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Geotechnical Study
Genola Public Works Building
Approximately 700 South 200 West
Genola, Utah

Project No. 250416G

August 25, 2025

Prepared For:

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1.0 SUMMARY

This entire report presents the results of Earthtec Engineering's completed geotechnical study for the Genola Public Works Building in Genola, Utah. This summary provides a general synopsis of our recommendations and findings. Details of our findings, conclusions, and recommendations are provided within the body of this report.

- Conventional strip and spread footings may be used to support the structures, with foundations placed entirely on firm, undisturbed, uniform native soils (i.e. completely on gravel soils), or entirely on a minimum of 18 inches of properly placed, compacted, and tested structural fill extending to undisturbed native soils for structural loads up to 5,000 pounds per linear foot for bearing walls and up to 150,000 pounds for column loads. If loads exceed these see Section 10 for further recommendations.

Based on the results of our field exploration, laboratory testing, and engineering analyses, it is our opinion that the subject site may be suitable for the proposed development, provided the recommendations presented in this report are followed and implemented during design and construction.

Failure to consult with Earthtec Engineering (Earthtec) regarding any changes made during design and/or construction of the project from those discussed herein relieves Earthtec from any liability arising from changed conditions at the site. We also strongly recommend that Earthtec observes the building excavations to verify the adequacy of our recommendations presented herein, and that Earthtec performs materials testing and special inspections for this project to provide continuity during construction.

2.0 INTRODUCTION

The project is located at Approximately 700 South 200 West in Genola, Utah. The general location of the site is shown on Figure No. 1, *Vicinity Map* and Figure No. 2, *Aerial Photograph Showing Location of Borings, ReMi, and Percolation Test,* at the end of this report. The purposes of this study are 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, miscellaneous concrete flatwork, and asphalt and concrete paved parking and drive areas.

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. This report was prepared according to the signed agreement dated July 7, 2025.

3.0 PROPOSED CONSTRUCTION

We understand that the proposed project, as described to us by Mr. Dave Edwards with WPA

Architecture, consists of developing the approximately ½-acre existing parcel with a new public works building. The proposed structures will consist of conventionally framed, two- to three-story, slab-on-grade buildings. We have based our recommendations in this report that the anticipated foundation loads for the proposed structures will not exceed 5,000 pounds per linear foot for bearing walls, 150,000 pounds for column loads, and 100 pounds per square foot for floor slabs. If structural loads will be greater Earthtec should be notified so that we may review our recommendations and make modifications, if necessary.

In addition to the construction described above, we anticipate that utilities will be installed to service the proposed buildings, exterior concrete flatwork will be placed in the form of curb, gutter, sidewalks, driveways, and asphalt and concrete paved parking and drive areas will be constructed.

4.0 GENERAL SITE DESCRIPTION

4.1 Site Description

At the time of our subsurface exploration the site was an undeveloped portion of an existing parcel covered with gravel and crushed asphalt and sparsely vegetated with grass and weeds. The ground surface appears to be relatively flat; we anticipate less than 3 feet feet of cut and fill may be required for site grading. The lot was bounded on the north by a cell tower, on the east by a landscaped field, on the south by a vacant lot, and on the west by South Main Street.

4.2 Geologic Setting

The subject property is located in the southern portion of Utah Valley near the southern shore of Utah Lake. Utah Valley is a deep, sediment-filled basin that is part of the Basin and Range Physiographic Province. The valley was formed by extensional tectonic processes during the Tertiary and Quaternary geologic time periods. The valley is bordered by the Wasatch Mountain Range on the east and the Lake and West Mountains on the west. Much of northwestern Utah, including Utah Valley, was previously covered by the Pleistocene age Lake Bonneville. Utah Lake, which currently covers much of the western portion of the valley, is a remnant of this ancient freshwater lake. The surficial geology of much of the southernmost margin of the valley has been mapped by *Witkind and Weiss, 1991*[1]. The surficial geology at the location of the subject site and adjacent properties is mapped as “Offshore deposits of the Bonneville lake cycle” (Map Unit Qbo) dated to the Pleistocene. These soil or deposits are generally described in the referenced mapping as “Light-gray to light-tan, well sorted and even-bedded deposits of clay, silt, and some sand. Chiefly of lacustrine origin.” However, a geologic hazard study was not performed for the subject site during this study.

[1] Witkind, I.J., Weiss, M.P., 1991, Geologic Map of the Nephi 30’ X 60’ Quadrangle, Carbon, Emery, Juab, Utah, and Wasatch Counties, Utah; U.S. Geological Survey, Map I-1937, Scale 1:100,000

5.0 SUBSURFACE EXPLORATION

5.1 Soil Exploration

Under the direction of a qualified member of our geotechnical staff, subsurface explorations were conducted at the site on July 29, 2025, by the boring of two (2) borings to depths of 21½ to 32½ feet below the existing ground surface using a a truck-mounted hydraulic drill rig. The approximate locations of the borings are shown on Figure No. 2, *Aerial Photograph Showing Location of Borings, ReMi, and Percolation Test*. Graphical representations and detailed descriptions of the soils encountered are shown on Figure Nos. 3 through 4, *Boring 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 No. 5, *Legend*.

