 of 2

BORING: B-1

CLIENT: DR Horton Homes - Salt Lake City Division | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/1/16 | DATE FINISHED: 2/1/16

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
			25								
	SM	SILTY FINE SAND brown		22		27.2		14.2			saturated medium dense
			30	10		26.2		14.4			
	CL	SILTY CLAY with some fine sand; light brown	35	5							saturated medium stiff
	GP/GM	FINE AND COARSE GRAVEL with fine to coarse sand and some silt; brown	40	50		12.6		10.3			saturated very dense
			45	12							medium dense
		End of Exploration at 46.5'. Installed 1.25" diameter slotted PVC pipe to 20.0'.	50								

See Subsurface Conditions section in the report for additional information.

FIGURE 3A
(continued)

BORING LOG

Page: 1 of 2

BORING: B-2

CLIENT: DR Horton Homes - Salt Lake City Division | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/1/16 | DATE FINISHED: 2/1/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: RG

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

GROUNDWATER DEPTH: 6.5' (2/23/16) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL	SILTY CLAY with some fine sand; major roots (topsoil) to 4"; blocky structure; brown									loose/disturbed to 6" moist
				7							very moist medium stiff
		grades with oxidation	5	10		18.1	100				stiff
▼											saturated
		grades with oxidation mottling	10	14		29.0	94				
		light oxidation	15	18		29.4	93				
			20	28		20.4	97				very stiff
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3B

BORING LOG

Page: 2 of 2

BORING: B-2

CLIENT: DR Horton Homes - Salt Lake City Division | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/1/16 | DATE FINISHED: 2/1/16

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
			25								
		grades gray		6					47	30	medium stiff
		grades with trace fine sand	30	5							
		grades dark gray	35	push							soft
	CL/ ML	SILTY CLAY/CLAYEY SILT with some thin silty clay layers; gray	40	2					22	4	saturated soft
			45	2							
		End of Exploration at 46.5'. Installed 1.25" diameter slotted PVC pipe to 20.0'.	50								

See Subsurface Conditions section in the report for additional information.

FIGURE 3B
(continued)

BORING LOG

Page: 1 of 2

BORING: B-3

CLIENT: DR Horton Homes - Salt Lake City Division | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/1/16 | DATE FINISHED: 2/1/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: RG

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

GROUNDWATER DEPTH: 2.1' (2/23/16) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	GC FILL	CLAYEY FINE AND COARSE GRAVEL, FILL with fine to coarse sand; brown									moist medium dense
▼	CL	SILTY CLAY with some fine sand; brown		9		22.6	100				moist stiff
			5	5							very moist saturated medium stiff
		grades with blocky structure and oxidation	10	9							stiff
		grades with oxidation mottling	15	13		30.9	92				
			20	17							
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3C

GSH

BORING LOG

Page: 2 of 2

BORING: B-3

CLIENT: DR Horton Homes - Salt Lake City Division | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/1/16 | DATE FINISHED: 2/1/16

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
			25								
				19							very stiff
		grades gray	30	12							stiff
			35	7							medium stiff
			40	7							
			45	2							soft
		End of Exploration at 46.5'. Installed 1.25" diameter slotted PVC pipe to 20.0'.	50								

See Subsurface Conditions section in the report for additional information.

FIGURE 3C
(continued)

BORING LOG

Page: 1 of 2

BORING: B-4

CLIENT: DR Horton Homes - Salt Lake City Division | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/3/16 | DATE FINISHED: 2/3/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: ZM

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

GROUNDWATER DEPTH: 0.1' (2/23/16) (surface runoff) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
▼		**Ground Surface**	0								
	CL	SILTY CLAY with some fine sand; brown									moist
				7							very moist medium stiff
		grades with oxidation									
			5	14							stiff
		oxidation grades out									
		imbedded silty fine sandy layers									
			10	16		32.6	88				
											saturated medium stiff
		silty fine sand layers grade out	15	9					28	11	
		grades gray	20	8		31.5	90				
		grades dark gray	25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3D

BORING LOG

Page: 2 of 2

BORING: B-4

CLIENT: DR Horton Homes - Salt Lake City Division | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/3/16 | DATE FINISHED: 2/3/16

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
			25								
			30	2							soft
			35	5							medium stiff
			40	2							soft
			45	2							
		End of Exploration at 46.0'. Installed 1.25” diameter slotted PVC pipe to 46.0’.	50								

See Subsurface Conditions section in the report for additional information.

