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# GEOTECHNICAL STUDY
# LOT 13-A-R CEDAR COVE SUBDIVISION
# 2716 EAST BYBEE DRIVE
# WEBER COUNTY, UTAH

**Project No. 13-0055G**

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## 1.0 EXECUTIVE SUMMARY

This report presents the results of our geotechnical study for the proposed single-family residence to be constructed on Lot 13-A-R of the Cedar Cove Subdivision, located at 2716 East Bybee Drive in Weber County, Utah. We understand the proposed building, as currently planned, will consist of a one to two-story structure founded on spread footings with the possibility of a full basement.

For the field exploration, we excavated a total of two test pits to depths of about 9½ to 10½ feet below the existing ground surface. Groundwater was not encountered in the test pits during our initial site investigation. The subsurface soils encountered generally consisted of approximately 2 feet of fill material (consisting of Silty Sand (SM)), followed by layers of Poorly Graded Sand with silt (SP-SM) and Poorly Graded Sand with silt and gravel (SP-SM) extending to the maximum depths explored of about 9½ to 10½ feet below the existing ground surface. The fill material should be removed beneath the entire building footprint and beneath exterior flatwork.

Based on the results of our field exploration, laboratory testing and engineering analyses, it is our opinion that the subject site is suitable for the proposed development, provided the recommendations presented herein are followed and implemented during design and construction. Conventional strip and spread footings may be used to support the structures, with foundations placed entirely on uniform, undisturbed, native sands or entirely on a minimum of 18 inches of properly placed and compacted structural fill.

The global stability of the existing slope at the property was analyzed as part of our study. Our analyses indicate that the existing slope as currently graded does not meet the required minimum factors of safety. To meet the required minimum factors of safety, the slope should be regraded as indicated in Section 9.0.

This executive summary provides a general synopsis of our recommendations. Details of our findings, conclusions and recommendations are provided within the body of this report.

Failure to consult with Earthtec regarding any changes made during design and/or construction of the project from those discussed above in Section 3.0 relieves Earthtec from any liability arising from changed conditions at the site. We also strongly recommend that Earthtec observe the building excavations to verify the adequacy of our recommendations presented herein, and that Earthtec perform materials testing and special inspections for this project to provide consistency during construction.

## 2.0 INTRODUCTION

This report presents the results of our geotechnical study for the proposed single-family residence located at 2716 East Bybee Drive in Weber County, Utah. The general location of the site is shown on Figure 1, *Vicinity Map*, at the end of this report.

The purposes of this study were to

- Evaluate the subsurface soil conditions at the site,
- Assess the engineering characteristics of the subsurface soils, and
- Provide geotechnical recommendations for general site grading and the design and construction of foundations, concrete floor slabs, and miscellaneous concrete flatwork.

The scope of work completed for this study included field reconnaissance, subsurface exploration, field and laboratory soil testing, geotechnical engineering analysis, and the preparation of this report.

## 3.0 PROPOSED CONSTRUCTION

We understand that a single-family residence will be constructed on the subject property located at 2716 East Bybee Drive in Weber County, Utah. The proposed home will be conventionally framed, one to two stories in height, and will likely be founded on spread footings with the possibility of a full basement. We have based our recommendations in this report on the assumption that foundation loads for the proposed home will not exceed 3,000 pounds per linear foot for bearing walls, 20,000 pounds for column loads, and 100 pounds

per square foot for floor slabs. If structural loads will be greater our office should be notified so that we may review our recommendations and, if necessary, make modifications.

In addition to the construction described above, we anticipate that

- Utilities will be installed to service the proposed building,
- Exterior concrete flatwork will be placed in the form of curb, gutter, and sidewalks.

## 4.0 GENERAL SITE DESCRIPTION

Lot 13 A-R of the Cedar Cove Subdivision is located at 2716 East Bybee Drive in Weber County, Utah. At the time of our subsurface investigation, the subject property was a vacant lot that contained little to no vegetation. A few well established trees were observed in the northeast corner of the lot. The lot was relatively flat, less than 2 percent grades for approximately 90 feet east of the road. The lot then slopes uphill and to the east at approximate grades ranging from 1H:1V (Horizontal:Vertical) to 1V:6H slope with an approximate change in elevation of 123 feet across the property. The subject lot is bounded on the north and south by undeveloped lots, on the east by undeveloped property, and on the west by Bybee Drive.

## 5.0 SUBSURFACE EXPLORATION

Under the direction of a qualified member of our geotechnical staff, subsurface explorations were conducted at the site on March 6, 2013 by excavating two exploratory test pits to depths of about 9½ to 10½ feet below the existing ground surface using a rubber-tire mounted backhoe. The approximate locations of the test pits are shown on Figure 2, *Aerial Photograph Showing the Location of Test Pits.* Graphical representations and detailed descriptions of the soils encountered are shown on Figures 3 through 4, *Test Pit Log,* at the end of this report. The stratification lines shown on the logs represent the approximate boundary between soil units; the actual transition may be gradual. Due to potential natural variations inherent in soil deposits, care should be taken in interpolating between and extrapolating beyond exploration points. A key to the symbols and terms on the logs is presented on Figure 5, *Legend.*

The subsurface soils exposed in the test pits were classified by visual examination using the guidelines of the Unified Soil Classification System (USCS). Disturbed bag samples and relatively undisturbed thin-walled "Shelby" tube samples were collected at various depths in each test pit. Samples were transported to our Ogden, Utah laboratory for further analysis. Samples will be retained in our laboratory for 30 days following the date of this report and then discarded unless a written request for additional holding time is received prior to the disposal date.

## 6.0 LABORATORY TESTING

Representative soil samples collected during our field exploration were tested in the laboratory to assess pertinent engineering properties and to aid in refining field classifications, if needed. Tests performed included natural moisture content and dry density tests, liquid and plastic limits determinations, full gradation analyses, and a direct shear test. The following table summarizes the laboratory test results, which are also included on the attached test pit logs at the respective sample depths, on Figure No. 6, *Direct Shear Test,* and on Figure No. 7, *Grain Size Distribution.*

**Table No. 1: Laboratory Test Results**

| Test Pit No. | Depth (ft.) | Natural Moisture (%) | Natural Dry Density (pcf) | Atterberg Limits | | Grain Size Distribution (%) | | | **Soil Type |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Liquid Limit | Plasticity Index | Gravel (+ #4) | Sand | Silt/Clay (- #200) | |
| TP-1 | 4½ | 8 | --- | 17 | *NP | 2 | 91 | 7 | SP-SM |
| TP-1 | 10 | 5 | --- | 18 | NP | 31 | 64 | 5 | SP-SM |
| TP-2 | 1 | 11 | --- | 17 | NP | 9 | 74 | 17 | FILL (SM) |
| TP-2 | 9 | 8 | --- | 18 | NP | 2 | 90 | 8 | SP-SM |

* NP = Non-Plastic
**Detailed descriptions of the soils encountered are presented on the test pit logs

## 7.0 SUBSURFACE CONDITIONS

### 7.1 Soil Types

On the surface of the site, we encountered fill material which we estimated to extend about 2 feet in depth at the test pit locations. Below the fill material we encountered layers of Poorly Graded Sand with silt (SP-SM) and Poorly Graded Sand with silt and gravel (SP-SM) extending to the maximum depths explored of about 9½ to 10½ feet below the existing ground surface. Based on our experience and observations during the field exploration, the sandy soils appeared to be very loose to loose in consistency.

### 7.2 Groundwater Conditions

Groundwater was not encountered at the test pit location at the time of our field investigation. Groundwater levels will fluctuate in response to the season, precipitation and snow melt, irrigation, and other on and off-site influences. Precisely quantifying these fluctuations would require long term monitoring. The contractor should be prepared to dewater excavations as needed.

## 8.0 SITE GRADING

### 8.1 General Site Grading

All surface vegetation and unsuitable soils (such as topsoil, organic soils, undocumented fill, soft, loose, or disturbed native soils, and any other inapt materials) should be removed from below foundation, floor slab, and exterior concrete flatwork. We encountered fill material on the surface of the site which we estimated to extend about 2 feet below the existing ground surface. The fill we encountered on the site is considered undocumented (untested). The fill material and topsoil (including soil with roots larger than about ¼ inch in diameter) should be completely removed, even if found to extend deeper, along with any other unsuitable soils that may be encountered.

Fill placed over large areas, even if only a few feet in depth, can cause consolidation in the underlying native soils resulting in settlement of the fill. If more than 3 feet of grading fill will be placed above the existing surface (to raise site grades), Earthtec should be notified so

that we may assess potential settlement and make additional recommendations if needed. Such recommendations may include placing the fill several weeks prior to construction to allow settlement to occur.

## 8.2 Temporary Excavations

Temporary excavations that are less than 4 feet in depth and above groundwater should have side slopes no steeper than ½H:1V (Horizontal:Vertical). Temporary excavations where water is encountered in the upper 4 feet or that extend deeper than 4 feet below site grades should be sloped or braced in accordance with OSHA[1] requirements for Type C soils.

## 8.3 Fill Material Composition

The native Poorly Graded Sand with silt and gravel (SP-SM) encountered at the site appear to be suitable for use as structural fill. All other soils, including the existing fill soils and Poorly Graded Sand with silt, may be stockpiled for reuse in landscape areas.

Structural fill is defined as fill material that will ultimately be subjected to any kind of structural loading, such as those imposed by footings, floor slabs, pavement, etc. We recommend that a professional engineer or geologist verify that the structural fill to be used on this project meets our requirements, given below. We recommend that structural fill consist of imported or native sandy/gravelly soils meeting the following requirements:

**Table No. 2: Structural Fill Recommendations**

| Sieve Size/Other | Percent Passing (by weight) |
|---|---|
| 4 inches | 100 |
| 3/4 inches | 70 – 100 |
| No. 4 | 40 – 80 |
| No. 40 | 15 – 50 |
| No. 200 | 0 – 20 |
| Liquid Limit | 35 maximum |
| Plasticity Index | 15 maximum |

[1] OSHA Health And Safety Standards, Final Rule, CFR 29, part 1926.

In some situations, particles larger than 4 inches and/or more than 30 percent coarse gravel may be acceptable, but would likely make compaction more difficult and/or significantly reduce the possibility of successful compaction testing. Consequently, more strict quality control measures than normally used may be required, such as using thinner lifts and increased or full time observation of fill placement.

We recommend that utility trenches below any structural load be backfilled using structural fill. Note that most local governments and utility companies require Type A-1-a or A-1-b (AASHTO classification) soils (which overall is stricter than our recommendation for structural fill) be used as backfill above utilities in certain areas. All backfill soil should have a maximum particle size of 4 inches, a maximum Liquid Limit of 35 and a maximum Plasticity Index of 15.

Where needed *(i.e. fill in submerged areas)*, we recommend that free draining granular material (clean sand and/or gravel) meet the following requirements:

**Table No. 3: Free-Draining Fill Recommendations**

| Sieve Size/Other | Percent Passing (by weight) |
|---|---|
| 3 inches | 100 |
| No. 10 | 0 – 25 |
| No. 40 | 0 – 15 |
| No. 200 | 0 – 5 |
| Plasticity Index | Non-plastic |

Three inch minus washed rock (sometimes called river rock or drain rock) and pea gravel materials usually meet these requirements and may be used as free draining fill. If free draining fill will be placed adjacent to soil containing a significant amount of sand or silt/clay, precautions should be taken to prevent the migration of fine soil into the free draining fill. Such precautions should include either placing a filter fabric between the free draining fill and the adjacent material, or using a well graded, clean filtering material approved by the geotechnical engineer.