Samples of the subsurface soils were collected in the borings at depth intervals of approximately 2½ to 5 feet. A relatively undisturbed sample was collected with a 2.4 inch inside diameter Modified California sampler. Disturbed samples were collected with a 1⅜ inch inside diameter split spoon sampler. The split spoon sampler and Modifed California sampler were driven up to 18 inches into undisturbed soil with a 140-pound hammer free-falling through a distance of 30 inches. The blows required to drive the sampler through the final 12 inches of penetration is called the “N-value” or “blow count,” and is recorded as “blows per foot” on the attached boring logs at the respective sample depths. The blows for each 6-inch interval (or less) are noted on the logs when more than 50 blows per 6 inches (or less) of sampler driving were achieved. The blow count provides a reasonable indication of the in-place relative density of sandy soils but provides only a limited indication of the relative stiffness of cohesive (clayey) materials, since the penetration resistance for these soils is a function of the moisture content. In gravelly soils, the blow count may be higher than it otherwise would be, particularly when one or more gravel particles are larger than the sampler diameter.

The soil samples collected were classified by visual examination in the field following the guidelines of the Unified Soil Classification System (USCS). The samples were transported to our Lindon, Utah laboratory where they will be retained 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 30-day limit.

5.2 Percolation Testing

A percolation test was conducted in the location specified in Figure No. 2 (PERC-1). The test was performed at 5 feet below the existing ground surface by boring a hole with a truck-mounted hydraulic drill rig, installing a perforated PVC pipe, filling the boring with water, and measuring the water loss with time. The soils at the elevation of the percolation test consisted of dense gravels (GM, GC-GM). The test was performed several times and the final measured rate is 1 minute per inch.

5.3 Shear-Wave Velocity Testing

A geophysical exploration was conducted on August 4, 2025, which consisted of Refraction Microtremor (ReMi) testing. Performing the test consisted of laying out a series of geophone sensors connected to a seismic source, the location of which is shown on Figure No. 2. A wavefield transformation is performed on the data recorded from the geophone movement, and then utilized to create a shear-wave dispersion curve to model the shear-wave velocity profile of the subsurface. The results of the test can be seen on Figure No. 3, *Shear Wave Velocity Profile with Site Class Determination*.

According to the gathered data and analyzed results, an average shear-wave velocity of value of 954.34 ft/sec was found. This characterizes the site as a Site Class D as defined in Chapter 20 of ASCE 7-16. Further recommendations regarding this classification can be found in Section 9.1, *Seismic Design*.

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 contents, a dry density test, liquid and plastic limits determinations, and mechanical (partial) gradation analyses. The laboratory test results are also included on the attached *Boring Logs* at the respective sample depths.

A water-soluble sulfate test was performed on a representative sample obtained during our field exploration which indicated a value of 42 parts per million. Based on this result, the risk of sulfate attack to concrete appears to be “negligible” according to American Concrete Institute standards. Therefore, there are no restrictions on the type of Portland cement that may be used for concrete in contact with on-site soils. The results can be found in Appendix A.

7.0 SUBSURFACE CONDITIONS

7.1 Soil Types

On the surface of the site, we encountered fill which is estimated to extend about 12 to 18 inches in depth at the boring locations. Below the fill we encountered layers of sand and gravel extending to depths of 21½ to 32½ feet below the existing ground surface. Graphical representations and detailed descriptions of the soils encountered are shown on Figure Nos. 3 through 4, *Boring Log* at the end of this report. Based on the blow counts obtained during field exploration, the sand and gravel soils had a relative density varying from medium dense to very dense.

It should be considered that a limited number of small diameter soil borings were used during the course of our subsurface exploration. Topsoil and fill material composition and contacts are difficult to determine from boring sampling. Variation in fill depths may occur at the site.

7.2 Collapsible/Expansive Soils

Collapsible soils are typically characterized by a pinhole structure and relatively low unit weights. Foundations, floor slabs, and roadways supported on these soils may be susceptible to large settlements and structural distress when wetted. Significantly collapsible soils were not encountered in our explorations.

7.3 Groundwater Conditions

Groundwater was not encountered within the excavations at the depths explored. We did not observe oxidation or other indicators in the soils which would indicate signs of past water or seepage levels shallower than the groundwater. No artesian conditions were encountered during our explorations. Note that groundwater levels will fluctuate in response to the season, precipitation, snow melt, irrigation, and other on and off-site influences. Quantifying these fluctuations would require long term monitoring, which is beyond the scope of this study. 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, collapsible, and any other inapt materials) should be removed from below foundations, floor slabs, exterior concrete flatwork, and pavement areas. We encountered fill on the surface of the site. The fill encountered on the site is considered undocumented (untested). The fill (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. Over-excavations below footings and slabs also may be needed, as discussed in Section 10.0.

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. Because the site is relatively flat, we anticipate that less than 3 feet of grading fill will be placed. 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 provide additional recommendations, if required. Such recommendations will likely include placing the fill several weeks (or possibly more) 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[2] requirements for Type B soils.

[2] OSHA Health and Safety Standards, Final Rule, CFR 29, part 1926.

8.3 Fill Material Composition

The existing granular fill soils appear to be suitable for use as placed and compacted engineered fill provided the material meets the requirements for structural fill and any existing debris and particles larger than 6 inches in diameter are removed prior to use. Excavated soils, including clay and silt, may be stockpiled for use as fill in landscape areas.

Structural fill is defined as imported fill material that will ultimately be subjected to any kind of structural loading, such as those imposed by footings, floor slabs, pavements, etc. Gradation requirements stated below shall be verified in intervals not exceeding 1,000 tons. We recommend that imported structural fill consist of sandy/gravelly soils meeting the following requirements in the table below:

Table 1: Imported 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

Engineered fill is defined as reworked native, granular (sands or gravels) material that will ultimately be subjected to any kind of structural loading, such as those imposed by footings, floor slabs, pavements, etc. Native clay and silt soils are not suitable for use as engineered fill. We recommend that a professional engineer or geologist verify that the engineered fill to be used on this project meets the requirements. Engineered fill should be clear of all organics, have a maximum particle size of 4 inches, less than 70 percent retained on the ¾-seive, a maximum Liquid Limit of 35, and a maximum Plasticity Index of 15.