FIGURE 3D
(continued)

BORING LOG

Page: 1 of 2

BORING: B-5

CLIENT: DR Horton Homes - Salt Lake City Division | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/4/16 | DATE FINISHED: 2/4/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: AA

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

GROUNDWATER DEPTH: 3.5' (2/23/16) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL	SILTY CLAY with trace fine to coarse sand; major roots (topsoil) to 3"; brown									slightly moist stiff
▽				47		10.2	92				
		grades slightly blocky; light brown									very stiff
			5	42		12.2	84				
		grades fine to medium sandy clay with some fine gravel									
		grades no gravel with clayey sand layers up to 1/2" thick									
	GC	CLAYEY FINE AND COARSE GRAVEL brown	10	37		10.9		21.5			dense moist
			15	32							
	CL	FINE TO COARSE SANDY CLAY with trace gravel; brown									moist dense
			20	42							hard
		grades with trace fine sand									
			25	22							

See Subsurface Conditions section in the report for additional information.

FIGURE 3E

GSH

BORING LOG

Page: 2 of 2

BORING: B-5

CLIENT: DR Horton Homes - Salt Lake City Division | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/4/16 | DATE FINISHED: 2/4/16

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
			25	22							very stiff
		grades with trace coarse sand; light reddish-brown	30	45							moist
			35	45							
		grades with trace fine and coarse gravel									
	GC	CLAYEY FINE AND COARSE GRAVEL with some fine to coarse sand; gray/light brown	40	60+							moist very dense
		End of Exploration at 41.0'. No groundwater encountered at time of drilling. Installed 1.25" diameter slotted PVC pipe to 41.0'.	45								
			50								

See Subsurface Conditions section in the report for additional information.

FIGURE 3E
(continued)

BORING LOG

Page: 1 of 1

BORING: B-6

CLIENT: DR Horton Homes - Salt Lake City Division | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/5/16 | DATE FINISHED: 2/5/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: AA

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

GROUNDWATER DEPTH: Not Encountered (2/5/16) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL	SILTY CLAY with trace fine to coarse sand; major roots (topsoil) to 3"; brown									dry very stiff
				44							
		grades slightly blocky and trace rootholes; light brown									
			5	47							
		grades with oxidation									
			10	34							
		End of Exploration at 11.0'. No groundwater encountered at time of drilling.									
			15								
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3F

BORING LOG

Page: 1 of 1

BORING: B-7

CLIENT: DR Horton Homes - Salt Lake City Division | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/5/16 | DATE FINISHED: 2/5/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: AA

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

GROUNDWATER DEPTH: Not Encountered (2/5/16) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL	SILTY CLAY with trace fine to coarse sand; light brown									slightly moist very stiff
				18							
		grades brown	5	25					38	21	
			10	16							stiff/very stiff
		End of Exploration at 11.0'. No groundwater encountered at time of drilling.	15								
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3G

BORING LOG

Page: 1 of 1

BORING: B-8

CLIENT: DR Horton Homes - Salt Lake City Division | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/5/16 | DATE FINISHED: 2/5/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: AA

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

GROUNDWATER DEPTH: >20.0' (2/23/16) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL	SILTY CLAY with trace fine to coarse sand and trace rootholes; brown		46							slightly moist very stiff
			5	34		20.2	97				moist
			10	28		20.3	97				
			15	24		26.6	96				
		grades with trace fine sand; gray	20	14							medium stiff
		End of Exploration at 21.0'. No groundwater encountered at time of drilling. Installed 1.25" diameter slotted PVC pipe to 21.0'.	25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3H

BORING LOG

Page: 1 of 1

BORING: B-9

CLIENT: DR Horton Homes - Salt Lake City Division | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/5/16 | DATE FINISHED: 2/5/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: AA

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

GROUNDWATER DEPTH: Not Encountered (2/5/16) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL	SILTY CLAY with trace fine to coarse sand; brown									moist very stiff
				23		18.9	91				
			5	19							slightly moist
			10	28							
		End of Exploration at 11.0'. No groundwater encountered at time of drilling.	15								
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3I

GSH

BORING LOG

Page: 1 of 1

BORING: B-10

CLIENT: DR Horton Homes - Salt Lake City Division | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/9/16 | DATE FINISHED: 2/9/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: HRW