## 8.4 Fill Placement and Compaction

The thickness of each lift should be appropriate for the compaction equipment that is used. We recommend a maximum lift thickness prior to compaction of 4 inches for hand operated equipment, 6 inches for most "trench compactors" and 8 inches for larger rollers, unless it can be demonstrated by in-place density tests that the required compaction can be obtained throughout a thicker lift. The full thickness of each lift of structural fill placed should be compacted to at least the following percentages of the maximum dry density, as determined by ASTM D-1557:

- In landscape and other areas not below structurally loaded areas: 90%
- Less than 5 feet of fill below structurally loaded areas: 95%
- Between 5 and 10 feet of fill below structurally loaded areas: 98%

Generally, placing and compacting fill at a moisture content within ±2 percent of the optimum moisture content, as determined by ASTM D-1557, will facilitate compaction. Typically, the further the moisture content is from optimum the more difficult it will be to achieve the required compaction.

Fill should be tested frequently during placement and we recommend early testing to demonstrate that placement and compaction methods are achieving the required compaction. The contractor is responsible to ensure that fill materials and compaction efforts are consistent so that tested areas are representative of the entire fill.

## 8.5 Stabilization Recommendations

Near surface layers of fine sandy soils were encountered during our field exploration. These soils may rut and pump during grading and construction. The likelihood of rutting and/or pumping, and the depth of disturbance, is proportional to the moisture content in the soil, the load applied to the ground surface, and the frequency of the load. Consequently, rutting and pumping can be minimized by avoiding concentrated traffic, minimizing the load applied to the ground surface by using lighter equipment and/or partial loads, by working in dry times of the year, or by providing a working surface for equipment.

During grading the soil in any obvious soft spots should be removed and replaced with granular material. If rutting or pumping occurs traffic should be stopped in the area of concern. The soil in rutted areas should be removed and replaced with granular material. In areas where pumping occurs the soil should either be allowed to sit until pore pressures dissipate (several hours to several days) and the soil firms up, or be removed and replaced with granular material. Typically, we recommend removal to a minimum depth of 24 inches. For granular material, we recommend using angular well-graded gravel, such as pit run, or crushed rock with a maximum particle size of four inches. We suggest that the initial lift be approximately 12 inches thick and be compacted with a static roller-type compactor. A finer granular material such as sand, gravelly sand, sandy gravel or road base may also be used. The more angular and coarse the material, the thinner the lift that will be required. We recommend that the fines content (percent passing the No. 200 sieve) be less than 15%, the liquid limit be less than 35, and the plasticity index be less than 15.

Using a geosynthetic fabric, such as Mirafi 600X or equivalent, may also reduce the amount of material required and avoid mixing of the granular material and the subgrade. If a fabric is used, following removal of disturbed soils and water, the fabric should be placed over the bottom and up the sides of the excavation a minimum of 24 inches. The fabric should be placed in accordance with the manufacturer's recommendations, including proper overlaps. The granular material should then be placed over the fabric in compacted lifts. Again, we suggest that the initial lift be approximately 12 inches thick and be compacted with a static roller-type compactor.

## 9.0 SLOPE STABILITY

We evaluated the overall stability of the existing and proposed grading slope at the subject property. The properties of the native soils at the site were estimated using direct shear testing on samples recovered during our field investigation and our experience with similar soils. Our direct shear testing on the native sands encountered during our field investigation indicated the soils have an internal friction angle of about 33 degrees and cohesion of 195 psf. Accordingly, we used an internal friction angle of 32 degrees, an apparent cohesion of

195 psf, a saturated unit weight of 119 pcf, and a moist unit weight of 114 pcf for our analyses.

For the seismic (pseudostatic) analysis, a peak horizontal ground acceleration of 0.61g for the 2% probability of exceedance in 50 years was obtained for site (grid) locations of 41.142 degrees north latitude and -111.912 degrees west longitude. Typically, one-third to one-half this value is utilized in analysis. Accordingly, a value of 0.20 was used as the pseudostatic coefficient for the stability analysis.

We evaluated the global stability of the site using the computer program XSTABLE. This program uses a limit equilibrium (Bishop's modified) method for calculating factors of safety against sliding on an assumed failure surface and evaluates numerous potential failure surfaces, with the most critical failure surface identified as the one yielding the lowest factor of safety of those evaluated. The configuration analyzed was based on the site plan provided by the client and consisted of an approximately 35-foot high slope inclined at approximately 1V:1H (Vertical:Horizontal) followed by an approximately 8-foot high slope inclined at approximately 1V:6H followed by an approximately 80-foot high slope inclined at approximately 1V:3H. Typically, the required minimum factors of safety are 1.5 for static conditions and 1.0 for seismic (pseudostatic) conditions. The results of our analyses indicate that the slope configuration described above does not meet the required minimum factors of safety, with failure surface propagating in the 1V:1H (Vertical:Horizontal) portion of the slope at the toe of the slope. Regrading of the slope is required to meet the minimum factors of safety. We understand that a minimum of 3 feet of fill material will be placed and compacted on the lot as part of this grading process, thus reducing the slope height by 3 feet. We analyzed a proposed configuration for the slope consisting of an approximately 40-foot tall slope inclined at 1V:1.5H followed by an 80-foot tall slope inclined at 1V:3H. The results of our analyses indicate that the proposed slope configuration described above meets the required minimum factors of safety. The slope stability results are attached as Figures Nos. 8 through 11, *Stability Results*. Any modifications to the slope, including the construction of retaining walls, should be properly designed and engineered.

It should be clearly understood that slope movements or even failure can occur if the slope is undermined or the slope soils become saturated. The property owner and the owner's representatives should be made aware of the risks should these or other conditions occur that could saturate or erode/undermine the soils. Surface water should be directed away from the top and bottom of the slope, the slope should be vegetated with drought resistant plants, and sprinklers should not be placed on the face of the slope.

## 10.0 SEISMIC CONSIDERATIONS

### 10.1 Seismic Design

The residential structures should be designed in accordance with the International Residential Code (IRC). The IRC designates this area as a seismic design class $D_2$.

The site is located at approximately 41.142 degrees latitude and -111.912 degrees longitude from the approximate center of the site. The IRC site value for this property is 0.94g. The design spectral response acceleration parameters are given below in Table 5.

**Table No. 4: Design Acceleration for Short Period**

| $S_S$ | $F_a$ | Site Value ($S_{DS}$) |
|---|---|---|
| | | 2/3 $S_S$*$F_a$ |
| 1.41g | 1.00 | 0.94g |

$S_S$ = Mapped spectral acceleration for short periods
$F_a$ = Site coefficient from Table 1613.5.3(1)
$S_{DS}$ = ⅔$S_{MS}$= ⅔ ($F_a$·$S_s$ ) = 5% damped design spectral response acceleration for short periods

### 10.2 Faulting

Based upon published geologic maps[2], no active faults traverse through or immediately adjacent to the site and the site is not located within local fault study zones. The nearest mapped fault trace is the Wasatch Fault Zone, Weber Section located about 0.21 miles (0.34 kilometers) east from the approximate center of the subject site.

[2] U.S. Geological Survey, Quaternary Fault and Fold Database of the United States, November 3, 2010

### 10.3 Liquefaction Potential

Liquefaction is a phenomenon where soils lose their intergranular strength due to an increase of pore pressures during a dynamic event such as an earthquake. The potential for liquefaction is based on several factors, including 1) the grain size distribution of the soil, 2) the plasticity of the fine fraction of the soil (material passing the No. 200 sieve), 3) relative density of the soil, 4) earthquake strength (magnitude) and duration, and 5) overburden pressures. In addition, the soils must be near saturation for liquefaction to occur. The site appears to be located within an area which has been mapped by the Utah Geological Survey[3] as having a low to moderate in liquefaction potential. Liquefaction can occur when saturated subsurface soils below groundwater lose their intergranular strength due to an increase in soil pore water pressures during a dynamic event such as an earthquake.

Loose, saturated sands are most susceptible to liquefaction, but some loose, saturated gravels and relatively sensitive silt to low-plasticity silty clay soils can also liquefy during a seismic event. Subsurface soils were composed of unsaturated, very loose to loose sands. The soils encountered do not appear liquefiable, but the liquefaction susceptibility of underlying soils (deeper than our explorations) is not known and would require deeper explorations to quantify.

## 11.0 FOUNDATIONS

### 11.1 General

The foundation recommendations presented in this report are based on the soil conditions encountered during our field exploration, the results of laboratory testing of samples of the native soils, the site grading recommendations presented in this report, and the foundation loading conditions presented in Section 3.0, *Proposed Construction*, of this report. If loading conditions and assumptions related to foundations are significantly different, Earthtec should be notified so that we can re-evaluate our design parameters and estimates (higher loads may cause more settlement), and to provide additional recommendations if necessary.

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[3] Liquefaction Potential Map For A Portion Of Weber County, Utah Geological Survey, Public Information Series 27, August 1994.

Conventional strip and spread footings may be used to support the proposed residences after appropriate removals as outlined in Section 8.1. Foundations should not be installed on topsoil, undocumented fill, debris, combination soils, organic soils, frozen soil, or in ponded water. If foundation soils become disturbed during construction they should be removed or recompacted.

### 11.2 Strip/Spread Footings

We recommend that conventional strip and spread foundations be constructed entirely on firm, native, uniform sands or entirely on a minimum 18 inches of structural fill placed on undisturbed native soils. For foundation design we recommend the following:

- Footings founded on native sands or a minimum of 18 inches of structural fill may be designed using a maximum allowable bearing capacity of 2,000 pounds per square foot. The values for vertical foundation pressure can be increased by one-third for wind and seismic conditions per Section 1806.1 when used with the Alternative Basic Load Combinations found in Section 1605.3.2 of the 2009 International Building Code.

- Continuous and spot footings should be uniformly loaded and should have a minimum width of 20 and 30 inches, respectively.

- Exterior footings should be placed below frost depth which is determined by local building codes. In general 30 inches of cover is adequate for most sites; however local code should be verified by the end design professional. Interior footings, not subject to frost (heated structures), should extend at least 18 inches below the lowest adjacent grade.

- Foundation walls and footings should be properly reinforced to resist all vertical and lateral loads and differential settlement.

- The bottom of footing excavations should be compacted to a minimum of 95% of the Modified Proctor value for the material. If soft areas are encountered, they should be stabilized as recommended in Section 8.5.

- Footing excavations should be observed by the geotechnical engineer prior to beginning footing construction to evaluate whether suitable bearing soils have been exposed and whether excavation bottoms are free of loose or disturbed soils.

- Structural fill used below foundations should extend laterally a minimum of 6 inches for every 12 vertical inches of structural fill placed. For example, if 18 inches of structural fill are required to bring the excavation to footing grade, the structural fill should extend laterally a minimum of 9 inches beyond the edge of the footings on both sides.

### 11.3 Estimated Settlements

If the proposed foundations are properly designed and constructed using the parameters provided above, we estimate that total settlements should not exceed one inch and differential settlements should be one-half of the total settlement over a 25-foot length of continuous foundation, for non-earthquake conditions. Additional settlement could occur during an earthquake due to ground shaking, if more than 3 feet of grading fill is placed above the existing ground surface, and/or if foundation soils are allowed to become wetted.