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, stricter 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 or engineered fill. Local governments or utility companies required specification for backfill should be followed unless our recommendations stricter.

If native soil is used as fill material, the contractor should be aware that native clay and silt soils (as observed in the explorations) may be time consuming to compact due to potential difficulties

in controlling the moisture content needed to obtain optimum compaction and changes proctor values.

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

Table 2: 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 soil 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%
- 5 feet or greater of fill below structurally loaded areas: 98%

Generally, placing and compacting fill at moisture contents within ±2 percent of the optimum moisture content, as determined by ASTM D-1557, will facilitate compaction. Typically, the further the moisture content deviates 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. For mass grading or building pads a minimum of one test per 5,000 square feet per lift, with a minimum of 2 tests per lift. For trenches one test per 100 linear feet per lift is required. 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 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, partially loaded equipment, tracked equipment, by working in dry times of the year, and/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. Materials which are more angular and coarse may require thinner lifts in order to achieve compaction. 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 SEISMIC AND GEOLOGIC CONSIDERATIONS

9.1 Seismic Design

The results of the ReMi Tremor testing, found on Figure No. 6, found an average shear-wave velocity of 954.3 ft/sec. The site is thereby designated as a Site Class D by ASCE 7-22. The site is located at approximately 39.983 degrees latitude and -111.845 degrees longitude. Using Site Class D, the design spectral response acceleration parameters are given below.

Table 3: Design Accelerations

S_S	F_a	S_{MS}	S_{DS}	S_1
1.611 g	1	1.611 g	1.074 g	0.572 g

9.2 Faulting

The subject property is located within the Intermountain Seismic Belt where the potential for active faulting and related earthquakes is present. Based upon published geologic maps[3], 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 Long Ridge (Northwest Side) Fault approximately one mile to the southwest, with the Nephi Section of the Wasatch Fault lying approximately 4½ miles to the east. The Long Ridge Fault is a poorly understood Quaternary fault along the northern side of Long Ridge in southern Goshen Valley. The fault has no known recurrence interval and an unknown slip rate.

9.3 Liquefaction Potential

According to current liquefaction maps[4] for Utah County, the site is located within an area designated as "Moderate" in liquefaction potential. Liquefaction can occur when saturated subsurface soils below groundwater lose their inter-granular 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 encountered were composed of unsaturated gravel soils.

As part of this study, the potential for liquefaction to occur in the soils we encountered was assessed using Youd *et al*[5] and Boulanger & Idriss[6]. Potential liquefaction-induced movements were evaluated using Tokimatsu & Seed[7] and Youd, Hansen & Bartlett[8]. Our analysis indicates that, owing to the very dense and dry gravel soils, the risk of liquefaction settlement and spread is relatively low and liquefaction mitigation is not necessary for the planned structures.

[3] U.S. Geological Survey, Quaternary Fault and Fold Database of the United States, November 3, 2010.
[4] Christenson, G.E., Shaw, L.M., 2008, Liquefaction Special Study Areas, Wasatch and Nearby Areas, Utah; Utah Geological Survey, Map to Circular 106, Scale 1:250,000
[5] Youd, T.L. (Chair), Idriss, I.M. (Co-Chair), and 20 other authors, 2001, Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils, Journal of Geotechnical and Geoenvironmental Engineering, ASCE, October 2001, p. 817-833.
[6] Boulanger, R.W. and Idriss, I.M., 2006, Liquefaction Susceptibility Criteria for Silts and Clays, Journal of Geotechnical and Geoenvironmental Engineering, ASCE, November 2006, p. 1413-1426.
[7] Tokimatsu, K. and Seed, H.B., 1987, Evaluation of Settlements in Sands due to Earthquake Shaking, Journal of Geotechnical Engineering, ASCE, p. 861-878.
[8] Youd, T.L., Hansen, C.M. and Bartlett, S.F., 2002, Revised Multilinear Regression Equations for Prediction of Lateral Spread Displacement, Journal of Geotechnical and Geoenvironmental Engineering, ASCE, December 2002, p. 1007-1017.

10.0 FOUNDATIONS

10.1 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.

Conventional strip and spread footings may be used to support the proposed structures 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 compacted.

10.2 Strip/Spread Footings

We recommend that conventional strip and spread foundations be constructed entirely on firm, undisturbed, uniform native soils (i.e. completely on gravel soils), or entirely on a minimum of 18 inches of properly placed, compacted, and tested structural fill extending to undisturbed native soils for structural loads up to 5,000 pounds per linear foot for bearing walls and up to 150,000 pounds for column loads. If loads exceed 5,000 pounds per linear foot for bearing walls, 150,000 pounds for column loads, please contact Earthtec for further recommendations. For foundation design we recommend the following:

- Footings founded on undisturbed native soils may be designed using a maximum allowable bearing capacity of 2,000 pounds per square foot. Footings founded on a minimum of 18 inches of structural fill extending to undisturbed native soil may be designed using a maximum allowable bearing capacity of 2,500 pounds per square foot. The values for vertical foundation pressure can be increased by one-third for wind and seismic conditions per Section 1806 when used with the Alternative Basic Load Combinations found in Section 1605.2 of the 2021 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 with at least 4 passes of an approved

non-vibratory roller prior to erection of forms or placement of structural fill to densify soils that may have been loosened during excavation and to identify soft spots. 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 fill placement or footing construction if fill is not required to evaluate whether suitable bearing soils have been exposed and whether excavation bottoms are free of loose or disturbed soils.
- In lieu of traditional structural fill, clean 1- to 2-inch clean gravel may be used in conjunction with a stabilization fabric, such as Mirafi 600X or equivalent, which should be placed between the native soils and the clean gravel (additional recommendations for placing clean gravel and stabilization fabric are given in Section 8.5 of this report).
- 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 is 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.