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

GROUNDWATER DEPTH: Not Encountered (2/9/16) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL	SILTY CLAY with some fine sand; major roots (topsoil) to 3"; possible pinholes; brown									slightly moist very stiff
				39		10.4	86				
			5	58		11.1	102				
		pinholes grade out									
		grades blocky	10	23							moist
		End of Exploration at 11.0'. No groundwater encountered at time of drilling.									
			15								
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3J

BORING LOG

Page: 1 of 1

BORING: B-11

CLIENT: DR Horton Homes - Salt Lake City Division | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/9/16 | DATE FINISHED: 2/9/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: HRW

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

GROUNDWATER DEPTH: Not Encountered (2/9/16) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL	SILTY CLAY with some fine sand; major roots (topsoil) to 3"; slightly blocky; possible pinholes; brown									slightly moist very stiff
				41	X						
		clays grade blocky									
			5	26	X						
	SM/ ML	SILTY FINE SAND/FINE SANDY SILT brown									moist medium dense
			10	29	X						
		End of Exploration at 11.0'. No groundwater encountered at time of drilling.									
			15								
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3K

BORING LOG

Page: 1 of 1

BORING: B-12

CLIENT: DR Horton Homes - Salt Lake City Division | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/9/16 | DATE FINISHED: 2/9/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: HRW

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

GROUNDWATER DEPTH: Not Encountered (2/9/16) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL	SILTY CLAY with some fine sand; major roots (topsoil) to 3"; possible rootholes; brown									slightly moist very stiff
				43							
		grades with increasing sand and less pinholes	5	20							stiff slightly moist
	SM	SILTY FINE SAND brown									medium dense
	SP/SM	FINE SAND with some silt; brown									slightly moist medium dense
			10	39							
		End of Exploration at 11.0'. No groundwater encountered at time of drilling.									
			15								
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3L

TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-1

CLIENT: DR Horton Homes - Salt Lake City Division | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/2/16 | DATE FINISHED: 2/2/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: AA

EXCAVATING METHOD/EQUIPMENT: JCB 214S - Backhoe

GROUNDWATER DEPTH: Not Encountered (2/2/16) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
	CL	SILTY CLAY with trace fine sand; trace roots/rootholes; gray								slightly moist soft
		grades with oxidation								
			5		31.3	76				soft/medium stiff
										moist
		End of Exploration at 10.0' No significant sidewall caving. No groundwater encountered at time of excavation.	10							
			15							
			20							
			25							

See Subsurface Conditions section in the report for additional information.

FIGURE 4A

TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-2

CLIENT: DR Horton Homes - Salt Lake City Division | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/2/16 | DATE FINISHED: 2/2/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: AA

EXCAVATING METHOD/EQUIPMENT: JCB 214S - Backhoe

GROUNDWATER DEPTH: Not Encountered (2/2/16) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
	CL FILL	SILTY CLAY, FILL with some fine to coarse sand and fine and coarse gravel; brown								slightly moist medium stiff
		grades with hay wrap/twine; brown/black	5							
		cement								
		tires; black/brown	10							
	CL	SILTY CLAY with trace fine sand and some organics/roots; gray								moist medium stiff
		End of Exploration at 13.0' No significant sidewall caving. No groundwater encountered at time of excavation.	15							
			20							
			25							

See Subsurface Conditions section in the report for additional information.

FIGURE 4B

TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-3

CLIENT: DR Horton Homes - Salt Lake City Division | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/2/16 | DATE FINISHED: 2/2/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: AA

EXCAVATING METHOD/EQUIPMENT: JCB 214S - Backhoe

GROUNDWATER DEPTH: Not Encountered (2/2/16) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
	CL	SILTY CLAY with trace fine sand; minor roots (topsoil) to 12"; gray								slightly moist medium stiff
					12.5	90				
			5							
		End of Exploration at 10.0' No significant sidewall caving. No groundwater encountered at time of excavation.	10							
			15							
			20							
			25							

See Subsurface Conditions section in the report for additional information.