### 11.4 Lateral Earth Pressures

Below grade walls act as soil retaining structures and should be designed to resist pressures induced by the backfill soils. The lateral pressures imposed on a retaining structure are dependant on the rigidity of the structure and its ability to resist rotation. Most retaining walls that can rotate or move slightly will develop an active lateral earth pressure condition. Structures that are not allowed to rotate or move laterally, such as subgrade basement walls, will develop an at-rest lateral earth pressure condition. Lateral pressures applied to structures may be computed by multiplying the vertical depth of backfill material by the appropriate equivalent fluid density. Any surcharge loads in excess of the soil weight applied to the backfill should be multiplied by the appropriate lateral pressure coefficient and added to the soil pressure. For static conditions the resultant forces is applied at about one-third the wall height (measured from bottom of wall). For seismic conditions, the resultant forces are applied at about two-third times the height of the wall both measured from the bottom of the wall. The lateral pressures presented in the table below are based on drained, horizontally placed structural fill (as outlined in this report) soils as backfill material using a 32° friction angle and a dry unit weight of 110 pcf.

**Table No. 5: Lateral Earth Pressures (Static and Dynamic)**

| Condition | Case | Lateral Pressure Coefficient | Equivalent Fluid Pressure (pcf) |
|---|---|---|---|
| Active | Static | 0.31 | 34 |
| | Seismic | 0.53 | 58 |
| At-Rest | Static | 0.47 | 52 |
| | Seismic | 0.73 | 81 |
| Passive | Static | 3.25 | 358 |
| | Seismic | 4.31 | 475 |

*Seismic values combine the static and dynamic values

These pressure values do not include any surcharge, and are based on a relatively level ground surface at the top of the wall and drained conditions behind the wall. It is important that water is not allowed to build up (hydrostatic pressures) behind retaining structures. Retaining walls should incorporate drainage behind the walls as appropriate, and surface water should be directed away from the top and bottom of the walls.

Lateral loads are typically resisted by friction between the underlying soil and footing bottoms. Resistance to sliding may incorporate the friction acting along the base of foundations, which may be computed using a coefficient of friction of soils against concrete of 0.35 for native sands and 0.55 for structural fill meeting the recommendations presented herein. For allowable stress design, the lateral resistance may be computed using section 1806 of the 2009 International Building Code and all sections referenced therein. Retaining wall lateral resistance design should further reference Section 1807.2 for reference of Safety Factors. Retaining systems are assumed to be founded upon and backfilled with granular structural fill. Resistances can be calculated assuming Class 3 material in Table 1806.2, which is sandy gravel and/or gravel, provided clay or silt is not used immediately below the foundation, or as backfill material. If backfilling with clay or silt, it is required to contact Earthtec Engineering prior to construction for further review and recommendations. The values for lateral foundation pressure can be increased by one-third for wind and seismic

conditions per Section 1806.1 when used with the Alternative Basic Load Combinations found in Section 1605.3.2 of the 2009 International Building Code.

The pressure and coefficient values presented above are ultimate; therefore an appropriate factor of safety may need to be applied to these values for design purposes. The appropriate factor of safety will depend on the design condition and should be determined by the project structural engineer.

## 12.0 FLOOR SLABS AND FLATWORK

Concrete floor slabs and exterior flatwork may be supported on native soils or properly placed and compacted structural fill, after the appropriate removals and grading as outlined in Section 8.1 are completed. We recommend placing a minimum 6 inches of free-draining fill material (see Section 8.3) beneath floor slabs to facilitate construction, act as a capillary break, and aid in distributing floor loads. For flatwork, we recommend placing a minimum 4 inches of roadbase material. Prior to placing the free-draining fill or roadbase materials, the native subgrade should be proof-rolled to identify soft spots, which should be stabilized as discussed above in Section 8.5.

For slab design, we recommend using a modulus of subgrade reaction of 120 pounds per cubic inch. To help control normal shrinkage and stress cracking, we recommend that floor slabs have adequate reinforcement for the anticipated floor loads with the reinforcement continuous through interior floor joints, frequent crack control joints, and non-rigid attachment of the slabs to foundation and bearing walls. Special precautions should be taken during placement and curing of all concrete slabs and flatwork. Excessive slump (high water-cement ratios) of the concrete and/or improper finishing and curing procedures used during hot or cold weather conditions may lead to excessive shrinkage, cracking, spalling, or curling of slabs. We recommend all concrete placement and curing operations be performed in accordance with American Concrete Institute (ACI) codes and practices.

## 13.0 DRAINAGE

### 13.1 Surface Drainage

As part of good construction practice, precautions should be taken during and after construction to reduce the potential for water to collect near foundation walls. Accordingly, we recommend the following:

- Adequate compaction of foundation backfill should be provided i.e. a minimum of 90% of ASTM D-1557. **Water consolidation methods should not be used.**
- The ground surface should be graded to drain away from the building in all directions. We recommend a minimum fall of 8 inches in the first 10 feet.
- Roof runoff should be collected in rain gutters with downspouts designed to discharge well outside of the backfill limits, or at least 10 feet from foundations, whichever is greater.
- Sprinklers should be aimed away, and all sprinkler components (valves, lines, sprinkler heads) should be placed at least 5 feet from foundation walls. Sprinkler systems should be well maintained, checked for leaks frequently, and repaired promptly. Overwatering at any time should be avoided.
- Any additional precautions which may become evident during construction.

### 13.2 Subsurface Drainage

Section R405.1 of the 2009 International Residential Code states, "Drains shall be provided around all concrete and masonry foundations that retain earth and enclose habitable or usable spaces located below grade." An exception is allowed when the foundation is installed on well drained ground consisting of Group 1 soils, which include those defined by the Unified Soil Classification System as GW, GP, SW, SP, GM, and SM. The soils encountered at the site were Group 1 soils (SP-SM), therefore foundation drains are not required for the proposed residence. If a foundation drains is utilized for this home, the recommendations presented below should be followed during design and construction of the foundation drains:

- A perforated 4-inch minimum diameter pipe should be enveloped in at least 12 inches of free-draining gravel and placed adjacent to the perimeter footings. The perforations should be oriented such that they are not located on the bottom side of the pipe, as much as possible. The free-draining gravel should consist of primarily ¾-

to 2-inch size gravel having less than 5 percent passing the No. 4 sieve, and should be wrapped with a separation fabric such as Mirafi 140N or equivalent.

- The highest point of the perforated pipe bottom should be equal to the bottom elevation of the footings. The pipe should be uniformly graded to drain to an appropriate outlet (storm drain, land drain, other gravity outlet, etc.) or to one or more sumps where water can be removed by pumping.

- To facilitate drainage beneath basement floor slabs we recommend that the minimum thickness of free-draining fill beneath the slabs be increased to at least 10 inches (approximately equal to the bottom of footing elevations). A separation fabric such as Mirafi 140N or equivalent should be placed beneath the free-draining gravel. Connections should be made to allow any water beneath the slabs to reach the perimeter foundation drain (i.e. placing at least 10 inches of free-draining fill beneath footings).

- The drain system should be periodically inspected and clean-outs should be installed for the foundation drain to allow occasional cleaning/purging, as needed. Proper drain operation depends on proper construction and maintenance.

## 14.0 GENERAL CONDITIONS

The exploratory data presented in this report was collected to provide geotechnical design recommendations for this project. The test pits may not be indicative of subsurface conditions outside the study area or between points explored and thus have a limited value in depicting subsurface conditions for contractor bidding. Variations from the conditions portrayed in the test pits may occur and which may be sufficient to require modifications in the design. If during construction, conditions are different than presented in this report, please advise us so that the appropriate modifications can be made.

The findings and recommendations presented in this geotechnical report were prepared in accordance with generally accepted geotechnical engineering principles and practice in this area of Utah at this time. No other warranty or representation, either expressed or implied, is intended in our proposals, contracts or reports.

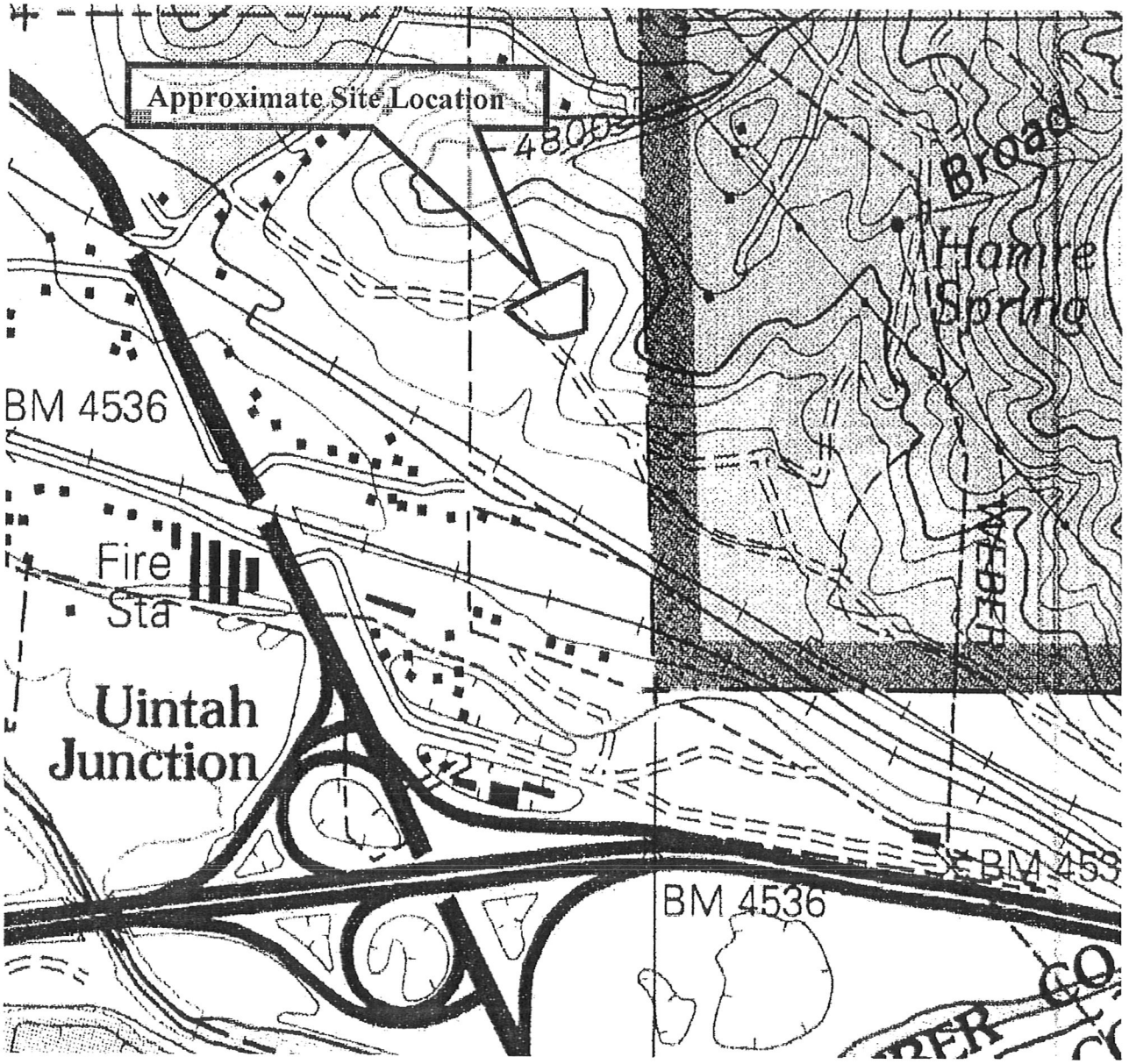
This geotechnical report is based on relatively limited subsurface explorations and laboratory testing. Subsurface conditions may differ in some locations of the site from those described

herein, which may require additional analyses and possibly modified recommendations. Thus we strongly recommend consulting with Earthtec Engineering, Inc. regarding any changes made during design and construction of the project from those discussed above in Section 3.0. Failure to consult with Earthtec regarding any such changes relieves Earthtec from any liability arising from changed conditions at the site.