10.3 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 a seismic event due to ground shaking, if more than 3 feet of grading fill is placed above the existing ground surface, if loading conditions are greater than anticipated in Section 2, if any of the recommendations in Section 12 are not followed, and/or if foundation soils are allowed to become wetted.

10.4 Lateral Load Resistance

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 gravels, clean gravel, or structural fill meeting the recommendations presented herein. The values for lateral resistance can be increased by one-third for wind and seismic conditions per Section 1806 when used with the Alternative Basic Load Combinations found in Section 1605.3.2 of the 2021 International Building Code.

11.0 FLOOR SLABS AND FLATWORK

Concrete floor slabs and exterior flatwork may be supported on undisturbed native soils or on a minimum of 12 inches properly placed, compacted, and tested engineered fill or imported structural fill extending to undisturbed native soils after appropriate removals and grading as outlined in Sections 7.2 and 8.1 are completed. We recommend placing a minimum of 4 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 exterior flatwork, we recommend placing a minimum of 4 inches of road-base material. Prior to placing the free-draining fill or road-base materials, the native sub-grade 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 sub-grade reaction of 120 pounds per cubic inch. The thickness of slabs supported directly on the ground shall not be less than 3½ inches. A 6-mil polyethylene vapor retarder with joints lapped not less than 6 inches shall be placed between the ground surface and the concrete, as per Section 1907.1 of the 2021 International Building Code.

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.

12.0 DRAINAGE

12.1 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:

- The contractor should take precautions to prevent significant wetting of the soil at the base of the excavation. Such precautions may include: grading to prevent runoff from entering the excavation, excavating during normally dry times of the year, covering the base of the excavation if significant rain or snow is forecast, backfill at the earliest possible date, frame floors and/or the roof at the earliest possible date, other precautions that might become evident during construction.
- Adequate compaction of foundation wall backfill must 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 down spouts designed to discharge well outside of the backfill limits, or at least 10 feet from foundations, whichever is greater.

- Sprinkler nozzles should be aimed away, and all sprinkler components kept at least 5 feet, from foundation walls. A drip irrigation system may be utilized in landscaping areas within 10 feet of foundation walls to minimize water intrusion of foundation backfill. Also, sprinklers should not be placed at the top or on the face of slopes. Sprinkler systems should be designed with proper drainage and well maintained. Over-watering should be avoided.
- Any additional precautions which may become evident during construction.

12.2 Subsurface Drainage

Walls or portions thereof that retain earth and enclose interior spaces and floors below grade shall conform to Section 1805 of the 2021 International Building Code for damp proofing and water proofing.

13.0 PAVEMENT RECOMMENDATIONS

We understand that asphalt and concrete paved parking and drive areas will be constructed as part of the project. The native soils encountered beneath the fill during our field exploration were predominantly composed of gravels. We estimate that a California Bearing Ratio (CBR) value of 20 is appropriate for these soils. If the fill is left beneath concrete flatwork and pavement areas, increased maintenance costs over time should be anticipated.

We anticipate that the traffic volume will be about 300 vehicles per day (5.3 ESAL/day) or less for the parking and drive areas, consisting of mostly cars and pickup trucks, with daily utility trucks and a weekly garbage truck. Based on these traffic parameters, the estimated CBR given above, a 20-year life expectancy, and the procedures and typical design inputs outlined in the UDOT Pavement Design Manual (2008), we recommend the minimum asphalt pavement section presented below. The pavement section should meet the minimum values are required by the jurisdiction or the values below, whichever is greater.

Table 4: Pavement Section Recommendations

Asphalt Thickness (in)	Compacted Aggregate Base Thickness (in)	Compacted Subbase Thickness (in)
3	6*	0

* Stabilization may be required

If the pavement will be required to support excessive construction traffic (such as dump trucks hauling soil to raise or lower the site), more than an occasional semi-tractor or fire truck, or more traffic than listed above, our office should be notified so that we can re-evaluate the pavement section recommendations. The following also apply:

- The subgrade should be prepared by proof rolling to a firm, non-yielding surface, with any identified soft areas stabilized as discussed above in Section 8.5.
- Site grading fills below the pavements should meet structural fill composition and placement

recommendations per Sections 8.3 and 8.4 herein.

- Asphaltic concrete, aggregate base and sub-base material composition should meet local, APWA, or UDOT requirements. Gradation requirements and frequency shall be followed as required by local, APWA, or UDOT requirements, but not to exceed 500 tons.
- Aggregate base and sub-base is compacted to local, APWA, or UDOT requirements, or to at least 95 percent of maximum dry density (ASTM D 1557).
- The aggregate base shall have a CBR value to 70 percent or greater and the subbase shall have a CBR value of 10 percent or greater.
- Asphaltic concrete is compacted to local or UDOT requirements, or to at least 96 percent of the laboratory Marshall density (ASTM D 6927).

Due to high static loads imposed at dumpster locations, we recommend that a rigid pavement section for this area of a minimum of six (6) inches of Portland Cement Concrete (PCC) over a minimum of six (6) inches of aggregate base material. The aggregate base material should meet local, APWA or UDOT requirements and should be compacted to local, APWA, or UDOT requirements, or to at least 95 percent of maximum dry density (ASTM D1557).