FIGURE 4C

TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-4

CLIENT: DR Horton Homes - Salt Lake City Division | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/2/16 | DATE FINISHED: 2/2/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: AA

EXCAVATING METHOD/EQUIPMENT: JCB 214S - Backhoe

GROUNDWATER DEPTH: 3.9' (2/23/16) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
	CL	SILTY CLAY with trace fine sand with trace roots/rootholes; brown/gray								slightly moist soft/medium stiff
▼		grades with oxidation	5							moist saturated
			10							
		End of Exploration at 14.0' No significant sidewall caving. Installed 1.25” diameter slotted PVC pipe to 14.0’.	15							
			20							
			25							

See Subsurface Conditions section in the report for additional information.

FIGURE 4D

TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-5

CLIENT: DR Horton Homes - Salt Lake City Division | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/3/16 | DATE FINISHED: 2/3/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: AA

EXCAVATING METHOD/EQUIPMENT: JCB 214S - Backhoe

GROUNDWATER DEPTH: Not Encountered (2/3/16) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
	CL	SILTY CLAY with some fine sand; major roots (topsoil) to 3"; brown								slightly moist medium stiff
		grades light brown/gray								
		some roots and rootholes; blocky	5							
										moist
		grades gray with oxidation	10							
		End of Exploration at 10.5' No significant sidewall caving. No groundwater encountered at time of excavation.								
			15							
			20							
			25							

See Subsurface Conditions section in the report for additional information.

FIGURE 4E

GSH

TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-6

CLIENT: DR Horton Homes - Salt Lake City Division | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/3/16 | DATE FINISHED: 2/3/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: AA

EXCAVATING METHOD/EQUIPMENT: JCB 214S - Backhoe

GROUNDWATER DEPTH: Not Encountered (2/3/16) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
	CL	SILTY CLAY with trace fine sand; trace organics/rootholes; brown								slightly moist stiff
		grades blocky; light brown/gray								
			5							
	GP	SILTY FINE AND COARSE GRAVEL with some fine to coarse sand; light brown	10				24.6			slightly moist dense
		End of Exploration at 10.5' No significant sidewall caving. No groundwater encountered at time of excavation.								
			15							
			20							
			25							

See Subsurface Conditions section in the report for additional information.

FIGURE 4F

TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-7

CLIENT: DR Horton Homes - Salt Lake City Division | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/3/16 | DATE FINISHED: 2/3/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: AA

EXCAVATING METHOD/EQUIPMENT: JCB 214S - Backhoe

GROUNDWATER DEPTH: Not Encountered (2/3/16) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
	CL	SILTY CLAY with trace fine sand; major roots (topsoil) to 3"; brown								slightly moist medium stiff
		grades with trace rootholes; light brown/gray with oxidation			17.8	100				stiff
			5							
			10							
	SM	SILTY FINE TO MEDIUM SAND with trace clay; light brown								slightly moist medium dense
		End of Exploration at 12.5' No significant sidewall caving. No groundwater encountered at time of excavation.								
			15							
			20							
			25							

See Subsurface Conditions section in the report for additional information.

FIGURE 4G

TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-8

CLIENT: DR Horton Homes - Salt Lake City Division | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/3/16 | DATE FINISHED: 2/3/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: AA

EXCAVATING METHOD/EQUIPMENT: JCB 214S - Backhoe

GROUNDWATER DEPTH: Not Encountered (2/3/16) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
	CL	SILTY CLAY with trace fine sand; brown								slightly moist medium stiff
		grades light brown/gray with oxidation	5							stiff
		grades with trace rootholes								
		grades gray with oxidation	10							
		End of Exploration at 12.5' No significant sidewall caving. No groundwater encountered at time of excavation.	15							
			20							
			25							

See Subsurface Conditions section in the report for additional information.

FIGURE 4H

TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-9

CLIENT: DR Horton Homes - Salt Lake City Division | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/3/16 | DATE FINISHED: 2/3/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: AA

EXCAVATING METHOD/EQUIPMENT: JCB 214S - Backhoe

GROUNDWATER DEPTH: Not Encountered (2/3/16) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
	CL	SILTY CLAY with trace fine sand; major roots (topsoil) to 3"; brown								slightly moist stiff
		grades with trace rootholes; light brown/gray								
			5		13.8	107				
		End of Exploration at 10.0' No significant sidewall caving. No groundwater encountered at time of excavation.	10							
			15							
			20							
			25							

See Subsurface Conditions section in the report for additional information.