For consistency, Earthtec Engineering Inc. should also perform materials testing and special inspections for this project. The recommendations presented herein are based on the assumption that an adequate program of tests and observations will be followed during construction to verify compliance with our recommendations. We also assume that we will review the project plans and specifications to verify that our conclusions and recommendations are incorporated and remain appropriate (based on the actual design). Earthtec Engineering, Inc. should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Earthtec Engineering, Inc. also should be retained to provide observation and testing services during grading, excavation, foundation construction and other earth-related construction phases of the project.

We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please contact Earthtec at your convenience.

# VICINITY MAP
## LOT 13-A-R CEDAR COVE SUBDIVISION
## WEBER COUNTY, UT




(cida.usgs.gov)

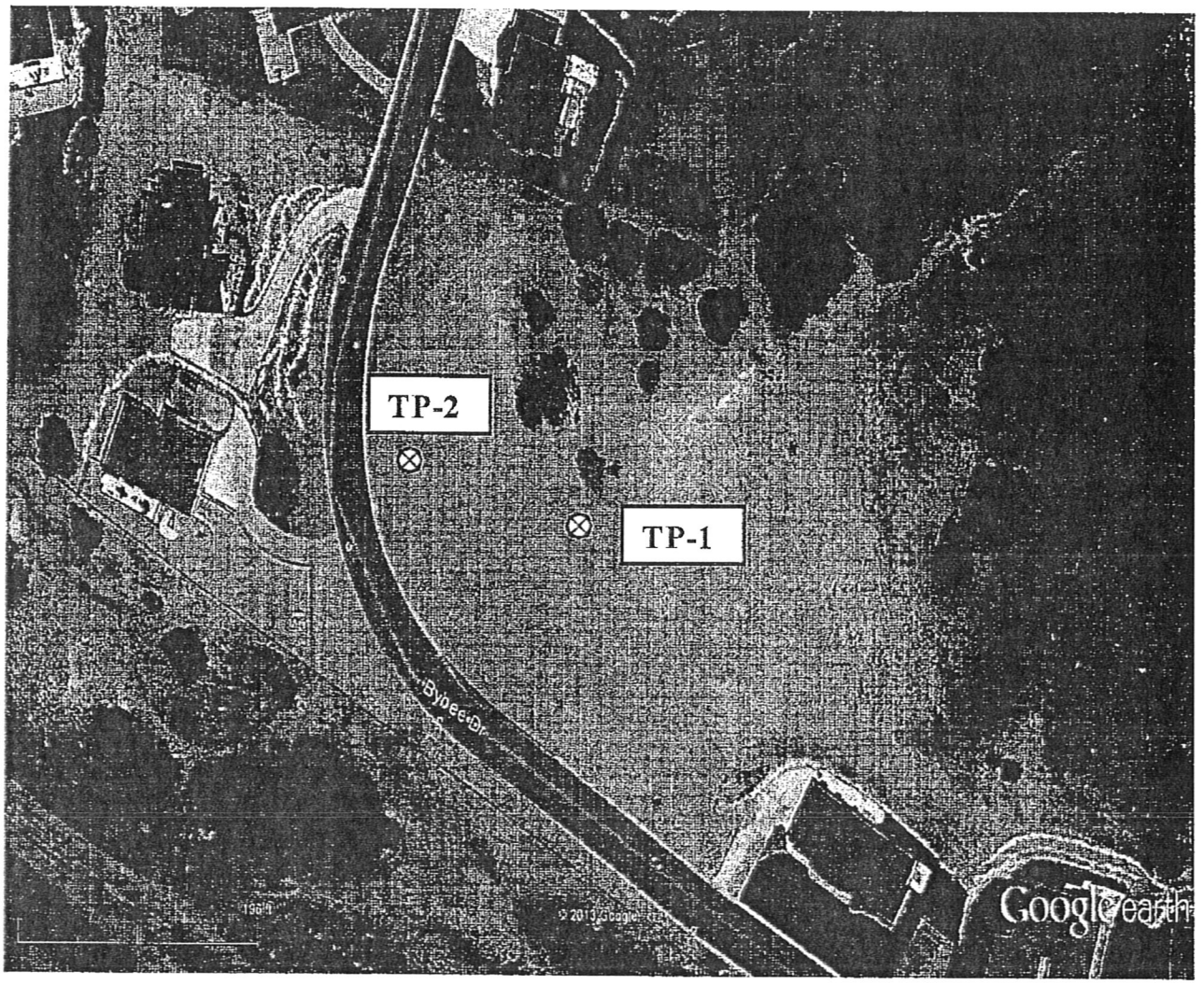
N

Not to Scale

| PROJECT NO.: 13-0055G | Earthtec Engineering Inc. | FIGURE NO.: 1 |
|---|---|---|

# AERIAL PHOTOGRAPH SHOWING LOCATION OF TEST PITS

## LOT 13-A-R CEDAR COVE SUBDIVISION
## WEBER COUNTY, UTAH




⊗ Approximate Location of Test Pits (Google Earth)

N

Not to Scale

| PROJECT NO.: 13-0055G | Earthtec Engineering Inc. | FIGURE NO.: 2 |
|---|---|---|

# TEST PIT LOG
## NO.: TP-1

**PROJECT:** Lot 13-A-R Cedar Cove Subdivision
**CLIENT:** Tracy Harper
**LOCATION:** See Figure 2
**OPERATOR:** C.E. Butters Construction
**EQUIPMENT:** Rubber-tire Backhoe
**DEPTH TO WATER; INITIAL ▽ :**

**PROJECT NO.:** 13-0055G
**DATE:** 03/06/13 - 03/06/13
**ELEVATION:** Not Measured
**LOGGED BY:** SAS
**AT COMPLETION ▼ :**

| Depth (Ft.) | Graphic Log | USCS | Description | Samples | TEST RESULTS: Water Cont. (%) | Dry Dens. (pcf) | LL | PI | Gravel (%) | Sand (%) | Fines (%) | Other Tests |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | | | |
| 1 | | FILL | Fill: dry, light brown, sandy, contains debris (wood and plastic) | | | | | | | | | |
| 2 | | | | | | | | | | | | |
| 3 | | SP-SM | Poorly Graded Sand with silt, very loose to loose (estimated), slightly moist, brown | | | | | | | | | |
| 4 | | | | | | | | | | | | |
| 5 | | | | X | 8 | | 17 | NP | 2 | 91 | 7 | |
| 6 | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | |
| 10 | | SP-SM | Poorly Graded Sand with silt and gravel, very loose to loose (estimated), slightly moist, brown | X | 5 | | 18 | NP | 31 | 64 | 5 | DS |
| 11 | | | MAXIMUM DEPTH EXPLORED APPROXIMATELY 10.5 FEET | | | | | | | | | |
| 12 | | | | | | | | | | | | |

**Notes:** No groundwater encountered.

**Tests Key**
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

**PROJECT NO.:** 13-0055G

Earthtec Engineering Inc.

**FIGURE NO.:** 3

LOG OF TESTPIT 13-0055G.GPJ EARTHTEC.GDT 3/29/13

# TEST PIT LOG
## NO.: TP-2

**PROJECT:** Lot 13-A-R Cedar Cove Subdivision
**CLIENT:** Tracy Harper
**LOCATION:** See Figure 2
**OPERATOR:** C.E. Butters Construction
**EQUIPMENT:** Rubber-tire Backhoe
**DEPTH TO WATER; INITIAL ▽ :**

**PROJECT NO.:** 13-0055G
**DATE:** 03/06/13 - 03/06/13
**ELEVATION:** Not Measured
**LOGGED BY:** SAS
**AT COMPLETION ▼ :**

| Depth (Ft.) | Graphic Log | USCS | Description | Samples | TEST RESULTS: Water Cont. (%) | Dry Dens. (pcf) | LL | PI | Gravel (%) | Sand (%) | Fines (%) | Other Tests |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | | | |
| 1 | | FILL | Fill: comprised of Silty Sand, slightly moist, brown, some gravel | | | | | | | | | |
| 2 | | | | X | 11 | | 17 | NP | 9 | 74 | 17 | |
| 3 | | SP-SM | Poorly Graded Sand with silt, very loose to loose (estimated), slightly moist, light brown, minor thin organics to 3.5 feet | | | | | | | | | |
| 4 | | | | | | | | | | | | |
| 5 | | | | X | | | | | | | | |
| 6 | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 9 | | | | X | 8 | | 18 | NP | 2 | 90 | 8 | |
| 10 | | | MAXIMUM DEPTH EXPLORED APPROXIMATELY 9.5 FEET | | | | | | | | | |
| 11 | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | |

**Notes:** No groundwater encountered.

**Tests Key**
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

**PROJECT NO.:** 13-0055G

Earthtec Engineering Inc.

**FIGURE NO.:** 4

LOG OF TESTPIT 13-0055G.GPJ EARTHTEC.GDT 3/25/13

# LEGEND

**PROJECT:** Lot 13-A-R Cedar Cove Subdivision **DATE:** 03/06/13 - 03/06/13
**CLIENT:** Tracy Harper **LOGGED BY:** SAS

## UNIFIED SOIL CLASSIFICATION SYSTEM

| MAJOR SOIL DIVISIONS | | | USCS SYMBOL | TYPICAL SOIL DESCRIPTIONS |
|---|---|---|---|---|
| COARSE GRAINED SOILS (More than 50% retaining on No. 200 Sieve) | GRAVELS (More than 50% of coarse fraction retained on No. 4 Sieve) | CLEAN GRAVELS (Less than 5% fines) | GW | Well Graded Gravel, May Contain Sand, Very Little Fines |
| | | | GP | Poorly Graded Gravel, May Contain Sand, Very Little Fines |
| | | GRAVELS WITH FINES (More than 12% fines) | GM | Silty Gravel, May Contain Sand |
| | | | GC | Clayey Gravel, May Contain Sand |
| | SANDS (50% or more of coarse fraction passes No. 4 Sieve) | CLEAN SANDS (Less than 5% fines) | SW | Well Graded Sand, May Contain Gravel, Very Little Fines |
| | | | SP | Poorly Graded Sand, May Contain Gravel, Very Little Fines |
| | | SANDS WITH FINES (More than 12% fines) | SM | Silty Sand, May Contain Gravel |
| | | | SC | Clayey Sand, May Contain Gravel |
| FINE GRAINED SOILS (More than 50% passing No. 200 Sieve) | SILTS AND CLAYS (Liquid Limit less than 50) | | CL | Lean Clay, Inorganic, May Contain Gravel and/or Sand |
| | | | ML | Silt, Inorganic, May Contain Gravel and/or Sand |
| | | | OL | Organic Silt or Clay, May Contain Gravel and/or Sand |
| | SILTS AND CLAYS (Liquid Limit Greater than 50) | | CH | Fat Clay, Inorganic, May Contain Gravel and/or Sand |
| | | | MH | Elastic Silt, Inorganic, May Contain Gravel and/or Sand |
| | | | OH | Organic Clay or Silt, May Contain Gravel and/or Sand |
| HIGHLY ORGANIC SOILS | | | PT | Peat, Primarily Organic Matter |

## SAMPLER DESCRIPTIONS

- SPLIT SPOON SAMPLER (1 3/8 inch inside diameter)
- MODIFIED CALIFORNIA SAMPLER (2 inch outside diameter)
- SHELBY TUBE (3 inch outside diameter)
- BLOCK SAMPLE
- BAG/BULK SAMPLE

## WATER SYMBOLS

- Water level encountered during field exploration
- Water level encountered at completion of field exploration

**NOTES:**
1. The logs are subject to the limitations, conclusions, and recommendations in this report.
2. Results of tests conducted on samples recovered are reported on the logs and any applicable graphs.
3. Strata lines on the logs represent approximate boundaries only. Actual transitions may be gradual.
4. In general, USCS symbols shown on the logs are based on visual methods only: actual designations (based on laboratory tests) may vary.