14.0 GENERAL CONDITIONS

The exploratory data presented in this report was collected to provide geotechnical design recommendations for this project. The explorations 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 explorations may occur and which may be sufficient to require modifications in the design. If during construction, conditions are different than presented in this report, Earthtec should be advised immediately 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 warranty or representation is intended in our proposals, contracts, letters, or reports. Failure to consult with Earthtec regarding any changes made during design and/or construction of the project from those discussed herein relieves Earthtec from any liability arising from changed conditions at the site.

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 regarding any changes made during design and construction of the project from those discussed herein. Failure to consult with Earthtec regarding any such changes relieves Earthtec from any liability arising from changed conditions at the site.

To maintain continuity, Earthtec 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 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 also should be retained to provide observation and testing services during grading, excavation, foundation construction, and other earth-related construction phases of the project.

This report is valid until the legislative adoption of an updated IBC/IRC code. At that time, an update to this report will be required to validate the results. This report is for the exclusive use of the Client named on the title page of this report and may not be relied upon by any party other than the Client. Some or all of the information in this report may come into the possession of third parties. No such third parties shall have rights of recourse or action against EE, its officers, employees, vendors, successors, or assigns in the absence of a written agreement from EE granting such reliance to third parties. All general conditions within the signed proposal between Earthtec Engineering and the Client remain applicable to this report.

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.

Respectfully;

EARTHTEC ENGINEERING

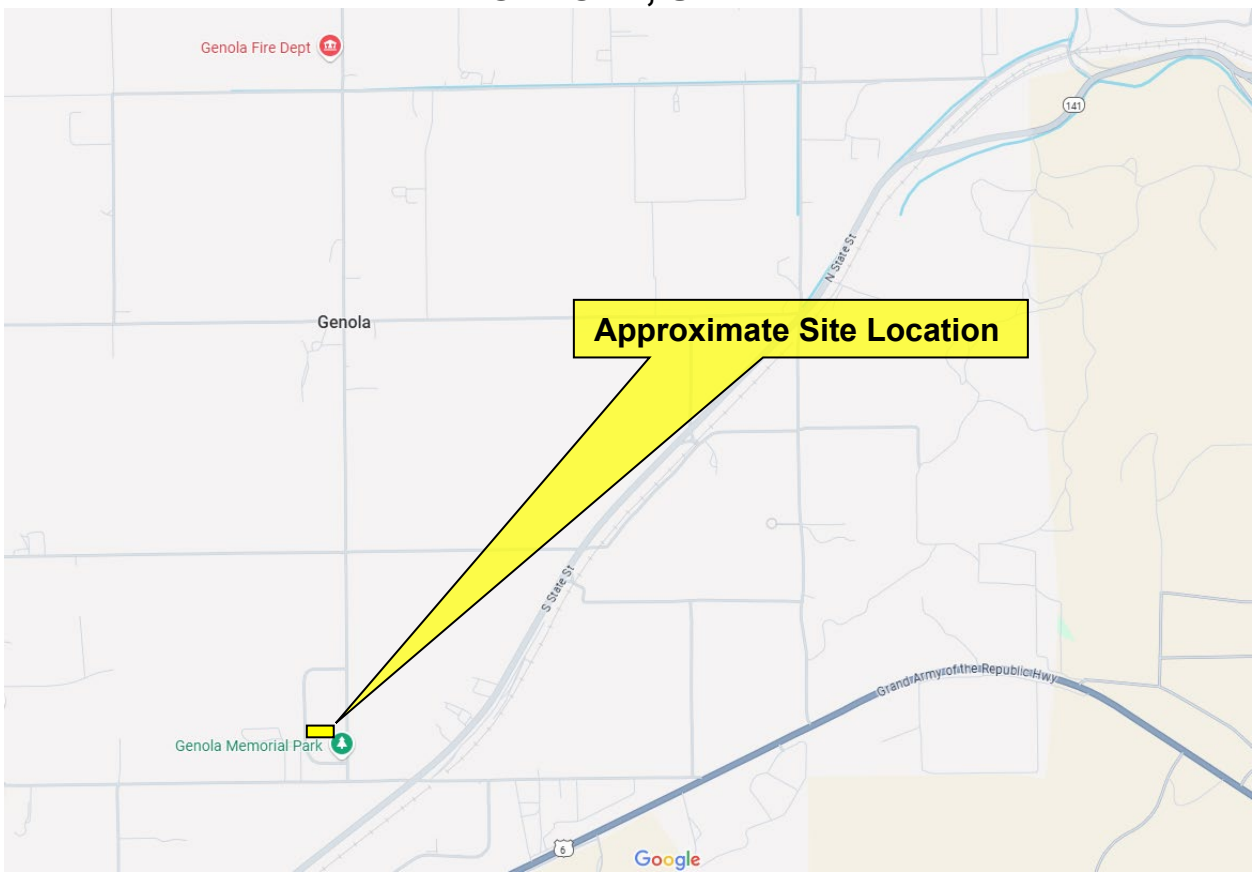
PROFESSIONAL ENGINEER
No. 5567049-2202
TIMOTHY ALLAN MITCHELL
Electronically generated on
08/25/2025
STATE OF UTAH