FIGURE 4I

TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-10

CLIENT: DR Horton Homes - Salt Lake City Division | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/3/16 | DATE FINISHED: 2/3/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: AA

EXCAVATING METHOD/EQUIPMENT: JCB 214S - Backhoe

GROUNDWATER DEPTH: Not Encountered (2/3/16) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
	CL	SILTY CLAY with trace fine sand; major roots (topsoil) to 3"; brown								slightly moist medium stiff
		grades light brown/gray with oxidation	5							stiff
	SM	SILTY FINE SAND with some clay; light brown	10							slightly moist medium dense
		End of Exploration at 10.5' No significant sidewall caving. No groundwater encountered at time of excavation.	15							
			20							
			25							

See Subsurface Conditions section in the report for additional information.

FIGURE 4J

GSH

TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-11

CLIENT: DR Horton Homes - Salt Lake City Division | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/3/16 | DATE FINISHED: 2/3/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: AA

EXCAVATING METHOD/EQUIPMENT: JCB 214S - Backhoe

GROUNDWATER DEPTH: Not Encountered (2/3/16) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
	CL	SILTY CLAY with trace fine sand; major roots (topsoil) to 3"; brown								slightly moist stiff
					8.7	94				
		with trace organics; light brown/gray	5							
		grades with oxidation								
	SM	SILTY FINE SAND with some clay; light brown	10							slightly moist medium dense
		End of Exploration at 10.5' No significant sidewall caving. No groundwater encountered at time of excavation.	15							
			20							
			25							

See Subsurface Conditions section in the report for additional information.

FIGURE 4K

TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-12

CLIENT: DR Horton Homes - Salt Lake City Division | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/3/16 | DATE FINISHED: 2/3/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: AA

EXCAVATING METHOD/EQUIPMENT: JCB 214S - Backhoe

GROUNDWATER DEPTH: Not Encountered (2/3/16) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
	CL	SILTY CLAY with trace fine sand; major roots (topsoil) to 3"; brown								slightly moist stiff
		grades with trace rootholes; light brown		■						
		grades light brown/gray	5	■						
	GP/GM	FINE AND COARSE GRAVEL with some silt and some fine to coarse sand; light brown	10							slightly moist dense
		grades with small to large cobbles								
		End of Exploration at 11.0' No significant sidewall caving. No groundwater encountered at time of excavation.	15							
			20							
			25							

See Subsurface Conditions section in the report for additional information.

FIGURE 4L

TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-13

CLIENT: DR Horton | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/4/16 | DATE FINISHED: 2/4/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: HRW

EXCAVATING METHOD/EQUIPMENT: JCB 214S - Backhoe

GROUNDWATER DEPTH: 8.0' (2/4/16) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
	CL FILL	SILTY CLAY, FILL with some fine sand and trace fine and coarse gravel; brown								moist
	CL	SILTY CLAY with some fine sand; brown								moist medium dense
			5		32.6	74				
		grades with oxidation mottling								very moist
▼										saturated
			10							
		End of Exploration at 11.0' Installed 1.25" diameter slotted PVC pipe to 11.0'. No significant sidewall caving.	15							
			20							
			25							

See Subsurface Conditions section in the report for additional information.

FIGURE 4M

GSH

TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-14

CLIENT: DR Horton | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/4/16 | DATE FINISHED: 2/4/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: HRW

EXCAVATING METHOD/EQUIPMENT: JCB 214S - Backhoe

GROUNDWATER DEPTH: 7.0' (2/4/16) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
	CL	SILTY CLAY with some fine sand; brown								moist medium stiff
▽	SP/SM	FINE TO COARSE SAND with some silt; brown	5							saturated medium dense
			10		18.3		5.1			
		End of Exploration at 10.0' No significant sidewall caving.	15							
			20							
			25							

See Subsurface Conditions section in the report for additional information.

FIGURE 4N

GSH — TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-15

CLIENT: DR Horton — PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development — DATE STARTED: 2/4/16 — DATE FINISHED: 2/4/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT — GSH FIELD REP.: HRW

EXCAVATING METHOD/EQUIPMENT: JCB 214S - Backhoe

GROUNDWATER DEPTH: 7.0' (2/4/16) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
	CL	SILTY CLAY with some fine sand; brown								moist medium stiff
					46.7	79				
		grades with oxidation mottling	5							very moist
▼	SM	SILTY FINE SAND brown								very moist saturated
	SM	SILTY FINE TO COARSE SAND brown								saturated medium dense
			10		29.8		18.7			
		End of Exploration at 11.0' No significant sidewall caving.								
			15							
			20							
			25							

See Subsurface Conditions section in the report for additional information.