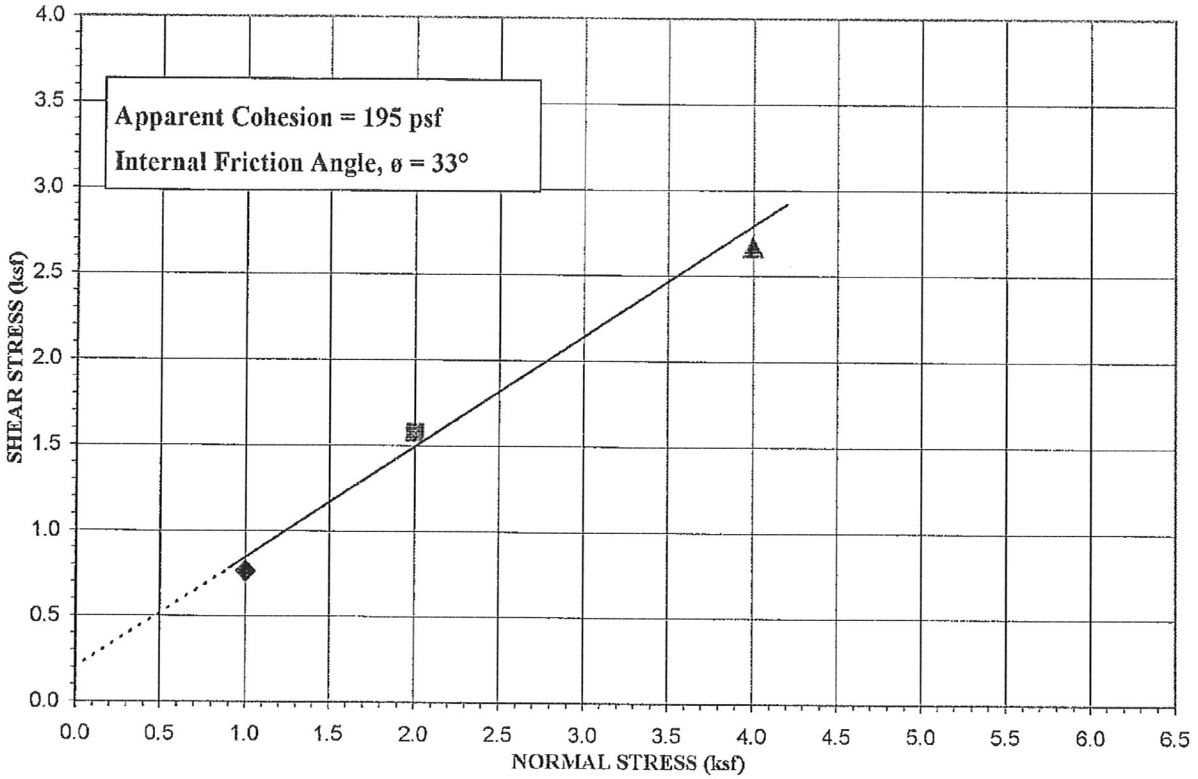
**PROJECT NO.:** 13-0055G

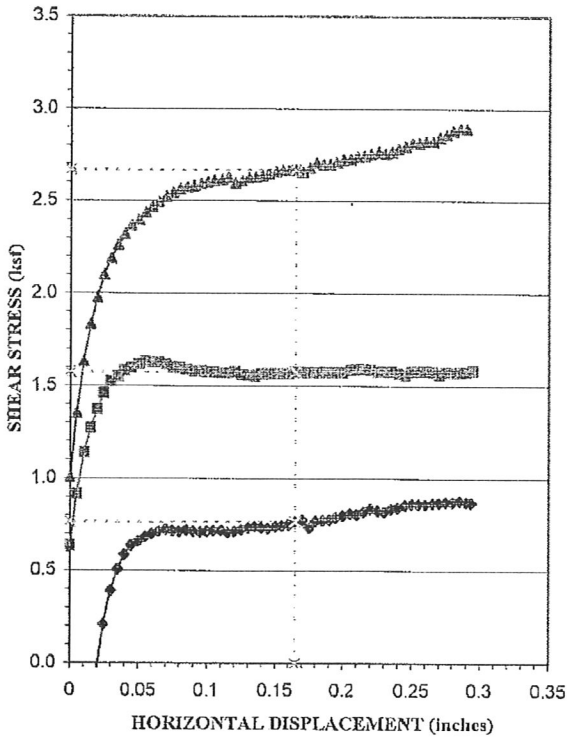
Earthtec Engineering Inc.

**FIGURE NO.:** 5

LEGEND 13-0055G.GPJ EARTHTEC.GDT 3/25/13

# DIRECT SHEAR TEST



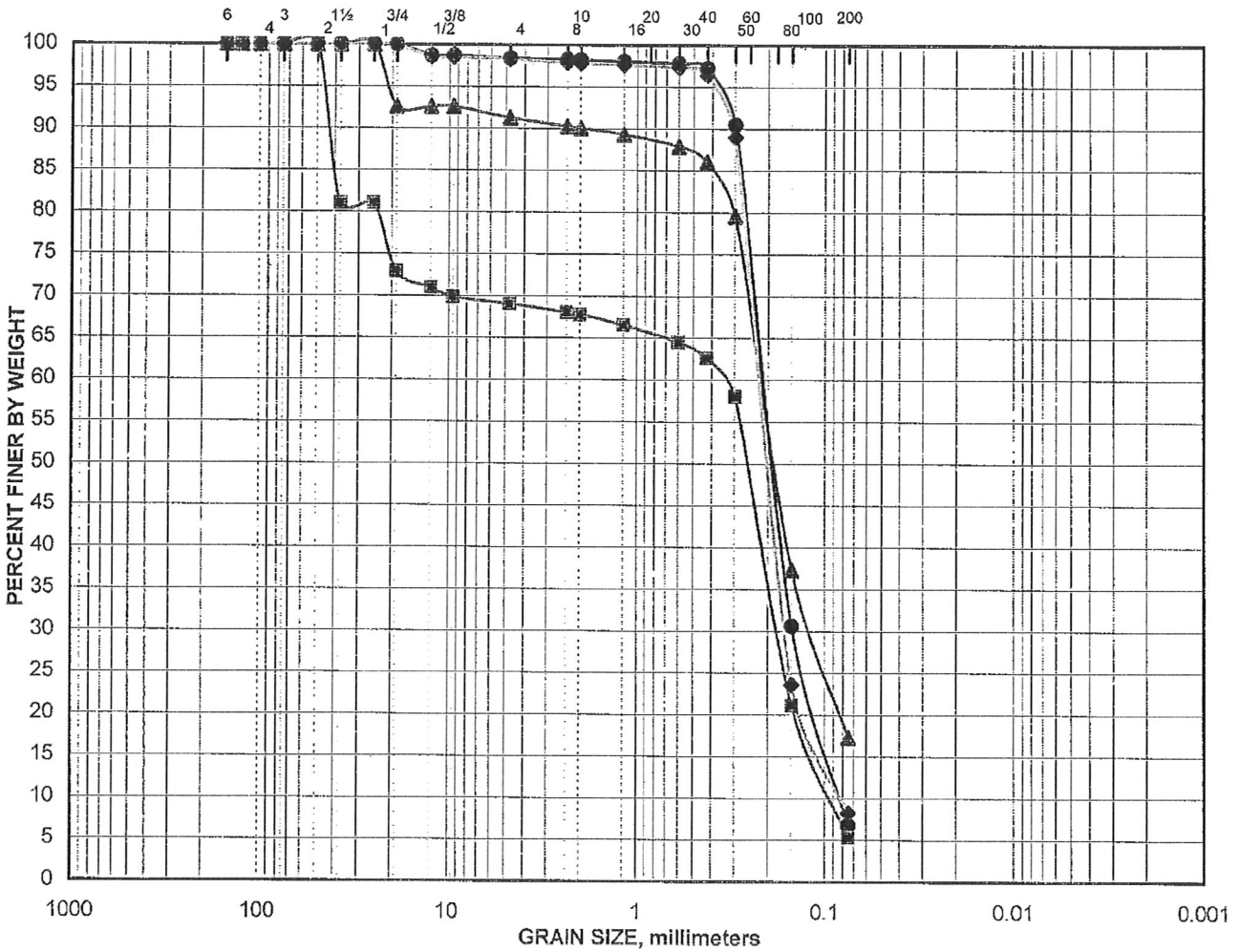

| Source: 1 | Depth: 10.0 ft | | |
|---|---|---|---|
| Type of Test: | Consolidated Drained/Saturated | | |
| Test No. (Symbol) | 1 (◆) | 2 (■) | 3 (▲) |
| Sample Type | Remolded | | |
| Initial Height, in. | 1 | 1 | 1 |
| Diameter, in. | 2.4 | 2.4 | 2.4 |
| Dry Density Before, pcf | 114.7 | 114.0 | 113.9 |
| Dry Density After, pcf | 113.7 | 113.2 | 112.9 |
| Moisture % Before | 5.0 | 5.0 | 5.0 |
| Moisture % After | 22.2 | 22.1 | 22.3 |
| Normal Load, ksf | 1.0 | 2.0 | 4.0 |
| Shear Stress, ksf | 0.77 | 1.57 | 2.67 |
| Strain Rate | .00008282 IN/SEC | | |

| Sample Properties | |
|---|---|
| Cohesion, psf | 195 |
| Friction Angle, ϕ | 33 |
| Liquid Limit, % | 18 |
| Plasticity Index, % | NP |
| Percent Gravel | 31 |
| Percent Sand | 64 |
| Percent Passing No. 200 sieve | 5 |
| Classification | SP-SM |

**PROJECT:** Lot 13-A-R Cedar Cove Subdivision

| | | |
|---|---|---|
| **PROJECT NO.:** 13-0055G | Earthtec Engineering Inc. | **FIGURE NO.:** 6 |

# GRAIN SIZE DISTRIBUTION




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| Specimen Identification | Classification | MC% | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|
| ● TP-1 @ 4.5' | Poorly Graded SAND with silt (SP-SM) | 8 | 17 | NP | NP | 1.3 | 3 |
| ■ TP1 @ 10' | Poorly Graded SAND with silt and gravel (SP-SM) | 5 | 18 | NP | NP | 1.0 | 4 |
| ▲ TP2 @ 1' | FILL (Silty SAND (SM)) | 11 | 17 | NP | NP | | |
| ◆ TP2 @ 9' | Poorly Graded SAND with silt (SP-SM) | 8 | 18 | NP | NP | 1.4 | 3 |
| X | | | | | | | |