Michael S. Schedel, P.G.
Staff Geologist

Timothy A. Mitchell, P.E.
Vice President

VICINITY MAP

GENOLA PUBLIC WORKS BUILDING
APPROXIMATELY 700 SOUTH 200 WEST
GENOLA, UTAH



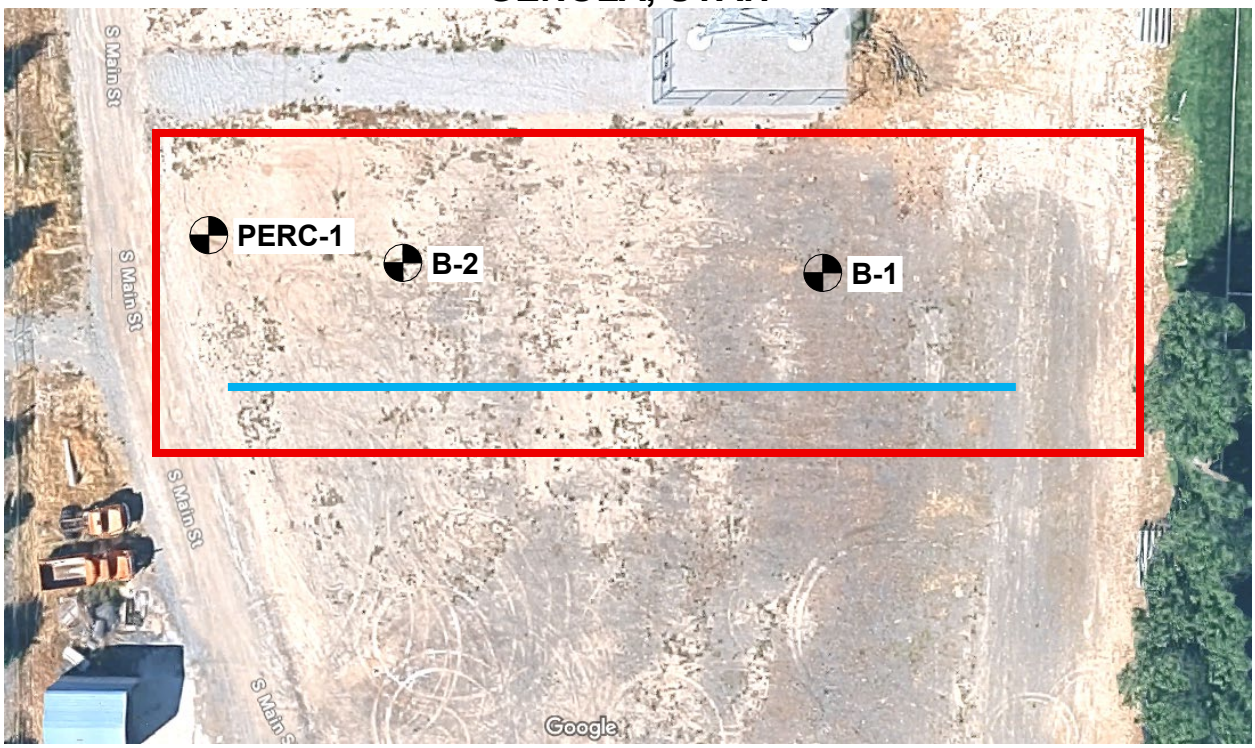
N

Not to Scale

PROJECT NO.: 250416G	EARTHTEC ENGINEERING	**FIGURE NO.:** 1

AERIAL PHOTOGRAPH SHOWING LOCATION OF BORINGS, REMI, AND PERCOLATION TEST

GENOLA PUBLIC WORKS BUILDING
APPROXIMATELY 700 SOUTH 200 WEST
GENOLA, UTAH



*Aerial Photograph from Google Maps

Approximate Boring Locations

Subject Site Area

Refraction MicroTremor Test Line

N

Not to Scale

PROJECT NO.: 250416G	EARTHTEC ENGINEERING	**FIGURE NO.:** 2

BORING LOG: B-1

PROJECT TITLE: Genola Public Works Building
CLIENT: WPA Architecture
LOCATION: See Figure No. 2
OPERATOR: Great Basin Drilling Inc.
EQUIPMENT: CME-55, 7" H.S.A.

LOGGED BY: M. Schedel
DATE: 2025-07-29
COORD.: 39.98324, -111.84425
ELEVATION:

No Groundwater Encountered

Depth	Sample Type	Graphic Log	Lithologic Description	USCS Soil Class	N-Value	Moisture (%)	Dry Density	Gravel (%)	Sand (%)	Fines (%)	Liquid Limit	Plastic Index	Other Tests
0–1			**FILL** ...gravel and crushed asphalt over silty gravel with sand, dry, light brown, organics										
2			**Clayey SAND with gravel** ...medium dense, moist, brown										
3–4	▽		**Silty GRAVEL with sand** ...medium dense, dry, light brown		39								SS
5–6	▽		...very dense, cobbles	GM	78	2		56	20	24	17	NP	
7–8	▽				50/5"								
9–11	▽			GM	88	2		49	39	12			
12–16	▽				60								
17–20													
20–21	▽		**Silty SAND with gravel** ...very dense, dry, light brown, cobbles	SM	52	4		38	46	16			
22			Boring Terminated at 21½ Feet										

PROJECT NO.: 250416G

EARTHTEC ENGINEERING
ENGINEERING • TESTING • INSPECTION

FIGURE NO.: 3

RSLog / Boring Log / earthtec-engineering / admin / August 05, 2025 11:58 AM

BORING LOG: B-2

PROJECT TITLE: Genola Public Works Building
CLIENT: WPA Architecture
LOCATION: See Figure No. 2
OPERATOR: Great Basin Drilling Inc.
EQUIPMENT: CME-55, 7" H.S.A.