FIGURE 4O

TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-16

CLIENT: DR Horton | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/4/16 | DATE FINISHED: 2/4/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: HRW

EXCAVATING METHOD/EQUIPMENT: JCB 214S - Backhoe

GROUNDWATER DEPTH: 9.0' (2/4/16) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
		SILTY CLAY with some fine sand; brown								slightly moist to moist medium stiff
			5							moist
										very moist
▼		grades gray	10							saturated
		End of Exploration at 11.0' No significant sidewall caving.								
			15							
			20							
			25							

See Subsurface Conditions section in the report for additional information.

FIGURE 4P

TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-17

CLIENT: DR Horton | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/4/16 | DATE FINISHED: 2/4/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: HRW

EXCAVATING METHOD/EQUIPMENT: JCB 214S - Backhoe

GROUNDWATER DEPTH: 7.5' (2/4/16) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
	CL	SILTY CLAY with some fine sand; brown			31.0	76				moist
			5							very moist
										very moist
▼	SP	FINE TO COARSE SAND with trace silt; brown grades with numerous silty clay layers up to 6" thick								medium dense saturated
		End of Exploration at 10.0' No significant sidewall caving.	10							
			15							
			20							
			25							

See Subsurface Conditions section in the report for additional information.

FIGURE 4Q

TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-18

CLIENT: DR Horton | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/4/16 | DATE FINISHED: 2/4/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: HRW

EXCAVATING METHOD/EQUIPMENT: JCB 214S - Backhoe

GROUNDWATER DEPTH: 7.5' (2/4/16) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
	CL	SILTY CLAY with some fine sand; brown								moist medium stiff
			5							very moist
▽	SP/SM	FINE TO MEDIUM SAND with some silt; gray-brown			25.6		8.4			saturated medium dense
	CL	SILTY CLAY with some fine sand; brown	10							medium stiff
		End of Exploration at 10.0' No significant sidewall caving.	15							
			20							
			25							

See Subsurface Conditions section in the report for additional information.

FIGURE 4R

TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-19

CLIENT: DR Horton | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/4/16 | DATE FINISHED: 2/4/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: HRW

EXCAVATING METHOD/EQUIPMENT: JCB 214S - Backhoe

GROUNDWATER DEPTH: 4.5' (2/4/16) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
	CL	SILTY CLAY with some fine sand; brown								moist medium stiff
▼	SM	SILTY FINE SAND brown	5							saturated medium dense
		grades with numberous silty clay layers up to 6" thick								
		End of Exploration at 10.0' No significant sidewall caving.	10							
			15							
			20							
			25							

See Subsurface Conditions section in the report for additional information.

FIGURE 4S

TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-20

CLIENT: DR Horton | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/5/16 | DATE FINISHED: 2/5/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: AA

EXCAVATING METHOD/EQUIPMENT: JCB 214S - Backhoe

GROUNDWATER DEPTH: Not Encountered (2/5/16) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
	CL	SILTY CLAY with trace fine sand; brown								slightly moist stiff
			5	■	32.2	86				
			10							
		End of Exploration at 10.0' No significant sidewall caving. No groundwater encountered at time of excavation.								
			15							
			20							
			25							

See Subsurface Conditions section in the report for additional information.

FIGURE 4T

TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-21

CLIENT: DR Horton | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/5/16 | DATE FINISHED: 2/5/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: AA

EXCAVATING METHOD/EQUIPMENT: JCB 214S - Backhoe

GROUNDWATER DEPTH: Not Encountered (2/5/16) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
	CL	SILTY CLAY with trace fine sand; brown								slightly moist stiff
			5		24.8	92				
		End of Exploration at 10.0' No significant sidewall caving. No groundwater encountered at time of excavation.	10							
			15							
			20							
			25							

See Subsurface Conditions section in the report for additional information.