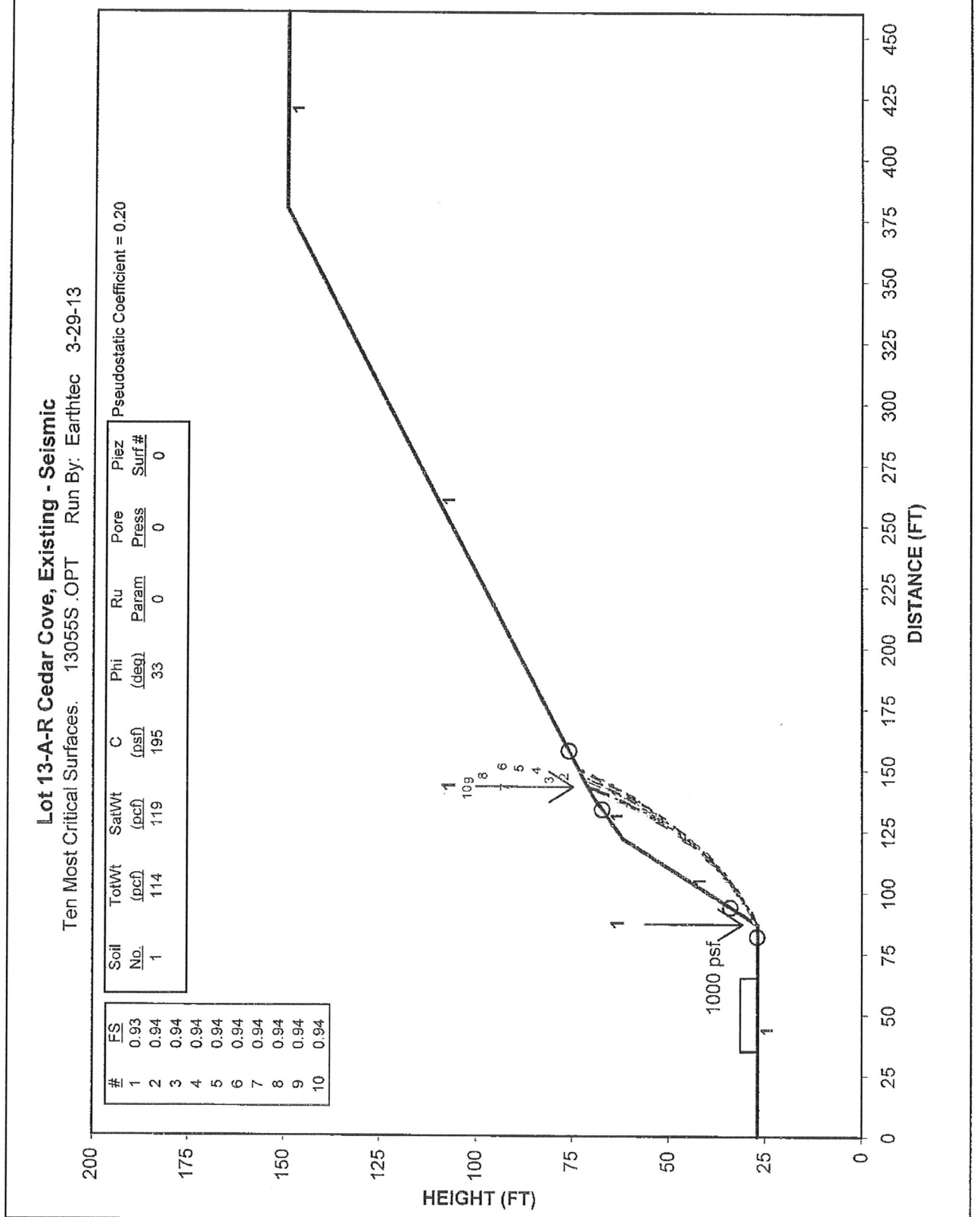
| Specimen Identification | D100 | D85 | D60 | D30 | D15 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● TP-1 @ 4.5' | 150 | 0.282 | 0.211 | 0.149 | 0.125 | 0.118 | 2 | 91 | 7 | |
| ■ TP1 @ 10' | 150 | 39.8 | 0.348 | 0.177 | 0.134 | 0.122 | 31 | 64 | 5 | |
| ▲ TP2 @ 1' | 150 | 0.402 | 0.218 | 0.133 | | | 9 | 74 | 17 | |
| ◆ TP2 @ 9' | 150 | 0.288 | 0.221 | 0.161 | 0.137 | 0.130 | 2 | 90 | 8 | |
| X | | | | | | | | | | |

PROJECT NO.: 13-0055G

Earthtec Engineering Inc.

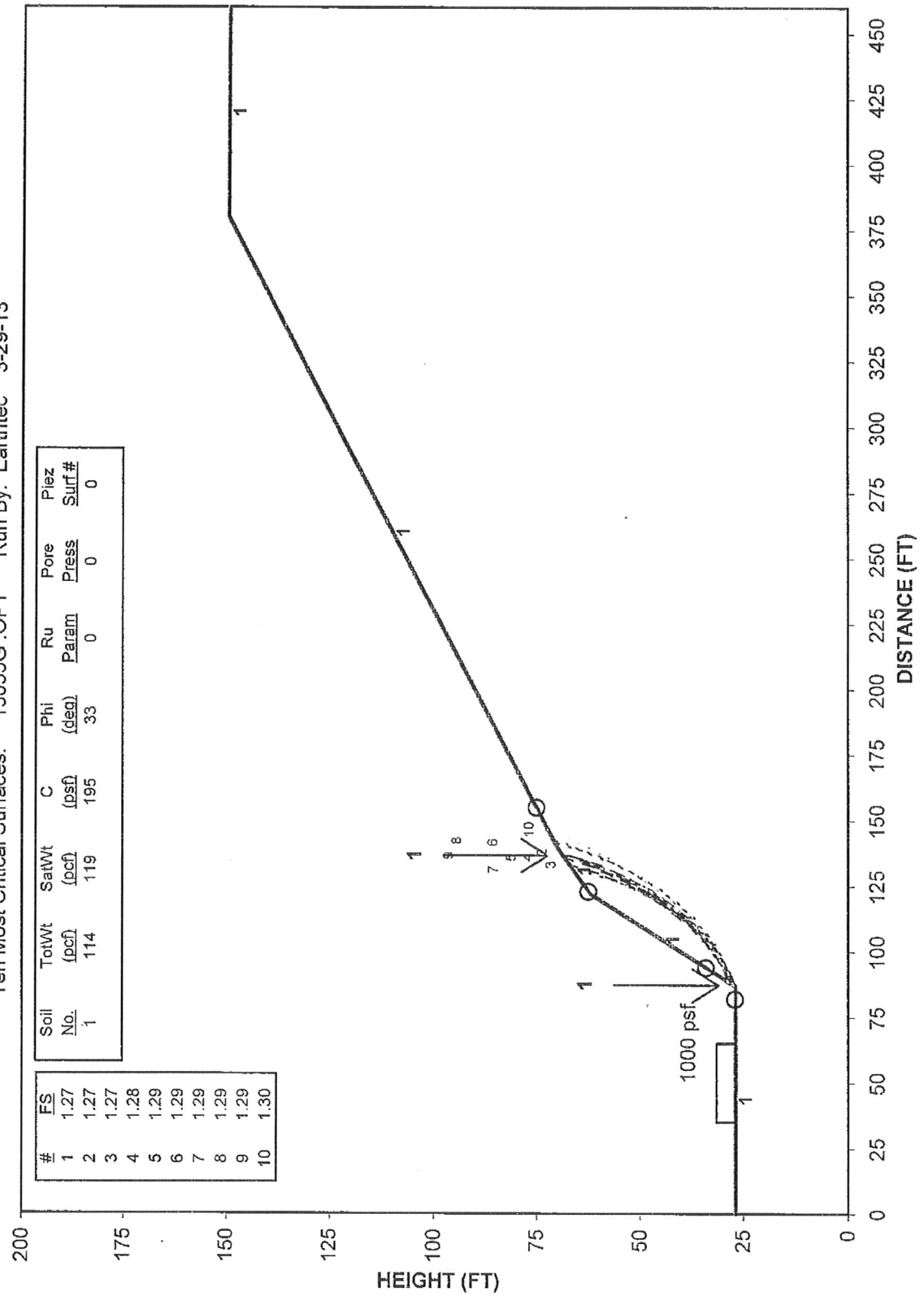
FIGURE NO.: 7

# STABILITY RESULTS



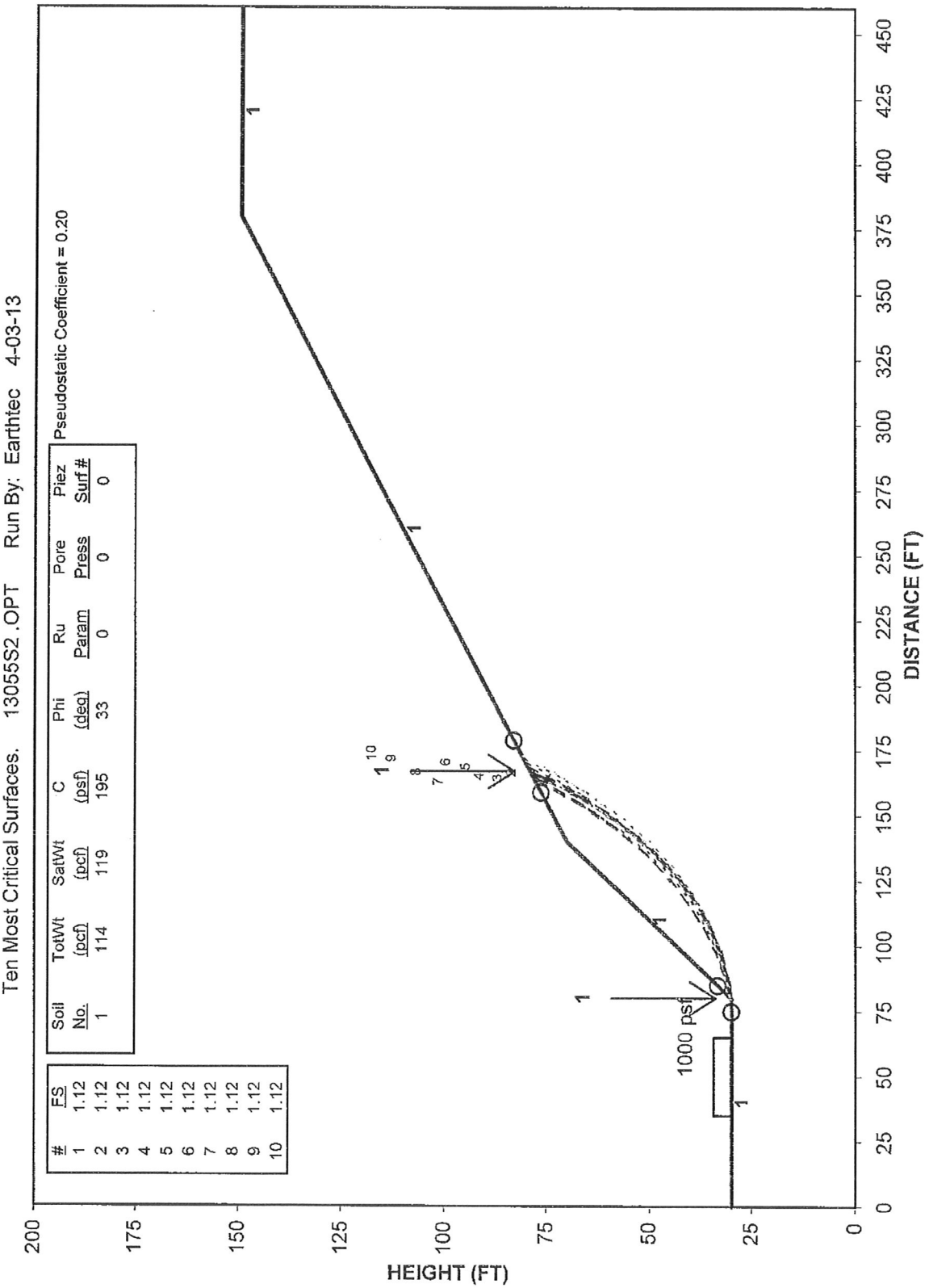

| PROJECT NO.: 13-0055G | Earthtec Engineering Inc. | FIGURE NO.: 8 |
|---|---|---|

# STABILITY RESULTS




| PROJECT NO.: 13-0055G | Earthtec Engineering Inc. | FIGURE NO.: 9 |
|---|---|---|

# STABILITY RESULTS




| PROJECT NO.: 13-0055G | Earthtec Engineering Inc. | FIGURE NO.: 10 |
|---|---|---|

PROJECT NO.: 13-0055G

Earthtec Engineering Inc.