LOGGED BY: M. Schedel
DATE: 2025-07-29
COORD.: 39.98327, -111.84459
ELEVATION:

No Groundwater Encountered

Depth	Sample Type	Graphic Log	Lithologic Description	USCS Soil Class	N-Value	Moisture (%)	Dry Density	Gravel (%)	Sand (%)	Fines (%)	Liquid Limit	Plastic Index	Other Tests
0–1			**FILL** ...gravel and crushed asphalt over silty gravel with sand, dry, light brown, sparse organics										
2–3	○		**Silty Clayey GRAVEL with sand** ...very dense, dry, light brown	GC-GM	70/5"	3	102	49	19	32	23	4	
5–6	▽		**Silty GRAVEL with sand** ...very dense, dry, light brown	GM	80	2		47	35	18			
8	▽				50/5"								
10–11	▽			GM	81	2		50	34	16			
13			...cobbles										
15–16	▽		...brown	GM	50/5"	3		46	37	17			
20	▽				50/5"								
25–26	▽			GM	97/11"	3		49	35	16			
30	▽		...slightly moist		50/5"								
33			Auger Refusal at 32½ due to Dense Gravels										

PROJECT NO.: 250416G

EARTHTEC ENGINEERING
ENGINEERING • TESTING • INSPECTION

FIGURE NO.: 4

RSLog / Boring Log / earthtec-engineering / admin / August 05, 2025 11:58 AM

LEGEND

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 Few Fines
			GP	Poorly Graded Gravel, May Contain Sand, Very Few 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 Few Fines
			SP	Poorly Graded Sand, May Contain Gravel, Very Few 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)
- ○ MODIFIED CALIFORNIA SAMPLER (2½ inch outside diamter)
- ■ BLOCK SAMPLE
- ● BAG/BULK SAMPLE

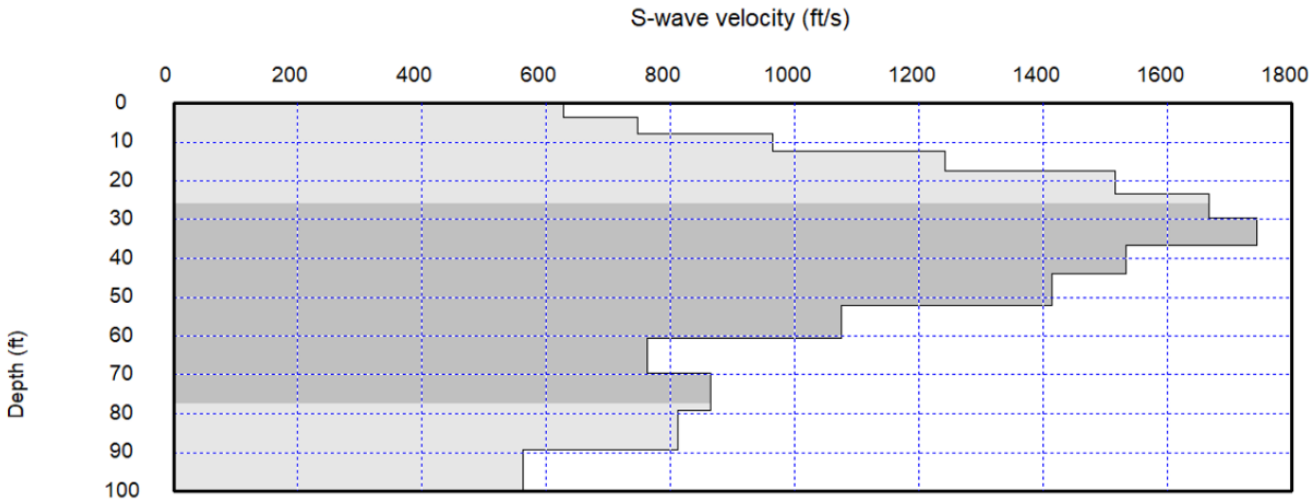
WATER SYMBOLS

- ▽ 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.

SHEAR WAVE VELOCITY PROFILE WITH SITE CLASS DETERMINATION



AVS = 954.3 ft/sec

Site Class = D

PROJECT NO.: 250416G	EARTHTEC ENGINEERING	**FIGURE NO.:** 6

APPENDIX A

Chemtech-Ford Laboratories

Serving the Intermountain West Since 1953

9632 South 500 West
Sandy, UT 84070
O:(801) 262-7299 F: (866) 792-0093
www.ChemtechFord.com

Certificate of Analysis

BGT Partners (dba Earthtec Engineering)
Jeremy Balleck
1497 West 40 South
Lindon, UT 84042

PO#: **250416G**
Receipt: **7/29/25 12:56 @ 23.6** °C
Date Reported: 8/1/2025
Project Name: **Genola Public Works Building**

Sample ID: **250416G B1 - 2.5'**

Matrix: **Solid**

Lab ID: **25G2437-01**

Date Sampled: **7/29/25 9:30**

Sampled By: **Michael Schedel**

	Result	Units	Minimum Reporting Limit	Method	Preparation Date/Time	Analysis Date/Time	Flag(s)
Inorganic							
Sulfate, Soluble (IC)	42	mg/kg dry	11	EPA 300.0	7/30/25	7/30/25	
Total Solids	91.9	%	0.1	CTF8000	7/30/25	7/30/25	

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Receipt: **7/29/25 12:56 @ 23.6** °C
Date Reported: 8/1/2025
Project Name: **Genola Public Works Building**

Report Footnotes

Abbreviations

ND = Not detected at the corresponding Minimum Reporting Limit (MRL).
1 mg/L = one milligram per liter or 1 mg/kg = one milligram per kilogram = 1 part per million.
1 ug/L = one microgram per liter or 1 ug/kg = one microgram per kilogram = 1 part per billion.
1 ng/L = one nanogram per liter or 1 ng/kg = one nanogram per kilogram = 1 part per trillion.
On calculated parameters, there may be a slight difference between summing the rounded values shown on the report vs the unrounded values used in the calculation.

Chemtech-Ford, Inc

Joyce Applegate, Project Manager

Analyses presented in this report were performed in accordance with the National Environmental Laboratory Accreditation Conference, unless otherwise noted.