FIGURE 4U

TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-22

CLIENT: DR Horton | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/5/16 | DATE FINISHED: 2/5/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: AA

EXCAVATING METHOD/EQUIPMENT: JCB 214S - Backhoe

GROUNDWATER DEPTH: Not Encountered (2/5/16) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
	CL	SILTY CLAY with some fine to coarse sand; major roots (topsoil) to 3"; brown								dry stiff
		grades with trace fine to coarse sand; light brown	5							slightly moist
		End of Exploration at 10.0' No significant sidewall caving. No groundwater encountered at time of excavation.	10							
			15							
			20							
			25							

See Subsurface Conditions section in the report for additional information.

FIGURE 4V

TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-23

CLIENT: DR Horton | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/5/16 | DATE FINISHED: 2/5/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: AA

EXCAVATING METHOD/EQUIPMENT: JCB 214S - Backhoe

GROUNDWATER DEPTH: 0.6' (2/23/16) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
▼	CL	SILTY CLAY with trace fine sand; brown								moist medium stiff
					26.5	98				
		grades gray								saturated
			5							
			10							
		End of Exploration at 10.0' Sidewall caving from 4.0'. No groundwater encountered at time of excavation. Installed 1.25” diameter slotted PVC pipe to 10.0’.								
			15							
			20							
			25							

See Subsurface Conditions section in the report for additional information.

FIGURE 4W

TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-24

CLIENT: DR Horton | PROJECT NUMBER: 0997-002-16

PROJECT: Proposed Allred Piece Development | DATE STARTED: 2/5/16 | DATE FINISHED: 2/5/16

LOCATION: Between Redwood Road & Jordan River, North of Commerce Dr, Saratoga Springs, UT | GSH FIELD REP.: AA

EXCAVATING METHOD/EQUIPMENT: JCB 214S - Backhoe

GROUNDWATER DEPTH: 4.0' (2/5/16) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
	CL	SILTY CLAY with trace fine sand; brown								moist medium stiff
		grades gray								
▽		grades with some organics	5							saturated
		End of Exploration at 10.0' Sidewall caving from 2.0'. No groundwater encountered at time of excavation.	10							
			15							
			20							
			25							

See Subsurface Conditions section in the report for additional information.

FIGURE 4X

CLIENT: DR Horton Homes - Salt Lake City Division
PROJECT: Proposed Allred Piece Development
PROJECT NUMBER: 0997-002-16

KEY TO BORING LOG

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

COLUMN DESCRIPTIONS

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

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

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

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

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

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

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

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

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

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

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

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

CEMENTATION:

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

Moderately: Crumbles or breaks with considerable finger pressure.

Strongly: Will not crumble or break with finger pressure.

MODIFIERS:

Trace <5%

Some 5-12%

With > 12%

MOISTURE CONTENT (FIELD TEST):

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

Moist: Damp but no visible water.

Saturated: Visible water, usually soil below water table.

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

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

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

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

STRATIFICATION:

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

Occasional: One or less per 6" of thickness

Numerous; More than one per 6" of thickness

TYPICAL SAMPLER GRAPHIC SYMBOLS

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

WATER SYMBOL

Water Level

FIGURE 5

GSH

CLIENT: DR Horton
PROJECT: Proposed Allred Piece Development
PROJECT NUMBER: 0997-002-16

KEY TO TEST PIT LOG

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

COLUMN DESCRIPTIONS

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

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

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

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

⑤ **Sample Symbol:** Type of soil sample collected at depth interval shown; sampler symbols are explained below.

⑥ **Moisture (%):** Water content of soil sample measured in laboratory; expressed as percentage of dryweight of

⑦ **Dry Density (pcf):** The density of a soil measured in laboratory; expressed in pounds per cubic foot.

⑧ **% Passing 200:** Fines content of soils sample passing a No. 200 sieve; expressed as a percentage.

⑨ **Liquid Limit (%):** Water content at which a soil changes from plastic to liquid behavior.

⑩ **Plasticity Index (%):** Range of water content at which a soil exhibits plastic properties.

⑪ **Remarks:** Comments and observations regarding drilling or sampling made by driller or field personnel. May include other field and laboratory test results using the following abbreviations:

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

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

STRATIFICATION:

DESCRIPTION	THICKNESS
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- Rock Core
- No Recovery
- 3.25" OD, 2.42" ID D&M Sampler
- 3.0" OD, 2.42" ID D&M Sampler
- California Sampler
- Thin Wall

WATER SYMBOL

- Water Level

FIGURE 6

GSH