FIGURE NO.: 11

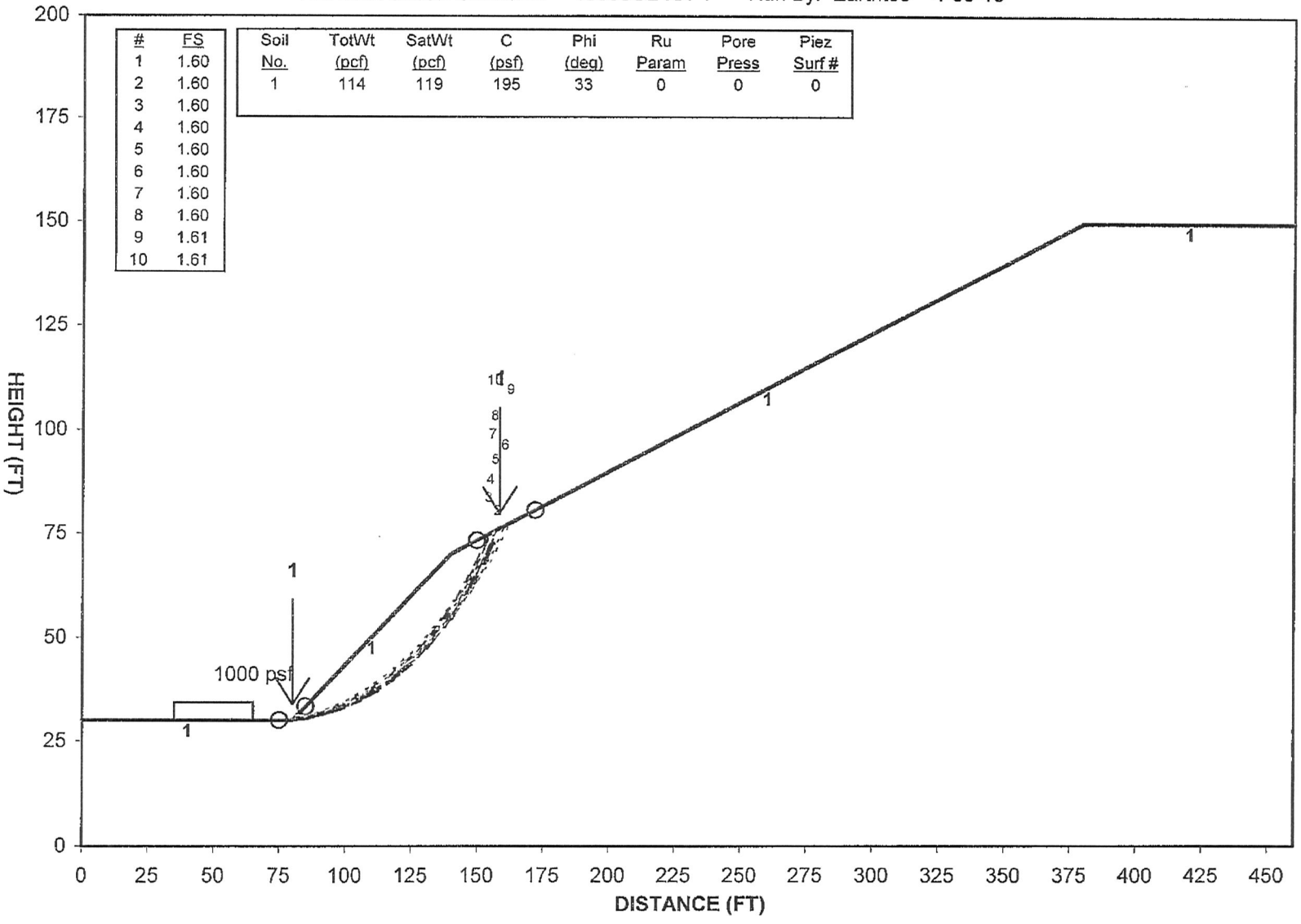
# STABILITY RESULTS

**Lot 13-A-R Cedar Cove, Proposed - Static**

Ten Most Critical Surfaces. 13055G2 .OPT Run By: Earthtec 4-03-13

| # | FS |
|---|---|
| 1 | 1.60 |
| 2 | 1.60 |
| 3 | 1.60 |
| 4 | 1.60 |
| 5 | 1.60 |
| 6 | 1.60 |
| 7 | 1.60 |
| 8 | 1.60 |
| 9 | 1.61 |
| 10 | 1.61 |

| Soil No. | TotWt (pcf) | SatWt (pcf) | C (psf) | Phi (deg) | Ru Param | Pore Press | Piez Surf # |
|---|---|---|---|---|---|---|---|
| 1 | 114 | 119 | 195 | 33 | 0 | 0 | 0 |



# Earthtec Engineering, Inc.

133 North 1330 West
**Orem, Utah - 84057**
Phone (801) 225-5711
Fax (801) 225-3363

1596 W. 2650 S. #108
**Ogden, Utah - 84401**
Phone (801) 399-9516
Fax (801) 399-9842


February 28, 2013

Reeve and Associates
Attention: Thomas Hunt, E.I.T.
920 Chambers Street, Suite 14
Ogden, Utah 84403

**Re: Proposal for Geotechnical Study**
**Lot 13-A-R Cedar Cove Estates**
**Approximately 2705 East Bybee Drive**
**Near Uintah, Utah**

Mr. Hunt:

Earthtec is pleased to present this proposal to provide a Geotechnical Study for the subject project located near Uintah, Utah. We strive to provide quality service to our clients based on their needs. Please, do not hesitate to call us if you have any questions or concerns about the scope of this proposal. We will consider modifications based on suggestions, needs, or changes in the proposed work, subject to professional standards of care.

## PROJECT UNDERSTANDING

Proposed Construction

Based on the information provided to us, we understand that the proposed project consists of constructing a single family residence on Lot 13-A-R of the Cedar Cove Estates development located at approximately 2705 East Bybee Drive, Utah. We anticipate that the future home will be conventionally framed, one to two stories in height. The home will likely be founded on spread footings with the possibility of a full basement (if conditions allow). We expect structural loads for the building to be in the range of 1 to 3 kips per lineal foot for walls, less than 20 kips for columns, and up to 100 psf for floor slabs. Miscellaneous concrete flatwork is also planned. A correct understanding of the proposed development is necessary for us to plan the study and provide appropriate recommendations. Please notify us as quickly as possible if the plans change or are in any way different from what we have assumed.

Anticipated Site Conditions

Based on available geologic information and our experience with other projects in the area, we expect subsurface conditions at this site to consist predominately of sands and gravels. Groundwater is anticipated to be greater than 10 feet below the existing ground surface, but groundwater and soil conditions vary from site to site. According to the Weber County Liquefaction Potential Map, the site is located within an area mapped as moderate in liquefaction potential.

## PROPOSED SCOPE OF WORK

Site Investigation

We propose to excavate two test pits within the proposed development area. Test pits will be excavated to a depth of approximately 8 to 12 feet below existing site grades. Upon completion the test pits will be backfilled, but not compacted. The purpose of the explorations will be to observe subsurface conditions, collect representative soil samples, and to provide information for use in our geotechnical evaluations. The soils will be visually classified using guidelines of the Unified Soil Classification System (USCS). Logs of the subsurface conditions encountered in the explorations will be provided.

Laboratory Testing

Laboratory tests will be conducted on selected soil samples obtained during the field exploration. The test results will be used to refine field soil classifications, refine the exploration logs, and to estimate pertinent engineering properties. Tests may include some or all of the following: natural moisture content and density, gradation (grain size) tests, Atterberg limits (for plastic properties), direct shear test (for slope stability analysis), and one-dimensional consolidation tests (for settlement analysis). A summary of the results of the laboratory testing and the finalized exploration logs will be included in the final report.

Engineering Analyses and Geotechnical Report

The results of the study will be summarized and presented in a bound report (3 copies). This report will include but may not necessarily be limited to the following:

- A description of surface conditions at the site.
- A brief summary of the field exploration.
- A description of the subsurface conditions encountered, including depth to groundwater.
- Soil exploration logs and a legend.
- A site plan or aerial photo showing the approximate location of the explorations.
- A discussion of seismic and other geologic hazards at the site that may affect design, including liquefaction potential. We will provide parameters for International Building Code (IBC) seismic design including the longitude and latitude of the site, and recommended values for $S_{DS}$, $S_{1S}$, $F_a$ and $F_v$.
- Geotechnical recommendations for grading, pad preparation, and excavations, considering groundwater levels as applicable.
- Geotechnical recommendations for foundation design, including frost depth requirements, allowable bearing pressures (considering settlement) and any recommended over-excavation.
- Lateral earth pressures for below-grade walls.
- Slope stability analysis based on available grading plan.

## EXCLUSIONS

Our scope of work for the geotechnical study presented above is completed once the reports have been finished, and does not include any of the following services:

1. Review, interpretation and/or modifications of project plans and specifications
2. Inspections and/or testing during the construction
3. Additional analysis as mandated by regulatory agencies
4. Compliance letters
5. Geologic hazards or surface fault rupture studies
6. Groundwater or surface water modeling
7. Phase I or II Environmental Assessments

Earthtec does provide the services listed above, and can do so upon request with the appropriate authorization. Any of these additional services will be billed separately, and are not included in the fees presented below.

## ESTIMATED FEES/SCHEDULE

We propose to conduct the Geotechnical Study as described above for a lump sum fee, which we estimate as follows:

| | |
|---|---|
| Excavation Equipment | $ 345 |
| Field Engineering | $ 200 |
| Laboratory Testing | $1,080 |
| Engineering & Geotechnical Report Preparation | $ 720 |
| **Lump Sum Total** | **$2,345** |

We request that the excavation equipment portion of the fee (**$345**) be paid prior to beginning our scope of work indicated above. Our final invoice will be submitted upon completion of the reports and is payable immediately. All reports will be released after payment has been received. The costs quoted above supersede any verbal fee quotes that may have been given prior to this proposal.

We expect to begin the geotechnical study by contacting Blue Stakes for utility locations within one day following receipt of the "Notice to Proceed" and have the final report prepared within approximately 15 to 20 working days (depending on equipment availability) after your authorization of this work. The schedule assumes site accessibility and reasonable weather conditions. Note that utilities beyond private meters and sprinkler lines are typically not marked by Blue Stake utility companies and our fee does not include repairs if such utilities are damaged during our field exploration.