CHAIN OF CUSTODY - SAMPLE SUBMITTAL FORM

COMPANY: BGT Partners (dba Earthtec Engineering
ADDRESS: 1497 W 40 S
CITY/STATE/ZIP: Lindon, UT. 84042
PHONE #: 801-225-5711
CONTACT: Jeremy Balleck Mike Schedel
EMAIL: jballeck@earthteceng.com mschedel@earthteceng.com
PROJECT: Genola Public Works Building
PO Number: 250416G
INVOICE EMAIL ADDRESS: cdavis@earthteceng.com

*RUSH Due Date
5-Day

* Additional fees may apply

QC Level

QC1: None sent to client
QC2: Batch QC, random sample
QC3: 25% surcharge. Narrative + QC client sample
QC4: 40% surcharge. QC3 + raw data

CHEMTECH-FORD LABORATORIES

Chemtech-Ford Laboratories
- Drop-Off Location -
1384 W 130 S
Orem, Ut. 84058
Phone: 801-229-2282

Sample Condition				Delivery Method		
	Custody Seals	✓	COC Complete		UPS	USPS
✓	Container Intact	✓	Sufficient Sample Volume		FedEx	Chemtech-Ford Courier
✓	COC/Labels Agree		Headspace Present (VOC)	✓	Walk-in	Customer Courier
	Received on Ice		Temperature Blank		Tracking Number:	
✓	Correct Containers	✓	Received within Holding Time			

25E2437

CLIENT SAMPLE INFORMATION

Lab Use Only	LOCATION / IDENTIFICATION	DATE	TIME	MATRIX	TESTS REQUESTED: Soluble Sulfate	BOTTLE LOT #S
-01	1. 250416G, B1-2.5'	7/29	0930	S	x	SI 1423
	2.					
	3.					
	4.					
	5.					
	6.					
	7.					
	8.					
	9.					
	10.					
	11					

Sampled by: [print] M. Schedel
Sampled by: [signature]

ON ICE NOT ON ICE Temp (C°): 23.6

Samples received outside the EPA recommended temperature range of 0-6 C° may be rejected.

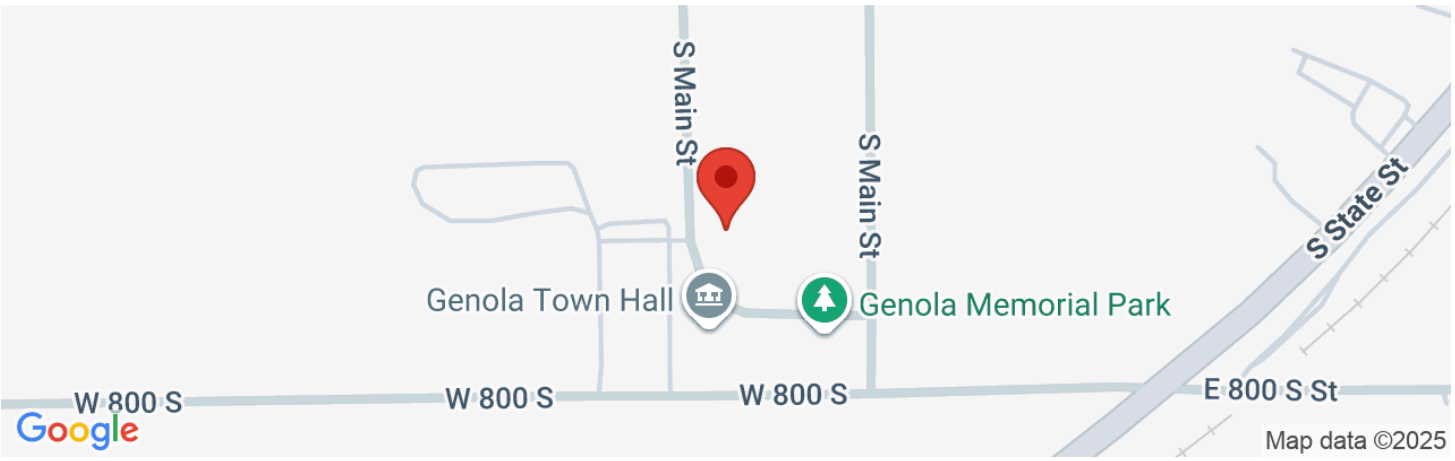
Special Instructions:

Relinquished by: [signature]	Date/Time 7/29-1256	Received by: [signature]	Date/Time 7.29.25 1256
Relinquished by: [signature]	Date/Time 7.29.25 1400	Received by: [signature]	Date/Time 7/29/25 1440
Relinquished by: [signature]	Date/Time	Received by: [signature]	Date/Time

Payment Terms are net 30 days OAC. 1.5% interest charge per month (18% per annum). Client agress to pay collection costs and attorney's fees.

Announcement
ASCE 7-22 is now available.

Latitude, Longitude: 39.98330536569583, -111.84451509744179



Date	8/21/2025, 2:07:06 PM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D

Type	Value	Description
S_S	1.611	MCE_R ground motion. (for 0.2 second period)
S_1	0.572	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.611	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	1.074	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.724	MCE_G peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	0.796	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	1.611	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.874	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	2.989	Factored deterministic acceleration value. (0.2 second)
S1RT	0.572	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.666	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	1.119	Factored deterministic acceleration value. (1.0 second)
PGAd	1.197	Factored deterministic acceleration value. (Peak Ground Acceleration)
PGA_{UH}	0.724	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C_{RS}	0.86	Mapped value of the risk coefficient at short periods

Type	Value	Description
C_{R1}	0.859	Mapped value of the risk coefficient at a period of 1 s
C_V	1.422	Vertical coefficient

DISCLAIMER

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