## AUTHORIZATION

The General Conditions (revised January 2011), attached, are considered part of this proposal. Returning a signed copy of this proposal will be considered your authorization. You may fax the signature page to us at 801-399-9842.

I, TRACY HARPER, agree to the foregoing terms and authorize the work to proceed.
(please print name and title)

| Owner or Authorized Agent (Signature) | Date | Phone Number | Fax Number |
|---|---|---|---|
| | 3-7-2013 | 80-479-0650 | |

| Address (if different than addressee) | City | State | Zip Code |
|---|---|---|---|
| 7817 S. 1750 E. SO. WEBER | | UT. | 84405 |

Acceptance of this proposal constitutes a contract between Earthtec Engineering, Inc. and the above-mentioned signatory in accordance with the attached general conditions. After the proposal has been signed, or verbal agreement has been given to proceed, full termination of project must be in writing and delivered by certified mail. All invoicing will include fees and expenses up to the date the notification is received.

We appreciate the opportunity to submit this proposal to you. If you have any questions or require further information, please contact us at (801) 399-9516.

Sincerely;
**EARTHTEC ENGINEERING, INC.**

Andrew M. Harris, P.E.
Engineering Manager

Attachments: General Conditions (Rev. 1/11)

1 copy emailed

## EARTHTEC ENGINEERING, INC. GENERAL CONDITIONS (PROFESSIONAL SERVICES)

**1.** **Services.** This Agreement is entered into between Client and Earthtec Engineering, Inc. ("Consultant") wherein Client engages Consultant to provide services ("Services") in connection with the project. In certain cases the scope of services may be described in the Consultant's proposal to which these General Conditions are attached. Client agrees that services not specifically described in the Scope of Services identified in Consultant's proposal are not included in the Scope of Services described by Consultant. This Agreement, including the Consultant's proposal, these General Conditions, Consultant's Addenda and Fee Schedule, represents the entire Agreement between the parties and supercedes any and all agreements between the parties, either oral or in writing, including any purchase or work order issued by Client.

**2.** **Prevailing Wages.** It is Client's legal responsibility to determine whether the Project is covered under prevailing wage regulations. Unless Client specifically informs Consultant in writing that the Project is a prevailing wage project and is identified as such in Consultant's Scope of Services, Client agrees to reimburse Consultant and to defend, indemnify and hold harmless Consultant from and against any liability, including costs, fines and attorneys' fees, resulting from a determination that the Project was covered under prevailing wage regulations.

**3.** **Work Product.** Services provided under this Agreement, including all reports, information, recommendations, or opinions ("Reports") prepared or issued by Consultant, are for the exclusive use and benefit of Client or its agents in connection with the Project. No other use is authorized under this Agreement. Consultant grants to Client a non-exclusive license to reproduce Consultant's Reports solely for the purposes of the Project. Client will not distribute or convey such Reports to any other persons or entities other than those involved with the Project without Consultant's prior written consent. Client releases Consultant from liability and agrees to defend, indemnify, protect, and hold harmless Consultant from any and all claims, liabilities, damages or expenses arising from an unauthorized distribution of Consultant's Reports. Consultant's Reports, logs, maps, field data, drawings, test results and other work products are part of Consultant's professional services, do not constitute goods or products and are copyrighted works of Consultant. However, such copyright is not intended to limit the Client's use of Consultant's Reports in connection with the Project and in accordance with the non-exclusive license granted herein.

**4.** **Standard of Care.** Consultant will strive to perform the Services in a manner consistent with that level of care and skill ordinarily exercised by members of the Consultant's profession practicing in the same locality under similar circumstances at the time the services are performed. No other warranty or guarantee; either expressed or implied, is created by this Agreement.

**5.** **Limitation of Liability.** Consultant's potential liability to Client and others is grossly disproportionate to Consultant's fee due to the size, scope, and value of the Project. Therefore, unless Client and Consultant otherwise agree in writing in consideration for an increase in Consultant's fee, Client, including its directors, officers, partners, employees, agents, contractors and their respective assigns, agree to limit Consultant's liability (whether arising from contract, statutory violation or tort) to the greater of $25,000 or the amount of Consultant's fee. Prior to the initiation of Consultant's services hereunder, this limitation may be increased up to Consultant's then effective professional liability insurance limits, upon mutual agreement and Client's payment of an additional fee equal to 0.5% of the requested limitation. This limitation of liability shall apply to all phases of Services performed in connection with this Project, whether subsequent to or prior to the execution of this Agreement. In no event shall Consultant be liable for consequential, incidental or special damages. The Client hereby agrees to indemnify and hold harmless Consultant for all third party legal action that may be taken upon Client whereas Client is held liable for its own actions.

**6.** **Certificates of Insurances.** For normal copies of certificates of insurance there will be no charge. If Client needs to be named as additional insured there may be a $45.00 assessed per certificate.

**7.** **Construction Observation.** If expressly included in the Services, Consultant's services during construction shall be limited to observation and testing of construction materials. Consultant shall not be responsible for constant or exhaustive inspection of the work, the means and methods of construction or the safety procedures employed by Client's contractor. Performance of construction observation services does not constitute a warranty or guarantee of any type, since even with diligent observation, some construction defects, deficiencies or omissions in the Contractor's work may occur. Client shall hold its contractor solely responsible for the quality and completion of the Project, including construction in accordance with the construction documents. Any duty hereunder is for the sole benefit of the Client and not for any third party, including the contractor or any subcontractor. Client, or its designees, shall notify Consultant at least twenty-four (24) hours in advance of any field tests and observations required by the construction documents. Client will indemnify and hold Consultant harmless for its failure to retain Consultant's services according to written reports, plans and specifications.

**8.** **Certifications.** Consultant shall sign certifications only if (a) Consultant approves the form of such certification prior to the commencement of Services, (b) such certification is included in Consultant's Services, (c) the certification is limited to a statement of professional opinion and does not constitute a warranty or guarantee of project performance, express or implied. Any certification shall not relieve any entity of its obligations.

**9.** **Samples.** All samples shall remain the property of the Client. Client shall promptly, at its cost, remove and lawfully dispose of samples, cuttings and hazardous materials. If appropriate, Consultant shall preserve samples obtained no longer than thirty (30) days after the issuance of any document that includes the data obtained from those samples. After that date, Consultant may dispose of the samples or return them to Client at its cost.

**10.** **Client Responsibilities.** Client shall bear sole responsibility for (a) jobsite safety; (b) notifying third parties including any governmental agency or prospective purchaser, of the existence of any buried debris, or hazardous or dangerous materials located in or

around the Project site; and (c) providing and updating Consultant with accurate information regarding existing conditions, including the existence of hazardous or dangerous materials, proposed Project site uses, the correct location of Project property boundaries, any change in Project plans, and all subsurface installations, such as pipes, tanks, cables, electrical lines, telephone lines and utilities within the Project site. Client shall cooperate with all requests by Consultant, including obtaining permission for access to the Project site. Client releases Consultant from liability for any incorrect advice, judgment or decision based on inaccurate information furnished by Client, Client's subcontractors, employees, representatives, or agents. If reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including hazardous materials, encountered on the site, Consultant shall immediately stop work in the affected area and report the condition to the Client. Furthermore, the Client, including its subcontractors and affiliates, shall indemnify and hold Consultant harmless for failure to implement all recommendations made by the Consultant and for any deviations made thereof.

**11.** **Electronic Media.** Because data stored on electronic media can deteriorate undetected or be modified without Consultant's knowledge, the Client accepts responsibility for the completeness or readability of the electronic media after an acceptance period of 30 days from delivery of the electronic files. Client shall not be responsible for loss of information or clarity through electronic transmission, computer viruses or lack of software compatibility. In all cases Client must rely on the hard copy. In a case where there is a discrepancy the hard copy shall control.

**12.** **Dispute Resolution.** Excluding any action to collect money due upon an account by the Consultant, the parties shall attempt resolution of any dispute arising under or related to this Agreement by mediation. Either party may demand mediation by serving a written notice on the other party stating the essential nature of the dispute. The mediation shall be before a mutually acceptable mediator and shall be conducted within forty-five (45) days from the service of notice, unless mutually agreed otherwise. In the event the parties are unable to agree upon a mediator, or said mediator shall be appointed by a court of competent jurisdiction and of proper venue. The parties shall share the fees equally. If mediation fails, either party may institute litigation in the state or federal court of the county in which Consultant's office issuing the proposal is located. Excluding any action to collect money due upon an account by the Consultant, the parties expressly waive any statute of limitations for a longer period of time and agree that any other action shall be brought within one year from the date of Consultant's final invoice. The parties agree that any other claim not brought within one year from the date of Consultant's final invoice shall be barred, deemed waived and released. The parties expressly waive any and all rights to a trial by jury in any action, proceeding or counterclaim brought by either of the parties against the other with respect to any matter relating to arising out of or in any way connected with this Agreement.

**13.** **Changed Conditions.** If during the course of performance of this Agreement conditions or circumstances are discovered which were not contemplated by Consultant at the commencement of this Agreement, Consultant shall notify Client of the newly discovered conditions or circumstances, and Client and Consultant shall renegotiate, in good faith, the terms and conditions of this Agreement. If amended terms and conditions cannot be agreed upon within thirty (30) days after notice, Consultant may terminate this Agreement and Consultant shall be paid for its services through the date of termination.

**14.** **Governing Law and Venue.** The laws of the State of Utah shall govern interpretation of this Agreement. The place of venue will be within the boundary of Salt Lake County or Utah County. If any term is or provision is deemed unenforceable, in violation of law, or void, it shall not affect the validity or enforceability of any other term or provision and the remainder of the Agreement shall continue in full force and effect.

**15.** **Additional Provisions.** Neither party may assign its interest in this Agreement without the prior written consent of the other. Any modification to this Agreement will be binding only if it is provided in writing by the Consultant and not objected in writing by the Client within 30 days, except that if Consultant has performed services in reliance on Client's verbal approval to proceed, Client shall be bound by such verbal approval. One or more waivers of any term, condition or covenant by either party shall not be construed as a waiver of any other term, condition or covenant.

**16.** **Liens.** A lien may be processed by Consultant on projects with invoices past 90 days. An additional fee of $100 will be added to the Clients invoice.

**17.** **Collections.** In the event that payment in full for charges incurred is not made within 30 days, Client agrees to pay interest at the rate of 1.5% per month (18% per year). In the event that payment in full for charges incurred is not made within 90 days, Client agrees to pay court costs and reasonable attorneys' fees, with or without suit, incurred in collecting any past due balance, and a collection fee of 40% of the principal amount if the account is assigned to a collection agency.

**18.** **Termination.** Consultant may, upon five (5) calendar days' notice to client, suspend all Services until paid in full and may terminate the Agreement. Termination by Client must be provided in writing and (5) calendar days' notice.

**19.** **Term.** The Agreement is for one year from date of signature by Client. This Agreement will automatically renew for another term each coming year if notice by either Client or Consultant is not given in writing within a (30) day time period of renewal. The act of cancelling the Agreement does not place further liability upon the Consultant. The General Conditions of the original, including the written modifications thereafter, prior to the date of cancellation are still in effect and are binding.

**20.** **Supersedes.** This Agreement supersedes all other Agreements that may have been signed between Client and Consultant prior to date of Clients signature.

(Revised January 2011)